COMBINED AQUATICS STUDY PLANS

CAWG-2-GEOMORPHOLOGY

PAGE

1.0 EXECUTIVE SUMMARY

Sediment supply in the Project area watershed is primarily from three sources: (1) debris flows in the steep-gradient headwater channels that are tributary to the mainstem rivers; (2) rockfalls in exposed jointed bedrock along the inner gorges of the San Joaquin River (SJR), the lower-half of the South Fork San Joaquin River (SFSJR) (River Mile (RM) 0.0 to 14), and along portions of Big Creek; and (3) sheetwash erosion that delivers sand which is widespread throughout the watershed. Other hillslope erosion processes including gullies, rills, and landslides were rarely observed in the watershed, although there are well-forested areas along many non-project streams that could not be inspected during aerial reconnaissance where some of these sediment production processes may be operative. It was noted during the aerial reconnaissance that the mainstem SJR upstream from the confluence with the South Fork, transports sand and gravels (GIS Map 3, Data Set 2, Figure CAWG-2-6c, and Section 5.3.3 In-Channel Sediment Storage and Sand and Gravel Accumulation).

Bank erosion is not a significant sediment production process on project affected streams, and the vast majority of streams are laterally stable. Project affected streams were characterized as having either erodible or non-erodible streambanks. Non-erodible streambanks comprise approximately 77% (71.2 miles) of the total channel length surveyed downstream of project facilities. Locations of erodible and non-erodible streambanks are mapped. The largest area of potentially erodible streambanks (i.e., does not necessarily mean that streambanks are actively eroding) is along most sections of the SFSJR downstream from Florence Lake, between RM 14 and 27.7. Locations of lateral stream instability are mapped. Most of these unstable locations are associated with channels that cross alluvial debris fans, including Hooper, North and South Slide, Tombstone, Chinquapin, and Bolsillo Creeks. Lateral instability on these channels is expressed as channel avulsion and the formation of multiple channels, and probably occurs episodically whenever there is a debris flow. Lateral instability is also indicated for a section of North Fork Stevenson Creek (RM 1.8 to 2.4), in a reach that appears to have aggraded due to excess sediment supply (GIS Maps, Data Set 1 Map 1 Figure CAWG-2-3a, Data Set 2, Map 1 Figure CAWG-2-6a, Section 5.2.3, and Section 5.3.3 In-Channel Sediment Storage and Sand and Gravel Accumulation).

Gravel sources are predominantly from those basins that contain a large proportion of glacial till. These areas have been previously mapped by the California Division of Mines and Geology, and this mapping was supplemented by observations of glacial till locations during the aerial surveys. Glacial till locations are presented in the Geology Section of this report. The total area of glacial till in the SJR basin upstream from Kerckhoff Lake represents approximately 9% of the total lithology. Project tributaries to the SFSJR below Florence Lake proportionally contain the largest areas of glacial till, typically 40% or more of their respective drainage areas. In terms of absolute area, Mono Creek upstream from the Mono Creek diversion and Big Creek upstream from

Huntington Lake encompass the largest glacial-till areas. Most of the glacial till areas drain to Huntington Lake, Edison Lake, and the Mono Creek diversion.

Lower gradient, poorly entrenched and unconfined channels (for example, C and E channel types) present the best opportunity for deposition of gravel bars. These channel types also provide suitable deposition sites for sand bars. The more moderately entrenched or moderate gradient channels (B and G channel types) tend to have cobble and boulder bars mixed with gravels, or poorly-sorted, gravels scattered on the bed. These channel types can also express well-sorted gravel deposits in smaller areas such as the velocity shadows created by boulders and bedrock outcrops. Higher gradient channels and bedrock channels (A1a, A1a+) tend to have few, scattered gravel deposits in pools or no deposits at all due to their high transport capacity.

Streams that drain proportionately large areas of glacial till within their basins but have channel morphologies that generate high transport capacities, tend to have scattered, poorly sorted gravel “deposits”, that are typically mixed with a wide range of other particle sizes. North Slide, South Slide, Hooper, Bolsillo, Camp 62, and Chinquapin all have greater than 40% of their basins draining glacial till, but gravel deposits are not found as well-sorted accumulations, probably due to their relatively steep-gradients and entrenched morphology. Gravels were also observed to accumulate as bars or other well-sorted deposits in drainage basins that have relatively smaller amounts of glacial till, but have suitable deposition locations (ie, lower gradient and moderately entrenched morphology). Pitman Creek immediately upstream of the diversion is a good example of a short (approximately 1,000-ft long), but flat-gradient locale where well-sorted gravel deposits occur. Just upstream from these gravel deposits is a steeper, bedrock controlled reach with very few, and scattered gravel deposits. About 16% of the Pitman Creek drainage basin is comprised of glacial till. A description of the transport capacity of stream channels is provided in Section 5.3.4, Conceptual Framework for Sediment Transport.

In-channel sediment storage is discussed in Section 5.3.3 and locations of sediment storage are mapped. Of all the sand and gravel deposition sites, the following locations are considered to be the most likely to represent an “excessive” condition and are the most extensive in area. It is cautioned that even from this list there may be sites only responding to a natural, episodic cycle of sediment input and transport.

Mono Creek

- Sand deposits at 2 sites (RM 2.3 to 2.8 and RM 3.6 to 3.8)

<u>San Joaquin River</u>

- Sand accumulation immediately below the Willow Creek confluence
- Sand accumulation at the Shakeflat Creek confluence (RM 25.3 to 25.6)

- Sand accumulation in pools between Dam 6 and Redinger Lake (RM 12.6 to 13.0 and RM 15.2 to15.6)

- Coarse sediment accumulation (mostly boulders) between Dam 6 and Powerhouse 3

- Coarse sediment accumulation (mostly boulders and cobble) between Rock and Ross Creek

North Fork Stevenson Creek

- Gravel, cobble, and sand accumulations in the C3 and B3 classified reaches (RM 1.8 to 2.4)

Stevenson Creek

- Sand accumulation immediately below Shaver Dam (RM 3.8 to 4.2)

Big Creek

- Sand accumulation in locations upstream from Kerckhoff Dome (RM 8.0 to 10.0)

South Fork San Joaquin River

- Sand and gravel accumulation in the low-gradient channel section along Jackass Meadow (RM 26.2 to 27.7)

Identifying “excessive” erosion and scour presents the same difficulties as defining “excessive” build-up of fine sediments. The following list identifies the most obvious and extensive locations of potentially excessive erosion and scour identified during the qualitative field study:

Stevenson Creek

- Channel incision immediately below Shaver Dam (RM 3.8 to 4.2)

North Fork Stevenson Creek

- Channel incision and widening immediately below Tunnel 7 outlet (RM 3.45 to 3.55)

- Bank erosion in the gravel, cobble, and sand accumulated C3 and B3 classified reaches (RM 1.8 to 2.4)

Deposition of material at tributary junctions was investigated for all project and many non-project streams in the watershed. Very few tributary deposit locations were identified, the most notable of which were the Shakeflat and Willow Creek confluences on the SJR. Both locations are also listed above as sand accumulation sites.

A conceptual framework describing sediment transport through the SJR channel network is provided based on channel bed morphology. Bed morphology is in part formed by and linked to sediment supply and sediment transport characteristics. Project streams are organized into source, transport and response segments that generally define their relative capacity to transport and store sediments at the reach scale.

In general, the steep-gradient, headwater streams tributary to the higher-order mainstem channels (Big Creek, SFSJR, and SJR) are intimately connected to hillslope sediment production processes. Sediment supply from the steep tributary channels collects in the headwater areas, and is episodically conveyed by debris flows. Some of the sediment supply is stored on alluvial fans or the valley floodplain, and must be transported by streambank erosion processes before entering the mainstem streams.

The Hooper and Chinquapin diversions interrupt transport and subsequent storage of sediment from debris flow processes, reducing at least the coarse material load naturally delivered to the alluvial fan. However, a recent (1997) debris flow destroyed the Chinquapin diversion facility, and the sediment supply from that event has clearly deposited at the site of the old diversion, which has subsequently been rebuilt about ¼ mile upstream. Since Tombstone, North and South Slide, and Adit 8 are inoperable they do not alter the transport of sediments. These four facilities are not currently diverting flow and therefore, do not alter the natural flow regime, and additionally, they are not collecting sediments since they have no sediment storage capacity behind their diversions. The other smaller diversion facilities on the tributaries to the SFSJR, Big Creek, and SJR including Crater Creek, Camp 62, Bolsillo, Balsam, Ely, Ross, and Rock Creeks, all have relatively small sediment storage capacities and smaller diversion dams than either Hooper or Chinquapin. The high gradient tributaries are predominantly step-pool, cascade, and bedrock channel types that are defined as transport channels. Coarse sediment tends to be stable in these channel types except for infrequent large flood flows. Fine sediment is more regularly transported over the stable, large bed elements by frequently occurring annual floods. The mainstem channels also collect coarse sediment (mostly boulders) derived from rockfalls along bedrock valley walls of their inner gorges. Much of the coarse boulder material can be moved only in the largest floods, or may not ever be transported.

A considerable portion of the mainstem SJR between Mammoth Pool and Redinger Lake is designated as a response type channel; plane-bed and pool-riffle channel morphology (Section 5.2.7 Montgomery-Buffington). The response channel type is typically a transport-limited stream (i.e. sediment supply exceeds the transport capacity), and therefore tends to store sediments. In addition, the large rockfalls which are not fluvially transported sediments, accumulate in long-term storage. This portion of the SJR is significantly confined by bedrock valley walls which is relatively unusual for plane-bed and pool-riffle channel types. The highly confined morphology increases shear stress and therefore sediment transport capacity relative to an unconfined channel, and restricts channel responsiveness to alterations of the flow or sediment regime (ie, channel dimensions and planform are resistant to alteration). Tributary channels to the SJR, including Ross and Rock Creeks are transport reaches, indicative of a bedrock channel morphology. These tributaries are supply-limited, having a much greater transport capacity than sediment supply.

The lower-half of the SFSJR is designated a transport reach (step-pool and plane-bed morphology), and similar to the SJR, is highly confined by bedrock valley walls. The upper-half of the SFSJR (from approximately Rattlesnake Crossing to Florence Lake) is a response type reach (plane-bed and pool-riffle channel morphology), but is unconfined by valley walls and has banks that could be erodible. Big Creek, except for a one-mile segment below Huntington Lake, is a steep-gradient transport reach (bedrock channel morphology), indicative of the supply-limited streams. The one mile long segment below Huntington Lake is a classified as a response reach, and there are indicators that this portion of the channel has aggraded and narrowed. Pitman Creek is also a bedrock type transport channel. Most of Stevenson Creek and North Fork Stevenson Creek is also a transport reach; bedrock, cascade, or step-pool morphology (Section 5.2.7 Montgomery-Buffington).

Large woody debris (LWD) accumulations were identified and mapped. Generally, more woody debris was observed on the well-forested, narrow, and steep-gradient tributary channels to the SFSJR and tributaries to Big Creek than at other project stream locations. Mono Creek was observed to have more extensive areas with accumulations of LWD than all other project streams.

LWD had no geomorphic function in the larger streams with large roughness elements, for example on the San Joaquin River and South Fork San Joaquin River (Section 5.2.6 Large Woody Debris). In-channel LWD was often observed lying over the top of boulders and did not appear to interact with stream flow. In moderate to steep gradient streams with boulder and bedrock substrates LWD had little opportunity to influence channel morphology. In those instances when a geomorphic function was observed, it was typically related to facilitating storage of fine sediments behind debris jams or creating dammed pools. LWD was identified collecting at the Bear Creek and Mono Creek diversions, and at the inlet to Mammoth Pool.

Several potential floodplain areas were identified and mapped, and their observed connectivity to the channel was characterized whenever possible. Further hydrologic data and analysis is necessary in order to better estimate how floodplain connectivity (i.e., frequency and extent of overbank flows) may be influenced by project diversions. Most of the project channels do not have a floodplain (as defined by criteria in this study), because they are highly entrenched channels, that is A, and G channel types that by definition do not have floodplains. Some of the B-channel types have, and others do not have, a floodplain (Section 5.2.4 Floodplain Connectivity).

Streams with segments that have potential floodplain areas include:

- North Fork Stevenson Creek (RM 1.7 to 2.4)
- Stevenson Creek (RM 3.9 to 4.3)

- Big Creek (RM 8.3 to 8.6)
- SFSJR (RM 14.0 to 24.1 and RM 26.1 to 27.7)
- Crater Creek (RM 0.0 to 0.7)
- Tombstone Creek (RM 0.0 to 0.5)
- Mono Creek (RM 2.3 to 2.8, and RM 3.5 to 3.7)

Riparian vegetation within and along the margins of the bankfull channel was catalogued, identifying those areas considered to be potentially encroached. Given that the 2002 field surveys were qualitative in nature, for purposes of this study encroachment is referred to as potential encroachment. Designations of potential encroachment, at this time, are not definitive statements of an encroached condition.

Potential channel encroachment by riparian vegetation was classified into one of two primary groups: 1) dense and continuous; and 2) limited and discontinuous. The two groups encompass the widely differing extent of potential encroachment conditions observed in the field. Locations identified as dense and continuous riparian encroachment are listed below. There were several areas identified under the limited and discontinuous encroachment category, notably on the SFSJR below Florence Lake, a portion of Big Creek, and a portion of Mono Creek, as well as a few other scattered locations. Both categories of potential riparian encroachment are depicted on maps in this report. The appearance of vegetation extensively colonizing infrequent and widely spaced bars, or mature riparian vegetation growing on colluvial deposits at the toe of a steep gradient hillslope within the estimated historic bankfull elevation, or a discontinuous "band" of vegetation within the estimated historic bankfull elevation growing along the channel margin, were all identified as potentially encroached conditions in this report. Photographs are provided in the Potential Riparian Encroachment section depicting both categories of encroachment as recognized in this study.

<u>Locations of Dense and Continuous Potential Encroachment</u>

- Stevenson Creek below Shaver Dam, there is a 0.4 mile reach (RM 3.9 to 4.3)
- Big Creek, immediately downstream of Huntington Lake (RM 8.0 to 9.6)
- Mono Creek from RM 1.35 to 4.05
- Bolsillo Creek immediately downstream from diversion (RM 1.47 to 1.57)

Channel geomorphic classifications based on Rosgen and on Montgomery-Buffington were performed for all project streams (Sections 5.2.6 and 5.2.7, respectively), and are presented as maps in this report (Figures CAWG-2-3a, 3b, 3c, 3d, CAWG-2-8a, 8b, 8c, and 8d). These geomorphic classification systems were used to describe channel morphology (Section 5.2 Channel Morphology), develop the conceptual framework for sediment supply and sediment transport in the watershed (Section 5.3.4 Conceptual Framework for Sediment Transport), to identify sensitive channel types (Section 5.2.8 Sensitive Channel Types) and describe the probable range of channel responses to project operations (Section 5.2.8).

The following channel types and the total project stream miles associated with each channel type that are most responsive to project operations, include:

- Pool-riffle (7.6 miles)
- Plane-bed/pool-riffle (15.8 miles)
- Plane-bed (11.9 miles)

Using the Montgomery-Buffington classification and criteria for sensitive channel types, which is the most conservative approach (i.e., most inclusive of responsive channel types compared with the Rosgen classification), a total of approximately 35 miles of project streams (39%) are recognized as potentially sensitive to project operations. The sensitive plane-bed and pool-riffle channel types are mapped in this report as part of the Montgomery-Buffington classification. The majority of project streams (61%) are not considered to be channel types particularly responsive to changes in the flow or sediment regime. The Montgomery-Buffington classification system can be used to predict reach-scale channel responses to changes in the flow or sediment regime, although the predictive capability of the classification system does have limitations, including addressing the magnitude of changes at a smaller, habitat-unit scale.

The majority of the potentially sensitive channel types are located on the SJR between Redinger Lake and Mammoth Pool (16.8 miles) and SFSJR between Florence Lake and Rattlesnake Crossing (10.8 miles), in addition to a few shorter reaches of Big Creek and Mono Creek. Almost all of the SJR sensitive channel reach is highly confined by steep valley, mostly non-erodible bedrock walls. Channel confinement exerts an important control on potential channel response, as channels with wide floodplains (i.e. poorly confined) may laterally shift, change their sinuosity or planform in response to disturbance (Montgomery and MacDonald 2002) and highly confined channels can have only a limited response, reducing their sensitivity to alterations of the flow and sediment regime (Montgomery and MacDonald 2002; and Montgomery and Buffington,1997). The most likely response of the highly confined sensitive channel reach in the SJR is a change in particle size or sediment storage.

A less conservative approach to identifying sensitive channels, based in part on the Rosgen classification and study results from other fluvial geomorphologists, identify the following channel types and their respective total lengths, as sensitive:

- B3, B4, B5 (8.5 miles)
- C3, C4, C5 (2.9 miles)

- DA (accounted for under the E5/DA5 channel type)
- E3, E4, E5 (.9 miles)
- G3, G4, G5 (2.5 miles)

The C and E channel types listed above are found primarily on the SFSJR at Mono Hot Springs, the lowermost 0.5 mile Crater Creek and 0.5 mile of Tombstone Creek near the confluence with the SFSJR, and a section of North Fork Stevenson Creek upstream from the Eastwood Powerhouse. The B3, B4, and B5 channel types are found on several project streams, including SFSJR between Florence Lake and Rattlesnake crossing, on Mono Creek downstream of Mono Meadow, Big Creek between Kerkhoff Dome and Huntington Lake, North Fork Stevenson upstream from Eastwood Powerhouse, and Stevenson Creek immediately below Shaver Lake. In addition, there are numerous shorter channel segments (less than 1,000 ft lengths) of B channel types on the tributary channels to Big Creek and to the SFSJR that are found between steeper gradient A-type channel segments. The G3, G4, G5 channel types are predominantly found in the lowermost reach of the SJR, just downstream of Redinger Lake.

Using this approach, there is approximately 14.8 miles of sensitive project channels. All of the sensitive channels based on Rosgen classification are included within the Montgomery-Buffington classification.

2.0 STUDY OBJECTIVES

The objective of the CAWG-2 study is to determine the effect of flows on the geomorphology of Project-affected streams and impoundments. The CAWG-2 study plan includes the following objectives:

- Determination of sediment conditions and sediment transport requirements;
- Evaluation of sediment sources (including tributaries) and conditions;
- Identification and mapping of major sediment deposits;
- Evaluation of stream channel stability;
- Comparison of unimpaired and Project-affected sediment regimes;
- Evaluation of the timing, magnitude, and duration of unimpaired and Project-affected flows in relation to geomorphic effects;
- Quantification and characterization of sediment volume and grain size variation in Project reservoirs and impoundments;
- Characterization of the effects of existing sediment management actions and Large Woody Debris (LWD) management;

- Determination of whether the presence and amount of woody debris in Project-affected reaches is within the range of natural variability;
- Determination of the functionality of riparian habitat;
- Determination of the effects of potential PM&Es on fluvial geomorphology; and
- Determination of the effect of the Project on fluvial geomorphological features.

3.0 STUDY IMPLEMENTATION

This section describes the CAWG-2 Study Plan elements completed during 2002 and identifies the outstanding study elements to be completed in 2003. The study plan is divided into six sequential steps with specific information to be collected and evaluated during each step. This section is organized to follow each step and describe the elements completed or outstanding for each step.

3.1 STUDY ELEMENTS COMPLETED

A description of the CAWG-2 Study Plan elements that were completed during 2002 is provided below and summarized in Table CAWG-2-1.

Step 1: Review and Analyze Existing Data

- Reviewed existing information and developed a conceptual framework for the sediment transport regime within the Big Creek system. The methods utilized in this step are described in Section 4.1 and the information obtained is incorporated into the discussion of the sediment supply and transport characteristics presented in Section 5.3.
- Reviewed existing aerial photography and maps. The methods utilized in this step are described in Section 4.1 and the information obtained was used in conjunction with the data collected during the aerial and ground reconnaissance surveys to describe the watershed characteristics and channel morphology as presented in Sections 5.1 and 5.2, respectively.
- Developed Rosgen (1996) Level I classification for project streams. The methods utilized in this step are described in Section 4.1 and the information obtained was used in conjunction with the data collected during the aerial and ground reconnaissance surveys to describe the channel morphology as presented in Section 5.2.

Step 2: Qualitative Reconnaissance Field Survey of the Study Area

- Developed field data sheets that were submitted and approved by the Combined Aquatic Working Group (CAWG) in June 2002.

- Conducted aerial and ground reconnaissance surveys to describe existing geomorphic and sediment conditions and characterize parameters useful in assessing the effects of Project-flow regimes on the streams' ability to maintain dynamically stable, functional channels. The methods utilized in this step are described in Sections 4.2 and 4.3 and the information obtained was used to describe the channel morphology as presented in Section 5.2.

- Mapped floodplain and wetland areas, including abandoned floodplains (terraces) in all Project-affected reaches. The methods utilized in this step are described in Sections 4.2 and 4.3 and the information obtained was used to describe the channel morphology as presented in Section 5.2.

- Transferred and stored data in GIS format.

- Documented ground reconnaissance surveys with photographs. A compilation of the photographs collected during the surveys is provided in Appendix A.

- Evaluated potential reference areas in adjacent tributaries and sub-basins during the Rosgen Level I analysis described in the Watershed and Reach-Scale Characteristics section. The results of this evaluation were distributed in digital format to the CAWG in June 2002 (*SCE Big Creek ALP Level I Geomorphic Classification and Candidate Reach Assessment, June 2002*). The Level I analysis results are presented in Appendix B of this report.

• Step 3: Data Synthesis and Interpretation for Presentation to the CAWG

- Describe the overall sediment transport regime in the relicensing basin, and within each Project-related stream and reservoir. The sediment transport regime is described in Section 5.3 of this report. This description will be updated to include information related to SCE sediment maintenance practices at project facilities following the completion of the quantitative studies in 2003.

- Use field data and observations in conjunction with existing information on geology, soils, hydrology, and Project operations to evaluate the balance between sediment input to the channels, and their capacity to transport this sediment at current flows. A description of the sediment supply and sediment transport characteristics is provided in Section 5.3 of this report. This description will be updated based on the results of the hydrologic analysis and road assessment following completion of the quantitative studies in 2003.

- Use field channel morphology data and hydrological analyses (Step 1) in conjunction with information on riparian vegetation, floodplains and wetlands, to assess the relationship of in-channel and overbank flow frequency, magnitude, and duration. A description of floodplain/terrace connectivity is provided in Section 5.2.3 of this report and a discussion of riparian encroachment is provided in Section 5.2.4 of this report. These descriptions will be updated following the completion of the quantitative studies in 2003.

- Describe the type, quality, and limitations of available reference conditions for all project-affected reaches. This information was provided in digital format to the CAWG in June 2002 (*SCE Big Creek ALP Level I Geomorphic Classification and Candidate Reach Assessment, June 2002*). The Level I analysis results are presented in Appendix B of this report.

3.2 OUTSTANDING STUDY ELEMENTS

A description of the CAWG-2 Study Plan elements that remain to be implemented in 2003 is provided below and summarized in Table CAWG-2-1.

Step 1: Review and Analyze Existing Data

- A determination of the timing, magnitude, and duration of geomorphically-significant and riparian/floodplain flows by analyzing hydrologic records and performing flood-frequency analyses (Leopold, et al., 1964).

- Additional review of ground and aerial photographs to specifically include historic photos of Florence Lake.

Step 2: Qualitative Reconnaissance Field Survey of the Study Area

- An evaluation of the potential for sediment delivery to the channel from upslope roads, based on the approach of Weaver and Hagans (1994), or similar USFS method.

- Additional analysis of potential delivery of sediment from tailings/spoils piles associated with the project.

Step 3: Data Synthesis and Interpretation for Presentation to the CAWG

- An assessment of the relationship of in-channel and overbank flow frequency, magnitude, and duration using field channel morphology data and hydrological analyses (Step 1) in conjunction with information on riparian vegetation, floodplains and wetlands.

- Evaluation of shoreline erosion in Project reservoirs.

- For reservoirs and impoundments, the following will be described in the field: 1) location and estimated volume of visible sediment deposits; and, 2) effects of wave erosion on turbidity. In addition, project operations data regarding reservoir sediment and woody debris management methods and history will be collected and reviewed.

- A conceptual sediment budget will be developed for the streams and reservoirs of the Licensing Basin based upon the results of Steps 1 and 2. The budget will identify locations, types, and relative magnitudes of sediment sources, and describe the location, volume, and trapping status of sediment traps (reservoirs and other impoundments). The budget will help identify areas subject to Project-related effects in the next steps, compared to the natural conditions that would be expected in the absence of the project.

Step 4: CAWG Determines which Impacted Areas and Appropriate Reference Locations are to be Studied Further

- From the results summarized in Step 3, the selection of sites in project-affected streams for quantitative study by the CAWG.

- If necessary, nearby unregulated streams will be identified as channel reference locations, in collaboration with the CAWG. The CAWG will determine additional survey requirements to supplement the initial reconnaissance level surveys performed in Step 2. Additional studies will be conducted at these locations during Step 5, and the data collected will be shared with the CAWG. Selection of final reference locations for quantitative analysis will be conducted in coordination with the CAWG.

Step 5: Quantitative Study of Impacted Areas and Associated Reference Sites

- The installation of study [SCE] transects. The CAWG will determine the location of temporary and monumented transects. Within these sites, a survey of the following:

  - bed elevation profiles and cross sections;

  - substrate material including embeddedness;

  - bankfull channel elevation adjacent to gaging stations (if suitable indicators are present); and

  - assessment of floodplain connectivity, where applicable.

- Collection of data elements outlined in the USFS Stream Condition Inventory (SCI) protocol at sites selected by the CAWG not already conducted during initial field surveys (Step 2).

- Collection of data elements outlined in the Proper Functioning Condition (PFC) protocol at sites selected by the CAWG not already conducted during initial surveys (Step 2).

- Comparison of data in project-affected reaches to similar data collected in reference reaches to assess the magnitude of project impact.

- Using existing and, if necessary, additional measurements of sediment accumulation, including woody debris, in reservoirs, and ongoing monitoring of the effects of SCE's sediment management practices to characterize: (1) watershed sedimentation rates; and (2) potential effects of Project operation and maintenance over time on downstream reaches.

- Quantification of woody debris in sensitive stream reaches following SCI protocol.

- For all identified transects, detailed field measurements will include surveying the channel profile into the floodplain and abandoned floodplain (if present), identification of bankfull elevation, water surface slope, and the wetted perimeter at the time of measurement. Substrate material will also be documented (Wolman pebble count and laboratory grain size analysis), and bank slope would be recorded for alluvial sections. An assessment of out-of-channel flow requirements for riparian vegetation/floodplain landforms will be completed at CAWG approved transect locations. In addition, measurements of channel dimensions, indicators of sediment accumulation (V* or other sediment accumulation indicator), quantitative analysis of flows required to initiate motion (Shields criterion), and quantitative comparison of sediment supply and transport capacity (expressed in tons/day or equivalent) will be analyzed at each site.

- Reservoir bathymetry from the CAWG-1 study will be compared to previous bathymetry, when available, and pre-reservoir topography. In addition to volume comparison, reservoir profiles will be evaluated to locate areas of sediment deposition, if any. Where possible, the type and character of these sediment deposits will be assessed visually when the reservoirs are drawn down during the late fall and early winter months.

Step 6: Data Synthesis of Step 5 and Recommendations to CAWG

- The approach and methodologies used to complete the study will be described and presented to the CAWG.

- The geomorphology data obtained from the project reaches will be compared to reference conditions to identify any differences in the stream channel geomorphology.

- Differences identified between project reaches and reference conditions will be evaluated to determine their geomorphological significance and whether they are attributable to project operations.

- Of the areas surveyed in Step 5, determine which impacts are considered adverse and, of those, which can be attributed to Project operations. The hydrologic and field-based determination of geomorphically-significant flows, conducted in Steps 1, 2, and 5, will be used as part of this assessment of degree of impact by Project operations.

- The CAWG will determine whether additional quantitative analysis is needed to supplement the studies conducted in Step 5.

4.0 STUDY METHODOLOGY

4.1 REVIEW AND ANALYZE EXISTING DATA

The review and analysis of existing data included:

Consideration of topographic map data and aerial photography suitable for developing a Level I (Rosgen) channel classification.

Identifying candidate reference stream reaches.

Review of existing topographic map data and aerial photography information to assist with understanding channel stability and developing a conceptual framework for characterizing the sediment transport regime of the Big Creek project area.

4.1.1 WATERSHED AND REACH-SCALE CHARACTERISTICS

Watershed and reach-scale geomorphic characteristics were compiled for streams in the Project Area. Characterization of watershed and reach scale geomorphic conditions fulfills three purposes: (1) provides input for Level I and Level 1.5 classification (Rosgen 1996) of project-affected streams; (2) provides geomorphic information for identifying stream reaches sensitive to project operations; and (3) identifies potential candidate reference reaches that may later be selected for comparison to project streams to assist with characterizing and quantifying project influences. The Level 1.5 field ground survey classification methods are described in the Ground Reconnaissance Surveys section.

The watershed and reach-scale[1] characteristics were determined utilizing a combination of 7.5-minute USGS topographic maps, geologic maps and relevant reports, recent aerial photography, and 10-meter resolution Digital Elevation Models (DEMs) in GIS format. In addition to these sources of information, data previously collected by ENTRIX characterizing fish habitat (CAWG-1) was reviewed and compiled at the reach scale. The fish habitat data reviewed included bed particle size characteristics and locations of spawning gravel deposits.

The EMERGE aerial photography was used to assist with the Level 1 Rosgen classifications which were provided in June 2002 to the CAWG on CD. The photography provided information on channel planform and width characteristics in

[1] Reach-scale defined as being a length of channel 10 to 100 times the bankfull width

those areas that did not have a dense canopy cover. The EMERGE photography was also reviewed to assist with identifying locations of large scale sediment sources, primarily landslides. In addition to the recent aerial photography, historical aerial photographs dating from the early 1940's were obtained for a small section of the SJR in the vicinity of Mammoth Pool. The photographs were obtained at various scales to determine the feasibility of using such photography to evaluate changes in channel morphology. Due to the very high cost of purchasing the photography at a useful enlargement scale, it was decided to use the historical photography to focus on specific questions related to quantitative assessments, as may be deemed useful. Helicopter and ground surveys were used rather than aerial photography to identify relative stability of the channel and to provide additional information on the location of sediment sources.

Project streams were stationed in increments of 0.1 miles using GIS to establish a standardized spatial reference. For each stream, river stationing begins at the confluence (River Mile 0.0) with the next higher order channel and extends upstream to the limit of the digitized stream segment. Stream segments were stationed to at least 0.5 mile above project diversion facilities. River stationing was extended through project reservoirs, to maintain continuous river stationing sequence.

Watershed and stream characteristics, compiled included:

- stream order
- drainage area
- basin elevation
- aspect
- hillslope gradient classification
- geology

The primary watershed parameters developed for the Level I classification included channel slope and valley width since parameters such as entrenchment ratio, and width-depth ratio cannot be directly derived from the typical map and DEM data. Valley width was used as a proxy for entrenchment, since wider valley areas tend to hold channels with higher entrenchment ratios, and narrower valleys tend to hold channels that have lower entrenchment ratios. Reach breaks also considered changes in geology, basin hillslope gradient, drainage area, and other factors such as the presence of project facilities and road crossings. The initial step for delineating geomorphic reaches was to calculate longitudinal profile (i.e. channel slope) and valley width. Longitudinal profiles were created from GIS digitized stream channels and USGS DEMs. Stream profiles were created to plot the channel bed elevation at 0.1-mile intervals. Valley width was determined by using the DEMs to locate the transition point from the valley floor to the valley hillslope.

Table CAWG-2-2 lists Level I channel types and corresponding channel slope ranges.

There are overlapping slope categories that define various stream types, therefore, more than one Rosgen type was designated for a given channel segment for Level I classification.

Candidate reference streams were identified using the watershed and stream characteristics, including the Rosgen Level I classification, to search for non-project stream reaches with reasonably similar geomorphic characteristics to the project affected reaches. Similarities in stream profile and drainage area were first sought in the initial phase of the search. After finding preliminary reference stream reaches that had comparable stream profiles and drainage areas to the project affected streams, additional geomorphic attributes were analyzed to selectively reduce the number of non-project affected stream reaches that could serve as candidate reference reaches.

A candidate reference reach can be on the same stream as the project affected reach (i.e., above all project facilities), or it may be in a different drainage basin. First priority was given to evaluating potential references from the same stream, above all diversions. However, if no suitable reference matches could be found on the same stream, then other basins were considered. Comparative ratings for similarity ("+") and dissimilarity ("-") were provided for each of 10 geomorphic parameters. Criteria for rating similarity/dissimilarity are discussed in Appendix B, and a table with the results of the comparative ratings is provided.

The geomorphic parameters considered in the ratings are as follows:

- Stream Profile / Rosgen Level I Stream Type
- Drainage Area
- Elevation at Geomorphic Reach Break
- Maximum Basin Elevation
- Stream Order
- Reach Geology:
- Basin Geology
- Basin Aspect
- Valley Width
- Basin Hillslope

The results of the watershed, reach-scale, reference reach assessment and Level I classification were distributed in digital format to the CAWG (*SCE Big Creek ALP Level I*

Geomorphic Classification and Candidate Reach Assessment, June 2002), and are presented in Appendix B. The results included tabular data, graphical plots, and GIS-based topographic maps that summarize watershed geomorphic characteristics. A graphical plot was created for project streams illustrating channel profile, valley width, and Level I classification.

4.2 AERIAL RECONNAISSANCE SURVEYS

Low-altitude helicopter reconnaissance surveys were performed along all project streams in order to characterize geomorphic conditions at a watershed scale. Aerial reconnaissance inventory data was collected over a total of approximately 90 of the approximately 108 miles of project regulated streams (including the length of inundated reservoir areas) within the Project area. Dense vegetation prevented aerial survey data collection over approximately 18 miles of project streams, which were subsequently ground-surveyed. In addition to the project streams, aerial reconnaissance surveys were performed over approximately 100 miles of selected channels on non-project, unregulated streams. Figures CAWG-2-1a, 1b, 1c, and 1d show the locations of data collected using aerial reconnaissance surveys on project streams.

The purpose of the aerial reconnaissance surveys was to qualitatively characterize channel and valley geomorphology, and sediment recruitment and transport conditions. In combination with the supporting ground reconnaissance inventories and other general field observations, the aerial surveys provide a comprehensive inspection of watershed- and reach-scale conditions from both project and non-project affected streams. Information was recorded on aerial survey data forms including:

- valley shape and material
- channel entrenchment
- Rosgen stream type
- bedform (Montgomery-Buffington, 1997)
- bed material particle size
- bank material particle size
- presence of LWD (the criteria used for LWD was a log or piece of downed wood at least 4-inches in diameter with a length equal to or greater than one half of the channel bankfull width (per USFS SCI Guidebook). The abundance of LWD within a reach was characterized based on the following criteria: 1) “none to low” in reaches with less than 5 pieces per mile; and, 2) “moderate to high” in reaches with 5 or more pieces per mile.)
- extent of floodplain development

- sediment recruitment potential from the stream corridor, upslope, and tributaries
- spoil sites
- bank erosion rating

The data inventory form was developed in consultation with the CAWG during spring 2002, and is provided in Appendix C. Also provided in Appendix C is an explanation of the guidelines/criteria used to rate the presence, extent, or condition of the geomorphic features recorded on the data inventory form. All of the guidelines/criteria were developed in consultation with the CAWG prior to conducting the aerial surveys.

The data forms were filled out for a given reach of stream, defined by the Rosgen stream type (Level 1.5). A new data form was filled out when the Rosgen stream type changed. The Level 1.5 stream classification was performed during the aerial reconnaissance by an experienced geomorphologist, with supporting information on channel slope and valley confinement obtained from US Geological Survey (USGS) topographic maps. The slope and valley confinement information was determined prior to performing the aerial surveys (see Watershed and Reach-Scale Characteristics section).

Level 1.5 provides the same information as Level II (a morphological description and classification of stream reaches); however, this information was not collected to the same level of detail as the standard Level II assessment. Level II involves measuring five primary morphometric parameters: (1) entrenchment ratio; (2) width-to-depth ratio; (3) sinuosity; (4) water surface slope; and (5) bed particle size. These morphometric parameters are typically measured at each transect by conducting a topographic survey using an engineers level. Level 1.5 uses the same parameters as Level II to develop stream reach classifications; however, the determination of these morphometric parameters is based on visual estimates of the morphometric features by highly experienced individuals. The Level 1.5 aerial data was corroborated utilizing information gathered as part of the qualitative aerial and ground inventory surveys. During ground surveys the entrenchment ratio and width-to-depth ratio were determined using standard protocols to identify the bankfull channel width, depth, and the floodprone width. However, a fiberglass tape was used to make the field measurements; no topographic surveys of established transects using an engineers level was performed. Visual estimates and USGS map data were also used to determine sinuosity, water surface slope, and bed particle size, rather than the more rigorous Level II procedures that rely on topographic surveys and pebble counts.

Several geomorphic features were observed and specifically recorded on topographic base maps in addition to the data collected on the aerial survey forms. The features recorded on the maps include Rosgen stream type (Level 1.5), location of bars, location of large-scale sediment sources (landslides, gullies, road-related erosion, or other anthropogenic sediment sources such as tailings), general location of floodplain/terrace surfaces adjacent to the channel, and areas of potential vegetation encroachment. The dominant particle size and stability (rated as either active or inactive, based on the presence and extent of vegetative growth) of bar formations were also determined.

The aerial survey was typically performed at an altitude of approximately 500 feet. Three observers were simultaneously seated in the helicopter, each with a responsibility to collect a pre-arranged portion of the geomorphic data. As necessary, the helicopter hovered, circled, or made return trips to a stream reach in order to collect all of the data. The location of certain site-specific features, for example tailings, large-scale erosion sites, and some project facilities, were determined using the pilot's GPS. Photographs were selectively taken of some channel features, representative geomorphic reaches, or unusual conditions, as time allowed.

A field verification follow-up to the aerial surveys was performed over a two-day period with representatives from the CAWG. Portions of several project affected streams, readily accessible but diverse stream types widely distributed throughout the project watershed, were inspected by the CAWG during the two-day field verification. The previously completed aerial survey data sheets were compared with conditions observed on the ground.

The data collected from the aerial surveys were compiled into spreadsheet or tabular formats, and transferred onto topographic base maps, as appropriate, for analysis and presentation.

4.3 GROUND RECONNAISSANCE SURVEYS

Ground reconnaissance surveys were conducted over approximately 18 miles of project regulated streams and approximately 7.5 miles of unregulated streams within the Project area. The objectives of the ground surveys were to: (1) characterize the geomorphic features of each project stream reach that could not be clearly observed from the air; (2) validate or revise geomorphic characterization from aerial surveys; and (3) support assessment of project-related effects on the sediment transport regime, fluvial processes, and geomorphic conditions.

Two types of qualitative ground surveys were conducted: field inventory data collection surveys and general reconnaissance surveys. The field inventory data collection surveys recorded geomorphic information on data forms that were developed and approved in consultation with the CAWG. A copy of the data form template is presented in Appendix D along with a description of the guidelines/criteria used to collect the data and copies of the completed field data sheets are provided in Appendix E. The field inventory data collection was performed approximately 0.5 mile upstream and 0.5 mile downstream of most diversion facilities, and in those stream reaches that could not be clearly viewed by aerial reconnaissance. Ground inventory survey locations were approved by the CAWG in July 2002, and are shown in Figures CAWG-2-1a, 1b, 1c, and 1d.

General reconnaissance surveys were performed to supplement information collected from the aerial and the ground inventory surveys. The general reconnaissance surveys were performed at selected locations in the project area including diversions (see Figures CAWG-2-1a, 1b, 1c, and 1d). General reconnaissance surveys were conducted at most of the same locations where ground inventory surveys were performed (0.5 mile upstream and 0.5 mile downstream of project diversion facilities) and in many areas observed from the air. Data collection forms were not used during the general reconnaissance surveys; instead field notes, photographs, and sketches were made to describe geomorphic conditions.

General reconnaissance surveys were conducted by senior geomorphologists as quality control assessment of field inventory results and specifically to look for indicators of project effects.

The field inventory surveys were conducted by two field crews. Each field crew consisted of two geomorphologists. The lead field geomorphologist was responsible for directing the reach survey, including documentation of field measurements, stream features, and potential Rosgen reach breaks. Prior to conducting each ground survey, field crew leaders reviewed existing information, such as topographic maps and aerial photos, the Level I Rosgen data, and information related to stream corridor access. The field surveys were documented in field note-books and recorded geomorphic information on survey data sheets (Appendix D). In addition to each survey field book, the ground survey crews were accompanied by the following information:

Topographic map(s) with river station labels, significant geomorphic features (tributaries, sediment sources, etc.) and the Rosgen Level 1 channel classification

Aerial photographs with significant geomorphic features, such as tributaries, sediment sources, large in-channel bars, identified.

Tabulated GPS coordinates, if available, for each identified feature, including geomorphic breaks, tributary and/or sediment inputs, and Edison facilities

Utilization of reach-specific field books assured that relevant background information was in-hand during the field survey, and kept reach documentation centralized for future data reduction, analysis, and interpretation. Each field book included a cover sheet that documented the dates, times, study reach, and the survey crew.

The field survey data forms were developed to comply with the information specified in the CAWG-2 Study Plan, as well as record additional data and observations to aid in understanding and characterizing the geomorphic condition of the project affected streams. A summary of the data collected and associated field protocols is described below.

Project affected streams were inventoried using a sub-sampling procedure based on stream size. An inventoried study reach length was equivalent to approximately 25 bankfull widths. A new data form was filled out when the Rosgen stream type changed. Every third study reach length within the same Level 1.5 stream type was inventoried. This sub-sampling protocol was developed in conjunction with approval from the CAWG in spring of 2002. Data collected during each ground survey is described in greater detail as follows.

4.3.1 CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED FORM, AND CHANNEL CLASSIFICATION

Measurements of channel entrenchment were estimated based on direct measurement of bankfull width, flood prone width, and valley width. Bankfull width was measured using field indicators as outlined in *Stream Channel Reference Sites: An Illustrated Guide to Field Technique* (Harrelson et al. 1994). Bankfull indicators include changes in bank slope, presence of woody riparian vegetation, changes in particle size of bank materials, and other features such as bank undercuts, stain lines, and the top of bars or localized bank deposition. Bankfull width was measured with a stadia rod or field tape. The floodprone width was estimated based on field indicators or channel/valley width at two times the maximum bankfull elevation. The floodprone width was measured using a field tape. Entrenchment was calculated by dividing the floodprone width by the bankfull width (W_{fp}/W_{bf}). The width to depth ratio was calculated by dividing the bankfull width by the average bankfull depth (W_{bf}/D_{bf}). Entrenchment and width to depth ratios, along with channel slope (determined from topographic maps and visual observations of bedform), were used to determine an appropriate Level 1.5 classification.

Channel bed form was also classified based on visual observation of criteria developed by Montgomery and Buffington (1997). This classification system identifies bedforms for alluvial, colluvial, and bedrock streams. For alluvial channels, cascade, step-pool, plane-bed, riffle-pool, regime, and braided are the six types of bedforms represented in Montgomery and Buffington's system. Bedform was classified for each study site, along with Rosgen classification.

4.3.2 PARTICLE SIZE AND DEPOSITIONAL FEATURES

Particle size composition was visually estimated for each study site segment, according to the Rosgen classification system. The particle size classes are as follows:

- Large Boulder – 512 to <4096 mm (20 to 160 in)
- Small Boulder – 256 to <512 mm (10 to 20 in)
- Cobble – 64 to <256 mm (2.5 to 10 in)
- Gravel – 2 to <64 mm (0.08 to 2.5 in)
- Sand - <2 mm (<0.08 in)
- Fines – Silt/Clay

In addition to particle size composition, sand and gravel depositional features were characterized. Sand and gravel deposits were recorded on the field data form to characterize the type of deposit (bars, bed, pools) and describe the forming factors (boulder shadows and LWD). Instream bars were tallied by bar type (lateral, mid-channel, point). The stability of bars was also rated as either active or inactive, based on the extent of riparian vegetation growing on the bar deposit, and the dominant particle size composition was determined.

4.3.3 Large Woody Debris (LWD)

The presence of LWD was documented for each study site segment. The criteria used for LWD was a log or piece of downed wood at least 4-inches in diameter, and a length equal to or greater than one half of the channel bankfull width (per USFS SCI Guidebook). The channel position (low flow, bankfull, floodprone) of LWD was recorded. In addition, geomorphic function of the LWD was indicated, along with recruitment potential. Geomorphic function categories for LWD include bank stability, formation of habitat units, or no apparent function.

4.3.4 Bank Stability

Bank stability was evaluated at each reach study site in conformance with the USFS SCI Guidebook. The evaluation included a determination of bank erodibility, a description of bank cover composition, presence of instability features or causative erosion processes. Based on these factors, an SCI stability rating was assigned. Banks were classified as erodible when the bank materials or bank matrix is susceptible to erosion, while non-erodible bank materials were resistant to erosion and scour. Bank cover composition was made up of four classes: massive (large boulders, bedrock); coarse (predominantly small boulders to gravel); sand (predominantly sand material; may include gravels or larger material); and fine (predominantly comprised of silt or clay). Observed evidence of bank instability, features such as landslides or mass wasting, blocking, slumping, or rilling, or evidence of bank scour or undercutting, were also documented. The causative erosion processes were documented as either upslope, flow-related, or anthropogenic. In some cases more than one instability feature or causative erosion process were recorded for a particular reach study site. The qualitative SCI stability ratings assigned for each study site were recorded as stable, vulnerable, or unstable. The SCI stability rating is based on the following criteria:

- Stable - >75% cover of living plants and/or other stability components
- Vulnerable - >75% but has one or more instability indicators
- Unstable – <75% cover and has instability indicators

4.3.5 Vegetation Encroachment

The presence of riparian vegetation within the existing or former bankfull channel was identified. Established vegetation present in the bankfull channel was classified by channel position (margin, bed, bar), vegetation type (conifer, alder, willow, shrub, perennial herbaceous), and size class (seedling, young mature, mature). A vegetation encroachment rating was based on the relative density and maturity of vegetation, and extent of establishment. The age class of vegetation observed within relict bankfull channel indicators, when present, was identified. Indicators of vegetative encroachment identified during ground surveys were extrapolated to areas that were not ground surveyed, using the Rosgen Level 1.5 channel type as a guide for determining the extent of the encroached stream locations. Vegetation encroachment was also identified as part of the aerial reconnaissance surveys (see Appendix C for description).

4.3.6 Description of Channel Bars

The presence, distribution, frequency, and stability of channel bars were recorded for each reach survey site. The dominant and subdominant particle size composition was identified, including an estimated relative abundance of fine sediment. An instream deposit was characterized as a bar if it was at least as long as the channel bankfull width, and as wide as one-quarter of the bankfull width (see Appendix D). Bars were tallied and classified as being lateral, mid-channel, or point bars. Each bar was determined to be active or inactive, based on evidence of recent mobility or stability, including the presence of riparian vegetation growing on the bars. The predominant particle size was visually estimated for the bars observed.

4.3.7 Tributary Inputs

The location of tributary inputs was recorded for each stream survey. Each tributary confluence was examined for evidence of deposition and whether tributary deposition was active or inactive. The relative size of the depositional feature was also recorded, along with dominant particle size composition.

4.3.8 Sediment Sources and Deposits

Streamside sediment sources were identified for each reach surveyed. Sediment sources were classified by upslope and streambank position. The relative size of the erosion or depositional feature was estimated, as well as dominant particle size composition.

4.3.9 Additional Comments and Observations

For each stream reach surveyed, notes regarding unique or significant geomorphic features were documented. Significant features and reach study sites were recorded by standardized river station and GPS coordinates for future mapping reference. Notes included narratives describing observations and channel conditions including evidence of changes in channel alignment and vertical stability, presence/absence of fine sediment, type of depositional features, floodplain connectivity, indicators of scour and erosion, etc.

The data collected from the ground surveys were compiled into spreadsheet or tabular formats, and transferred onto topographic base maps, as appropriate, for analysis and presentation.

5.0 STUDY RESULTS AND ANALYSIS

5.1 WATERSHED CHARACTERISTICS

5.1.1 GEOLOGY

This section provides a description of the topography and geology of the Sierra Nevada Mountain Range and the Big Creek Project Area.

Topographic Setting

The Big Creek Project Area is situated along the western side of the Sierra Nevada Mountains, which are part of the Sierra Nevada geomorphic province of California. The Sierra Nevada Mountains are formed by a westerly-tilted fault block which is approximately 400 miles long and 40 to 80 miles wide extending from the Mojave Desert to the south to the Cascade Range to the north (Feth et al. 1964; SCE 2000). The range strikes northwest and is asymetric in shape with the eastern side characterized by a high, steep escarpment and the western side consisting of a relatively gentle slope. Accordingly, drainages on the eastern flank tend to be steeper and narrower than those on the western flank (USFS 1995). The southern Sierra Nevada exhibits a distinctive “stepped” topography along the west facing slopes and along the canyon walls of the major drainages. The steps are believed to have formed in response to the weathering characteristics of granitic rock in combination with uplift and fluvial erosion (Wahrhaftig 1965). Elevations along the west slope of the Sierra Nevada vary from a few hundred feet above mean sea level (msl) in the foothill areas of the Sacramento and San Joaquin Valleys to 14,496 feet msl at Mount Whitney.

Geologic History

In the Paleozoic Era (approximately 500 million years ago (Ma)), the continents were joined together as one landmass and throughout this period the area which has become the Sierra Nevada was overlain by a shallow ocean. Accordingly, sediment deposits of sand, silt, clay, and volcanic ash from submarine volcanoes accumulated on the sea floor and, eventually, hardened to form sedimentary rocks. In the early Mesozoic Era (approximately 210 Ma), the continents began to drift apart and the granitic batholith which forms the Sierra Nevada began to form. During this same era, volcanic activity partially metamorphosed and buried the sedimentary rock units of the former sea floor. Between 80-210 Ma, hundreds of different batches of granitic magma, which originated from the subduction of the Farallon Plate, crystallized to form the Sierra Nevada Batholith (Harden 1998). As the granitic magma intruded into the overlying sediments, it metamorphosed the overlying sedimentary and volcanic rocks.

Formation of the modern Sierra Nevada began approximately 50 Ma when uplift of the Sierra Nevada batholith commenced. Tectonic activity along the Basin and Range fault system situated to the east of the Sierra Nevada Range has resulted in the asymetric, westward tilting form of the Sierra Nevada. This fault system is still active and uplift of the Sierra Nevada continues today (Huber 1981); however, no known active or potentially active fault zones are located within the Big Creek Project Area.

The geology and topography of the modern Sierra Nevada is the result of extensive weathering and erosion occurring during uplift of the batholith and overlying rock. In particular, glaciation during the Pleistocene Epoch (up to 2.5 Ma) has formed much of the landscape of the High Sierra above approximately 6,000 feet msl. At least three identified periods of glaciation have occurred: (1) the Sherwin glaciation which occurred approximately 790,000 years ago; (2) the Tahoe glaciation which occurred between 130,000 to 160,000 years ago; and, (3) the Tioga glaciation which occurred between 20,000 and 100,000 years ago (Harden 1998). The glaciers eroded large quantities of material from higher elevations and deposited this material down valley in moraines situated along the sides and terminus of the glaciers. The glaciers were responsible for creating various landforms including U-shaped valleys, hanging valleys, and cirques.

Regional Geology

The geology of the Sierra Nevada Mountain range is characterized by three general rock groups: (1) Mesozoic and pre-Cenozoic metamorphosed sedimentary and volcanic rocks; (2) Mesozoic granitic rocks; and, (3) Cenozoic volcanic and sedimentary rocks (SCE 2000; CDMG 2000).

Mesozoic and pre-Cenozoic metamorphic rocks are present primarily as roof pendants in the High Sierra, septa at the margins of granitic plutons, and in an extensive zone described as the western metamorphic belt in the northwestern foothills. Most of the metamorphic rocks have only been slightly metamorphosed with highly metamorphosed rock being relatively rare and concentrated in the southern portion of the batholith (Harden 1998). The metamorphic rock types consist of schist, slate, quartzite, marble, calc-silicate hornfels, amphibolite, and serpentine. The metamorphic rock are generally more resistant to weathering than granitic rock and generally rise above the immediately adjacent granitic terrain to form sharp-crested peaks with long even sideslopes (Wahrhaftig, 1965).

Mesozoic granitic rocks form the majority of the Sierra Nevada. The granitic rock is primarily composed of quartz, orthoclase, plagioclase, biotite, and hornblende (Huber 1989). The rock types present include diorite, gabbro, quartz-monzodiorite, quartz diorite, tonalite, granodiorite, and granite. The most abundant granitic rock is granodiorite with granite and tonalite also present in abundant quantities (Harden 1998).

Cenozoic volcanic rock consists of ash flows originating in the Great Basin and andesitic volcanoes in the High Sierra (Harden 1998), and Cenozoic sedimentary rocks originating from erosion of the surface material during uplift of the Sierra Nevada.

Basin Geology

The geology of the Big Creek Project Area predominately consists of Mesozoic granitic rock (granite and granodiorite) with localized areas consisting of quaternary glacial deposits and Mesozoic volcanic and metavolcanic rock as summarized in Table CAWG-2-3 and presented in Figures CAWG-2-2a, 2b, 2c, and 2d (map and data derived from California Division of Mines and Geology (CDMG) 2000). Granitic rock comprises approximately 76% of the SJR Watershed above Kerckhoff Reservoir with glacial deposits and volcanic/metavolcanic rock making up approximately 9.5% and 8%, respectively.

Glacial deposits are primarily found in the eastern portion (east of Huntington Lake) of the project area at elevations above 6,000 feet msl; although, glaciers extended down to approximately 3,000 feet msl on the main stem of the SJR (Wahrhaftig 1965 Figures CAWG-2-2a, 2b, 2c, and 2d include field observations of glacial deposits that were mapped during aerial surveys which were not included in the original GIS data from the Geologic Map of California (CDMG 2000). Glacial deposits comprise approximately 14.5% of the SFSJR Watershed (67.5 square miles) and 22.5% (30 square miles) of the Big Creek Watershed. Notably, glacial deposits represent 46% of the Big Creek drainage area upstream from Huntington Reservoir. No significant glacial deposits are identified in the Stevenson Creek watershed on the CDMG map, but glacial deposits were identified along North Fork Stevenson Creek in the vicinity of River Mile (RM) 2.2 during the ENTRIX aerial surveys conducted in June 2002. In the South Fork San Joaquin Watershed, the glacial deposits are predominantly found in the tributaries below Florence Lake, comprising approximately 40% or greater of the watershed areas in Bolsillo Creek, Camp 61 Creek, Camp 62 Creek, Chinquapin Creek, Hooper Creek, North Slide Creek, and South Slide Creek. In the Big Creek watershed, glacial deposits make up approximately 46.5% and 32% of the Big Creek and Rancheria Creek watershed areas, respectively, above Huntington Lake and approximately 16.5% of the Pitman Creek watershed area.

Glacial deposits primarily consist of till deposited in lateral and terminal moraines and glacial outwash material deposited by glacial meltwater. Till consists of poorly sorted, angular sediment varying in size from clay to boulders which exhibit no regular bedding planes. Glacial outwash material is also characterized by a wide range of grain sizes (clay to boulder size grains), but is well sorted, rounded, and stratified. Glacial deposits, including outwash material, likely represent an important source of gravel in the Project area.

Mesozoic volcanic and metavolcanic rock are primarily found in the SJR watershed upstream of the confluence with the SFSJR (approximately 29% of the SJR watershed area), the SFSJR upstream of Florence Lake (approximately 9% of the watershed area), and in the Hooper and Bear Creek watersheds (approximately 8% and 6% of the watershed areas, respectively).

A summary of the geologic composition of the Big Creek Project stream watersheds is provided in Table CAWG-2-4.

Basin Soils

Soils within the Big Creek Project area primarily consist of residual granitic soils, non-granitic bedrock soils, glacial soils (till and outwash), alluvial soils, colluvial soils, and volcanic soils (USFS 1983; USFS 1995). Residual granitic soils are the oldest and most common soils in the area, and are comprised of coarse-grained sands with little clay. The non-granitic residual bedrock soils are similar to granitic soils, but are formed from the weathering of basalt and andesite bedrock. Glacial soils consist of either till-derived soils which are poorly sorted with a wide range of particle sizes or glacial outwash soils which are well sorted but include a wide range of particle sizes. Alluvial soils consist of accumulations of water-transported deposits and occur in active drainageways and floodplains, localized depressions such as former lakes, and at higher elevations or beneath slopes where there may be collections of glacial debris or colluvium. Colluvial soils are those formed in parent material deposited as a result of gravitational movement, and volcanic soils occur in areas with significant accumulations of volcanic ash and cinders.

Sub-categorization of the soils within the Big Creek Project area is based mainly on topography, since this soil forming factor correlates well with localized climatic conditions, biological activity, and landscape position. In general terms, the most developed soils occur at lower altitudes due to the lack of glacial disturbance, gentler slopes, and warmer year-round temperatures.

Weathering Processes

Sediment within the Big Creek Project streams is primarily derived from the weathering products of granitic rock and to a lesser degree glacial deposits. Weathering of granitic rock yields a bimodal grain size distribution (Selby 1993) as mechanical weathering processes such as frost heave result in cobble and larger sized clasts and chemical weathering processes result in sand and finer grain sizes. Gravel sized clasts are typically generated through alluvial transport of cobble and larger sized clasts and are generally found distant from the source. Mechanical weathering processes are responsible for large-scale rockfalls that are a significant source of the boulder-sized granitic material found along the inner gorges of streams that are well-entrenched and confined by their canyon walls. During the chemical weathering process, hydrolysis and hydration of biotite, plagioclase, and orthoclase initially result in the formation of angular, coarse-grained material termed grus and further weathering transforms grus into silty sand and eventually illite and kaolin clays (Ruxton and Berry 1957; Clayton, et. al. 1979).

The susceptibility of granitic rock to weathering is influenced by: (1) mineralogy (rocks with higher compositions of biotite, plagioclase, and orthoclase are more susceptible to weathering); (2) degree of exposure (exposed granite is less susceptible to erosion than buried granite as buried granite is typically in contact with groundwater which accelerates the chemical breakdown of biotite, plagioclase, and orthoclase) (Wahrhaftig 1965); (3) texture (finer grained granitic rock tends to be more resistant to weathering than larger grained granitic rock) (Ruxton and Berry 1957; Bloom 1978); and, (4) permeability (rocks with higher permeability have greater contact with air and water which lead to increased susceptibility to weathering) (Bloom 1978).

5.2 CHANNEL MORPHOLOGY

5.2.1 ROSGEN LEVEL 1.0 CLASSIFICATION AND REFERENCE REACH ASSESSMENT

Geomorphic classification of project streams was performed based on Rosgen (1996). This classification system uses a hierarchical approach that considers different morphological variables at various spatial scales of analysis. The four assessment levels begin with Level I, a broad geomorphic characterization on a watershed scale, to the most detailed and site-specific assessment, Level IV, which requires repeat measurements to verify stream processes (for example, sediment transport rates).

Rosgen Level I classification results are provided in Appendix B. It is noted that there are multiple Level I classifications provided for many stream reaches. Rosgen stream type for this portion of the study was based primarily on channel slope data. Entrenchment ratio, width-depth ratio, and sinuosity, which are also parameters used to define a Level I classification cannot be readily determined from the map and DEM data, therefore slope is the primary determinant for possible Level I stream types. Since there are overlapping slope categories that define the same stream type, more than Level I channel type may be listed for the same stream reach.

Results of the reference reach assessment are also provided in Appendix B. Each project stream is compared with at least one candidate reference stream, by evaluation against 10 geomorphic parameters. There are no final conclusions identifying which streams may serve as a suitable reference reach at this time. Once it is determined that for a specific project stream location a reference is needed in order to quantify project effects, then additional field work will be conducted to inspect the candidate reference stream(s) before final selection. There is no known standard protocol in the geomorphic literature that describes criteria or standards for selection of a suitable reference reach.

5.2.2 ROSGEN LEVEL 1.5 CLASSIFICATION

For this portion of the study, geomorphic classification was performed based on data collection that is intermediate between Level I and II, and as discussed with the CAWG, is hereafter referred to as Level 1.5. The Level 1.5 classification builds on, and supercedes the previous Level I classification.

The following discussion provides a brief description of the morphometric parameters used to classify the stream reaches, the physical and stream process characteristics associated with each Rosgen stream type, and the results of the aerial and ground surveys.

Morphometric Parameters Used in Level 1.5 Classification

Morphometric parameters used in the Level 1.5 classification included entrenchment ratio, width-to-depth ratio, sinuosity, channel gradient, and bed particle size.

Geomorphic classification of the project streams were determined based on field measurements, topographic maps, and visual estimates of these parameters. A description of these parameters is described below.

Entrenchment describes the degree of vertical containment of the channel in its valley. The entrenchment ratio is computed as the width of the flood prone area at an elevation twice the maximum bankfull depth divided by the top width of the bankfull channel. Low values of the entrenchment ratio indicate that the channel is deeply entrenched, whereas high entrenchment ratios indicate that the channel is weakly entrenched and can greatly enlarge its width during high flow events.

Width-depth ratio is an index of the channel cross-section shape, and is computed as the ratio of the bankfull width divided by the mean bankfull depth. High values indicate the channel is relatively broad and shallow, whereas low values indicate that the channel is narrow and deep. The channel shape affects distribution of energy within the channel. Channels with high width-depth ratios tend to develop shear stress near the banks, while low width-depth ratios indicate shear stress is more distributed on the bed. Width-depth ratio is an indicator for sensitivity to changes in the flow and sediment regime.

Sinuosity characterizes the planform of the channel, and is calculated as stream length divided by the valley length. Higher sinuosity is associated with a meandering channel planform, and lower sinuosity is associated with straighter channels. While useful as a description, sinuosity carries the least weight of the five morphologic parameters in the Rosgen system.

Channel gradient characterizes the kinetic energy of the channel and is directly related to hydraulic parameters such as shear stress. During the aerial and ground reconnaissance surveys, the channel gradient was used to aid in classifying the Rosgen channel type and was estimated by visual observations where apparent and/or by measuring the difference in channel bed elevation over a length of stream using a hand level.

Bed particle size influences the planform, cross-section shape, and longitudinal profile of the channel. Bed particle size also affects the rate of sediment transport and the vertical or lateral channel stability. The Rosgen classification system refines the major channel types into one of six sub-categories on the basis of dominant bed material size. Bed particle size is potentially sensitive to and reflective of changes in the flow and sediment regime.

Using the morphometric parameters described above, stream reaches are classified into 7 major stream types (Aa+ through G) based on Rosgen's 1996 criteria and shown in Table CAWG-2-5. The stream reaches are further classified according to dominant bed particle size (bedrock to silt/clay) as presented in Table CAWG-2-6. A description of the physical and stream process characteristics for each of the stream types is provided below.

“Aa+” Stream Type

This stream type typically occurs in debris avalanche terrain, zones of deep deposition such as glacial tills and outwash terraces, or landforms that are structurally controlled or influenced by faults, joints, or other structural contact zones. “Aa+” channels are characterized by very high gradients (>10%), high entrenchment (low entrenchment ratio (<1.4)), low sinuosity (1.0–1.1), and a low width-to-depth ratio (<12). The bedforms associated with this stream type are typically cascade or step/pool morphology with vertical steps and deep scour pools. Aa+ channels are typically described as high energy/high sediment supply systems due to the steep channel slopes and narrow/deep channel cross-sections.

“A” Stream Type

This stream type typically occurs in areas of high relief, zones of deep deposition, or landforms that are structurally controlled. “A” channels are characterized by moderate to steep gradients (4-10%), high entrenchment (low entrenchment ratio (<1.4)), low sinuosity (1.0–1.2), and a low width-to-depth ratio (<12). The bedforms associated with this stream type are typically cascade or step/pool morphology with associated plunge or scour pools. “A” stream types typically exhibit a high energy/high sediment transport potential and a relatively low in-channel sediment storage capacity.

“B” Stream Type

This stream type primarily exists on moderately steep to gently sloped terrain in areas where structural contact zones, faults, joints, colluvial-alluvial deposits, and structurally controlled valley side-slopes limit the development of a wide floodplain. “B” channels are characterized by moderate to steep slopes (4-10%), moderate entrenchment (entrenchment ratio of 1.4–2.2), low sinuosity (>1.2), and a moderate width-to-depth ratio (>12). The bedforms associated with this stream type are typically rapids and scour pool morphology which may be influenced by debris constrictions and local confinement. Streambank erosion rates are typically low, and are generally considered to be vertically and laterally stable, particularly when the dominant bed particle size is bedrock, and boulder.

“C” Stream Type

This stream type is primarily found in narrow to wide valleys constructed by alluvial deposition. “C” channels are characterized by gentle slopes (<2%), low entrenchment (high entrenchment ratio (>2.2)), relatively high sinuosity (>1.4), and a high width-to-depth ratio (>12). The bedform associated with this stream type is typically a pool-riffle morphology that is linked to the meander geometry of the river. These channel types have well developed floodplains and characteristic point bars within the active channel. The channel aggradation/degradation and lateral extension processes are dependent on and sensitive to changes in the natural stability of streambanks, existing conditions in the upstream watershed, and the flow and sediment regime.

“D” Stream Type

This stream type is typically found in landforms and valleys consisting of steep depositional fans, steep glacial trough valleys, glacial outwash valleys, broad alluvial mountain valleys, and deltas. “D” channels consist of a multiple channel system which exhibit a braided or bar braided pattern with a very high width-to-depth ratio (>40) and relatively low gradient (<4%). These channels occur in areas where sediment supply exceeds the sediment transport capacity and in areas where the hydrology is typically “flashy”. Multiple channel features are displayed as a series of various bar types and unvegetated islands that shift positions frequently during runoff events. Adjustments to the channel patterns are related to changes in the encompassing landform, contributing watershed area, or the existing channel system.

“DA” (Anastomosed) Stream Type

This stream type is found in broad, low gradient valleys developed on or within lacustrine deposits, river deltas, and fine grained alluvial deposits. “DA” channels consist of multiple-thread channel system with a very low stream gradient (<0.5%) and low entrenchment (high entrenchment ration (>2.2)). The bedform associated with this stream type typically has a pool-riffle morphology. Stream banks are typically very stable and are often constructed of cohesive, fine-grained materials which support dense-rooted vegetation. Lateral migration rates of the individual channels are very low except for infrequent avulsion. The ratio of bedload to total sediment load is very low.

“E” Stream Type

This stream type is found in gently sloping alluvial valleys in areas ranging from high elevation alpine meadows to low elevation coastal plains. “E” channels are characterized by low stream gradient (<2%), low entrenchment (high entrenchment ratio (>2.2)), very high sinuosity (>1.5), and low width-to-depth ratio (<12). The bedform features predominately consist of riffle-pool reaches with a wide floodplain. These channels are considered highly stable, but are sensitive to changes in the natural stability of streambanks, existing conditions in the upstream watershed, and the flow and sediment regime.

“F” Stream Type

This stream type is found in gently sloping, deeply incised valleys typically consisting of highly weathered rock and/or erodible alluvial/colluvial materials. “F” channels are characterized by low stream gradient (<2%), high entrenchment (low entrenchment ratio (<1.4)), very high sinuosity (>1.4), and high width-to-depth ratio (>12). The bedform features predominately consist of riffle-pool reaches. These channels can develop very high bank erosion rates, lateral extension rates, significant bar deposition, and accelerated channel aggradation and/or degradation and provide for very high sediment supply and storage capacities.

"G" Stream Type

This stream type is found in a variety of land-types including alluvial fans, debris cones, meadows, or channels within older relic channels. The G channel type can also occur as narrow deep gorges on larger rivers when the predominant bed material is bedrock or boulder. "G" channels are characterized by moderate stream gradient (2-4%), high entrenchment (low entrenchment ratio (<1.4)), relatively low sinuosity (>1.2), and low width-to-depth ratio (<12). With the exception of those channels containing bedrock and boulder, these stream types have very high bank erosion rates and high sediment supply. Channel degradation and side-slope rejuvenation processes are typical. The "G" stream type generates high bedload and suspended sediment transport rates.

5.2.3 RESULTS OF ROSGEN LEVEL 1.5 CLASSIFICATION OF PROJECT-AFFECTED STREAMS

The following discussion presents the results of the Rosgen Level 1.5 classification. The discussion is organized according to four watershed areas: (1) the SFSJR watershed situated downstream of Florence Lake, including Project-affected tributaries; (2) the Big Creek watershed downstream of Huntington Lake, including Project-affected tributaries; (3) the Stevenson Creek watershed which includes North Fork Stevenson Creek below the Tunnel 7 outlet and Stevenson Creek downstream of Shaver Lake; and, (4) the mainstem of San Joaquin River (SJR) between the confluence of SFSJR and Kerckhoff Reservoir, including Project-affected tributaries. The results of the Rosgen Level 1.5 classification are presented in Table CAWG-2-7 and the Level 1.5 results are mapped on Figures CAWG-2-3a, 3b, 3c, and 3d. The discussion focuses on project reaches below diversions, however the figures show the Level 1.5 classification along reaches upstream of the diversions that were ground-surveyed.

<u>South Fork San Joaquin River Watershed</u>

The SFSJR between the confluence with the SJR and Florence Lake is primarily composed of G2 channel (approximately 50.2%) and B2/B3 channel (approximately 39.8%) with interspersed reaches of C5/B5c (approximately 5.7%), C3 (approximately 2.9%), and G1 channel (approximately 1.4%).

Beginning at the confluence with the SJR (RM 0.0), the South Fork alternates between distinctly identifiable G2 and B3 reaches to RM 1.9 (Figure CAWG-2-3c). The B3 sections occur where the valley and channel tends to widen, and then as the valley narrows the channel type changes to G2. From RM 1.9 to 14, the South Fork is quite uniform in its dimensions, pattern, and profile. This reach is structurally controlled, and is delineated as a G2, boulder-dominated channel type (Figure CAWG-2-3c).

At RM 14.0 (Rattlesnake Crossing) there is a dramatic change in channel morphology. The highly entrenched, low width-depth ratio G-channel type downstream of RM 14.0 gives way to a more moderately entrenched, moderate width-depth ratio channel that is no longer confined by vertical bedrock slopes. A low-terrace/potential floodplain adjoins the channel for most of its length upstream of RM 14.0. The SFSJR is classified as B3 from RM 14.0 to 15.9 with a cobble dominated streambed, and then a B2/B3 alternating boulder and cobble dominated bed material from RM 15.9 to 19.0.

From RM 19.0 to 20.1, the South Fork alternates between several short distinct sections of G2 and B3 channel types (Figure CAWG-2-3d). From RM 20.1 to 20.9 there is a 0.8 mile long reach of C3 channel type at Mono Hot Springs. The C3 stream type is found in broad alluvial valleys, and glaciated valleys such as the South Fork San Joaquin. The channel is slightly entrenched, with a high width-depth ratio, and an adjacent floodplain. The floodplain has been developed with buildings and campgrounds for recreational use. The C3 channel can have high rates of lateral adjustment, but the presence of riparian vegetation in this part of the SFSJR has a strong influence on bank stability. Sediment supply is generally considered low in C3 channels, unless the streambanks are in a highly erodible condition (Rosgen 1996).

From RM 20.9 to 26.1 the channel is predominantly B2 and B3 stream types, interspersed with short sections of G1 and G2 stream types where bedrock outcrops narrowly confine and entrench the channel (see Figure CAWG-2-3d). Channel morphology dramatically shifts at RM 26.1 upstream from the South Slide Creek confluence where the valley significantly broadens downstream of Florence Lake. From RM 26.1 to 27.7 the channel has been designated as a C5/B5c classification. The C5 channel is slightly entrenched, meandering, and sand-dominated with a well-developed floodplain. Estimates of bankfull channel width, entrenchment, and width-depth ratio made during ground surveys indicate that this reach may fall between the delineative criteria established for a B5c and C5 channel type, hence the classification as a C5/B5c. The most upstream project reach of the South Fork San Joaquin is an entrenched G1 bedrock channel type where it emerges from Florence Dam from RM 27.7 to 27.9.

The Project-affected tributaries to the SFSJR are separated into the following two categories based on the relative size of the watershed area and type of project diversion: (1) the smaller tributaries including Bolsillo, Camp 62, Chinquapin, Crater, Crater Diversion, North Slide, South Slide, and Tombstone Creeks; and, (2) the larger tributaries including Bear, Mono, and Hooper Creeks. The Project-affected reaches of the smaller tributaries are primarily composed of “Aa+” and “B” stream types with interspersed reaches of “A”, “C”, “E”, and “G” stream types. In general, the smaller tributaries exhibit much more variability in stream type over a shorter distance in comparison with the larger tributaries.

Each of the larger tributaries is dominated by different stream types. Mono Creek is predominately composed of “B” channel, Bear Creek primarily consists of “A” channel with smaller sections of “B” inclusions, and Hooper Creek is mostly composed of “Aa+” channel.

The dominant sediment classes observed in the tributaries primarily consist of bedrock and boulder with sporadic areas of cobble, gravel, and sand. A brief description of the Rosgen Level 1.5 classification for each of the tributaries is presented below, and the geomorphic reach breaks are presented in Figure CAWG-2-3d.

Bolsillo Creek downstream of the diversion is primarily composed of A1a+/A2a+ channel (approximately 42.7%), G2/G5 channel (approximately 19.1%), and B2/B3/B5 channel (approximately 14.6%) with interspersed reaches of B2/B5 (approximately 9.6%), A2/B2 (approximately 7.6%), and E5 channel (approximately 6.4%).

From RM 0.0 (the confluence with the SFSJR) to RM 0.9, the channel is dominated by high gradient A1a+/A2a+ reaches with a short E5 reach (RM 0.1 to 0.2) situated in a relatively flat meadow area and a short B2/B5 reach (RM 0.65 and 0.8) between the high gradient A1a+/A2a+ channel type. Upstream of RM 0.9, the gradient decreases and consists of A2/B2 channel from RM 0.9 to 1.02, G2/G5 between RM 1.02 and 1.32 (immediately above and below Kaiser Pass Road), and B2/B3/B5 between RM 1.32 and 1.55 (situated upstream of Kaiser Pass Road). The G2/G5 segment of channel is laterally unstable, as evidenced by multiple remnant channels. The B2/B3/B5 reach includes several LWD jams which significantly influence the channel morphology through sediment retention, grade control, and formation of scour pools. The project diversion is situated within a short A2a+ reach (RM 1.55 to 1.57) upstream of the B2/B3/B5 reach at RM 1.57.

Camp 62 Creek downstream of the diversion is composed of A2a+ channel (approximately 34.8%), B2/B3 channel (approximately 28.1%), A2 channel (approximately 20.0%), and B2 channel (approximately 17.0%).

Between RM 0.0 (the confluence with the SFSJR) and RM 0.79, the stream type alternates between A2a+ (RM 0.0 to 0.12 and RM 0.35 to 0.55) and B2/B3 (B2 from RM 0.12 to 0.35 and B2/B3 from RM 0.55 to 0.79) stream types depending on the gradient and entrenchment. In the vicinity of the confluence with Chinquapin Creek (RM 0.98), the channel is classified as A2 (RM 0.79 to 1.02) and is highly entrenched with boulder substrate. Immediately upstream and downstream of Kaiser Pass Road, the channel consists of B2/B3 stream type and upstream of this reach and immediately downstream of the diversion the channel is classified as A2a+ due to the steep gradient.

Chinquapin Creek downstream of the diversion is primarily composed of A2a+ channel (approximately 65.6%) with interspersed reaches of B3 channel (approximately 13.3%), A2 (approximately 11.1%), G2/G4 (approximately 5.6%), and B3/B4 channel (approximately 4.4%).

The lower portion of Chinquapin Creek is affected by the Florence Lake road crossing which is located at RM 0.1. Immediately downstream of the road crossing the A2 channel (RM 0.0 to 0.1) is downcutting. On the upstream side, the culvert at the road crossing acts as a grade control. The channel is classified as B3/B4 between RM 0.1 and 0.14 and G2/G4 between RM 0.14 and 0.19. Between the G2/G4 reach and Florence Lake Road, the gradient increases and is predominantly classified as A2a+ with short reaches of “B” channel interspersed. Upstream of the road to Florence Lake, the gradient decreases and consists of a short “G” reach immediately upstream of the road which transitions into a B3 reach between RM 0.38 and 0.50. Between the B3 reach and the diversion, the gradient increases significantly and consists of A2a+ channel (RM 0.5 to 0.90).

Crater Creek downstream of the diversion is primarily composed of A1a+/A2a+ channel (approximately 74.6%) with interspersed reaches of E5/DA5 channel (approximately 5.2%), B4/B5 (approximately 5.9%), B5 (approximately 9.1%), C5/B5 (approximately 3.5%), and B2/B3 channel (approximately 1.7%).

The lower 0.5 miles of Crater Creek is situated in a meadow and is classified as a B4/B5 channel from RM 0.0 to 0.17, E5/DA5 from RM 0.17 to 0.32, and C5/B5 from RM 0.32 to 0.42. Based on the delineative criteria, the C5/B5 portion of the channel has morphological characteristics that are indicative of both C5 and B5 channel types. Upstream of the meadow, the gradient increases significantly and the channel is classified as A2a+ between RM 0.42 and 1.51. Within the A2a+ section, the channel is laterally confined by bedrock. Between RM 1.51 and 1.77, the channel transitions to a “B” stream type with B5 channel present between RM 1.51 and 1.77 and B2/B3 present between RM 1.77 to 1.82. Upstream of RM 1.82, the channel gradient increases and is predominantly an A1a+/A2a+ and A2 channel type to the diversion at RM 2.87.

The Crater Diversion Channel is primarily composed of A1a+/A2a+ channel (approximately 48.4%) with interspersed reaches of G2 channel (approximately 14.8%), B1/B2 (approximately 7.7%), A1/A5 (approximately 5.2%), DA4/DA5 (approximately 5.2%), B2/B5 (approximately 4.5%), A4/A5 (approximately 3.9%), A2 (approximately 3.2%), B2 (approximately 3.2%), B3/B5 (approximately 1.9%), and G1 channel (approximately 1.9%).

The upper portion of the Crater Diversion Channel between RM 2.1 to 2.2 consists of a constructed channel with a rock-mortar wall along the right bank (facing upstream) and the hillslope along the left bank. This portion of the channel is classified as A2 between RM 2.15 and 2.2 and G2 between RM 2.1 and 2.15. Downstream of the constructed channel, there is a short B3/B5 reach (RM 2.07 to 2.10) immediately below the old gaging station (no longer active) at RM 2.1, and the channel transitions to A2a+ between RM 1.98 and 2.07 as the gradient increases significantly. Immediately downstream of the A2a+ reach, the gradient decreases significantly and the channel transitions to a DA4/DA5 type. The DA4/DA5 reach is situated between RM 1.9 and 1.98 and is a deposition zone with multiple channels braiding around vegetated bars and areas of higher relief. Downstream of the DA4/DA5 reach, the gradient gradually increases and the channel transitions to B1/B2 between RM 1.78 and 1.90 and A1/A5 between RM 1.7 and 1.78. Between RM 0.98 and 1.7, the channel is predominately classified as A1a+ as the gradient increases significantly and the channel cascades down bedrock. Downstream of the A1a+ reach between RM 0.65 and 0.98, the channel alternates between B2 and G2 stream types with the exception of a short A2a+ reach situated immediately upstream of the Florence Lake road crossing between RM 0.85 and 0.88.

Tombstone Creek downstream of the diversion is primarily composed of E5/E6 channel (approximately 56.1%) and A1a+/A2a+ (approximately 36.7%) with a short reach of B2/B5 (approximately 7.1%).

The upper portion between RM 0.62 and 0.98 consists of high gradient A2a+ channel which transitions to an E5 channel which flows through Jackass Meadow between RM 0.0 and 0.55. A short transitional B2/B5 reach is located on an alluvial fan deposited by the channel between RM 0.55 and 0.62 just above the valley floor. There is evidence of active lateral channel instability as indicated by multiple remnant channels on the alluvial fan (see Figure CAWG-2-3d).

Below their respective diversions, North Slide, South Slide, and Hooper Creeks all flow over a very large and active alluvial fan deposited near where the channel gradient decreases and meets the valley floor. North Slide Creek consists of high gradient, boulder dominated A2a+ channel which comprises approximately 100% of the stream downstream of the diversion. Areas of lower gradient "B" type depositional zones with cobble, gravel, and sand are interspersed within the Aa+ channel.

South Slide Creek downstream of the diversion is composed of A1a+/A2a+ channel. The lower portion consists of high gradient, boulder dominated A2a+ channel between RM 0.0 and 0.27 and bedrock dominated A1a+ channel between RM 0.27 and 0.32. Areas of lower gradient "B" type depositional zones with cobble, gravel, and sand are interspersed within the Aa+ channel.

Hooper Creek downstream of the diversion is composed of A1a+/A2a+ channel (approximately 72.6%) and B3 channel (approximately 27.4%). The high gradient A1a+/A2a+ channel is situated in the upper portion immediately below the diversion (RM 0.21 to 0.65) and the moderate gradient B3 channel (RM 0.04 to 0.21) is situated on the alluvial fan area near the valley floor. There is evidence of lateral channel instability as indicated by multiple remnant channels on the alluvial fan (see Figure CAWG-2-3d). At the confluence with the SFSJR the channel consists of a short A2a+ reach between RM 0.0 and 0.04.

Bear Creek predominately consists of "A" stream type. The lower portion of the creek consists of A1 channel from RM 0.0 to 0.2 (approximately 12.7% of the surveyed stream miles), and between RM 0.2 and 1.43 the channel is classified as A2 with B inclusions (approximately 78.3% of the surveyed stream miles). Most of the A2 section is laterally confined by bedrock and the "B" type channel is present in areas where the valley widens or bedrock valley walls are absent. A B2 channel reach (approximately 8.9% of the surveyed stream miles) is present immediately downstream of the Bear Creek Diversion between RM 1.43 and 1.57.

The affected portion of Mono Creek primarily consists of alternating reaches of B2 with short segments of B5 channel, with the exception of an A2 section immediately below the diversion between RM 5.68 and 5.79. The B2 channel type is more prevalent than the B5 channel, comprising a total of approximately 5 miles (86.9% of the surveyed stream miles) and 0.7 mile of channel length (11.2% of the surveyed stream miles) respectively.

Big Creek Watershed

A description of the Rosgen Level 1.5 classification of the Big Creek watershed downstream of Huntington Lake and its Project-affected tributaries is provided below. The geomorphic classifications are presented in Figure CAWG-2-3a.

Big Creek between the confluence with the SJR and Huntington Lake is primarily composed of A1 channel (approximately 45.5%) and A1a+/A2a+ channel (approximately 22.0%) with interspersed reaches of A1/A2 (approximately 10.1%), B2 (approximately 7.3%), B5 (approximately 3.3%), B2/B5 (approximately 2.5%), A2/B2 (approximately 2.5%), G5 (approximately 1.7%), and A2 channel (approximately 1.0%).

The majority of the Big Creek channel below Huntington Lake is highly entrenched into bedrock and confined in a narrow gorge. The channel is predominately classified as “A” type with extensive areas of “A1a+” and a few short sections of “B” channel types. Bedrock and boulder are the most common particle sizes. The channel pattern, dimension, and profile is non-adjustable, structurally controlled in most areas by bedrock.

In the lowermost portion of the stream between the confluence with the San Joaquin River (RM 0.0) and Dam 5 (RM 1.7), the channel primarily consists of A1 and A1/A2 channel type with an A1a+ section immediately upstream of the confluence with the SJR between RM 0.0 and 0.5. A1 and A2 channels are typically very stable with limited rates of lateral or vertical adjustment, low sediment storage capacity and a low sediment supply due to the stable channel and bank materials (Rosgen 1996).

Between Dam 5 (RM 1.7) and Dam 4 (RM 6.2), the channel alternates between A1/A2 and B2 stream types. The B2 channel type is present in areas where the valley widens or bedrock walls are absent. The bed and bank materials of the B2 stream type are considered stable, contributing relatively small quantities of sediment during runoff events (Rosgen 1996).

Upstream of Dam 4, the channel gradient increases significantly between RM 6.4 and 7.95 and is classified as bedrock dominated, A1a+. The channel gradient decreases and the valley width increases between RM 7.95 and 8.85 as the channel transitions into a “B” type. B2 channel is present between RM 7.95 and 8.27 and upstream of this reach as the channel gradient decreases slightly and the bed material becomes finer, consisting of sand, resulting in a B5 channel type between RM 8.27 and 8.6. Between RM 8.6 and 8.85, the channel transitions to a B2/B5 channel as boulder material alternating with sandy depositional areas becomes more prevalent. The channel becomes more entrenched between RM 8.85 to 9.6, classified as A1/A2 with interspersed areas of B2 channel type where the valley widens. Upstream of RM 9.6, the gradient decreases and the channel is classified as G5 between RM 9.6 to 9.77. G5 channels are typically unstable and are present in areas where there is excessive bank erosion. Upstream of the G5 reach and immediately below Huntington Lake, the gradient increases significantly and the channel is classified as A1a+/A2a+.

The Project-affected tributaries to Big Creek consist of Pitman Creek, Balsam Creek, Ely Creek, and Adit 8 Creek. All of these creeks primarily consist of high gradient, bedrock/boulder dominated A1a+/A2a+ channels (approximately 94.1% of Pitman Creek, 100% of Balsam Creek, approximately 94.9% of Ely Creek, and approximately 82.3% of Adit 8 Creek). Notable exceptions include a short segment of Ely Creek between RM 0.53 and 0.58 which consists of B2/B3 channel, Pitman Creek immediately below the diversion between RM 1.43 and 1.52 which consists of B1 channel, and Adit 8 Creek between RM 0.53 and 0.7 which includes A4a+ channel.

Stevenson Creek Watershed

A description of the Rosgen Level 1.5 classification of the Stevenson Creek channel situated downstream of Shaver Lake and North Fork Stevenson Creek situated downstream of the Tunnel 7 outlet is provided below, and the geomorphic reach breaks are presented in Figure CAWG-2-1a.

Stevenson Creek between the confluence with the SJR and Shaver Lake is primarily composed of A1a+ channel (approximately 55.8%), A1 channel (approximately 16.3%), and B3 channel (approximately 11.6%) with interspersed reaches of B1/B3/B4 (approximately 7.0%), B3/B5 (approximately 5.1%), B5 (approximately 2.3%), and B1 channel (approximately 1.9%).

The portion of Stevenson Creek below Shaver Lake (RM 0.0 to 4.30) primarily consists of Aa+ channel with significant areas of “A” and “B” type channels. For the most part, the channel is highly entrenched into bedrock and confined in a narrow gorge. Bedrock and boulder are the most common particle sizes. The channel pattern, dimension, and profile is non-adjustable, and structurally controlled in most areas by bedrock.

In the lower portion between RM 0.0 (the confluence with the San Joaquin River) to RM 3.9, the channel primarily consists of high gradient A1a+ channel with A1 channel present between RM 0.7 to 1.4, and short segments of “B” type channel present in areas where the gradient decreases and the valley widens. In these “B” reaches, the bed material includes smaller cobble and gravel particle sizes, as indicated by the B1/B3/B4 channel between RM 2.2 and 2.5 and B3 channel between RM 2.7 and 3.2.

The upper portion of Stevenson Creek between RM 3.9 and 4.3 (Shaver Lake Dam) consists of “B” channel. Immediately below the Highway 168 road crossing between RM 3.90 and 3.98 the channel is classified as B1. Upstream of the road crossing between RM 3.98 and 4.3 the channel appears to be influenced by the road crossing as the gradient decreases significantly and the bed material becomes finer, primarily consisting of sand. B5 channel is present between RM 3.98 and 4.08, and the channel is designated as B3/B5 between RM 4.08 and 4.30.

North Fork Stevenson Creek between Shaver Lake and the Tunnel 7 outlet is primarily composed of A1a+/A2a+ channel (approximately 53.2%) with interspersed reaches of C3 (approximately 11.3%), G1 (approximately 11.3%), B3 (approximately 11.3%), B1/B2 (approximately 5.3%), C4 (approximately 3.8%), and A1 channel (approximately 3.8%).

The segment of North Fork Stevenson Creek downstream of the Tunnel 7 outlet (RM 0.9 to 3.55) primarily consists of "Aa+" channel with significant reaches of "B", "C", and "G" channel. Immediately above Shaver Lake between RM 0.9 and 1.1, the channel consists of high gradient A1a+ channel and upstream of this reach the channel transitions to A1 channel between RM 1.1 and 1.2. There is a short section of low-gradient C4 gravel dominated channel (RM 1.2 to 1.3) between two high gradient Aa+ reaches. The gradient increases above RM 1.3 near the Eastwood Powerhouse, with an A1a+ classification (RM 1.3 to 1.5). From RM 1.5 to1.8, the channel type is a bedrock dominated G1 channel. Above RM 1.8, the channel type changes dramatically for about one-half mile to a C3 (RM 1.8 to 2.1), and then to a B3 channel (RM 2.1 and 2.4). The C3 and B3 channel segments are dominated by cobbles, although there are significant areas of gravel bar deposits. There is evidence of historical lateral channel instability in the C3 and B3 reaches. Upstream of RM 2.4, the gradient increases significantly and the channel type changes to A1a+/A2a+ between RM 2.4 and 3.55, with the exception of a short reach of B1/B2 channel type (RM 3.11 to3.25).

San Joaquin River Watershed

A description of the Rosgen Level 1.5 classification for the Project-affected reaches of the mainstem SJR and the Project-affected tributaries is provided herein, and the geomorphic reach breaks are presented in Figures CAWG-2-3a, 3b, and 3c.

The mainstem SJR between the Big Creek Powerhouse No.4 and the confluence with the SFSJR is primarily composed of G2c channel (approximately 16.4%) and B2c channel (approximately 11.5%) with interspersed reaches of G1c (approximately 9.9%), G2c/G3c (approximately 7.3%), G3c (approximately 6.0%), G1/G2 (approximately 5.5%), and B5 channel (approximately 2.6%). Redinger Lake, Dam 6 Lake, and Mammoth Pool account for approximately 15.7 miles or 40.9% of the stream miles.

Most of the mainstem San Joaquin River is highly-entrenched into bedrock, confined by a narrow and deep canyon gorge. The channel is predominantly classified as a G-type, having a low width-depth ratio, moderate gradient, and high entrenchment ratio. Bedrock and boulder materials are the most common bed particle size, although there are a few reaches where cobble is dominant. The channel pattern, dimension, and profile are non-adjustable, structurally controlled in most areas by bedrock. There are a few portions of the San Joaquin where the river canyon is relatively wider with a more moderate entrenchment and width-depth ratio, represented by a B-channel type.

Beginning at the Big Creek Powerhouse No.4, the San Joaquin is a G1c channel type between river miles 0.0 to 6.1, with about a 2-mile long section of G3c channel between RM 3.3 to 5.6 (Figure CAWG-2-3a). The subscript "c" in the classification indicates channel slopes less than 2%. Upstream from Redinger Lake (RM 6.1 to 11.3), the channel is classified as a G2c from RM 11.3 to 17.0 up to Dam 6 (RM 17.0 to 18.2). The G1 and G2 stream types are typically very stable with limited rates of lateral or vertical adjustment, low sediment storage capacity and a low sediment supply due to the stable channel and bank materials (Rosgen 1996). G3 channels are described as typically unstable, incised into unconsolidated depositional material with a very high sediment supply available from both upslope and channel derived sources (Rosgen 1996). However, the G3c segment of the San Joaquin River, although it is cobble dominated, is not incised into unconsolidated depositional material, and has very little upslope sediment sources other than rockfalls which tend to contribute boulder-sized materials. This section of the river is structurally controlled by bedrock banks, and like the G1 and G2 channel types, is very stable.

Upstream from the Dam 6 impoundment, the channel occupies a somewhat wider section of the canyon gorge for about 4.6 miles between RM 18.2 to 22.6. This reach is designated as a B2c channel type. The B2c channel is moderately entrenched, and has a moderate width-depth ratio. The B2c stream type is often found in rockfall and talus areas, with coarse colluvial deposits dominated by boulders (with smaller amounts of cobble, gravel, and sand) along structurally controlled valleys. The bed and bank materials of the B2 stream type are considered stable, contributing relatively small quantities of sediment during runoff events (Rosgen 1996). Upstream from the B2c reach, there is another G-type channel segment (RM 22.6 to 25.4) that has been identified as a G2c/G3c stream type based on the alternating boulder or cobble dominated portions of the channel.

There is a small, 0.2 section of channel classified as B5 (sand-dominated) where Shakeflat Creek is a tributary to the San Joaquin River (RM 25.4 to 25.6). Upstream of Mammoth Pool (RM 26.2 to 35.5), the channel alternates between a G1/G2 type, as bedrock and boulders dominate the bed material composition. From RM 37.6 to the South Fork San Joaquin River confluence (RM 38.4), the channel is again designated as B5. Sand-deposition along this most upstream reach of the San Joaquin is caused by a significant point of constriction by vertical bedrock walls and a jumble of large boulders at RM 37.6. This constriction point likely causes a slowing of flow velocities and backwater conditions during high flows that extends upstream to the confluence with the South Fork.

The Project-affected tributaries to the mainstem SJR consist of Ross Creek and Rock Creek. Both of these creeks consist of high gradient, bedrock dominated A1a+ channels (100% of each channel). The channel pattern, dimension, and profile of these creeks are non-adjustable as they are structurally controlled by bedrock.

5.2.4 FLOODPLAIN/TERRACE CONNECTIVITY

Floodplains, identified from both aerial and ground surveys, are indicated on map Figures CAWG-2-3a, 3b, 3c, and 3d. Floodplains are identified at locations where there is a valley flat adjacent to a channel reach that is moderately to weakly entrenched, and where the valley flat on either side of the stream is at least twice the estimated bankfull width of the channel. For example, if the bankfull channel width was estimated to be 50 feet, then the adjacent valley flat must be at least 100 foot wide in order to be identified as a floodplain. Highly entrenched channels, that is A-, and G- channel types by definition do not have floodplains (i.e., they are deeply entrenched, with an entrenchment ratio generally less than 1.4, and no adjacent valley flat). B-channel types may or may not have a floodplain, as defined by the above criteria. B-channel types with adjacent valley flats at least twice the bankfull width are identified as having floodplains. C- and E-type channels, based on the delineative criteria for entrenchment (Rosgen 1996), always have a floodplain.

As shown, the floodplain boundaries are intended to be very rough approximations of the floodplain width, and are not meant to define flood prone areas for the 100-year or any other flood frequency. Therefore, total floodplain area should not be estimated based on the map delineations.

It should be recognized that whether or not floodplain locations identified in this study are actually inundated on a regular basis under the current flow regime is not definitively known. Qualitative studies alone could not determine if identified floodplain areas are functioning (i.e., receive over-bank flows) or if they are abandoned floodplains that are only occasionally, or perhaps never flooded. Therefore, all floodplain locations delineated in this study are considered to be potential floodplains. By definition, an alluvial river channel is bordered by a floodplain that is inundated on average once every one or two years, over the long-term, and is a geologic feature that is being formed by the river in its present condition, and in the present climate (Dunne and Leopold 1978). Valley flat surfaces adjacent to the channel that are not inundated on average about once every one or two years, and are not being formed by the river under its present flow regime, are technically considered to be a terrace. A low-terrace, when present, may be inundated with high flows, but is not inundated as frequently as the floodplain.

There are no potential floodplains identified along the following channels, which are designated as A or G-channel types or with adjacent valley flats that do not meet the two bankfull width criteria for floodplains:

San Joaquin River

- Ross Creek
- Rock Creek
- Big Creek (except between RM 8.3 and 8.6)
- Pitman Creek
- Balsam Creek
- Ely Creek
- North Slide

- South Slide
- Tombstone
- Hooper
- Bear
- South Fork San Joaquin between RM 0.0 and 14.0
- Camp 62
- Bolsillo Creek
- Crater Diversion

Streams with segments that have potential flooplain areas include:

- North Fork Stevenson Creek (RM 1.7 to 2.4)
- Stevenson Creek (RM 3.9 to 4.3)
- Big Creek (RM 8.3 to 8.6)
- SFSJR (RM 14.0 to 24.1 and RM 26.1 to 27.7)
- Crater Creek (RM 0.0 to 0.7)
- Tombstone Creek (RM 0.0 to 0.5)
- Mono Creek (RM 2.3 to 2.8, and RM 3.5 to 3.7)

A discussion of the potential floodplain areas is presented below.

Stevenson Creek Watershed

Three potential floodplain areas were identified in the Stevenson Creek watershed. One of these areas is situated on North Fork Stevenson Creek between RM 1.7 and 2.4 (Figure CAWG-2-1a). This segment is comprised of a C3 reach and a B3 reach.

Along Stevenson Creek downstream of Shaver Lake, two potential floodplain areas were identified. One of these areas is situated between RM 3.9 and 4.3 and consists of B3 and B5 channel types (Figure CAWG-2-1a). Channel down-cutting is evident in this reach, causing an historic floodplain area to be abandoned as a low-terrace that is either infrequently, or possibly never inundated (Figure CAWG-2-1a). The cause of channel down-cutting is not known, and may not be associated with project operations since this segment of the channel has apparently been extensively altered due to historic timber operations and to construction of the dam. The other identified floodplain area is situated between RM 2.7 and 3.2 within a B3 section of channel that is well-forested. The channel appears to be both laterally and vertically stable in this reach. The spatial extent and frequency of floodplain inundation under the present-day flood regime is not known.

Big Creek Watershed

The only section of floodplain is a 0.3-mile long reach on Big Creek between RM 8.3 to 8.6. This is classified as a B5, sand-dominated section of channel downstream from Huntington Lake, near the siphon crossing. Based on field observations, this section of Big Creek is part of a longer reach below Huntington Lake that appears to be an under-sized channel compared with other sections of Big Creek. Whether or not this floodplain historically existed prior to flow regulation is not definitively known at this time. It is possible that a portion of the present day floodplain exists within the former channel cross-sectional area.

South Fork San Joaquin River Watershed

Several potential floodplain areas were identified in the South Fork San Joaquin River (SFSJR) watershed. A discussion of those areas identified along the mainstem of the SFSJR and the Project-affected tributaries is provided below.

No floodplain areas were identified within the deeply entrenched channel reach between RM 0.0 and 14.0; however, potential floodplain areas were identified along most of the channel between RM 14.0 and 24.1 with the exception of several short segments of G-channel and immediately downstream of Florence Lake between RM 26.1 and 27.7 (Figures CAWG-2-1c and 1d). It is not known if a portion, or nearly all of the channel situated between RM 14.0 and 24.1 functioned historically as a floodplain or as a low-terrace that may have only infrequently been inundated. Of this 10.1 mile-long reach, there is a C3 channel segment in the vicinity of Mono Hot Springs (RM 19.9 to 20.9) that based on visual observations has historically functioned as a floodplain, not as a low-terrace. This segment of the floodplain has been commercially developed for lodgings, campgrounds, and recreational use. Upstream from Crater Creek confluence (RM 23.5 to 24.1), there is recent evidence of overbank flows onto a portion of the delineated floodplain. The spatial extent and frequency of floodplain inundation along the 10.1 mile-long reach under the present-day flood regime is not known. Between RM 26.1 to 27.7 immediately below Florence Lake, the channel is situated in a broad valley area and consists of C5/B5c channel type with an extensive floodplain area adjacent to both banks. This floodplain area contains campgrounds, is heavily used for recreational purposes, and likely was historically used for grazing. The spatial extent and frequency of floodplain inundation under the present-day flood regime is not known.

Potential floodplain areas were identified on Crater Creek, Tombstone Creek, and Mono Creek as described below.

Along Crater Creek, a potential floodplain area was identified between RM 0.0 and 0.42 in the meadow near the confluence with the SFSJR. It is possible that a portion of this floodplain area was historically inundated by the SFSJR, as well as by Crater Creek itself. A section of Crater Creek within the floodplain area is classified as an anastomozing channel type (DA5), as evidenced by the multiple channels, and has also been subject to lateral adjustments.

The lower portion of Tombstone Creek between RM 0.0 and 0.55 consists of E5 channel which was identified as a potential floodplain area that merges with the floodplain of the SFSJR (see Figure CAWG-2-3d). As described above, this portion of the floodplain has likely been historically grazed, and is currently used for campgrounds and recreation.

Two potential floodplain areas were identified along Mono Creek between RM 2.3 to 2.8, and RM 3.5 to 3.7 (see Figure CAWG-2-3d). Both sections are classified as B5 channel types, indicating moderate entrenchment and sandy bed substrate. With the exception of these two floodplain locations, most of the length of Mono Creek appears to be bounded by a high terrace.

5.2.5 Potential Riparian Encroachment

Riparian vegetation within and along the margins of the bankfull channel was catalogued during the aerial and ground surveys. The surveys included identification of those areas considered to be potentially encroached. Typically, riparian vegetation is limited to the margins of the active channel during average runoff years. During the summer, the banks and exposed bars of many California rivers are covered with willow, alder, and other seedlings or sprouts. Riparian seedlings are usually inundated and scoured during moderate flows approaching bankfull discharge (Mount 1995). During extended periods of drought, gravel bars and banks may become colonized by riparian vegetation that can establish extensive root systems, resistant to scour by bankfull flows, and thus requiring much larger floods to re-establish the natural cycle of riparian scour and regeneration. Dams are known to mimic the effects of long-term droughts on riparian vegetation. Reduced peak flows due to regulation can cause establishment of vegetation on bars and banks within the formerly unvegetated cross-sectional area of the channel.

In order to identify possible areas of encroachment, the extent of vegetation on bars and on the channel banks and margins were observed, and considered with regard to the likely extent of vegetation within the cross-sectional area of the historic channel prior to flow regulation. Mature riparian vegetation colonizing extensive bar areas or along the channel margin was one indicator for potential encroachment. Less than mature vegetation, including seedlings, colonizing only the perimeters of bars or the stream margin was another indicator for potential encroachment, but obviously not as strong an indicator as more extensive and mature vegetation. Identification of encroached areas unavoidably involves some judgment and interpretation regarding the likely extent of the bankfull channel cross-sectional area and the pattern and density of riparian vegetation prior to flow regulation in order to make a comparison to present-day conditions. Given that the 2002 field surveys were qualitative in nature, and that some interpretation of historic versus present-day conditions is required in order to designate an area as encroached, for purposes of this study encroachment is referred to as potential encroachment. The intent of designating areas of potential encroachment during the 2002 surveys is to “red-flag” stream reaches that may be considered for additional, quantitative study in order to confirm encroached conditions or to describe the extent of encroachment in greater detail. Designations of potential encroachment, at this time, are not definitive statements of an encroached condition.

Potential channel encroachment by riparian vegetation was classified into one of two primary groups: (1) dense and continuous; and (2) limited and discontinuous. The two groups encompass the widely differing extent of potential encroachment conditions observed in the field. The dense and continuous classification refers to reaches where vegetation has probably altered the hydraulic capacity of the channel, and where the physical dimensions of the cross-sectional area of the historic channel may or may not have also been reduced. The limited and discontinuous areas of encroachment refers to reaches where the extent of potential encroachment is obviously less than the first group, with riparian vegetation found only on isolated bars or intermittently along the channel margin. The physical dimensions of channel cross-sectional area and hydraulic capacity have probably not been reduced in this case. The limited and discontinuous areas of encroachment includes, for example, locations such as bedrock channel reaches where scattered trees were growing in fissures or on isolated well-vegetated bars (that probably had not been established prior to project flow regulation). Identification of potentially encroached areas under either classification does not necessarily imply impacts to fish or amphibian species. Effects on biological resources were not evaluated as part of the geomorphic surveys. Potential riparian encroachment is depicted on Figures CAWG-2-3a, 3b, 3c, and 3d. It should be noted that only channel segments below project diversions are considered, since by definition, encroached conditions cannot exist in channels where the flow regime has not been altered (assuming that periods of drought are within the natural cycle of riparian colonization, growth, and then destruction when wet periods re-occur).

This discussion of potential riparian encroachment references the Project Area streams by the following basins: the San Joaquin River, Stevenson Creek, Big Creek, and the South Fork San Joaquin River.

<u>San Joaquin River</u>

Potential riparian encroachment was not observed during aerial and ground reconnaissance surveys of the San Joaquin River, including the two tributaries, Ross and Rock Creeks.

<u>Stevenson Creek Watershed</u>

There are possible changes in the channel morphology along North Fork Stevenson Creek, including a wider channel with development of a floodplain between RM 1.7 and 2.4. There are several large cobble-gravel bars in this reach with colonizing willows, alders, and some pines. This reach has been classified as a limited and discontinuous area of encroachment, and is depicted in the photograph, Figure CAWG-2-4.

Immediately below Shaver Dam, Stevenson Creek there is a 0.4 mile reach that is identified as an area of dense and continuous encroachment (RM 3.9 to 4.3). Historic bankfull indicators were identified above the present-day bankfull channel, with trees and woody riparian species growing within the former bankfull elevation. However, it is noted that this reach has been affected by mill ponds and dams long before Shaver Dam was constructed and has probably also been altered by construction of the road, and former timber operations. These former impoundments and land-uses could be the causative factor inducing encroachment and ongoing project-related operations may maintain it. Sorting out the different land-use influences on riparian conditions is problematic, at best.

Big Creek Watershed

Potential riparian encroachment was documented during aerial and ground reconnaissance surveys of Big Creek. Potential riparian encroachment was classified as limited and discontinuous from the Big Creek confluence with the San Joaquin River, RM 0.0 to 1.2, and from RM 2.1 to 6.2 upstream of the Dam 5 impoundment. Scattered, isolated patches of riparian vegetation were observed within the bankfull channel, comprised of young willows and alders, perennial herbaceous vegetation, and occasionally, the channel margin was forested. Bedrock and boulder-dominated conditions along most of Big Creek limits the extent of potential riparian encroachment.

Potential riparian encroachment, consisting of alder thickets growing along the stream margin and within the active channel, was dense and continuous from RM 8.0 to 9.6 immediately downstream of Huntington Lake. Figure CAWG-2-5 shows willows growing in this reach in a portion of the channel that is designated a steep-gradient A1/A2 channel type.

Potential riparian encroachment was not observed on the Big Creek tributaries surveyed, including Pitman (Tamarack), Balsam, Ely and Adit 8 creeks.

South Fork San Joaquin River Watershed

Potential riparian encroachment was documented during aerial and ground reconnaissance surveys of the South Fork San Joaquin River and its tributaries. Potential riparian encroachment was observed and classified as limited and discontinuous from RM 0.7 to 1.0, and from RM 1.55 to 1.9. These two short segments of channel have mature tree-species growing on several bars near the confluence with the San Joaquin River. Limited and discontinuous potential encroachment was also designated from RM 14.0 to 19.0, from RM 19.4 to 19.8, from RM 19.9 to 20.9, from RM 21.1 to 21.8, and from RM 22.0 to 24.0. These segments of the South Fork San Joaquin River between Rattlesnake crossing and Florence Lake all include B- and C-type channels, excluding the short segments of G-type channels from encroachment (see Figure CAWG-2-3d). The potentially encroached segments are on the channel banks and bars, where willows, alders, and some tree-species have colonized.

Potential riparian encroachment was classified as dense and continuous along Mono Creek from RM 1.35 to 4.05. This potentially encroached section of B2 and B5 type channel includes willows and alders established along the channel margins. Limited and discontinuous potential riparian encroachment was also observed upstream to the Mono Creek diversion from RM 4.2 to 5.8. This section of channel is classified as B2 with scattered riparian vegetation comprised of young willows, alders, and perennial herbaceous vegetation within the bankfull channel.

Limited and discontinuous potential riparian encroachment (willows, alder, grasses) was observed in Bear Creek from RM 1.0 to 1.5, immediately below the Bear Creek diversion.

Dense and continuous potential riparian encroachment was observed immediately downstream of the Bolsillo Creek diversion from RM 1.47 to 1.57. Potential riparian encroachment was observed downstream of the Crater Creek diversion, from RM 2.60 to 2.87 in Crater Creek, dense alder growth was observed within and along the margins of the bankfull channel.

Potential riparian encroachment was not observed during ground surveys on Camp 62, Chinquapin, Hooper, North and South Slide, and Tombstone creeks. In addition, surveys of the Crater Diversion Channel did not yield any observations of riparian encroachment.

5.2.6 Large Woody Debris (LWD) and Function

The presence of LWD and associated stream function were documented during the 2002 aerial and ground reconnaissance surveys. As discussed in Sections 4.2 and 4.3, the criteria used for LWD was a log or piece of downed wood at least 4-inches in diameter with a length equal to or greater than one half of the channel bankfull width (per USFS SCI Guidebook). During the aerial surveys, the abundance of LWD within a reach was characterized based on the following criteria: 1) “none to low” in reaches with less than 5 pieces per mile; and, 2) “moderate to high” in reaches with 5 or more pieces per mile (see Appendix C). Recruitment potential for LWD was rated during aerial surveys into “low”, “moderate”, and “high” categories from both the riparian corridor and upslope hillsides (see Appendix C for criteria and guidelines).

Ground surveys documented the presence of LWD in the low flow, bankfull, and floodprone channel zones (see Appendix D). The associated geomorphic function of LWD observed was classified as follows: (1) scour pool forming; (2) separation bar forming; (3) sediment retention; (4) bank protection; (5) promoting bank scour or erosion; and (6) no apparent function. In addition, the recruitment potential of LWD was rated based on the density and proximity of qualifying source trees, and hillslope steepness or delivery potential (see Appendix D).

Areas of “moderate to high” LWD derived from aerial and ground surveys are depicted on Figures CAWG-2-6a, 6b, 6c, and 6d. A summary of the status of LWD, recruitment potential, and geomorphic function is discussed below for each of the project streams.

San Joaquin River

Several pieces of LWD were observed at the upstream end of Mammoth Pool in the reservoir (RM 34.5), predominantly transported from upstream of Mammoth Pool and deposited when it enters the reservoir. No other LWD was observed on the SJR, or Rock and Ross creeks. Potential for recruitment of LWD from either the corridor or upslope areas adjacent to the SJR channel was rated as “Low” in all reaches. This “Low” rating was due to the fact that most of the slopes along the inner gorge of the SJR are bedrock, supporting little soil and few well-forested areas that would be a recruitment source of LWD. In addition, streambanks are nearly all non-erodible bedrock, so that bank erosion as a source of LWD is insignificant.

Stevenson Creek and North Fork Stevenson Creek

LWD was not observed in the project-stream reaches of Stevenson or North Fork Stevenson creeks. LWD was documented upstream of the Tunnel 7 outlet on North Fork Stevenson Creek (RM 3.6 to 3.9; 4.05). Primary functions of the LWD observed include bank scour, habitat formation (scour pool development), and sediment retention. Recruitment potential from the riparian corridor and upslope hillsides were rated “low” during aerial surveys for all portions of Stevenson Creek, except for the reach immediately below Shaver Dam which was rated as moderate (RM 3.9 to 4.3) due to the forested hillslopes. However, shallow adjacent hillslopes observed during ground surveys warranted a lower LWD recruitment rating. North Fork Stevenson was similarly rated as low recruitment potential, except for RM 1.8 to 2.3, which was rated as moderate recruitment potential from the riparian corridor. This moderate recruitment area is within the reach identified as a C3 channel type, which is well-forested, and subject to bank and hillslope erosion that would be a mechanism for LWD recruitment. A moderate to high recruitment rating was assigned for North Fork Stevenson above the Tunnel 7 outlet (RM 3.55 to 4.05) due to relatively steep, well-forested hillslopes along the channel.

Big Creek and Tributaries

LWD was observed on Big Creek between RM 9.0 and 9.25 (see Figure CAWG-2-6a). LWD recruitment in this area was moderate due to steep, densely forested banks and hillslopes along the channel. Windthrow, senescence, and possibly mass-wasting are likely mechanisms for recruiting LWD to the channel. Recruitment associated with fluvial processes (i.e., bank erosion) is minimal in this reach due to the lack of flow immediately below Huntington Dam. LWD recruitment was rated as low from both the corridor and upslope hillsides for most portions of Big Creek, except for a 1.5 mile long reach above Dam 4 (RM 6.4 to 7.9) which was rated as moderate potential for recruitment.

LWD was observed on Ely Creek at RM 0.7, and on Adit 8 Creek from RM 0.55 to 0.95. Accumulations of LWD were recorded above Project facilities on Balsam (RM 1.05; 2.55), Ely (RM 1.1; 1.3 to 1.5), and Adit 8 (RM 0.95 to 1.0) creeks. No LWD accumulations were documented on Pitman Creek, and recruitment potential was rated as low to moderate due to shallow hillslopes and lower tree densities. Recruitment potential was not rated for Balsam Creek during aerial surveys due to dense canopy cover limiting observations, however ground surveys rated moderate to high recruitment from steep hillslopes of moderate tree densities. Ely and Adit 8 creeks were rated as moderate to high for LWD recruitment based on observed well-forested, steep hillslopes.

South Fork San Joaquin River and Tributaries

LWD was observed during aerial surveys on the South Fork San Joaquin River from RM 22.3 to 26.0 (below the confluence of Crater Creek). LWD was observed suspended above the channel on boulders or jammed on boulder bars. The observed LWD appeared to lack geomorphic function, however LWD may provide good refuge habitat for fish. This reach was rated as moderate for recruitment of LWD from the riparian corridor. Recruitment from upslope areas was rated low due to the lack of channel confinement by adjoining hillsides. Further upstream from approximately the confluence with Crater Creek to Florence Lake (RM 26.1 to 27.7), potential for recruitment is rated as moderate from both the riparian corridor and upslope hillsides.

No other sections of the South Fork were identified as locations with LWD.

Mono Creek was observed to have more extensive areas with LWD than any other project stream. LWD was documented from the RM 0.0 (SFSJR confluence) to RM 5.7 (see Figure CAWG-2-6d). Below the Mono Creek diversion, hillslope recruitment of LWD was relatively high due to steep slopes and dense coniferous vegetation. On Mono Creek, LWD appeared to have no apparent geomorphic function. Similarly, Ruediger and Ward (1996) found in-channel LWD often laying over the top of boulders and did not appear to interact with streamflow. LWD Recruitment potential from the riparian corridor was rated as moderate from RM 0.0 to 3.5 during aerial surveys. Upslope recruitment potential was rated as low from RM 0 to 2.4, moderate from 2.4 to 2.8, low from 2.8 to the diversion (RM 3.5).

LWD was also recorded above the Mono Creek diversion impoundment below Lake Thomas A. Edison.

LWD was not observed on Bear Creek below the diversion, however LWD is present above the Bear Creek diversion (see Figure CAWG-2-6d). It is unlikely but unconfirmed that the LWD above the diversion was providing a geomorphic function. LWD recruitment potential was rated during aerial surveys as low below the diversion (RM 0.0 to 1.75), but upstream of the diversion, recruitment potential was rated as moderate. SCE removes LWD almost annually from the Bear Creek impoundment (pers. comm. Wayne Allen, SCE).

LWD was observed on Bolsillo Creek (RM 0.0 to 0.2; 1.2 to 1.4), Chinquapin Creek (RM 0.25; 0.5); and Camp 62 Creek (RM 1.3). Above the Bolsillo, Chinquapin, and Camp 62 diversions, LWD was also present. In Bolsillo, LWD provides sediment retention and scour pool forming function, a finding corroborated by Ruediger and Ward (1996) where

LWD was found to influence pools and sediment retention in low gradient reaches where depositional processes occur. Above the Bolsillo diversion, LWD lacks apparent geomorphic function and recruitment potential is rated as low to moderate due to shallow hillslopes and low densities of qualifying trees in proximity to the channel. Above the Camp 62 and Chinquapin diversions LWD is commingled with debris flow material, retaining sediment and creating scour pools. Below the Camp 62 and Chinquapin diversions, LWD lacks apparent geomorphic function except where jams retaining sediment have formed. Bolsillo, Chinquapin, and Camp 62 are steep, lower order streams flanked by steep, densely forested hillslopes that facilitate LWD delivery to the channel. Above the Camp 62 and Chinquapin diversions, LWD is also recruited via debris flow scour.

LWD was observed on Crater Creek (RM 0.17; 1.51 to 1.82; 2.38). The function of LWD on Crater Creek varies widely. In the lowermost meadow reaches (Hell Hole Meadow) where the channel gradient is relatively flat and is weakly entrenched (RM 0.2), LWD forms a debris jam, retaining sediment. From RM 1.51 to 1.82, LWD forms debris jams, resulting in localized lateral channel instability and channel avulsion. At RM 2.38 a LWD jam was recorded where the valley is confined by bedrock walls. Fine and coarse sediment was observed upstream of the LWD jam. A LWD accumulation was noted above the Crater diversion in a relatively flat area (C5 channel type) of sediment deposition. Upstream from RM 0.48 to the diversion (RM 2.87), recruitment potential was rated during aerial surveys as low (downstream from RM 0.48 the channel was not visible, and therefore recruitment potential was not rated). Ground surveys rated the lower portion of Crater Creek near Hell Hole Meadow as having low LWD recruitment potential due to nearly flat slopes and lack of available trees. Above the Crater diversion, LWD recruitment is rated as moderate owning to moderately dense tree densities on relatively steep hillslopes.

LWD was recorded on the Crater Diversion channel from RM 1.0 to 1.3 and 1.55 to 1.7. Sediment retention was noted in LWD areas, however geomorphic function of LWD was rather limited. Recruitment potential of LWD in the Crater Diversion channel was rated as moderate to high throughout, with varying degrees of hillslope steepness and low to moderate tree densities.

LWD was documented during ground surveys where Hooper Creek traverses over its alluvial fan from RM 0.1 to 0.2. Above the diversion (RM 0.7 to 1.6), LWD was rated “none to low” based on aerial surveys. Debris flows and accompanying channel avulsions are likely processes responsible for recruitment of LWD below the diversion on the alluvial fan. Some sediment retention function was noted in Hooper Creek below the diversion, however, geomorphic function was lacking overall. Recruitment potential of LWD in lower Hooper Creek was rated as low, owing to low to moderate tree densities on shallow to steep hillslopes. Evidence of recent fire activity was noted on Hooper Creek from RM 0.3 to 0.5, appearing to have burned vegetation within the channel and clearing understory vegetation throughout the area.

No LWD was observed on North and South Slide Creeks.

Tombstone Creek includes three LWD areas with LWD present, above the valley flat on the alluvial fan located below the diversion at RM 0.4 to 0.6, and above the diversion in a very steep reach (Aa+ and A-type channel classification), RM 0.95 to 1.2, and 1.55. Debris flows and accompanying channel avulsions are likely processes responsible for recruitment of LWD above and below the diversion, particularly on the alluvial fan portion of the channel. Some sediment retention function was noted during ground surveys, however geomorphic function was generally lacking. Recruitment potential of LWD was rated as high throughout Tombstone, owing to well-forested, steep hillslopes. The upper hillslopes are sparsely vegetated above the densely forested stream corridor.

At the watershed scale, LWD has been found to play a minor geomorphic role in the determination of channel alignment or geometry, or the temporary storage of sediment. However, some exceptions exist for specific reaches. LWD has a significant influence on sediment retention in Bolsillo Creek. However, LWD clearly plays an important role with regard to the occurrence and nature of aquatic habitat. Even in high transport systems like the SFSJR, the transient nature of LWD and LWD jams provide important refuge habitat during high flow events.

5.2.7 Montgomery Buffington Classification

The Montgomery-Buffington (1993) classification synthesizes stream morphology into seven reach types based on distinctive bed morphology (Figure CAWG-2-7). The diagnostic features of each channel type are shown in Table CAWG-2-8. The Montgomery-Buffington channel type is determined by visual observation, no measurements are required for the classification. The seven reach types can be grouped into 3 basic types of channels; colluvial, alluvial, and bedrock. Montgomery-Buffington classifies alluvial channels into five types; dune-ripple, pool-riffle, plane-bed, step-pool, and cascade. Bedrock and colluvial channels may have variable bedform patterns, but they are not further sub-divided into unique channel types as are the alluvial channels by the Montgomery-Buffington classification system.

Colluvial channels are small headwater streams that flow over colluvial valley fill and exhibit weak or ephemeral fluvial transport. They are typically very steep (> 10%), and exhibit variable bedforms. Colluvial channels have none to very limited floodplain development.

Bedrock streams can be defined as channels where a substantial proportion of the boundary is exposed bedrock, or is covered by an alluvial veneer that is largely mobilized during high flows such that the underlying bedrock geometry influences patterns of hydraulic and sediment movement (Wohl 1998). Bedrock channels are non-adjustable, typically confined, have a steep to moderate gradient, usually with little to no floodplain development. The bedform may be variable in bedrock channels.

Alluvial streams are defined by channels that can erode, transport, and deposit sediments, such that they are self-forming and self-maintained (Dunne and Leopold 1978). The transport capacity is not capable of scouring the channel to bedrock.

Alluvial channels are found over a relatively wide range of slopes, from low to high gradients, and may have very narrow to very wide floodplains.

Of the alluvial channel types, cascade type channels have the steepest slopes (>6.5%), with large particle sizes (typically boulders and cobble) relative to flow depth. The cascade type channels tend to have longitudinally and laterally disorganized bed material. Step-pools have relatively steep slopes ranging from about 3% to 6.5%, with relatively large particle sizes, usually boulder and cobble, often with some bedrock exposures. The step-pool bedform is organized into a series of channel-spanning accumulations that form a series of steps separating pools. Plane-bed channel types have moderate slopes, ranging from 1.5% to 3%. The bedform is considered featureless, with limited lateral and longitudinal bed oscillations, often typified by glides, riffles, and rapids. Cobble-gravel bed material is the typical particle size. The pool-riffle channels have low to moderate slopes, generally less than 1.5%. The bedform is organized into laterally oscillating sequence of bars, pools, and riffles. Dune-ripple types are exemplified by unconfined, low-gradient channels with sandy bed material. The Dune-ripple channels have mobile bedforms such as ripples, sand waves, dunes, and anti-dunes.

Montgomery-Buffington classification of step-pool, plane-bed, and pool-riffle, alluvial channel types generally correspond to the stream types A, B, and C in the Rosgen classification, respectively. The mode of slope gradients for these Montgomery-Buffington channel types corresponds fairly well to the slope gradients assigned to the A, B, and C stream types by Rosgen. However, Rosgen's classification may also fail to distinguish between different Montgomery-Buffington bedform classifications. For example, C channel types may include reaches with dune-ripple, pool-riffle, or plane-bed morphologies, B channel types may include plane-bed, pool-riffle, or step-pool morphologies, and A channel types may include colluvial, cascade, step-pool, or bedrock morphologies.

All of the project streams have been classified according to Montgomery-Buffington (map Figures CAWG-2-8a, 8b, 8c, and 8d). Many of the alluvial stream reaches are identified by an intermediate channel type that is a combination of the five basic alluvial types. Montgomery-Buffington recognizes that the five alluvial stream types are in reality found along a continuum, and that a given channel may be best described by combining the basic stream types into intermediate types.

A summary of Montgomery-Buffington stream types represented by Project affected streams is shown in Table CAWG-2-9. Bedrock channel types comprise approximately 21.8 miles (24%) of all project streams. Although some project streams are situated near to their headwaters and many receive colluvial sediment inputs, none were classified as strictly colluvial channels, with only 0.4 mile of classified as colluvial-step-pool (Tombstone Creek). Most project streams, approximately 67 miles (76%), are defined into one of the alluvial channel types. Most of the alluvial channel types, 20.3 miles (23%) are classified as step-pool/plane bed channels. Plane-bed/pool-riffle channel types represent 14.5 miles (16%), while strictly plane-bed channels comprise 13.0 miles (15%), pool-riffle types comprise 7.4 miles (8%), cascade/step-pool represent 4.5 miles (5%), cascade types represent 2.7 miles (3%), bedrock/cascade 2.0 miles (2%), and step-pool channels represent 1.6 miles (2%). The remaining streams are also classified as intermediate types, accounting for an additional 1.4 miles of channel. Dune-ripple channels are not represented in the project area.

A summary description of the Montgomery-Buffington channel classification for each project stream below the diversion location and above the diversion locations (where they were ground surveyed) is provided below. Channel classifications above the diversion locations are shown on their respective map figures.

San Joaquin River and Tributaries

Most of the San Joaquin River, approximately 8.0 miles, is classified as a pool-riffle/plane-bed channel type, approximately 6.5 miles are classified as pool-riffle, and approximately 6.0 miles are classified as bedrock (see Figures CAWG-2-8a and 8b).

From RM 0.0 to 6.1 (Redinger Lake), the river is nearly evenly split between bedrock and plane-bed channel types. Above Redinger Lake RM 11.1 to 17.2 (Dam 6) the channel is pool-riffle, defined by cobble-boulder bars and pools. From the backwater the Dam 6 lake (RM 18.2) to Mammoth Pool (RM 26.1) the river is classified as an intermediate type; pool-riffle/plane-bed, containing elements of both channel types. Upstream from Mammoth Pool RM 35.1 to 37.5 the channel is designated as bedrock. In the most upstream 0.8 mile long reach, (RM 37.5 to 38.3) at the confluence with the South Fork San Joaquin, the channel is designated as pool-riffle.

Ross and Rock Creeks are both designated as bedrock channels, and are primarily bedrock channels upstream of the diversion, except for a short 15 mile-long segment immediately above the Rock Creek diversion that is designated step-pool.

Big Creek and Tributaries

Big Creek and its tributaries are dominated by the bedrock channel type (see Figure CAWG-2-8a). Most of the mainstem Big Creek channel downstream from Huntington Lake, approximately 68% (6.9 miles), is designated as a bedrock channel type. Plane-bed channel comprises less than 19% (2.0 miles), with about 10% comprised of other intermediate types. Upstream from Huntington Lake, Big Creek is designated Cascade channel type (0.2 mile), but quickly transitions to a plane-bed channel type for over 2.5 miles.

Pitman Creek is entirely classified as a bedrock channel type. Pitman creek is nearly entirely classified as a bedrock channel type for one-mile upstream of the diversion. Over one-half of Ely Creek is designated as bedrock channel, and most of the other half of the channel length is designated as a bedrock/cascade channel type. For 0.3 mile above the diversion Ely creek is designated as a bedrock/cascade channel type, and then is classified as pool-riffle for the next 0.2 mile. Balsam Creek is entirely designated as bedrock/cascade and is dominated by bedrock channel for almost 2 miles above the diversion. Over one-half of Adit 8 Creek is designated as bedrock, with the other half nearly evenly split between cascade and cascade/step-pool types. Above the diversion, Adit 8 is bedrock and cascade channel types.

Stevenson and North Fork Stevenson Creeks

Stevenson Creek is 75% bedrock channel type (3.1 miles), with the other 25% of the channel nearly equally split between cascade/step-pool, plane-bed, and plane-bed/pool-riffle types (see Figure CAWG-2-8a). All of the non-bedrock channel types are found between RM 2.0 and Shaver Lake (RM 4.3).

North Fork Stevenson Creek is 65% bedrock channel (1.8 miles). There is a 0.6 mile long reach (22%) designated as plane-bed/pool-riffle (RM 1.8 to 2.4) where the channel gradient flattens out and several cobble-gravel bars are deposited. Another 10% of the channel is classified into step-pool, pool-riffle, and plane-bed/pool-riffle types. North Fork Stevenson Creek is cascade/step-pool, bedrock, plane-bed, and plane-bed/pool-riffle channel types beginning immediately upstream from Tunnel 7 outlet, progressing upstream in approximately 0.1 mile increments, respectively.

South Fork San Joaquin River and Tributaries

Over one-half (60%) of the South Fork San Joaquin River is designated as a step-pool/plane-bed channel type, all situated between RM 0.0 to 14.0. The step-pool/plane-bed channel is characterized by a nearly featureless bed, with almost no lateral oscillations (i.e., low sinuosity and few bars), and relatively little vertical oscillations of the bed except for occasional steep drops (“steps”) interspersed by longer reaches of flatter gradient water. About 22% (6.1 miles) of the channel is designated as strictly plane-bed and 14% (3.9 miles) as plane-bed/pool-riffle. The plane-bed and plane-bed/pool-riffle channel types are all located upstream between Rattlesnake Crossing and Florence Lake (RM 14.0 to 27.9). Upstream from Florence Lake, the South Fork San Joaquin is predominantly bedrock channel type to as far as Blayney Meadows, about 3 miles upstream.

Mono Creek is nearly half (48%) step-pool/plane-bed (2.8 miles), most of which is located in the most downstream reach (RM 0.0 to 2.4). About 30% of the channel is designated plane-bed/pool-riffle (1.8 miles), which is situated downstream of Mono Meadows (RM 2.4 to 4.2). Upstream from Mono Meadows, the stream is steeper gradient, and is predominantly classified as cascade/step-pool, comprising 21% (1.2 miles) of the total channel type. Immediately upstream from the tailwater of the diversion, Mono Creek is designated a cascade/plane bed channel type.

Most (78%) of Bear Creek is classified as step-pool (1.2 miles), with bedrock and plane-bed comprising the remainder of the channel types. Immediately upstream from the tailwater of the reservoir, the channel is classified as bedrock (0.1 mile), plane-bed (0.2 mile), and pool-riffle (0.1 mile). Thereafter, Bear Creek is classified as a bedrock channel type for several miles.

Most upstream project tributaries to the South Fork San Joaquin (Bolsillo, Camp 62, Crater Diversion, Tombstone, North and South Slide, and Hooper) are predominantly cascade and step-pool channel types, or an intermediate channel type that includes cascade and step-pools. These channel types are associated with relatively high gradient streams, typically dominated by boulder and bedrock particle sizes.

Bolsillo Creek is primarily divided between bedrock/cascade (29%), plane-bed (26%), and cascade/step-pool (21%) channel types. Together, these 3 channel types represent about 1.3 miles of stream. Bolsillo is classified as plane-bed for 0.2 mile above the diversion, and then cascade/step-pool for 0.4 mile.

Camp 62 Creek is predominantly characterized as relatively high gradient cascade/step-pool (0.5 miles, 35%), and cascade (0.3 miles, 20%) channel types. Step-pool and step-pool/plane bed comprise another 35% of the channel type on Camp 62 Creek. For 0.5 mile above the Camp 62 diversion, the channel is cascade/step-pool.

Cascade and cascade/step-pools, associated with the steeper gradient streams, are the predominant channel types on Crater Creek (respectively, 36%, 1.1 miles and 27%, 0.8 miles). The most downstream reaches of Crater Creek have a much lower gradient, and is situated in a broad meadow. Plane-bed/pool-riffle and pool-riffle channel types occur in this lowermost 0.42 mile long reach, representing approximately 15% of Crater Creek. Above the diversion, Crater Creek is designated cascade (0.1 mile), plane-bed (0.2 mile), pool-riffle (0.1 mile), and cascade/step-pool (0.1 mile).

The Crater Diversion channel is nearly equally divided into bedrock (27%), bedrock/cascade (21%), cascade (22%), and plane-bed (30%) channel types.

The lower half of Tombstone Creek is comprised of a low-gradient meadow reach that is characterized by the relatively featureless, sandy, plane-bed channel type (56%, 0.55 miles). The remainder of Tombstone Creek above the valley flat is a higher gradient, headwaters channel that receives colluvial sediment inputs, characterized as colluvial/step-pool (37%). Tombstone is colluvial/step-pool and colluvial/plane-bed for 0.2 mile above the diversion, and thence bedrock/cascade channel type.

Hooper Creek is dominated by the cascade/step-pool channel type (64%, 0.45 mile), with plane-bed (24%) and cascade (11%) making up the remainder of the channel. Hooper is classified as a bedrock channel type above the diversion.

North Slide and South Slide Creeks are almost completely dominated by the cascade channel type. North and South Slide are both designated as cascade channel types for 0.2 mile above their diversions.

5.2.8 Sensitive Channel Types

Although there is no widely accepted definition for sensitive channel types, geomorphic researchers have consistently found that different streams vary in their responsiveness to changes in streamflow and sediment supply (Montgomery and MacDonald, 2002). A study of 20 mountain streams in southern Wyoming and northern Colorado to flow depletion found no significant differences in bankfull channel width, depth, area, or conveyance capacity above and below diversion structures for steep to moderate gradient (> 1.5%) A and B channel types (Weshe 1991). However, lower-gradient C channel types did respond to flow depletion by significantly reducing mean channel depth, cross-sectional area, and conveyance capacity due to aggradation and vegetative encroachment.

Montgomery and Buffington (1997) developed a conceptual framework for assessing potential channel response to alteration of flow or sediment regime that is based on a channel classification system keyed to bed morphology (see Montgomery Buffington Classification section). The response potentials of the 7 different channel types defined by Montgomery and Buffington are shown in Table CAWG-2-10. Each of the 7 channel types are rated as to the responsiveness of their morphometric parameters; width, depth, slope, particle size, sediment storage, and roughness. Roughness here refers to riparian vegetation and LWD elements that interact with the flow, but does not include streambed particle size (which is typically considered part of the roughness characteristics of the channel).

The response predictions are based on geomorphic characteristics of the channel and reach-scale fluvial processes. In reality, channel response occurs as a matter of degree within a continuum, and cannot be forecast in a straightforward “black-or-white” manner. Channel morphology can provide a general indication of response potential, but a specific response depends on the nature, magnitude and persistence of the disturbance. The physical setting in which the channel is located including; confinement, bank materials, riparian vegetation, LWD, fires and other historical disturbances, is also important to predicting channel response. Additionally, channel response will vary with the type and intensity of change in the flow or sediment regime. Multiple, concurrent changes in the flow and sediment regime may cause opposing or constructive channel response, depending on the direction and magnitude of change (Montgomery and Buffington 1997). For example, trapping of fine sediment by upstream reservoirs and simultaneous reduction in downstream sediment transporting flows, may work as “opposing” forces, canceling each other’s effect and resulting in no net change in the amount of sediment deposited downstream and thus minimal channel response.

Although Montgomery-Buffington classification can be used to predict reach-scale responses to changes in fluvial processes and channel form, it is limited in predicting the nature and magnitude of adjustments at the habitat scale. For example, the classification system can be used to predict if a diversion is likely to alter bed particle sizes and sediment storage in the channel. But, it cannot be used to quantitatively estimate the extent to which the amount of spawning gravels in the tail-out of pools or pocket gravels deposited in the lee of boulders, may be changed. Thus, Montgomery-Buffington classification is a good guide to understanding the likely changes at a reach scale, but does not confirm the direction of the change (for example will the dominant particle size on the bed become finer or coarser?) or provide an estimate of the magnitude of that change, particularly at the habitat-scale. Additional information such as the nature and magnitude of change in the hydrologic regime and sediment regime, in conjunction with the channel classification, can improve the ability to predict channel response.

Bedrock, cascade, and step-pool channels are insensitive to most discharge or sediment-supply alterations due to their high transport capacity, generally supply-limited conditions, and non-erodible streambed materials. Bedrock channel types are considered to be the most insensitive to perturbations. Cascade and step-pool channels are typically confined, well-entrenched, with large, immobile bed material that makes channel incision or bank cutting unlikely. Potential responses in cascade type channels are generally limited to particle size alterations. Potential responses in step-pool channels include changes in grain size, sediment storage, depth, slope, and roughness. Bedrock, cascade, and step-pool streams are all classified as transport channels (see Table CAWG-2-10).

The more moderate gradient plane-bed, pool-riffle, and dune-ripple channels become progressively more responsive to altered discharge and sediment supply conditions. The lowest gradient dune-ripple channel type is most responsive. No project streams have been identified as dune-ripple channel types. The plane-bed, pool-riffle, and dune-ripple streams are all classified as response type channels. Since plane-bed and pool-riffle channels occur in both confined and unconfined valley settings, they may or may not be susceptible to channel widening or changes in valley bottom sediment storage. Unconfined pool-riffle channels have a high potential for channel geometry response, and confined pool-riffle channels have a lower potential for channel geometry response. Smaller and more easily mobilized bed particles in plane-bed and pool-riffle channels have potentially greater response of bed surface texture, sediment storage, and slope compared to cascade and step-pool morphologies. Changes in all geomorphic parameters are most likely in pool-riffle channel types.

Changes in sediment storage are the dominant responses of colluvial channel types due to their transport-limited capacities. Colluvial streams are classified as source type channels, which were very rarely identified along project streams below their diversion, although colluvial inputs were observed to be a source of sediment supply to many of the steep-gradient lower-order project streams. At some point above their diversions, all of these steep, low-order channels are colluvial channels.

The Rosgen classification system is not explicitly process-based as is the Montgomery-Buffington system, although there is a general correspondence between the A, B, and C channel types with the cascade and step-pool, plane-bed, and pool-riffle bedform classifications. Rosgen’s classification does combine reach morphologies that may have different response potentials. For example, C channel types may include reaches with dune-ripple, pool-riffle, or plane-bed morphologies, B channel types may include plane-bed, pool-riffle, or step-pool morphologies, and A channel types may include colluvial, cascade, step-pool, or bedrock morphologies.

Using as a guide Weshe’s (1991) study results based on Rosgen stream types, and the Montgomery-Buffington channel response framework, the following channel types may be recognized as the most responsive to project operations (total project stream miles are shown in parenthesis):

- Responsive Channel Types Based on Montgomery-Buffington Classification
- Pool-riffle (7.6 miles)
- Plane-bed/pool-riffle (15.8 miles)
- Plane-bed (11.90 miles)
- Responsive Channel Types Based on Rosgen Classification and Weshe Study Results
- B3, B4, B5 (8.5 miles)
- C3, C4, C5 (2.9 miles)
- DA (accounted for under the E5/DA5 channel type)
- E3, E4, E5 (0.9 miles)
- G3, G4, G5 (2.5 miles)

Although the DA and E channel types were not represented in Weshe's study, they are assumed to have similar sensitivities to alterations of the flow and sediment regime as the C channel types. This is because the C, DA, and E channel types all have relatively low gradients, and are poorly entrenched (i.e. high entrenchment ratio). The B channel types were not considered to be sensitive in Weshe's study, but he did not distinguish the extent to which bed particle size might account for channel responsiveness to changes in the hydrologic regime. It is likely that channels dominated by smaller bed particle sizes are more responsive to perturbations than channels dominated by larger bed particle sizes. Therefore for purposes of this study, B3, B4, and B5 channel types (cobble, gravel, and sand-dominated, respectively) are included as a continuum of sensitive channel types. The B1 and B2 channel types (bedrock and boulder dominated, respectively) are not considered to be sensitive due to their large bed elements. All of the A and Aa+ channel types are not considered to be sensitive to project operations. The G1 and G2 channel types are considered to be stable channel forms, and are functionally very similar to the A channel types given that most of the geomorphic characteristics, except for a lower gradient, are similar. However, G3, G4, and G5 channel types are considered to be highly unstable, while G1 and G2 channel types are considered to be very stable (Rosgen, 1996). Therefore, for purposes of this study, the G3, G4, and G5 channel types are identified as responsive channels.

There is overlap between identification of sensitive channels using the Montgomery-Buffington classification and the Rosgen classification systems. All of the C, E, and DA channel types, and nearly all of the B3, B4, and B5 channel types are already accounted for under the plane-bed and pool-riffle categories. In addition, the plane-bed and pool-riffle classifications already include several miles of Rosgen B2 and G2 channel types. Based solely on the Montgomery-Buffington system, there is approximately 35.3 miles of channel classified as response type streams (plane-bed, and pool-riffle), and therefore most likely to be sensitive to project operations. Based solely on the Rosgen classification system and criteria discussed above, there are 14.8 miles of sensitive channels.

Table CAWG-2-11 shows the locations of the responsive channel types based on the Rosgen Classification, and Table CAWG-2-12 shows the locations of responsive channel types based on the Montgomery-Buffington classification.

Using the Montgomery-Buffington classification and criteria for responsive channel types, which is the most conservative approach (i.e., most inclusive of responsive channel types), a total of 35.3 miles of project streams (39% of the total 90.5 stream miles, not including reservoir areas) are recognized as potentially sensitive to project operations. The sensitive plane-bed and pool-riffle channel types are shown on Figures CAWG-2-8a, 8b, 8c, and 8d. Using the Rosgen classification and criteria for responsive channel types, a total of 15.2 miles of project streams (16.8% of the total 90.5 stream miles, not including reservoir areas) are recognized as potentially sensitive to project operations. Tables CAWG-2-13 and CAWG-2-14 list the total lengths of responsive and non-responsive reaches for the project affected streams based on the Montgomery-Buffington and Rosgen classifications, respectively.

The majority of the potentially sensitive channel types are located on the San Joaquin River (16.8 miles), South Fork San Joaquin River (10.8 miles), Mono Creek (1.8 miles), and Big Creek (1.4 miles). It is noted that a considerable portion of the San Joaquin River and Big Creek sensitive channel reaches are highly confined by steep valley, mostly non-erodible bedrock walls. Confinement is defined as the ratio of the valley bottom width to the bankfull channel width. This ratio characterizes the extent to which lateral migration may be limited by valley walls; the lower the ratio, the more confined the channel. Channel confinement exerts an important control on potential channel response, as channels with wide floodplains (i.e., poorly confined) may laterally shift, change their sinuosity or planform in response to disturbance (Montgomery and MacDonald, 2002). Channels confined by valley walls are more limited in how they can respond to disturbance. Most segments of the other listed sensitive stream reaches are confined to a lesser degree than either the San Joaquin River or Big Creek.

5.3 Sediment Supply and Sediment Transport Characteristics

Qualitative aerial and ground surveys conducted in 2002 form the basis for developing an understanding of sediment supply and sediment transport conditions on project streams. CAWG-2 specifies under Step 3: Data Synthesis and Interpretation, that a description of the sediment transport regime be prepared, including:

- Determination of significant sources of sediment and erosion

- Areas of unnatural channel scour and bank erosion
- Importance of sediment input from tributary sources
- Significant sediment deposits in project streams and at tributary mouths
- Dominant transport mechanisms
- Effects of sediment trapping and sluicing at reservoirs

Sediment sources, including significant sources of sediment and erosion, unnatural channel scour and bank erosion, input of sediment from tributaries, and anthropogenic sediment inputs, are described below in the Sediment Sources sub-section. Sediment storage in-channel, including significant sediment deposits in project streams and at tributary mouths, is discussed in the Sand and Gravel Accumulations and Sediment Storage sub-section. The Conceptual Framework for Sediment Transport sub-section provides a description of dominant sediment transport mechanisms.

5.3.1 Sediment Sources

Sediment sources to project streams may include material delivered from the following processes:

- Hillslope processes (i.e., sources that deliver colluvial material)
- Landslides
- Rockfalls
- Gullying
- Rilling
- Sheetflow
- Channel processes
- Debris flows
- Streambanks
- In-channel storage sources (i.e., bars)
- Tributaries

Anthropogenic sources (road construction, tunnel construction, and other road-related sediment processes such as gullies).

Weathered bedrock material on hillslopes, once displaced, is known as colluvium. Colluvium may be mobilized by landslides, sheetflow, gullying, etc. Some hillslope transport processes may deliver sediments all the way to the stream channel, but often transported sediments may be redeposited on hillslopes, terraces, or floodplains, and remain in storage for periods of years, decades, or centuries.

Channel processes include (a) debris flows, (b) streambank erosion, and (c) in-channel sediment sources (i.e., mobilization of bars from in-channel storage). All sediment recognized as an in-channel source (primarily bars) are initially derived from either hillslope-driven processes or from channel processes (i.e., bank erosion, debris flows) which are deposited in the channel, and then periodically re-mobilized and transported downstream to higher-order channels. As such, in-channel sediment storage is not usually considered to be a channel process that supplies sediment. Thus, in-channel sediment storage is not further discussed as a sediment source in this sub-section, but is addressed in the Sediment Storage section as an important morphological characteristic of the project streams.

Erosion processes are commonly classified as either discrete or chronic. Discrete processes (for example, landslides, debris flows, and gullies) occur at a specific site and a specific time, and can usually be individually identified and counted, as they have been for this study. Chronic processes (for example sheetwash erosion) occur repeatedly, usually over long time periods, and although the process can be identified, it cannot as easily be counted or quantified as a site-specific, discrete processes.

Hillslope Processes

Of the colluvial sources, sediment may be derived from various mass-wasting mechanisms, including landslides, rock falls, sheetflow, gullies, and rills. In the project area, these colluvial sediment sources are not linked to streamflow conditions in the channel, but are driven by gravity, and usually in association with significant precipitation events.

Hillslope derived sediment from mass-wasting processes may not all be delivered to the stream channel. Where channels are unconfined, some sediments may be deposited on floodplains or terraces that act as long-term storage sites, never recruited to the channel. This may occur along the C and E type channels, and along some of the B type channels that have relatively wide valley bottoms. Where channels are confined (A, G, and some B type channels), a higher proportion of hillslope derived sediments will be delivered to the channel).

Discrete mass-wasting features identified during aerial and ground surveys are listed in Table CAWG-2-14 and shown on Figures CAWG-2-6a, 6b, 6c, and 6d. The field reconnaissance included all of the project streams where aerial and ground survey data was collected (see Figures CAWG-2-1a, 1b, 1c, 1d), and in addition included general observations of many non-project streams in the watershed that were not formally inventoried (i.e., using data sheets) from the helicopter. A total of three landslides and six debris flows (discussed under the Channel Processes section, below) were observed. These were the only types of mass-wasting processes identified and mapped. Other types of mass-wasting processes may occur, such as gullying, but might have been obscured from viewing in those areas that are heavily forested.

A shallow, small landslide (approximately 40 feet height by 150 feet width along the channel) was observed on Big Creek immediately below Huntington Lake. This landslide is located on a cut-bank that is comprised of predominantly coarse sand-sized particles. Although the landslide is not vegetated and appears to be active, it is not currently delivering large amounts of sediment to Big Creek because of the regulated flows from Huntington Lake. A landslide was observed along the inner gorge of the San Joaquin River downstream from Mammoth Pool, near Horsethief Creek. A large landslide was observed on Fish Creek (a non-project stream), a significant tributary to the San Joaquin River, located about 7 miles upstream from the confluence with the South Fork. The Fish Creek landslide appeared to be active, and delivering a large volume of predominantly fine material to the San Joaquin River. No other landslides were observed on non-project streams, or on project streams either upstream or downstream from diversion facilities.

Rockfalls are not indicated on Table CAWG-2-14 and have not been identified on maps. This is because rockfalls are so numerous, particularly along the inner gorge of the San Joaquin River, the lower-half of the South Fork San Joaquin River, and occasionally along Big Creek, where the channel is confined by steep bedrock valley walls, that it is unfeasible to count, and almost impossible to distinguish, one individual rockfall from another. The rockfalls were most prevalent in areas where there is jointed bedrock exposed in steep outcrops. Rockfalls primarily generate very coarse bed particle sizes (boulders), and is a significant process delivering material to these three stream channels. Confinement by valley walls allows direct sediment input by hillslope processes. Since rockfalls represent very coarse sediments delivered by non-fluvial processes, much of the boulder material delivered to the channel is likely not movable by the more frequently occurring flows.

The processes by which granitic rock weathers into sand was discussed in the Geology section. Field observations indicate that sheetflow on hillslopes is an important process by which predominantly sand-sized particles are delivered to channels, and is a significant sediment source in the project watershed. As a chronic erosion process, sheetwash is widespread throughout the San Joaquin River drainage, and is most prevalent on the steeper gradient headwater channels that are tributary to the South Fork San Joaquin River and to Big Creek. These channels are intimately connected to their adjacent hillslopes, so that sheetwash can deliver sediments directly to the channels. Some sheetwash delivery of sand also occurs where there are exposed bedrock slopes along the inner gorges of the San Joaquin River, South Fork San Joaquin River, and Big Creek.

Other processes such as gullies and rills may be responsible for transporting sand to project stream channels, however these types of erosion processes were almost never observed. During the 2002 aerial and ground field surveys, sand was commonly observed in streams throughout the project area. This includes locations above diversions and non-project affected streams. The widespread observations of sand is attributable to the lithology in the project area, where granite comprises about 76% of the San Joaquin River watershed above Kerckhoff Reservoir. Accumulations of sand, and gravel, are further described in section 5.3.3, In-Channel Sediment Storage and Sand and Gravel Accumulation.

Channel Processes

Debris flows are characterized by rapid mass-movement of densely-packed, coarse-bearing sediments. Typically, debris flows are evidenced by the presence of alluvial fans, and are distinguished by the random, unconsolidated, and poorly sorted deposits of coarse-to-fine particle sizes and by channels scoured to bedrock (Reid 1995). Debris flows are generated on steeper gradient slopes in the headwaters of smaller channels, and occur episodically. Recent debris flows were identified on six of the steeper gradient headwater tributaries of the South Fork San Joaquin River (see Table CAWG-2-15). In addition, there was some observations of likely past debris flows deposited on the alluvial fan of Tombstone Creek (approximately RM 0.5), although the evidence was not as clear as along the other South Fork tributaries. Debris flows were also evident in the Big Creek drainage on Ely Creek.

Based on field observations, debris flows are likely the most significant sediment input process to all of the 1st and 2nd order, steep-gradient project channels. Headwater channels are usually strongly coupled to sediment inputs from adjacent hillslopes, and are typically affected by the frequency of upslope debris flows and other mass movements (Montgomery and Buffington 1997).

Given the large project watershed area inspected, relatively few mass-wasting features were observed during the field surveys (other than rockfalls). Presumably, well-forested areas did not allow observations of some mass-wasting features, although the ground surveys located in well-forested areas also did not detect mass-wasting as a significant process. Other researchers previously doing geomorphic studies in the heavily forested Mill Creek drainage, a tributary to Mammoth Pool, found that mass-wasting processes were relatively insignificant as a natural erosion process (Seidelman et al, 1984?). That study also found that rockfalls were the predominant sediment production mechanism in those portions of the Mill Creek watershed that were comprised of erosion resistant bedrock, and channel incision into older alluvial deposits was an important source of sand. Seidelman (1984) also studied the forested Nehouse Creek watershed which drains to Mammoth Pool from the west-side. Debris flows and rock falls were found to be the most important sediment production mechanism in the steeper portions of the Nehouse Creek watershed, and bank erosion was thought to be an important source of sand. In both the Mill and Nehouse Creek watersheds, sand was found to cover the bed of most pools. Logging is a significant land-use in both watersheds, however, the Seidelman study could not determine if land management activities represent an accelerated source of sand to Mill Creek and Nehouse Creek. Streambank erosion is another source of sediment to project channels. Streambank erosion is usually directly linked to higher than average runoff events. However, there are processes such as slumping due to high pore pressure within dense, fine grained streambank material that can be responsible for bank erosion. Slumping processes were not observed during any of the field surveys.

In order to assess the potential contribution of sediment from streambanks, streambank erodibility and stability were evaluated during the reconnaissance surveys. Streambank erodibility was categorized using a combination of aerial and ground surveys as either “erodible” or “non-erodible” based on the streambank composition and susceptibility to erosion or scour. In general, the “non-erodible” category included banks composed of bedrock and/or boulders and the “erodible” category encompassed those areas where the bank material consisted of cobble and finer grained material or mixtures of boulder and finer grained material that appeared susceptible to erosion. It should be noted that channel areas rated as erodible are not necessarily in an active state of erosion. The classification only means these banks have a potential to be eroded by streamflow.

The results of the assessment indicate that non-erodible streambanks comprise approximately 87% (18.4 miles) of the channel length surveyed upstream of project facilities and approximately 77% (71.2 miles) of the channel length surveyed downstream of project facilities. Locations of erodible and non-erodible streambanks are shown on Figures CAWG-2-3a, 3b, 3c, and 3d. Sections of channel outlined in red are designated as erodible, and sections outlined in green are designated as non-erodible.

Streambank stability was assessed along approximately 26 miles of channel, as part of the ground inventory surveys using the United States Forest Service (USDA-FS) SCI criteria (USDA-FS 1996). Within each ground survey study segment, the streambank conditions were classified as stable, vulnerable, or unstable. Streambanks classified as stable had 75% or greater cover of living vegetation and/or other stability components such as rock or downed wood which are not easily eroded and had no indicators of instability. The vulnerable category was applied to streambanks which had 75% or greater cover but had instability indicators such as undercutting, fracturing, blocking, or slumping. Streambanks categorized as unstable had less than 75% cover and had instability indicators.

In regards to stability, the ground survey results indicate that stable banks are present along approximately 83% (5.9 miles) of the surveyed stream miles situated upstream of project facilities and approximately 67.2% (11.6 miles) of the surveyed stream miles situated downstream of project facilities. It should be recognized that the difference between the amount of stable stream banks above versus below diversions is in part due to fundamental differences in valley type and channel morphology. Streambanks categorized as vulnerable comprise approximately 14.6% (1.0 miles) and 19.5% (3.4 miles) of the surveyed stream miles situated upstream and downstream of project facilities, respectively. Unstable streambanks were identified along approximately 2.4% (0.17 miles) of the surveyed stream miles situated upstream of project facilities and approximately 15.1% (2.6 miles) of the surveyed stream miles situated downstream of project facilities. The results of the streambank erodibility and stability assessments are discussed in further detail below.

Streambank erosion below project diversions is considered to be a likely source of sediment production to the following channels:

- South Fork San Joaquin River (erodible between RM 14 and 27.7)
- Bolsillo
- Camp 62
- Chinquapin
- Crater Creek (erodible only at Hell Hole Meadow RM 0.0 to 0.5)
- North Slide Creek
- South Slide Creek
- Tombstone Creek (erodible only between RM 0.0 to 0.6)
- North Fork Stevenson Creek (erodible only between RM 1.8 to 2.4)
- Stevenson Creek (erodible only between RM 2.2 to 2.5, 2.7 to 3.2, 3.9 to 4.1)

Of the channels listed above with streambank erosion as a contributing sediment source, debris flows are likely a much more predominant sediment supply process on all except South Fork San Joaquin River, North Fork Stevenson Creek, and Stevenson Creek. Debris flow indicators were not observed on these three channels.

Streams where bank erosion is very unlikely to be a significant contributing sediment source, include:

- San Joaquin River
- South Fork San Joaquin River (RM 0.0 to 14.0)
- Mono Creek
- Bear Creek
- Big Creek
- Adit 8
- Balsam Creek
- Pitman Creek
- Ely Creek

The streambank erodibility results compiled from both the aerial and ground surveys are presented below and are summarized in Table CAWG-2-16 and shown in Figures CAWG-2-3a, 3b, 3c, and 3d. The streambank stability results derived from the ground surveys follow the erodibility discussion, and are summarized in Table CAWG-2-17.

<u>South Fork San Joaquin River Watershed</u>

The assessment results indicate that the SFSJR is predominately composed of non-erodible streambanks both upstream (approximately 2.60 miles or 66.7% of the surveyed upstream channel) and downstream (approximately 15.8 miles or 56.5% of the surveyed downstream channel) of Florence Lake. The erodible streambank areas are situated within the C-channel type situated between RM 32.9 and 34.2 upstream of Florence Lake and the B2/B3, B3, C3, and C5/B5c channel reaches downstream of Florence Lake which comprise approximately 12.14 miles or 43.5% of the channel.

The project tributaries to the SFSJR both upstream and downstream of the project diversions are primarily composed (>50%) of non-erodible streambanks with the exception of Bolsillo Creek, South Slide Creek, North Slide Creek, and Tombstone Creek downstream of the project diversions. South Slide, North Slide, and Tombstone Creek downstream of their diversions all flow through unconsolidated alluvial fan material and/or the valley flat where finer grained sediments are deposited and are susceptible to erosion. Erodible streambanks comprise approximately 57.3% (approximately 0.90 miles) of Bolsillo Creek downstream of the diversion. The erodible bank areas are situated within the B2/B5, A2/B2, G2/G5, B2/B3/B5, and E5 channel reaches between RM 0.1 and 1.55. In the vicinity of the High Sierra Ranger Station (RM 1.2), Bolsillo Creek is subject to lateral instability and avulsion where the banks are erodible (see Figure CAWG-2-1d). Along South Slide Creek, erodible streambank is present along 84.4% (approximately 0.27 miles) of the A2a+ channel reach situated between RM 0.0 and 0.27. Erodible streambank comprises 100% of North Slide Creek within the A2a+ reach between RM 0.0 and 0.29. Along Tombstone Creek, erodible streambank is present along 63.3% (approximately 0.62 miles) within the E5/E6 and B2/B5 reaches situated within Jackass Meadow between RM 0.0 and 0.62. There is approximately 0.55 mile of erodible streambank on Mono Creek in the sand-bedded B5 channel sections. On Bear Creek, none of the streambanks were rated as erodible.

<u>Big Creek Watershed</u>

The assessment results indicate that Big Creek is predominately composed of non-erodible streambanks both upstream (approximately 3.60 miles or 100% of the surveyed upstream area) and downstream (approximately 9.15 miles or 92.4% of the surveyed downstream area) of Huntington Lake. The erodible streambank areas are situated just downstream of Huntington Lake, within the B2/B5 and B5 reaches between RM 8.27 and 8.85 and the G5 reach between RM 9.6 and 9.77.

With the exception of Pitman Creek upstream of the project diversion, the project tributaries are primarily composed (>50%) of non-erodible streambanks. Erodible streambank comprises approximately 56.8% (approximately 0.5 miles) of the section of

Pitman Creek surveyed upstream of the diversion. The erodible bank areas are situated within the B1/B3/B5 channel reach situated between RM 1.52 and 2.02.

Stevenson Creek Watershed

The assessment results indicate that non-erodible streambanks comprise approximately 77.2% (approximately 3.3 miles) of Stevenson Creek downstream of Shaver Lake. The erodible streambank areas are situated within the B1/B3/B4 reach between RM 2.2 and 2.5, the B3 reach between RM 2.7 and 3.2, and the B1 and B5 reaches between RM 3.90 and 4.08.

Along North Fork Stevenson Creek, non-erodible streambank is present along 50% (0.5 miles) of the channel surveyed upstream of the Tunnel 7 outlet and 69.8% (1.85 miles) of the channel downstream of the Tunnel 7 outlet. Upstream of the Tunnel 7 outlet, the erodible streambank areas are situated within the B2, C5, and B5 reaches between RM 3.8 and 4.05. Downstream of the Tunnel 7 outlet, the erodible streambank areas are situated within the C4 reach between RM 1.2 and 1.3, and the C3 and B3 reaches between RM 1.8 and 2.4.

San Joaquin River Watershed

The assessment results indicate that non-erodible streambanks are present along the entire stream channel between Kerckhoff Reservoir and the confluence with the SFSJR excluding Redinger Lake, Dam 6 Lake, and Mammoth Pool. Non-erodible streambanks are also present along 100% of the project tributaries (Rock and Ross Creeks). The streambanks along these channels are composed of bedrock and large boulders.

The streambank stability results compiled during the ground surveys are presented below and are summarized in Table CAWG-2-17. Ground surveys were not conducted on the SFSJR or SJR. The ground surveys generally covered approximately 0.5 mile upstream and 0.5 mile downstream of the diversion facilities, although longer segments of some channels were inspected on those streams that could not be observed during aerial reconnaissance surveys. Therefore, the total percentages of stable, unstable, and vulnerable streambanks reflect only those segments of the channel that were actually ground surveyed, and do not represent the entire length of the channel below their diversion sites in most cases (except, Crater Creek, Crater diversion, Tombstone, North and South Slide Creeks, Hooper, Chiquapin, Camp 62, Bolsillo, Balsam; these streams were walked nearly in their entirety below the diversions).

South Fork San Joaquin River Watershed

The project tributaries to the SFSJR both upstream and downstream of the project diversions are primarily composed (>50%) of stable streambanks with the exception of Bolsillo Creek, North Slide Creek, and Tombstone Creek downstream of the project diversions. Along Bolsillo Creek, vulnerable and unstable streambanks comprise approximately 24.8% (0.39 miles of the surveyed channel) and 28.7% (0.45 miles of the surveyed channel), respectively, of the surveyed channel. The unstable streambanks are present within portions of the B2/B3/B5 and G2/G5 channel reaches between RM 1.02 and 1.55. Vulnerable streambanks are present along 65.5% (0.19 miles of the surveyed channel) of the surveyed channel along North Slide Creek and unstable streambanks are present along 34.5% (0.10 miles of the surveyed channel) of the surveyed channel. These areas are situated within the A2a+ reach between RM 0.0 and 0.29. Along Tombstone Creek, vulnerable streambank areas are present along 34.7% (0.34 miles) of the surveyed channel and unstable streambank areas are present along 28.6% (0.28 miles) of the surveyed channel. These areas are primarily situated on the valley flat along the low-gradient E5/E6 reach within Jackass Meadow. This section of channel has very likely been historically grazed. In addition, unstable streambanks were identified along 0.83 miles (37.1% of the surveyed channel) of Crater Creek below the diversion primarily in the flat-gradient Hellhole Meadow. Approximately 0.11 miles (7.1%) of the surveyed channel of the Crater Diversion channel, and 0.05 miles (5.6% of the surveyed channel) of Chinquapin Creek below the diversion were also rated as unstable. No unstable streambanks were rated along the surveyed reaches of Bear Creek, Hooper Creek, Mono Creek, or South Slide Creek.

Big Creek Watershed

The assessment results indicate that the streambanks along the surveyed reaches of Big Creek are predominately stable (2.08 miles or 69.3% of the surveyed channel). Vulnerable and unstable streambanks were identified along 24.0% (0.72 miles) and 6.7% (0.20 miles) of the surveyed channel, respectively. The unstable streambank area is primarily situated within the G5 reach between RM 9.6 and 9.77.

The project tributaries of Big Creek are predominately composed (>60%) of stable streambanks both upstream and downstream of project diversions. Unstable streambanks were only identified along 28.9% (0.15 miles) of Ely Creek upstream of the diversion within the B5/G5 and G3/G5 reaches between RM 1.3 and 1.5 and along 5.7% (0.04 miles) of Balsam Creek below the diversion within the A2a+ channel reach. No unstable streambanks were identified along Adit 8 or Pitman Creek.

Stevenson Creek Watershed

The assessment results indicate that streambanks along the surveyed reaches of Stevenson Creek are predominately vulnerable (0.26 miles or 65%). Stable streambanks were identified along 10% (0.04 miles) of the surveyed channel and unstable streambanks were identified along 25% (0.01 miles) of the surveyed channel primarily within the B5 classification situated between RM 3.98 and 4.08.

Along North Fork Stevenson Creek, stable streambanks were identified as stable along 50% of the surveyed reach upstream of the Tunnel 7 outlet and 80% of the reach downstream of the Tunnel 7 outlet. Unstable streambanks were only identified along 0.1 miles (20%) of the surveyed channel length downstream of the Tunnel 7 outlet within the A2a+ reach immediately downstream of the outlet (RM 3.45 to 3.55). Further downstream, during general reconnaissance of the section of North Fork Stevenson between RM 1.8 to 2.4, the channel was found to be laterally unstable, and bank erosion was significant. This appeared to be an unusual feature, not characteristic of the channel.

San Joaquin River Watershed

The assessment results indicate that stable streambanks are present along 100% of the project tributaries (Rock and Ross Creeks). The streambanks along these channels are composed of bedrock and large boulders.

5.3.2 TRIBUTARIES

Tributaries also deliver sediment to project streams. Sediments delivered from tributaries originate from colluvial sources, eroding streambanks, or from channel storage within the tributary itself. Thus, tributaries are not typically considered a sediment "source" by geomorphologists and sedimentologists. However, based on CAWG-2, all tributary mouths were inspected during the aerial surveys in order to identify deposits at the confluence with project streams that could indicate a significant sediment pathway to project streams. The mouths of numerous non-project affected tributaries were also included in the observations during aerial reconnaissance surveys.

Tributary deposits are indicated as either bar features or accumulations of sand or gravel, located at stream junctions (Figures CAWG-2-6a, 6b, 6c, 6d). All stream junctions, including non-project streams, were inspected as part of the aerial surveys, in addition, ground surveys inspected tributary junctions at selected locations. The following list describes where tributary deposits were found:

Tributaries to Big Creek

- Balsam Creek - sand deposit (RM 4.9)
- Ordinance Creek – boulder bar (RM 2.0)

Tributaries to San Joaquin River

- Willow Creek – sand deposit (RM 5.5)
- Shakeflat Creek – sand and gravel deposit (RM 25.5)
- South Fork San Joaquin – sand deposit (RM 38.4)
- Miller Creek – sand bar (RM 41.4)

No other deposits or bars were observed at tributary junctions. The lack of a sediment deposit does not mean that a tributary is not transporting a high sediment load. Conversely, the presence of a deposit very likely means that a tributary is transporting at least some sediment load, but it is not necessarily a good indicator of excessive sediment load.

Anthropogenic Sources

Anthropogenic sources identified during the 2002 field surveys included spoil material associated with construction of project facilities such as roads, adits and tunnels, etc. Other anthropogenic sediment sources including grazing, logging, off-highway vehicular use, recreation, fires, and chronic sediment delivery associated with roads were not identified for this study. Although chronic sediment delivery from roads was not inventoried during the 2002 field surveys, roads will be surveyed in 2003. Other anthropogenic sources of sediment, primarily construction related spoils, were identified and mapped during the aerial and ground surveys. Spoils sites are shown on Figures CAWG-2-6a, 6b, 6c, and 6d, and are listed below. A detailed description of the anthropogenic sediment sources associated with spoil sites is provided below.

- SFSJR at Florence Dam (RM 27.9)
- Camp 62 Creek (RM 1.0)
- Rock Creek (RM 0.1)
- North Fork Stevenson Creek (RM 3.4)
- Stevenson Creek (RM 0.25)
- Ely Creek (RM 1.3)

A tailings pile, probably related to construction of Florence Lake, is located immediately below the dam, but perched above the outflow channel. It appears that the spoils consist of a heterogeneous mix of coarse to fine particle sizes, and that during snowmelt or rainfall events, some of this material would be delivered to the channel.

Camp 62 Creek flows through a large tailings site near its confluence with Chinquapin Creek. The tailings are graded to the elevation of the stream channel, and include angular, gravel size material that is likely a source of recruitment to the channel.

A very large tailings site composed of a heterogeneous mixture of coarse to fine materials is located at the mouth of Rock Creek. Apparently, the tailings at one time filled and bridged both sides of the entire lower Rock Creek canyon. There is no longer evidence of tailings in the Rock Creek channel, having been transported downstream into the San Joaquin River. Today, the tailings are evident on both sides of the canyon, and are clearly unstable at a high angle of repose. These tailings are undoubtedly delivered to the mouth of Rock Creek and the San Joaquin River. It is possible that many bars in the SJR between Ross and Rock Creeks have aggraded due to accelerated sediment contribution from these tailings. It is also possible that former pools have been converted to runs.

A large tailings site composed of a heterogeneous mixture of coarse to fine materials is located on North Fork Stevenson Creek immediately downstream of Tunnel 7 (RM 3.4).

Similar to Rock Creek, it appears that the tailings had at one time bridged over both sides of the channel, as evidenced by the remaining tailings on opposite banks. The banks are erodible and unstable in this reach, so that the tailings are being recruited to the stream.

There is a moderate size tailings site on Ely Creek downstream of the diversion at RM 1.3, that was apparently within the active channel at one time. The tailings have been transported downstream by runoff, with some deposits evident on the streambanks, above the active channel. It appears that during high flows some of the tailings may be recruited to the channel.

There is an old tailings site on Stevenson Creek where the waterfall cascades towards its confluence with the San Joaquin River (RM 0.25). It is apparent that over time material from this site was delivered to the mouth of Stevenson Creek and into the San Joaquin River.

Construction of the “Million Dollar Mile” road along the San Joaquin River between Dam 6 and Powerhouse 3, has historically been an accelerated sediment source. Most of the material generated by the road construction is boulder size sediments. There are no tailings/spoil sites associated with the road construction that represent an ongoing source of sediment to the channel. Other potential road-related sediment sources (for example culvert crossings and road-cuts) will be investigated in 2003.

5.3.3 In-Channel Sediment Storage and Sand and Gravel Accumulation

Sediment accumulates in, and is released from, channels and valley floors over periods that range from days to millennia. Channels vary widely in their opportunities to store sediment. High-gradient channels and those constrained by bedrock banks have little floodplain development, with efficient sediment transport. Lower gradient channels generally provide more opportunity for sediment storage, and these sites often have well developed floodplains and terrace deposits. Fine sediment is usually stored as over-bank deposits on the floodplain, and in-channel. Changes in sediment input or flow regime in low-gradient channels can alter the balance between accumulation and erosion of sediment. The presence of once-active fluvial sediments in what are now rarely mobilized and inactive storage elements implies that a channel is capable of altering its form to reflect changing transport conditions; channel morphology has changed in these locations. The channel reaches most susceptible to change can often be identified by noting the distribution of storage elements (Reid and Dunne 1995).

Stored in-channel sediments may accumulate, and during sufficiently large flows are re-mobilized and transported downstream. In-channel sediment storage is not considered by geomorphologists and sedimentologists to be a sediment “source”, in that the stored material originates from other sediment production processes and locations. In-channel storage, however, provides a picture of the channel transport capacity and the pathways by which sediment is routed through the drainage network. Distinguishing long-term trends in storage volume from cyclical or seasonal changes can be challenging. Changes in storage could represent a temporary response to an infrequent large event such as a debris flow or a wildfire, and land-use influences may cause more permanent changes.

For this study, bar formations, accumulations of gravel, and accumulations of sand were identified as in-channel sediment storage elements, and are shown in Figures CAWG-2-6a, 6b, 6c, and 6d. Bars are depicted as triangular symbols, and are color-coded green to indicate “active” or red to indicate “inactive” bars. Inactive bars were distinguished based on the presence of rooted woody riparian vegetation growing over a significant portion of the bar, or the presence of mature riparian vegetation. As discussed in section 5.2.5 (Potential Riparian Encroachment), scouring limits riparian growth to the margins of the active channel of most rivers during average runoff years. During the summer, the banks and exposed bars of most California rivers are covered with seedlings or sprouts from willows, alders, and other riparian plants (Mount 1995). These seedlings tend to be scoured during bankfull stage flows that occur relatively frequently. Predominant particle sizes comprising bars are noted at the base of each triangular symbol. Sand and gravel accumulations, when not deposited as a bar (i.e., deposited in boulder shadows, or widespread deposits covering the bed), are also identified. The sand and gravel accumulations were identified during the 2002 aerial surveys, ground surveys, and supplemented by data collected for the fish habitat classification studies (CAWG-1). As part of the 2002 ground inventory surveys, the amount of sand found in pools was visually estimated and recorded as a percentage of the pool bed covered by sand. This data is presented in Table CAWG-2-18.

Following is a summary description of bars, sand accumulations, and gravel accumulations within the project-affected streams. At the conclusion of this section is an overview discussion synthesizing gravel sources and accumulations of gravel in the channel.

<u>San Joaquin River Watershed</u>

The only location on the mainstem San Joaquin River where there are no bars is the reach downstream from Redinger Lake. There is an 0.8 mile sand accumulation beginning immediately below the Willow Creek confluence; there are no gravel accumulations. The lack of bars in this reach could be potentially attributable to the capture of coarse bedload material at Dam 6 and Redinger Lake. The only tributary below Redinger Lake that can contribute sediments is Willow Creek.

Between Dam 6 and Redinger Lake, there are several cobble-boulder bars; all are active. Sand was very prevalent in pools as shown between RM 12.6 to 13.0 and 15.2 to 15.6 (see Figure CAWG-2-6b). There are no gravel accumulations. Bars become slightly more numerous between Dam 6 and Mammoth Pool. Most of the bars are a heterogeneous mix of boulder, cobble, and sand, and all but one is designated as active. Sand accumulations were noted at RM 19.4 and at the Shakeflat Creek confluence (RM 25.3 to 25.6).

Upstream from Mammoth Pool, there are sand accumulations near the inlet of the reservoir (RM 35.1 to 34.7) that might be attributable to slackwater, sand accumulations on the bed near RM 35.6, and in the reach downstream from the confluence with the South Fork (RM 37.6 to 38.3). There are also several active sand bars near the confluence, but no other bars are identified downstream of RM 37.8 to Mammoth Pool. There are no gravel accumulations.

There is also one 0.7 mile long sand accumulation identified on the unregulated portion of the mainstem SJR extending upstream from the confluence with the South Fork, (RM 38.3 to 40.0). This is an extension of the sand accumulation downstream that is hydraulically controlled by a rockfall on the mainstem SJR at RM 37.8. Further upstream on the unregulated SJR, there are several sandy bars, as well as a cobble and gravel bars; all are designated as active. Along the Middle Fork SJR, bars composed of sand-gravel-cobble were identified (RM 3.4). On Fish Creek, a tributary to the Middle Fork SJR, there is a 1.4-mile long section of the channel that has numerous cobble-sand bars (see Figure CAWG-2-6c).

There are no bars on either Ross or Rock Creek. There is a small area of sand accumulation upstream from the diversion on Ross Creek. Overall, pools contain a very low percentage of sand on both streams, upstream and downstream from their respective diversions (see Table CAWG-2-18). There are no other sand or gravel accumulations on either stream.

Stevenson Creek Watershed

North Fork Stevenson Creek has few bars, which is consistent with the steep, bedrock controlled (A1a+) sections that dominate most of the channel length. There is a notable, and unique reach classified as C3 and B3 where the channel is comprised of cobble-gravel-sand bars that are very large for the size of the channel and there are accumulations of gravel (RM 1.8 to 2.4). This section of channel is subject to lateral migration, and bank erosion was identified here as a significant sediment source. Upstream of the Tunnel 7 outlet (RM 3.5), there is a reach that is designated with sand accumulation (RM 3.9 to 4.1), and pools have a high percentage of sand (RM 3.8 to 4.0). No locations downstream of the Tunnel 7 outlet were noted as having sand accumulations, except in the lower-gradient C3 and B3 channel reach where cobbles and gravels were surrounded by a sand matrix, and sand was a significant component of the cobble-gravel-sand bars.

No bars were identified along Stevenson Creek, consistent with a predominantly bedrock (Ala+) channel type. There is sand accumulation immediately below Shaver Dam (RM 3.8 to 4.2), where the channel is designated with a B classification, and there is some gravel accumulation identified in another reach (RM 2.2 to 2.5) where the channel is also designated as a B-type. Immediately below Shaver Dam, sand accumulation in pools was variable, some pools had a very large percentage of sand, and some pools had a relatively small percentage (see Table CAWG-2-18).

Big Creek Watershed

Big Creek has very few bars and over most of its length, very little storage of either sand or gravels, consistent with the steep, bedrock A-channel types. Four very coarse, boulder dominated bars were identified in the reach downstream of the confluence with Ordinance Creek (RM 1.2 to 2.0), both upstream and downstream from Dam 5. Notably, the boulder bars were well-vegetated (alder, blackberry) and thus, designated as inactive. Boulder accumulations are likely the product of rockfalls that are infrequently mobilized by large flood flows. A small accumulation of sand, sandwiched between bedrock reaches, was identified at the confluence with Balsam Creek.

The segment of Big Creek upstream from Kerckhoff Dome (RM 8.0 to 10.0) is the only notable, and unusual reach where there are large areas of sand deposition. Sand deposits also cover a large percentage of the bottom of pools, which was not observed at other pool locations surveyed further downstream near Dam 5 (see Table CAWG-2-18). This reach of Big Creek coincides with locations identified as encroached. Encroachment can accelerate sand deposition, due to the increased roughness in the channel that riparian vegetation provides, resulting in a baffling effect that reduces flow velocities.

No sand accumulations or bars were identified on Adit 8 Creek. All pools were comprised of 60% or less sand. There was one location where a gravel accumulation was observed (RM 0.5). No gravel accumulations or bars were identified on Ely Creek, downstream of the diversion. One area of sand accumulation was noted well upstream of the diversion location, where there was also one active sand bar (RM 1.3). Sand covering the bed of pools is more extensive upstream of the diversion than downstream; as high as 95% upstream, but not exceeding 15% downstream (see Table CAWG-2-18). Balsam Creek has no bars or gravel accumulations. A sand deposit occurs at the mouth of Balsam Creek as previously described and sand deposits occur above the diversion, primarily in the lower gradient channel reach classified as B2/B3 that is situated between higher gradient A1a+ reaches. Similar to Ely Creek, the percentage of sand in pools is much greater upstream of the diversion than downstream. Pitman Creek below the diversion has no accumulations of sand, gravel, or bars. This reach is designated an A1a+ channel type, so a lack of sediment storage is to be expected. Immediately above the diversion (RM 1.6 to 2.0) there are several active cobble and boulder bars, and there are notable accumulations of gravel. This reach is lower gradient and less confined than downstream of the diversion, classified as B1/B3/B4. Upstream of the gravel-accumulated reach, the channel is designated B1. During aerial reconnaissance, Tamarack Creek was inspected well upstream of the diversion on Pitman Creek. Several inactive cobble bars were identified (RM 1.6) along this unregulated reach.

South Fork San Joaquin River Watershed

Very few bars were noted on the SFSJR between the confluence with the mainstem SJR and Rattlesnake Crossing (RM 0.0 to 14.0). There are no sand or gravel accumulations in this reach. This is a step-pool/plane-bed channel, classified as predominantly G-type, which to be consistent with this geomorphic classification, sediment storage in the form of bars should be a relatively rare feature. Sediment transport would be expected to exceed the sediment supply (i.e. supply limited) due to the high shear stress generated by the highly confined and entrenched morphology. It is interesting to note that the lack of bars in this G-type channel does not similarly occur on the San Joaquin River in the G-type channel sections (for example RM 11.0 to 17.0) where boulder and cobble bars are found.

Upstream from Rattlesnake Crossing, the channel is predominantly a B-type, and bars become much more prevalent. Most bars are dominated by cobble, although gravel is sometimes inter-mixed with the cobble bars. Several bars are identified as inactive, beginning with RM 19.4 (near Bolsillo Creek confluence), although no bars are indicated as inactive downstream from RM 19.4. This could be due to tributary flow accretions that are sufficient to scour bars and vegetation periodically. There are no accumulations of sand or gravel upstream from Rattlesnake crossing until within approximately 2 miles of Florence Lake. There is sand and small gravel accumulation in the low-gradient channel section along Jackass Meadow (RM 26.2 to 27.7). Aerial reconnaissance above Florence Lake shows numerous gravel-sand bars in a low-gradient C-type channel section in Blayney Meadows (RM 33.0 to 34.1).

There are very few bars on Mono Creek downstream from the diversion; two inactive bars upstream from Mono Meadow (RM 4.3) are identified. Several sand and cobble-gravel bars were observed in the half-mile reach above the diversion. Two significant areas of sand accumulation below the diversion are identified between RM 2.3 to 2.8 and RM 3.6 to 3.8. Both locations have abundant LWD jams in-channel, and this may be an important contributing factor to sand deposition at these sites. There is a smaller area of sand accumulation below the diversion, although specifically pools were not found to have a large percentage of sand (see Table CAWG-2-18). Overall, there is very little sediment storage available for transport in Mono Creek downstream from the diversion.

Bear Creek below the diversion has relatively little sediment in storage. There are several inactive boulder-cobble bars downstream of the diversion. The inactive bars could be due to the lack of scour from the altered flow regime. Pools downstream of the diversion had no sand deposition. Well upstream of the diversion in the unregulated channel, there is a B-type reach with several sandy bars. Pools upstream of the diversion varied widely in the amount of sand accumulation, two having 0% sand and one having 70% sand coverage (RM 4.0 to 5.7).

There are sand accumulations on Hooper Creek below the diversion, both in pools and generally covering the bed, embedding cobbles and boulders. Pools varied widely in the amount of sand accumulation, from 80% to 15%. Gravels are also found in the channel below the diversion, although they were not identified as accumulations since they were typically mixed with cobble, small boulders, and sand. There was very little sorting of sediments into bar formations. Upstream from the diversion the channel is bedrock and steep; sand and gravel accumulations were not observed.

Bar formations were not identified on either North or South Slide Creeks. Sand is prevalent in the channel, although it was not dominant in most pools downstream from the diversions, varying from 30% to 90% coverage (see Table CAWG-2-18), and there are no accumulations of either sand or gravel identified.

Tombstone Creek has few bar formations (one sand and one boulder-sand) identified below the diversion. Sand is predominant in the low-gradient reach on the valley floor (see Figure CAWG-2-6d). Sand is generally mixed with small boulders, cobble, and sub-angular gravels along the section of channel flowing through the alluvial fan and upstream to the diversion. Sand covers a significant proportion of pools upstream from the diversion (see Table CAWG-2-18), but not in the reach surveyed downstream of the diversion. The reason for this is not clear, but might be attributable to the random scouring of pools below the diversion and by localized colluvial sediment inputs above the diversion site, that could later be transported below the diversion on subsequent flow events. This is not unusual, particularly in channels subject to episodic debris flows. Since the diversion has not been operable for almost 20 years, streamflow alteration has not influenced sediment transport below the diversion site.

Crater Creek has no bar formations below the diversion, one gravel-sand bar formation was identified by aerial survey well above the diversion (RM 3.8). Sand accumulations occur throughout the low-gradient reach near the confluence with the SJR (RM 0.0 to 0.42) where pools were estimated to have 100% sand covering the bed (see Table CAWG-2-18). All other reaches of Crater Creek are much higher gradient, and sand is not prevalent in pools, (except near RM 1.8), although sand was observed mixed with other particle sizes in flatter gradient sections along the channel. Gravels were observed in much of the channel below the diversion, however they were not well-sorted (i.e., they are mixed with other particle sizes) so that there were no gravel accumulations, except near RM 1.52. One area of both sand and gravel accumulation was observed within the half-mile upstream from the diversion at RM 3.25. No other sand or gravel accumulations were noted upstream from the diversion.

The uppermost reaches of the Crater Diversion channel is comprised of several gravel-sand, cobble, and boulder bars (RM 1.9 to 2.2). Boulder bars and sand bars are found in the lowermost reach before the confluence with Florence Lake (downstream from RM 0.8). No other bars were identified between RM 0.8 to 1.9. Several sand and gravel accumulations were recorded throughout the length of the diversion channel.

Several cobble and one cobble-gravel bar are located on Chiquapin Creek below the diversion. No bars were identified above the diversion. Sand accumulation was observed at RM 0.2 and 0.45. Sand in pools downstream from the diversion is variable, ranging from 30% to 90% of the pool bed surface (see Table CAWG-2-18). Upstream from the diversion sand accumulation in pools was lower than downstream, ranging from 5% to 20%. There are no gravel accumulations; gravels occur as scattered poorly-sorted mixtures with sand and cobbles. On Camp 62 Creek there are several gravel bars and sand bars downstream of the diversion; no bars were identified upstream from the diversion. Sand and gravel accumulations occur both above and below the diversion, often in association with woody debris jams. Sand composition of pools downstream from the diversion ranged from 5% to 50%, with most pools between 5% and 25% sand. Upstream from the diversion sand composition ranged from 5% to 15%.

On Bolsillo Creek, two bars were identified above the diversion (sand, and gravel-sand composition), with no bars below the diversion. Sand accumulations occur both above and below the diversion, often in connection with LWD. Pool sand composition did not appear to be different upstream and downstream from the diversion, ranging from 30% to 100% upstream from the diversion, and from 5% to 100% downstream of the diversion. Two gravel accumulations were observed, one upstream (RM 1.6) and one downstream (RM 0.3) of the diversion.

Accumulations of gravel along project streams appear to generally correspond with drainage basins that have relatively large amounts of glacial till, but there are a few significant exceptions. Ely, Balsam and Adit 8 Creeks have nearly no gravel deposits in the channel, and they have no glacial till within their drainage basins. However, North Fork Stevenson Creek has a gravel accumulation downstream of Tunnel 7 in the reach classified as a C-type channel, but there is only a small glacial till area, recently mapped by ENTRIX (see Figures CAWG-2-2a, 2b, 2c, and 2d, Geology). It may be that past gravel augmentation practices in the reach immediately below Tunnel 7 has contributed to gravel accumulation here. Big Creek below Huntington Lake has no gravel accumulations, but only 11% of the watershed area downstream of Huntington Lake is comprised of glacial till. Upstream from Huntington Lake glacial till comprises 46% of the drainage area. Field observations for about 0.5 mile upstream from Huntington Lake found one gravel bar (downstream from the ski area at RM 0.6); most of the channel consisted of cobble and small boulders. Gravel accumulations are undoubtedly related to both the presence of glacial till that provides a source of gravels, and to a channel morphology that provides suitable deposition sites for the gravel. Both of these factors are further discussed under the section Conceptual Framework for Sediment Transport.

Pitman Creek also appears to be an exception to the necessity of a large proportion of gravel till in the drainage basin in order to accumulate gravels. With only 16% of the Pitman Creek basin comprised of glacial till, there is a significant accumulation of gravel just upstream from the diversion site.

It might also be expected that with a large proportion of glacial till in the North Slide Creek basin (88%) and the South Slide Creek basin (65%), there would be significant areas with gravel deposits, but none exist. There is gravel evident in both streams, but it is not well-sorted, and is found dispersed and mixed with other particle sizes. Bolsillo, Camp 62, and Chinquapin, all have greater than 40% glacial till in their respective drainage basins, and all have at least a few gravel accumulation sites. However, Hooper Creek with 49% of the drainage basin comprised of glacial till has no gravel accumulation sites. Like North and South Slide Creek basins, gravel is present, but it is not found in well-sorted, concentrated deposition features. Crater Creek and Tombstone Creek both have a more moderate amount of glacial till in the basin (29%). There are two gravel deposits downstream of the Crater Creek diversion and one upstream. Tombstone has one gravel accumulation site located upstream of the diversion. All of these drainage basins are steep-gradient, Aa+ and A type channels, with shorter segments of lower gradient, B and G type channels interspersed between the steeper sections. Overall, transport capacity is very high in these types of streams, but the flatter gradient sections can function as temporary retention sites for both sand and gravel. A channel morphology that provides suitable deposition sites for accumulating gravels is as important as a high percentage of glacial till in the watershed. The presence of glacial till is a necessary, but not a sufficient factor in accumulating gravels. The best locations for accumulating gravels into well-sorted deposits such as bars and riffles is a lower-gradient, poorly entrenched, C-type channel that has an adjoining floodplain. There are only a few locations along the project streams that provide this type of morphology. B type channels can also collect gravels in bar deposits, pool-tailouts, or in association with large roughness elements such as boulders or large woody debris. A and G type channels are much less likely to be associated with significant, well-sorted deposits than either C or B-type channels, although smaller accumulations of gravel can occur in the velocity shadow created by large roughness elements such as boulders and bedrock outcrops.

About 19% of the Mono Creek basin is glacial till. Significant gravel accumulations were noted downstream of the diversion, particularly in the vicinity of RM's 0.6, 2.4, and 3.6. A few gravel bars upstream of the diversion were also identified. Most of the glacial till in the Mono Creek basin is located upstream of the diversion, and a considerable proportion of the till is located upstream of Lake Edison (see Figures CAWG-2-2a, 2b, 2c, and 2d, Geology map).

Whether or not some of the sediment storage areas mapped on Figures CAWG-2-6a, 6b, 6c, and 6d represent an "excessive" or "unnatural" build-up of sediment is a difficult, interpretive task that requires at least some professional judgment based on an understanding of the valley setting, channel morphology, and nature of the change in the flow and sediment regime. There are many locations in the project watershed with fine sediment deposits, including localized flat-gradient sections of steeper, headwater channels. By way of comparison, there are numerous locations either above diversion facilities or on unregulated streams, (also mapped in this report) where there are significant areas of sand deposition. Further, inputs of sediment can cause deposition, even aggradation, that is a temporary condition, but is in fact part of the episodic and cyclical nature of sediment supply and transport in mountain streams. Clearly, not all sand or gravel deposition represents an "unnatural" condition.

Of all the sand and gravel deposition sites, the following locations are considered to be the most likely to represent an "excessive" condition and the most extensive in area. It is cautioned that even based on this list there may be sites only responding to the natural cycle of sediment supply and transport.

Mono Creek

- Sand deposits at 2 sites (RM 2.3 to 2.8 and RM 3.6 to 3.8)

At both of the Mono Creek sites, sand deposition appears to be in association with LWD, which might indicate that this is not an excessive condition. However, there is also a floodplain/low terrace bordering both sites, that if “disconnected” from overbank flows would no longer function as a fine sediment storage location, possibly allowing a build-up of fine sediment in the channel.

San Joaquin River

- Sand accumulation immediately below the Willow Creek confluence
- Sand accumulation at the Shakeflat Creek confluence (RM 25.3 to 25.6)
- Sand accumulation in pools between Dam 6 and Redinger Lake (RM 12.6 to 13.0 and RM 15.2 to 15.6)
- Coarse sediment accumulation (mostly boulders) between Dam 6 and Powerhouse 3
- Coarse sediment accumulation (mostly boulders and cobble) between Rock and Ross Creek

It is likely that there is additional coarse sediment accumulation between Dam 6 and Redinger Lake that is associated with historical road construction. This reach naturally accumulates coarse, boulder material due to rockfalls, however, significant additional coarse sediment exists in the channel due to side-cast material from road and tunnel construction. The coarse sediment accumulation, mostly in the form of bars between Ross and Rock Creek could be due to the side-cast tunnel tailings transported from the mouth of Rock Creek. However, it is noted that there are extensive coarse-material bars located upstream from Rock that could not be due to the construction tailings.

North Fork Stevenson Creek

- Gravel, cobble, and sand accumulations in the C3 and B3 classified reaches (RM 1.8 to 2.4).

This section of channel between RM 1.8 to 2.4 may be an aggraded reach, which is indicative of the lateral migration and bank erosion identified here.

Stevenson Creek

- Sand accumulation immediately below Shaver Dam (RM 3.8 to 4.2)

Big Creek

- Sand accumulation in locations upstream from Kerckhoff Dome (RM 8.0 to 10.0)

This segment of Big Creek is also identified as an encroached reach.

South Fork San Joaquin River

- Sand and gravel accumulation in the low-gradient channel section along Jackass Meadow (RM 26.2 to 27.7).

This section of the SFSJR may be an aggraded channel reach. However, there is a narrowing of the valley and bedrock control at the downstream end of Jackass Meadow that probably controls channel hydraulics upstream, and could therefore be responsible for the deposition process.

Identifying "excessive" erosion and scour presents the same difficulties as defining "excessive" build-up of fine sediments. The following list identifies the most likely locations of excessive erosion and scour.

Stevenson Creek

- Channel incision immediately below Shaver Dam (RM 3.8 to 4.2)

This location coincides with excessive deposition of sand. The two are not mutually exclusive processes, but are commonly found as complimentary indicators of incision. Unstable banks are the result of channel down-cutting, leading to deposition of fine sediments on the bed. The cause of the channel incision is not known, but might be attributable to past land-uses including logging, or to operation of Shaver Lake, or both.

North Fork Stevenson Creek

- Channel incision and widening immediately below Tunnel 7 outlet (RM 3.45 to 3.55)
- Bank erosion in the gravel, cobble, and sand accumulated C3 and B3 classified reaches (RM 1.8 to 2.4).

Deposition of material at tributary junctions was investigated for all project and many non-project affected streams in the watershed. Very few deposition sites at tributary confluences were observed; the most notable are the Shakeflat and Willow Creek tributaries to the San Joaquin River. Both locations are also listed above as sand accumulation sites.

5.3.4 Conceptual Framework for Sediment Transport

Notable differences in the ratio of transport capacity to sediment supply among different channel types, , allows classification of stream reaches into source, transport, and response segments (Montgomery and Buffington 1997). Table CAWG-2-8, identifies the stream types as source, transport, or response stream segments (see bottom row of table). The spatial distribution of stream types provides a conceptual watershed-scale framework linking channel morphology and sediment transport processes. Different channel morphologies reflect differences in energy dissipation and relative transport capacity (i.e., the balance between transport capacity and sediment supply). Figure CAWG-2-9 illustrates the transport capacity of the different channel types.

"Transport" streams include bedrock, cascade, and step-pool channels. These channel types readily convey their sediment loads and are morphologically resistant to alteration. The "Source" streams which primarily consist of low-order, upper watershed colluvial channels, are transport-limited, sediment storage sites subject to episodic debris-flow scour. The source type streams are rare within the project reaches below the diversion facilities, but likely represent an important sediment source in the headwaters of their drainage basins above the diversion facilities. The "Response" streams include plane-bed, pool-riffle, and dune-ripple channel types. These channel types are transport-limited (plane-bed is considered transitional between supply-limited and transport-limited), and are morphologically responsive to perturbations in either the flow or sediment regime. Figures CAWG-2-8a, 8b, 8c, and 8d identifies project streams as source, transport, or response channel reaches.

Colluvial channels are transport limited, that is, their transport capacity is less than their sediment supply, so they are subject to accumulation of colluvial material that is infrequently transported by large scale mass-wasting events such as debris flows. In the project area, this is typical of all the steeper gradient, headwater channels that are tributary to the South Fork San Joaquin River and to Big Creek. Although these channels are identified as cascade, step-pool, and plane-bed types within the project reach below their respective diversions, many are colluvial channels at some point upstream from their diversions, and they are all subject to colluvial inputs from debris flows.

Alluvial channels reflect a range of transport capacities. The steeper alluvial channels (cascade and step-pool) are supply-limited (i.e., the transport capacity is greater than the sediment supply). The lower gradient alluvial channels (dune-ripple and pool-riffle) are transport-limited, having a greater supply of sediment than their transport capacity. The plane-bed channels are considered to be transitional between transport-limited and supply-limited channels, reflecting properties of both. Pool-riffle channels that are heavily armored, are also considered to be transitional between transport-limited and supply-limited. Bedrock streams tend to have the highest slopes and they are supply-limited, having a much greater capacity to transport sediments than the other channel types.

At the river basin scale, transport capacity decreases in the downstream direction through the channel network as valley slope decreases and total sediment supply increases. This usually results in a pattern of downstream deposition and development of floodplains and unconfined valleys. The Big Creek Project area is within the upper portion of the SJR basin, as such, the stream channels have a predominantly high sediment transport capacity. .

Sediment transport characteristics in the project watershed are described below, beginning with the headwater tributaries to the South Fork San Joaquin River and working downstream.

South Fork San Joaquin River Watershed

Sediment transport in the project watershed is driven by debris flows originating upstream from project diversion facilities on the steeper-gradient channels (Tombstone, North and South Slide, Hooper, Crater, Camp 62, Bolsillo, Chinquapin, and Camp 61 Creek), as well as non-project affected streams such as Rattlesnake Creek. All of these streams are primarily transport type channels in the vicinity of their diversions, rapidly conveying debris flow material to their lowermost reaches and to the South Fork San Joaquin River. Debris flows occur as infrequent, episodic events, the effects of which vary with slope and position in the channel network. Most of these streams have either debris fans at some point below their diversions (Tombstone, North and South Slide, Hooper, Chinquapin) or an alluvial flat (Crater, Tombstone) that are long-term sediment storage sites, moderating sediment contribution from debris flows to the South Fork San Joaquin River. Hooper diversion probably interrupts transport and subsequent storage of sediment from debris flow processes, reducing at least the coarse material volume naturally delivered to the alluvial fan. Chinquapin diversion probably operates in a similar manner as Hooper, reducing sediment supply downstream to its alluvial fan. However, a recent (1997) debris flow destroyed the diversion facility, and the sediment supply from that event has clearly deposited at the site of the old diversion, which has subsequently been rebuilt about ¼ mile upstream. Since debris flows tend to occur only episodically, it may be that sediment delivery downstream from these diversions is not significantly altered if the diversions are subject to destruction even once every few decades. Since Tombstone, North and South Slide are inoperable, they do not alter the transport of sediments. The other SFSJR diversion facilities, including Crater Creek, Camp 62, and Bolsillo, are smaller than either Hooper or Chinquapin, so it is unlikely that coarse sediment loads carried by episodic events are interrupted from downstream transport on these channels.

Bank erosion and fluvial transport eventually erode the debris flow material over longer time periods, and delivers it to the South Fork San Joaquin River. Notably, all of these streams drain glacial till areas and are therefore sources of gravel as well as sand. Sediment storage on these transport reaches is not of a large volume, and tends to occur in locations where there is a relatively short, localized flattening of the channel gradient. These flatter gradient reaches are typically plane-bed channels that are designated as response type reaches. Passage of a debris flow can scour steep channels to bedrock, and depositing in lower-gradient channels resulting in temporary, local aggradation (Montgomery and Buffington 1997).

Sediment transported by the South Fork San Joaquin upstream from Florence Lake is captured in the reservoir. Florence Lake was a naturally occurring alpine lake prior to construction of the dam. A 1924 photograph taken from the northeast to southwest near Castle Crags at an elevation of 10,300 ft shows the natural lake occupying what is now the southern portion of the present-day Florence Lake. A 1917 photograph of Florence Lake is included in the book, The Story of Big Creek (by David H. Redinger). It is not clear from either photograph if the lake is actually on the South Fork San Joaquin River. Assuming that the natural lake is on the South Fork San Joaquin, capture of at least coarse particle sizes would have historically occurred, similar to today. Just downstream of Florence Lake is a low-gradient response reach (RM 27.9 to 26.1), defined by a plane-bed/pool-riffle channel type, that is adjoined by a floodplain. This response reach appears to be currently stable, but may have historically aggraded with sand and gravels. From just upstream of South Slide Creek to the Crater Creek confluence (RM 23.5), the South Fork San Joaquin is defined as a transport-response type channel, (comprised of both step-pool and plane-bed morphologies, and intermediate bed-form). The channel gradient increases in this reach, with coarser bed material than upstream. The next 9.5 mile-long reach of the South Fork San Joaquin River (RM 23.5 to 14.0 at Rattlesnake Crossing) is a response reach, comprised of plane-bed and pool-riffle morphologies.

Bear Creek and Mono Creek both enter the South Fork San Joaquin River in the response reach downstream from Rattlesnake Crossing. Downstream from the diversion, Bear Creek is primarily a transport type reach. Upstream from the diversion, Bear Creek is composed of bedrock, and is a transport reach but, it is interesting to note that there is an extensive area of sand deposition that occurs over the bedrock along this segment of the channel (see Figure CAWG-2-6d). Burial of the bed by sediment at low flow conditions is commonly observed in bedrock channels (Hancock, Anderson, and Whipple 1998). The Bear Creek diversion was observed to have notable sand deposits at the inlet, and is expected to capture all coarse sediments. Bear Creek drains a watershed area with less than 5% glacial till, so gravels are likely a small proportion of the total sediment load. Mono Creek consists of three different reach types; transport below the diversion to RM 4.2 at Mono Meadow (RM 4.2), response reach from Mono Meadow to RM 2.4, and transport-response reach from RM 2.4 to the confluence with the South Fork San Joaquin River. The response reach has two notable areas of sand and LWD accumulations. The diversion on Mono Creek, like that on Bear Creek, would be expected to capture most coarse material in the sediment load. Mono Creek is also influenced by the effects of Lake Edison. Lake Edison and the Mono diversion are downstream from most of the gravel bearing glacial-till areas in the drainage basin (see Figure CAWG-2-2d).

Progressing downstream from Rattlesnake Crossing to the confluence with the San Joaquin River, the South Fork is designated as a transport type reach. The bedform is step-pool/plane-bed. This 14-mile-long reach is a highly entrenched channel, confined by bedrock walls. Channel confinement strongly influences sediment transport and potential channel response to disturbance (Montgomery and Buffington 1997). Confined channels efficiently translate high flows into increased bed shear stress, resulting in higher sediment transport rates than unconfined channels with an otherwise similar morphology. Several unregulated tributaries enter this reach, including Rattlesnake Creek, Hoffman Creek, and Four Forks Creek.

San Joaquin River Watershed

The San Joaquin River, at its confluence with the South Fork, is a short response-type reach (RM 37.6 to 38.3). Sand deposition at this confluence is hydraulically controlled by a rockfall at RM 38.3. The channel is highly confined by bedrock valley walls, which continue into the next bedrock-controlled reach, designated as a transport reach, from RM 38.3 to Mammoth Pool (RM 35.5). Mammoth Pool captures all upstream sediments transported by the San Joaquin River, as well as from several unregulated tributaries (Kaiser Creek, Mill Creek, Jackass Creek, and Chiquito Creek). The unregulated tributaries do not drain glacial till, and the mainstem SJR and the Middle Fork and North Fork SJR drain relatively small areas of glacial till (see Table CAWG-2-4). Gravels were observed at some locations on the Middle Fork SJR and Fish Creek during aerial reconnaissance; presumably these gravels would be captured by Mammoth Pool.

Downstream from Mammoth Pool, the San Joaquin River is a response reach to Dam 6 (RM 18.2). The channel is designated as a pool-riffle/plane-bed, and there are several boulder-and-cobble bars that provide sediment storage in this reach. The river remains mostly confined, but the segment from about Rock Creek to Ross Creek is somewhat wider and less confined than all other segments of the river. Rock and Ross Creek are designated transport reaches, and several other steep-gradient unregulated tributaries that are presumably transport reaches also join the San Joaquin River. The San Joaquin River downstream from Dam 6 to Redinger Lake is also designated a response reach, having similar geomorphic characteristics as upstream from Dam 6. There are no glacial-till areas in the SJR basin downstream of Mammoth Pool.

Big Creek Watershed

Upstream from Huntington Lake, glacial tills comprise about 46% of the Big Creek drainage area. All coarse sediments are captured by the lake. Old photographs of the Huntington Lake area indicate that this was probably a relatively flat gradient meadow, capable of trapping or temporarily storing a portion of the coarse bedload.

Downstream from Huntington lake (RM 9.9) to approximately RM 8.0, the channel alternates between response (plane-bed channel morphology), response-transport (plane-bed/step-pool morphology), and transport (step-pool morphology) reaches. Sand accumulations were observed and recorded in the response channel segments; no gravel accumulations were identified. The response reaches would be the most likely suitable locations for gravel deposition.

Beginning at RM 8.0 to the confluence with the San Joaquin River (RM 0.0) the channel is almost entirely designated a transport reach (bedrock morphology), with little in-channel sediment storage. The channel is mostly confined by bedrock valley walls, downstream to the SJR, facilitating sediment transport. Smooth-polished bedrock walls and potholes worn in the bed and banks were commonly observed geomorphic features that attest to a high rate of sediment transport and abrasion by sand (Tinkler and Wohl 1998). Pitman Creek is the only tributary stream that was observed to be transporting gravels. Dams 4 and 5 likely capture any coarse material in transport.

Four project streams drain to Big Creek; Adit 8, Ely, Balsam, and Pitman. All four channels are designated transport type reaches. Although there was no clear evidence of debris flows on any of the stream reaches surveyed, it is likely that debris flows occur in their headwaters. There are no sediment storage sites in the stream reaches surveyed (alluvial fans or a valley flat) that would store and moderate sediment pulses to Big Creek.

Stevenson Creek Watershed

Stevenson Creek joins the SJR at RM 13.6, and is described beginning with North Fork Stevenson Creek. Downstream from Tunnel 7 (RM 3.6), North Fork Stevenson Creek is designated a transport reach to RM 2.4. This section of North Fork Stevenson Creek has boulder, cascade, and step-pool bedforms. From RM 2.4 to 1.8 the channel is an unconfined response reach. Cobble, gravel and sand deposition occurs in this response reach, there are indicators of lateral channel instability, and there are unstable, eroding banks. Downstream from the response reach the channel returns to a transport reach and is predominantly bedrock controlled to Shaver Lake. Shaver Lake was enlarged from a smaller natural lake, so that coarse sediment capture would have historically occurred at this location.

Stevenson Creek is predominantly a transport reach that is bedrock controlled. There are two response reaches. One response reach is immediately downstream of the dam where the channel is incised into an alluvial deposit and has a small adjoining floodplain. The second response reach is downstream (RM 5.2 to 4.7), where the channel is unconfined, has a floodplain, and is designated with a plane-bed/pool-riffle morphology. This second response reach appears to be both laterally and vertically stable. Stevenson Creek below this response reach is identified as a bedrock controlled transport reach to the confluence with the SJR.

Downstream from Redinger Lake (RM 6.0 to 3.3) the SJR is confined, and designated as a response reach, having a plane-bed morphology dominated by cobble size material. This reach is laterally stable, and appears to be vertically stable, although there is a sand accumulation that is probably associated with transport from Willow Creek. The most downstream project reach to Big Creek No. 4 powerhouse is a bedrock, transport channel. There are no bars and little sediment storage in both the response and transport sections of the SJR below Redinger Lake. Redinger Lake captures all sediments transported by the SJR, with the exception of those sediments delivered by the Willow Creek tributary.

5.4 Overview of Quantitative Study Recommendations

Quantitative study should focus mostly on identified sensitive channel reaches, as described in the CAWG-2 Study Plan. Relatively non-responsive channels, including bedrock, and cascade channel types are expected to be more resilient to possible alterations stemming from project operations. Ross, Rock, Pitman, Balsam (below the diversion), Ely, Adit 8, and Crater Creek (except the lowest 0.5 mile) are almost entirely classified as high-gradient, bedrock and/or cascade channel types. Based on qualitative studies, there are no indications of alterations to channel morphology along these streams. Further quantitative study is therefore not recommended for these channels.

A few segments of identified sensitive channels have most likely been significantly altered. These channel segments should be considered by the CAWG, and may require no, or only limited and focused, quantitative study in order to agree upon the nature and magnitude of morphological change. Additional quantitative study could address the feasibility, need, and biological value of modifying these stream segments.

These channels include:

- Big Creek above Kerkhoff Dome
- North Fork Stevenson Creek immediately below Tunnel 7 and upstream of the gaging station
- Stevenson Creek immediately downstream from Shaver Lake to Hwy 168

The San Joaquin River and South Fork San Joaquin River contain the vast majority of sensitive stream reaches (see Table CAWG-2-13). The sensitive portions of the SJR are pool-riffle and plane-bed channel types. These sections of the channel are predominantly confined by non-erodible, bedrock canyon walls, limiting the adjustability of the channel to primarily potential changes in particle size and sediment storage (see Table CAWG-2-10). Alterations to depth and slope are also possible, but qualitative study did not detect this type of change. Quantitative study on the mainstem SJR should address possible change in particle size and sediment storage using methodologies such as V* to quantify pool fine sediment volume and estimating gravel areas, and comparing with reference streams. Historic aerial photography may also be useful for comparison with existing conditions.

Similarly for adjustable portions of the South Fork SJR, alterations in particle size and sediment storage are possible, although fine sediment was rarely detected as an excessive accumulation in the channel. In fact, it is more likely that any alteration in particle size has led to a coarsening of the channel bed rather than deposition of fine sediments (except for the low-gradient, unconfined reach in Jackass Meadow). This working hypothesis could be supported by hydrology data assuming that it shows Florence Lake occasionally spills with sufficient discharge to mobilize finer sediments. Reservoirs that capture a portion of the coarse and fine sediment load from the upstream basin, but release sufficient discharge to transport finer materials from the bed downstream, can result in a net bed coarsening. This points up the importance of having supporting information from the hydrologic regime in order to interpret potential morphological alterations of the channel. V* would probably not be useful on most of the South Fork SJR given the relatively coarse channel bed, including pools, and apparent lack of fines. A quantitative accounting of the amount of coarser, gravel size material in comparison to reference streams could be an appropriate quantitative approach. V* might be most appropriately used in the low-gradient Jackass Meadow reach to quantify fine sediment deposition. In addition, measures of channel dimensions (width-depth, gradient) should be evaluated in Jackass Meadows and compared to reference areas in order to determine possible changes in width, depth, as well as particle size. Historical photos, if available can also be very useful.

There are relatively smaller sections of sensitive channels on other streams including lower Crater Creek, Mono Creek, lower Tombstone Creek, and Bosillio Creek that warrant consideration for evaluating effects on fine sediment and gravel deposition/transport.

Although most of the project streams do not have floodplains, potential floodplains were identified on 7 different streams (see Section 5.2.4 Floodplain/Terrace Connectivity). Quantitative study should be designed to determine stage-discharge relationships in all of these designated potential floodplain areas. Historic, unimpaired hydrology is necessary in order to compare stage-discharge relationships between present-day regulated and historic unregulated hydrologic regimes in the floodplain reaches. The quantitative study objective should be to determine if potential floodplains functioned as either floodplains or as terraces under current and historic flow conditions. Additionally, the extent of change should be quantified for areas determined to have historically functioned as floodplains.

Potential channel encroachment by riparian vegetation was classified into one of two primary groups: (1) dense and continuous; and (2) limited and discontinuous. Since the limited and discontinuous category represents a relatively subtle change in the amount of riparian vegetation that is unlikely to be biologically significant, it is recommended that any quantitative study focus on the potential encroachment in reaches classified as dense and continuous. The following streams were identified as potentially encroached with dense and continuous vegetation:

- Mono Creek from RM 1.4 to 4.1
- Crater Creek (RM 2.60 to 2.9)

These streams are in addition to Big Creek above Kerkhoff Dome, and Stevenson Creek below Shaver dam, as listed above and acknowledged to almost certainly be morphologically altered reaches. Quantitative study should determine if these streams are in fact encroached relative to historic conditions.

Changes in the recruitment and transport of LWD is most likely to occur on the larger streams with reservoirs that can capture wood. On the smaller streams (i.e., 1st and 2nd order channels) and diversions (i.e., diversions with no storage capacity), the project is most unlikely to alter recruitment and transport of LWD. On Bolsillo Creek, for example, the discharge is probably insufficient to move LWD, except perhaps on a very infrequent basis during high magnitude flows. Once LWD falls into the smaller channels it is generally quite stable. Therefore, alterations in the transport of LWD is unlikely. On the larger streams, there is sufficient discharge, and the channel is sufficiently large so that a piece of LWD is much more likely to be periodically transported than on the smaller streams. Additionally, impoundments with storage capacity will capture and remove LWD from downstream transport. Therefore, it is recommended that quantitative study focus on the larger channels with storage reservoirs.

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TABLES

Table CAWG-2-1. Summary of Study Elements Completed and Outstanding

CAWG-2 Study Plan Step	Completed Study Elements	Outstanding Study Elements
Step 1: Review and Analyze Existing Data		
	Reviewed existing information and developed a conceptual framework for the sediment transport regime within the Big Creek system.	A determination of the timing, magnitude, and duration of geomorphically-significant and riparian/floodplain flows by analyzing hydrologic records and performing flood-frequency analyses (Leopold, et al., 1964).
	Reviewed existing aerial photography and maps.	Additional review of ground and aerial photographs to specifically include historic photos of Florence Lake.
	Developed Rosgen (1996) Level I classification for project streams.	
Step 2: Qualitative Reconnaissance Field Survey of the Study Area		
	Developed field data sheets that were submitted and approved by the Combined Aquatic Working Group (CAWG) in June 2002.	An evaluation of the potential for sediment delivery to the channel from upslope roads, based on the approach of Weaver and Hagans (1994), or similar USFS method.
	Conducted aerial and ground reconnaissance surveys to describe existing geomorphic and sediment conditions and characterize parameters useful in assessing the effects of Project-flow regimes on the streams' ability to maintain dynamically stable, functional channels.	Additional analysis of potential delivery of sediment from tailings/spoils piles associated with the project.
	Mapped floodplain and wetland areas, including abandoned floodplains (terraces) in all Project-affected reaches.	
	Transferred and stored data in GIS format.	
	Documented ground reconnaissance surveys with photographs.	
	Evaluated potential reference areas in adjacent tributaries and sub-basins during the Rosgen Level I analysis described in the Watershed and Reach-Scale Characteristics section.	
Step 3: Data Synthesis and Interpretation for Presentation to the CAWG		
	Describe the overall sediment transport regime in the relicensing basin, and within each Project-related stream and reservoir.	An assessment of the relationship of in-channel and overbank flow frequency, magnitude, and duration using field channel morphology data and hydrological analyses (Step 1) in conjunction with information on riparian vegetation, floodplains and wetlands.
	Use field data and observations in conjunction with existing information on geology, soils, hydrology, and Project operations to evaluate the balance between sediment input to the channels, and their capacity to transport this sediment at current flows.	Evaluation of shoreline erosion in Project reservoirs.
	Use field channel morphology data and hydrological analyses (Step 1) in conjunction with information on riparian vegetation, floodplains and wetlands, to assess the relationship of in-channel and overbank flow frequency, magnitude, and duration.	
Step 4: CAWG Determines which Impacted Areas and Appropriate Reference Locations are to be Studied Further		
		From the results summarized in Step 3, the selection of sites in project-affected streams for quantitative study by the CAWG.
		If necessary, nearby unregulated streams will be identified as channel reference locations, in collaboration with the CAWG. The CAWG will determine additional survey requirements to supplement the initial reconnaissance level surveys performed in Step 2. Additional studies will be conducted at these locations during Step 5, and the data collected will be shared with the CAWG. Selection of final reference locations for quantitative analysis will be conducted in coordination with the CAWG.

Table CAWG-2-1. Summary of Study Elements Completed and Outstanding (continued)

Step 5: Quantitative Study of Impacted Areas and Associated Reference Sites		
		The installation of study [SCE] transects. The CAWG will determine the location of temporary and monumented transects.
		Collection of data elements outlined in the USFS Stream Condition Inventory (SCI) protocol at sites selected by the CAWG not already conducted during initial field surveys (Step 2).
		Collection of data elements outlined in the Proper Functioning Condition (PFC) protocol at sites selected by the CAWG not already conducted during initial surveys (Step 2).
		Comparison of data in project-affected reaches to similar data collected in reference reaches to assess the magnitude of project impact.
		Using existing and, if necessary, additional measurements of sediment accumulation, including woody debris, in reservoirs, and ongoing monitoring of the effects of SCE's sediment management practices to characterize: (1) watershed sedimentation rates; and (2) potential effects of Project operation and maintenance over time on downstream reaches.
		Quantification of woody debris in sensitive stream reaches following SCI protocol.
Step 6: Data Synthesis of Step 5 and Recommendations to CAWG		
		The approach and methodologies used to complete the study will be described and presented to the CAWG.
		The geomorphology data obtained from the project reaches will be compared to reference conditions to identify any differences in the stream channel geomorphology.
		Differences identified between project reaches and reference conditions will be evaluated to determine their geomorphological significance and whether they are attributable to project operations.
		Of the areas surveyed in Step 5, determine which impacts are considered adverse and, of those, which can be attributed to Project operations. The hydrologic and field-based determination of geomorphically-significant flows, conducted in Steps 1, 2, and 5, will be used as part of this assessment of degree of impact by Project operations.
		The CAWG will determine whether additional quantitative analysis is needed to supplement the studies conducted in Step 5.

Table CAWG-2-2. Rosgen Channel Types and Corresponding Channel Slope Ranges

Level I Rosgen Channel Type	Channel Slope (%) Lower Limit	Channel Slope (%) Upper Limit
Aa+	10	-
A	4	10
B	<2	10
C	<0.1	4
E	<2	4
F	<2	4
G	<2	4

Table CAWG-2-3. Summary of the Geologic Composition of the Big Creek Project Area [1]

Description	Map Symbol [2]	Area (sq miles)	% of Total Area
Glacial deposits	Qg	138.23	9.35%
Recent (Holocene) volcanic flow rocks (or predominantly flow rocks)	Qrv	0.56	0.04%
Quaternary volcanic flow rocks (or predominantly flow rocks)	Qv	10.43	0.71%
Tertiary volcanic flow rocks	Tv	28.50	1.93%
Mesozoic granitic rocks	grMz	1124.42	76.06%
Mesozoic gabbroic rocks	gb	0.13	0.01%
Granitic and metamorphic rocks, undivided, of pre-Cenozoic age	gr-m	4.64	0.31%
Mesozoic volcanic and metavolcanic rocks; Franciscan volcanic rocks	Mzv	120.55	8.15%
Undivided pre-Cenozoic metasedimentary and metavolcanic rocks	m	23.43	1.58%
Undivided pre-Cenozoic metavolcanic rocks	mv	0.74	0.05%
Permian marine	Pm	1.33	0.09%
Carboniferous marine	C	0.91	0.06%
Silurian and/or Ordovician marine	SO	0.01	0.00%
Water	Water	24.45	1.65%
	Total =	1478.33	

[1] Geologic info obtained from California Division of Mines and Geology, CD-ROM 2000-007 GIS Data for the Geologic Map of California.

[2] Map symbol associated with Figures CAWG-2-5a, b, c, and d.

Table CAWG-2-4 (a). Summary of Geologic Composition of Big Creek Project Watersheds [1, 2]

Watershed / Subwatershed	Total Area	Qg		Qrv		Qv		Tv		grMz		gb		gr-m	
	sq miles	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area
San Joaquin River US Kerchkoff Powerhouse	1,478.35	138.23	9.35%	0.56	0.04%	10.43	0.71%	28.50	1.93%	1,124.42	76.06%	0.13	0.01%	4.64	0.31%
MF San Joaquin River	189.05	4.47	2.37%	0.56	0.30%	10.43	5.52%	8.86	4.69%	114.10	60.36%	0.13	0.07%	-	-
NF San Joaquin River	56.97	1.40	2.45%	-	-	-	-	3.30	5.79%	13.12	23.02%	-	-	-	-
San Joaquin River US SFSJR	329.14	19.83	6.03%	0.56	0.17%	10.43	3.17%	16.03	4.87%	180.22	54.76%	0.13	0.04%	-	-
Rock Creek	16.35	-	-	-	-	-	-	-	-	14.75	90.20%	-	-	-	-
Ross Creek	6.49	-	-	-	-	-	-	-	-	6.49	100.00%	-	-	-	-
South Fork San Joaquin River	463.37	67.48	14.56%	-	-	-	-	7.56	1.63%	354.15	76.43%	-	-	-	-
SF San Joaquin River US Florence Lake	151.24	9.08	6.00%	-	-	-	-	-	0.00%	119.84	79.24%	-	-	-	-
Bear Creek	53.70	2.94	5.47%	-	-	-	-	0.55	1.03%	45.91	85.49%	-	-	-	-
Bolsillo Creek	1.95	1.13	57.73%	-	-	-	-	-	-	0.83	42.27%	-	-	-	-
Camp 61 Creek	7.88	4.36	55.30%	-	-	-	-	-	-	3.52	44.70%	-	-	-	-
Camp 62 Creek	2.19	1.04	47.67%	-	-	-	-	-	-	1.14	52.33%	-	-	-	-
Chinquapin Creek	4.88	1.97	40.34%	-	-	-	-	-	-	2.91	59.66%	-	-	-	-
Crater Creek	4.05	1.16	28.55%	-	-	-	-	-	-	2.89	71.45%	-	-	-	-
Hooper Creek	7.42	3.60	48.51%	-	-	-	-	-	-	3.23	43.50%	-	-	-	-
Mono	101.88	18.94	18.59%	-	-	-	-	1.62	1.59%	77.29	75.86%	-	-	-	-
North Slide Creek	0.32	0.28	88.05%	-	-	-	-	-	-	0.04	11.95%	-	-	-	-
South Slide Creek	0.43	0.28	65.30%	-	-	-	-	-	-	0.15	34.70%	-	-	-	-
Tombstone Creek	2.05	0.60	29.09%	-	-	-	-	-	-	1.46	70.91%	-	-	-	-
Big Creek	133.51	29.98	22.45%	-	-	-	-	0.21	0.15%	96.96	72.62%	-	-	-	-
Big Creek US Huntington Lake	41.72	19.39	46.47%	-	-	-	-	-	-	22.19	53.18%	-	-	-	-
Adit 8 Creek	0.53	-	-	-	-	-	-	-	-	0.53	100.00%	-	-	-	-
Balsam Creek	3.85	-	-	-	-	-	-	-	-	3.15	81.78%	-	-	-	-
Ely Creek	2.70	-	-	-	-	-	-	-	-	2.70	99.96%	-	-	-	-
Pitman Creek	25.12	4.16	16.57%	-	-	-	-	-	-	20.73	82.52%	-	-	-	-
Rancheria Creek	13.05	4.21	32.25%	-	-	-	-	-	-	8.84	67.75%	-	-	-	-
Stevenson Creek	35.59	-	-	-	-	-	-	-	-	32.07	90.12%	-	-	-	-
Stevenson Creek at Shaver Dam	29.39	-	-	-	-	-	-	-	-	25.88	88.04%	-	-	-	-
Stevenson Creek US Shaver Lake	8.04	-	-	-	-	-	-	-	-	8.04	100.00%	-	-	-	-
North Fork Stevenson Creek	5.88	-	-	-	-	-	-	-	-	5.88	100.00%	-	-	-	-

[1] Geologic information obtained from the California Division of Mines and Geology, CD-ROM 2000-007, GIS Data for the Geologic Map of California.

[2] Map symbols associated with Figures 1-4.

Table CAWG-2-4 (b). Summary of Geologic Composition of Big Creek Project Watersheds [1, 2]

Watershed	Total Area	Mzv		m		mv		Pm		C		SO		Water	
Subwatershed	sq miles	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area	sq miles	% of area
San Joaquin River US Kerchkoff Powerhouse	1,478.35	120.55	8.15%	23.43	1.59%	0.74	0.05%	1.33	0.09%	0.91	0.06%	0.01	-	24.45	1.65%
MF San Joaquin River	189.05	45.45	24.04%	-	-	-	-	1.22	0.64%	0.91	0.48%	0.01	0.01%	2.90	1.53%
NF San Joaquin River	56.97	39.10	68.64%	-	-	-	-	-	-	-	-	-	-	0.06	0.10%
San Joaquin River US SFSJR	329.14	96.77	29.40%	-	-	-	-	1.22	0.37%	0.91	0.28%	0.01	-	3.02	0.92%
Rock Creek	16.35	-	-	1.60	9.80%	-	-	-	-	-	-	-	-	-	-
Ross Creek	6.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Fork San Joaquin River	463.37	19.41	4.19%	4.52	0.98%	-	-	0.12	0.03%	-	-	-	-	10.14	2.19%
SF San Joaquin River US Florence Lake	151.24	14.11	9.33%	4.52	2.99%	-	-	-	-	-	-	-	-	3.69	2.44%
Bear Creek	53.70	3.14	5.85%	-	-	-	-	-	-	-	-	-	-	1.17	2.17%
Bolsillo Creek	1.95	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Camp 61 Creek	7.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Camp 62 Creek	2.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chinquapin Creek	4.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crater Creek	4.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hooper Creek	7.42	0.59	8.00%	-	-	-	-	-	-	-	-	-	-	-	-
Mono	101.88	0.13	0.13%	-	-	-	-	0.12	0.11%	-	-	-	-	3.78	3.71%
North Slide Creek	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Slide Creek	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tombstone Creek	2.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Big Creek	133.51	-	-	4.00	3.00%	-	-	-	-	-	-	-	-	2.37	1.77%
Big Creek US Huntington Lake	41.72	-	-	-	-	-	-	-	-	-	-	-	-	0.15	0.35%
Adit 8 Creek	0.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balsam Creek	3.85	-	-	0.70	18.22%	-	-	-	-	-	-	-	-	-	-
Ely Creek	2.70	-	-	0.00	0.04%	-	-	-	-	-	-	-	-	-	-
Pitman Creek	25.12	-	-	0.23	0.91%	-	-	-	-	-	-	-	-	-	-
Rancheria Creek	13.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stevenson Creek	35.59	-	-	-	-	-	-	-	-	-	-	-	-	3.52	9.88%
Stevenson Creek at Shaver Dam	29.39	-	-	-	-	-	-	-	-	-	-	-	-	3.52	11.96%
Stevenson Creek US Shaver Lake	8.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Fork Stevenson Creek	5.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] Geologic information obtained from the California Division of Mines and Geology, CD-ROM 2000-007, GIS Data for the Geologic Map of California.

[2] Map symbols associated with Figures 1-4.

Table CAWG-2-5. Summary of Rosgen Stream Type Classification (Rosgen 1996)

Rosgen Channel Type	Entrenchment Ratio	Width to Depth Ratio	Sinuosity	Slope Range (%)	Morphological Characteristics
Aa+	<1.4	<12	1.0 – 1.1	>10	Step-pool or cascading; plunge and scour pools, high gradient and high energy, low sediment storage, entrenched, low width-depth ratio, low sinuosity, stable
A	<1.4	<12	1.0 – 1.2	4 - 10	Step-pool or cascading; plunge and scour pools, high gradient and high energy, low sediment storage, entrenched, low width-depth ratio, low sinuosity, stable
B	1.4 – 2.2	>12	>1.2	<2 - 10	Riffles and rapids; some scour pools, bars occur but infrequent, moderate gradient, moderately entrenched, moderate width-depth ratio and sinuosity, stable
C	>2.2	>12	>1.4	<0.1 - 4	Pool-riffle; meandering, point bars, floodplain, high width-depth ratio, slightly entrenched, high sinuosity, low to moderate gradient, banks can be stable or unstable
D		>40		<0.1 - <4	Braided; multiple channels, shifting bars, deposition, high sediment supply, bank erosion, no entrenchment, high width-depth ratio, low sinuosity, and low gradient
DA	>2.2	Highly Variable	Highly Variable	<0.5	Anastomsing; multiple stable channels, pool-riffle, vegetated floodplain and bars, stable banks, high width-depth ratio, no entrenchment, low sinuosity, and low gradient
E	>2.2	<12		<2 - 4	Meadow meanders; well-developed floodplain, pool-riffle, high sediment transport, low width-depth ratio, slightly entrenched, low to moderate gradient, high sinuosity
F	<1.4	>12		<2 - 4	Valley/Canyon meanders; incised into valleys, small or no floodplain, pool-riffle, banks can be either stable or unstable, highly entrenched, moderate to high width-depth ratio, moderate to high sinuosity, moderate slope
G	<1.4	<12		<2 - 4	Gully; incised into hillslopes, alluvial fans, and meadows, high sediment supply, unstable banks, step-pool, entrenched, low width-depth ratio, moderate sinuosity, moderate gradient

Table CAWG-2-6. Summary of Rosgen Bed Material Classification (Rosgen 1996)

Dominant Bed Material	Size Range (mm)	Rosgen Designation
Bedrock	NA	1
Boulder	256 - 2048	2
Cobble	64 – 256	3
Gravel	2 – 64	4
Sand	0.062 - 2	5
Silt/Clay	<0.062	6

Table CAWG-2-7. Summary of Rosgen Level 1.5 Results of Project Affected Reaches from Aerial and Ground Reconnaissance Surveys

Watershed / Subwatershed	Rosgen Level 1.5 Results: Stream Type	Total Miles Surveyed	% of Miles Surveyed
San Joaquin River			
San Joaquin River (between Big Creek Powerhouse No.4 and Confluence with SF San San Joaquin River)*	G2c	6.3	16.4%
	B2c	4.4	11.5%
	G1c	3.8	9.9%
	G2c/G3c	2.8	7.3%
	G3c	2.3	6.0%
	G1/G2	2.1	5.5%
	B5	1	2.6%
Rock Creek	A1a+	0.48	100.0%
Ross Creek	A1a+	0.87	100.0%
South Fork San Joaquin River			
South Fork San Joaquin River (between confluence with San Joaquin River and Florence Lake)	G2	14	50.2%
	B2/B3	4.7	16.8%
	B3	4.6	16.5%
	B2	1.8	6.5%
	C5/B5c	1.6	5.7%
	C3	0.8	2.9%
	G1	0.4	1.4%
Bear Creek	A2 w/ B inclusions	1.23	78.3%
	A1	0.2	12.7%
	B2	0.14	8.9%
Bolsillo Creek	A1a+/A2a+	0.67	42.7%
	G2/G5	0.3	19.1%
	B2/B3/B5	0.23	14.6%
	B2/B5	0.15	9.6%
	A2/B2	0.12	7.6%
	E5	0.1	6.4%
Camp 62 Creek	A2a+	0.47	34.8%
	B2/B3	0.38	28.1%
	A2	0.27	20.0%
	B2	0.23	17.0%

Table CAWG-2-7. Summary of Rosgen Level 1.5 Results of Project Affected Reaches from Aerial and Ground Reconnaissance Surveys (continued)

Watershed Subwatershed	Rosgen Level 1.5 Results Stream Type	Total Miles Surveyed	% of Miles Surveyed
South Fork San Joaquin River (continued)			
Chinquapin Creek	A2a+	0.59	65.6%
	B3	0.12	13.3%
	A2	0.1	11.1%
	G2/G4	0.05	5.6%
	B3/B4	0.04	4.4%
Crater Creek	A1a+/A2a+	2.14	74.6%
	B5	0.26	9.1%
	B4/B5	0.17	5.9%
	E5/DA5	0.15	5.2%
	C5/B5	0.1	3.5%
	B2/B3	0.05	1.7%
Crater Diversion Channel	A1a+/A2a+	0.75	48.4%
	G2	0.23	14.8%
	B1/B2	0.12	7.7%
	A1/A5	0.08	5.2%
	DA4/DA5	0.08	5.2%
	B2/B5	0.07	4.5%
	A4/A5	0.06	3.9%
	A2	0.05	3.2%
	B2	0.05	3.2%
	B3/B5	0.03	1.9%
	G1	0.03	1.9%
Hooper Creek	A1a+/A2a+	0.45	72.6%
	B3	0.17	27.4%
Mono	B2	5.03	86.9%
	B5	0.65	11.2%
	A2	0.11	1.9%

Table CAWG-2-7. Summary of Rosgen Level 1.5 Results of Project Affected Reaches from Aerial and Ground Reconnaissance Surveys (continued)

Watershed	Rosgen Level 1.5 Results		
Subwatershed	Stream Type	Total Miles Surveyed	% of Miles Surveyed
South Fork San Joaquin River (continued)			
North Slide Creek	A2a+	0.29	100.0%
South Slide Creek	A1a+/A2a+	0.32	100.0%
Tombstone Creek	E5/E6	0.55	56.1%
	A1a+/A2a+	0.36	36.7%
	B2/B5	0.07	7.1%
Big Creek			
Big Creek (between San Joaquin River and Huntington Lake)	A1	4.5	45.5%
	A1a+/A2a+	2.18	22.0%
	A1/A2	1	10.1%
	B2	0.72	7.3%
	B5	0.33	3.3%
	B2/B5	0.25	2.5%
	A2/B2	0.25	2.5%
	G5	0.17	1.7%
	A2	0.1	1.0%
Adit 8 Creek	A1a+/A2a+/A4a+	0.96	100.0%
Balsam Creek	A1a+/A2a+	0.7	100.0%
Ely Creek	A1a+/A2a+	0.93	94.9%
	B2/B3	0.05	5.1%
Pitman Creek	A1a+	1.43	94.1%
	B1	0.09	5.9%
Stevenson Creek			
Stevenson Creek (between San Joaquin River and Shaver Lake)	A1a+	2.4	55.8%
	A1	0.7	16.3%
	B3	0.5	11.6%
	B1/B3/B4	0.3	7.0%
	B3/B5	0.22	5.1%
	B5	0.1	2.3%
	B1	0.08	1.9%

Table CAWG-2-7. Summary of Rosgen Level 1.5 Results of Project Affected Reaches from Aerial and Ground Reconnaissance Surveys (continued)

Watershed	Rosgen Level 1.5 Results		
Subwatershed	Stream Type	Total Miles Surveyed	% of Miles Surveyed
Stevenson Creek (continued)			
North Fork Stevenson Creek	A1a+/A2a+	1.41	53.2%
	C3	0.3	11.3%
	G1	0.3	11.3%
	B3	0.3	11.3%
	B1/B2	0.14	5.3%
	C4	0.1	3.8%
	A1	0.1	3.8%
	Total:	90.4	

Redinger Lake, Dam 6 Lake, and Mammoth Pool account for approximately 15.7 miles or 17% of total stream miles.

Table CAWG-2-8. Diagnostic Features of the Montgomery-Buffington Channel Types (Montgomery-Buffington, 1997)

	Colluvial	Alluvial					Bedrock
		Dune-Ripple	Pool-Riffle	Plane-Bed	Step-Pool	Cascade	
Bed Material	Variable	Sand	Gravel	Gravel- cobble	Cobble-boulder	Boulder	Bedrock
Bedform Pattern	Variable	Multi-layered	Laterally oscillatory	Featureless	Vertically oscillatory	Random	Variable
Dominant Roughness	Grains, LWD	Sinuosity, banks, grains, bedforms (dunes, ripples, bars)	Bedforms (bars, pools), sinuosity, banks, grains	Grains, banks	Grains, banks	Grains, banks	Boundaries (bed and banks) Grains
Sediment Sources	Hillslopes Debris Flows	Fluvial, bank failure	Fluvial, bank failure	Fluvial, bank failure, debris flow	Fluvial, hillslope, debris flow	Fluvial, hillslope, debris flows	Fluvial Hillslope Debris Flows
Sediment Storage	Bed	Overbank, bedforms	Overbank, bedforms	Overbank	Bedforms	Lee and stoss sides of obstructions	None
Confinement	Confined	Unconfined	Unconfined	Variable	Confined	Confined	Confined
Pool spacing (channel widths)		5 to 7	5 to 7	none	1 to 4	<1	
Typical Slope	>.10	<0.001	<0.015	0.015 - 0.03	0.03 – 0.065	>0.065	Variable
Reach Type	Source	Response Transport-limited	Response May have either Supply- or Transport-limited characteristics	Response May have either Supply- or Transport-limited characteristics	Transport Supply-limited	Transport Supply-limited	Transport

Table CAWG-2-9. Summary Montgomery-Buffington Classification of Project Affected Streams (miles)

	Bedrock	Colluvial	Alluvial
	21.8	0	
Alluvial Channel Types[1]			
Step-pool/plane-bed			20.3
Plane-bed/pool-riffle			14.5
Plane-bed			13
Pool-riffle			7.4
Cascade/step-pool			4.5
Cascade			2.7
Bedrock/cascade			2
Step-pool			1.6
Bedrock/plane-bed			0.5
Colluvial/step-pool			0.4
Bedrock/step-pool			0.3
Pool-riffle/plane-bed			0.2
Total	21.8	0	67.4

[1] Several of the alluvial channel types include some bedrock. These mixed intermediate types are all arbitrarily listed as alluvial in this table.

Table CAWG-2-10. Channel Response Potential to Moderate Changes in Sediment Supply and Discharge[1]

	Morphology	Width	Depth	Slope	Particle Size	Sediment Storage	Roughness
Response							
	Dune-ripple[2]	+	+	+	-	+	+
	Pool-riffle	+	+	+	+	+	+
	Plane-bed	P	+	+	+	P	P
Transport							
	Step-pool	-	P	P	P	P	P
	Cascade	-	-	-	P	-	P
	Bedrock	-	-	-	-	-	-
Source							
	Colluvial[2]	P	P	-	P	+	-

+ = likely to change   P = possible to change   - = unlikely to change

[1] adapted from Montgomery and Buffington (1997)
[2] not found along project affected streams

Table CAWG-2-11. Channel Responsiveness Based on Rosgen Classification

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length (miles)	Rosgen Reach Type	Responsiveness	
		Downstream RM	Upstream RM			Responsive	Not Responsive
San Joaquin River							
	San Joaquin River (between Big Creek Powerhouse No.4 and Confluence with SF San Joaquin River)	0	3.3	3.3	G1c		X
		3.3	5.6	2.3	G3c	X	
		5.6	6.1	0.5	G1c		X
		6.1	11.3	Redinger Lake	--		
		11.3	17	5.7	G2c		X
		17	18.2	Dam 6 Lake	--		
		18.2	22.6	4.4	B2c		X
		22.6	25.4	2.8	G2c/G3c		
		25.4	25.6	0.2	B5	X	
		25.6	26.2	0.6	G2c		X
		26.2	35.5	Mammoth Pool	--		
		35.5	37.6	2.1	G1/G2		X
		37.6	38.4	0.8	B5	X	
	Ross Creek	0	0.87	0.87	A1a+		X
	Rock Creek	0	0.48	0.48	A1a+		X
South Fork San Joaquin River							
	South Fork San Joaquin River	0	0.7	0.7	G2		X
		0.7	1	0.3	B3	X	
		1	1.55	0.55	G2		X
		1.55	1.9	0.35	B3	X	
		1.9	14	12.1	G2		X
		14	15.9	1.9	B3	X	
		15.9	19	3.1	B2/B3		X
		19	19.35	0.35	G2		X
		19.35	19.8	0.45	B3	X	
		19.8	19.9	0.1	G2		X
		19.9	20.1	0.2	B3	X	
		20.1	20.9	0.8	C3	X	
		20.9	21.1	0.2	G1		X
		21.1	21.8	0.7	B2/B3		X
		21.8	22	0.2	G2		X
		22	23.4	1.4	B3	X	
		23.4	25.2	1.8	B2		X

Table CAWG-2-11. Channel Responsiveness Based on Rosgen Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length (miles)	Rosgen Reach Type	Responsiveness	
		Downstream RM	Upstream RM			Responsive	Not Responsive
South Fork San Joaquin River (continued)							
	South Fork San Joaquin River (continued	25.2	26.1	0.9	B2/B3		X
		26.1	27.7	1.6	C5/B5c	X	
		27.7	27.9	0.2	G1		X
	Bear Creek	0	0.2	0.2	A1		X
		0.2	1.43	1.23	A2 with B inclusions		X
		1.43	1.57	0.14	B2		X
	Bolsillo Creek	0	0.1	0.1	A1a+		X
		0.1	0.2	0.1	E5	X	
		0.2	0.65	0.45	A1a+/A2a+		X
		0.65	0.8	0.15	B2/B5		X
		0.8	0.9	0.1	A2a+		X
		0.9	1.02	0.12	A2/B2		X
		1.02	1.32	0.3	G2/G5		X
		1.32	1.55	0.23	B2/B3/B5		X
		1.55	1.57	0.02	A2a+		X
	Camp 62 Creek	0	0.12	0.12	A2a+		X
		0.12	0.35	0.23	B2		X
		0.35	0.55	0.2	A2a+		X
		0.55	0.79	0.24	B2/B3		X
		0.79	1.06	0.27	A2		X
		1.06	1.2	0.14	B2/B3		X
		1.2	1.35	0.15	A2a+		X
	Chinquapin Creek	0	0.1	0.1	A2		X
		0.1	0.14	0.04	B3/B4	X	
		0.14	0.19	0.05	G2/G4		X
		0.19	0.35	0.16	A2a+		X
		0.35	0.5	0.15	B3	X	
		0.5	0.9	0.4	A2a+		X
	Crater Creek	0	0.17	0.17	B4/B5	X	
		0.17	0.32	0.15	E5/DA5	X	
		0.32	0.42	0.1	C5(B5)	X	
		0.42	1.44	1.02	A2a+		X
		1.44	1.51	0.07	A1a+/A2a+		X
		1.51	1.77	0.26	B5	X	

Table CAWG-2-11. Channel Responsiveness Based on Rosgen Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length (miles)	Rosgen Reach Type	Responsiveness	
		Downstream RM	Upstream RM			Responsive	Not Responsive
South Fork San Joaquin River (continued)							
	Crater Creek (continued)	1.77	1.82	0.05	B2/B3		X
		1.82	2.1	0.28	A1a+/A2a+		X
		2.1	2.87	0.77	A2a+ with A2/B2 inclusions		X
	Crater Diversion Channel	0.65	0.72	0.07	B2/B5		X
		0.72	0.8	0.08	G2		X
		0.8	0.85	0.05	B2		X
		0.85	0.88	0.03	A2a+		X
		0.88	0.98	0.1	G2		X
		0.98	1.1	0.12	A1a+/A2a+		X
		1.1	1.13	0.03	G1		X
		1.13	1.24	0.11	A1a+		X
		1.24	1.3	0.06	A4/A5		X
		1.3	1.6	0.3	A1a+		X
		1.6	1.7	0.1	A1a+/A2a+		X
		1.7	1.78	0.08	A1/A5		X
		1.78	1.9	0.12	B1/B2		X
		1.9	1.98	0.08	DA4/DA5	X	
		1.98	2.07	0.09	A2a+		X
		2.07	2.1	0.03	B3/B5	X	
		2.1	2.15	0.05	G2		X
		2.15	2.2	0.05	A2		X
	Hooper Creek	0	0.08	0.08	A2a+		X
		0.08	0.25	0.17	B3	X	
		0.25	0.7	0.45	A1a+/A2a+		X
	Mono Creek	0	2.4	2.4	B2		X
	(below diversion)	2.4	2.8	0.4	B5	X	
		2.8	3.5	0.7	B2		X
		3.5	3.75	0.25	B5	X	
		3.75	5.68	1.93	B2		X
		5.68	5.79	0.11	A2		X
	North Slide Creek	#REF!	0.29	#REF!	A2a+		X
	South Slide Creek	0	0.27	0.27	A2a+		X
		0.27	0.32	0.05	A1a+		X

Table CAWG-2-11. Channel Responsiveness Based on Rosgen Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length (miles)	Rosgen Reach Type	Responsiveness	
		Downstream RM	Upstream RM			Responsive	Not Responsive
South Fork San Joaquin River (continued)							
	Tombstone Creek	0	0.1	0.1	E6	X	
	Tombstone Creek	0.1	0.55	0.45	E5	X	
		0.55	0.62	0.07	B2/B5		X
		0.62	0.98	0.36	A1a+/A2a+		X
Big Creek							
	Big Creek	0	0.5	0.5	Aa+		X
		0.5	1.2	0.7	A1		X
		1.2	1.7	0.5	A1/A2		X
		1.7	1.9	Dam 5 Impoundment	--		
		1.9	2	0.1	A2		X
		2	2.2	0.2	B2		X
		2.2	5.2	3	A1		X
		5.2	5.4	0.2	B2		X
		5.4	6.2	0.8	A1		X
		6.2	6.4	Dam 4 Lake	--		
		6.4	7.8	1.4	Aa+		X
		7.8	7.95	0.15	A1a+		X
		7.95	8.27	0.32	B2		X
		8.27	8.6	0.33	B5	X	
		8.6	8.85	0.25	B2/B5		X
		8.85	9.35	0.5	A1/A2		X
		9.35	9.6	0.25	A2/B2		X
		9.6	9.77	0.17	G5	X	
		9.77	9.9	0.13	A1a+/A2a+		X
	Adit 8	0	0.5	0.5	Aa+		X
		0.5	0.53	0.03	A2a+		X
		0.53	0.6	0.07	A4a+		X
		0.6	0.7	0.1	A2a+/A4a+		X
		0.7	0.96	0.26	A1a+/A2a+		X
	Balsam Creek	0	0.7	0.7	A1a+/A2a+		X
	Ely Creek	0	0.53	0.53	A1a+		X
		0.53	0.58	0.05	B2/B3		X
		0.58	0.98	0.4	A1a+/A2a+		X

Table CAWG-2-11. Channel Responsiveness Based on Rosgen Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length (miles)	Rosgen Reach Type	Responsiveness	
		Downstream RM	Upstream RM			Responsive	Not Responsive
Big Creek (continued)							
	Pitman Creek	0	1.02	1.02	A1a+		X
		1.02	1.43	0.41	A1a+		X
		1.43	1.52	0.09	B1		X
Stevenson Creek							
	Stevenson Creek	0	0.7	0.7	A1a+		X
		0.7	1.4	0.7	A1		X
		1.4	2.2	0.8	A1a+		X
		2.2	2.5	0.3	B1/B3/B4		X
		2.5	2.7	0.2	A1a+		X
		2.7	3.2	0.5	B3	X	
		3.2	3.8	0.6	A1a+		X
		3.8	3.9	0.1	A1a+		X
		3.9	3.98	0.08	B1		X
		3.98	4.08	0.1	B5	X	
		4.08	4.3	0.22	B3/B5	X	
	North Fork Stevenson Creek	0.9	1.1	0.2	A1a+		X
		1.1	1.2	0.1	A1		X
		1.2	1.3	0.1	C4	X	
		1.3	1.5	0.2	Aa+		X
		1.5	1.8	0.3	G1		X
		1.8	2.1	0.3	C3	X	
		2.1	2.4	0.3	B3	X	
		2.4	3.05	0.65	Aa+		X
		3.05	3.11	0.06	A1a+		X
		3.11	3.25	0.14	B1/B2		X
		3.25	3.34	0.09	A2a+		X
		3.34	3.45	0.11	A1a+		X
		3.45	3.55	0.1	A2a+		X

Table CAWG-2-12. Channel Responsiveness Based on Montgomery-Buffington Classification

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length	Montgomery-Buffington Classification	Responsiveness	
		Downstream RM	Upstream RM	(miles)		Responsive	Not Responsive
San Joaquin River							
	San Joaquin River (between Kerchkoff Powerhouse and Confluence with SF San Joaquin River)	0	3.3	3.3	B		X
		3.3	5.6	2.3	PB	X	
		5.6	6.1	0.5	B		X
		6.1	11.3	Redinger Lake	--		
		11.3	17	5.7	PR	X	
		17	18.2	Dam 6 Lake	--		
		18.2	26.2	8	PR-PB	X	
		26.2	35.5	Mammoth Pool	--		
		35.5	37.6	2.1	B		X
		37.6	38.4	0.8	PR	X	
	Ross Creek	0	0.87	0.87	B		X
	Rock Creek	0	0.48	0.48	B		X
South Fork San Joaquin River							
	South Fork San Joaquin River	0	14	14	SP-PB		X
		14	17.8	3.8	PB	X	
		17.8	20.1	2.3	PB-PR	X	
		20.1	20.9	0.8	PR	X	
		20.9	21.1	0.2	B		X
		21.1	23.4	2.3	PB	X	
		23.4	26.1	2.7	SP-PB		X
		26.1	27.7	1.6	PB-PR	X	
		27.7	27.9	0.2	B		X
	Bear Creek	0	0.2	0.2	B		X
		0.2	1.43	1.23	SP		X
		1.43	1.57	0.14	PB	X	
	Bolsillo Creek	0	0.1	0.1	B		X
		0.1	0.2	0.1	PB	X	
		0.2	0.65	0.45	B-Ca		X
		0.65	0.8	0.15	SP-PB		X
		0.8	0.9	0.1	Ca-SP		X
		0.9	1.02	0.12	SP		X
		1.02	1.32	0.3	PB	X	

Table CAWG-2-12. Channel Responsiveness Based on Montgomery-Buffington Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length	Montgomery-Buffington Classification	Responsiveness	
		Downstream RM	Upstream RM	(miles)		Responsive	Not Responsive
South Fork San Joaquin River (continued)							
	Bolsillo Creek (continued)	1.32	1.55	0.23	Ca-SP		X
		1.55	1.57	0.02	Ca		X
	Camp 62 Creek	0	0.12	0.12	Ca-SP		X
		0.12	0.35	0.23	SP-PB		X
		0.35	0.55	0.2	Ca-SP		X
		0.55	0.79	0.24	PB	X	
		0.79	1.06	0.27	Ca		X
		1.06	1.2	0.14	SP		X
		1.2	1.35	0.15	B		X
	Chinquapin Creek	0	0.1	0.1	SP-PB		X
		0.1	0.19	0.09	PB	X	
		0.19	0.35	0.16	Ca-SP		X
		0.35	0.5	0.15	PB	X	
		0.5	0.9	0.4	Ca-SP		X
	Crater Creek	0	0.17	0.17	PB-PR	X	
		0.17	0.32	0.15	PR	X	
		0.32	0.42	0.1	B-Ca		X
		0.42	1.44	1.02	Ca		X
		1.44	1.51	0.07	B-Ca		X
		1.51	1.77	0.26	PB-PR	X	
		1.77	1.82	0.05	PB	X	
		1.82	2.1	0.28	B-SP		X
		2.1	2.87	0.77	Ca-SP		X
	Crater Diversion Channel	0.65	0.85	0.2	PB	X	
		0.85	0.88	0.03	Ca		X
		0.88	0.98	0.1	PB	X	
		0.98	1.1	0.12	Ca		X
		1.1	1.13	0.03	B		X
		1.13	1.24	0.11	B-Ca		X
		1.24	1.3	0.06	PB	X	
		1.3	1.6	0.3	B		X
		1.6	1.7	0.1	B-Ca		X
		1.7	1.78	0.08	B		X
		1.78	1.9	0.12	B-Ca		X
		1.9	1.98	0.08	PR	X	

Table CAWG-2-12. Channel Responsiveness Based on Montgomery-Buffington Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length	Montgomery-Buffington Classification	Responsiveness	
		Downstream RM	Upstream RM	(miles)		Responsive	Not Responsive
South Fork San Joaquin River (continued)							
	Crater Diversion Channel (continued)	1.98	2.07	0.09	Ca		X
		2.07	2.1	0.03	PB	X	
		2.1	2.2	0.1	Ca		X
	Hooper Creek	0	0.08	0.08	Ca		X
		0.08	0.25	0.17	PB	X	
		0.25	0.7	0.45	Ca-SP		X
	Mono Creek	0	2.4	2.4	SP-PB		X
		2.4	4.2	1.8	PR-PB	X	
		4.2	5.3	1.1	Ca-SP		X
		5.3	5.68	0.38	SP-PB		X
		5.68	5.79	0.11	Ca-SP		X
	North Slide Creek	0	0.29	0.29	SP		X
	South Slide Creek	0	0.27	0.27	Ca		X
		0.27	0.32	0.05	B		X
	Tombstone Creek	0	0.55	0.55	PB-PR	X	
		0.55	0.62	0.07	SP-PB		X
		0.62	0.98	0.36	Co-Ca		X
Big Creek							
	Big Creek	0	1.2	1.2	B		X
		1.2	1.7	0.5	B-PB		X
		1.7	1.9	Dam 5 Impoundment	--		
		1.9	2.2	0.3	PB	X	
		2.2	6.2	4	B		X
		6.2	6.4	Dam 4 Impoundment	--		
		6.4	7.95	1.55	B		X
		7.95	8.85	0.9	PB	X	
		8.85	9.35	0.5	SP		X
		9.35	9.6	0.25	PB-SP		X
		9.6	9.77	0.17	PB	X	
		9.77	9.9	0.13	Ca		X
	Adit 8	0	0.5	0.5	B		X
		0.5	0.7	0.2	Ca		X
		0.7	0.96	0.26	Ca-SP		X

Table CAWG-2-12. Channel Responsiveness Based on Montgomery-Buffington Classification (continued)

Watershed	Subwatershed	Station to Station (River Mile (RM))		Total Length	Montgomery-Buffington Classification	Responsiveness	
		Downstream RM	Upstream RM	(miles)		Responsive	Not Responsive
Big Creek (continued)							
	Balsam Creek	0	0.7	0.7	B-Ca		X
	Ely Creek	0	0.53	0.53	B		X
		0.53	0.58	0.05	PB	X	
		0.58	0.98	0.4	B-Ca		X
	Pitman Creek	0	1.52	1.52	B		X
Stevenson Creek							
	Stevenson Creek	0	2.2	2.2	B		X
		2.2	2.5	0.3	Ca-SP		X
		2.5	2.7	0.2	B		X
		2.7	3.2	0.5	PB-PR	X	
		3.2	3.9	0.7	B		X
		3.9	4.3	0.4	PB	X	
	North Fork Stevenson Creek	0.9	1.2	0.3	B		X
		1.2	1.3	0.1	PR	X	
		1.3	1.8	0.5	B		X
		1.8	2.4	0.6	PB-PR	X	
		2.4	3.25	0.85	B		X
		3.25	3.34	0.09	SP		X
		3.34	3.45	0.11	B		X
		3.45	3.55	0.1	Ca-SP		X

90.45

Table CAWG-2-13. Responsive and Non-Responsive Project Affected Stream Reaches (miles) Based on Montgomery-Buffington Channel Type[a]

Watershed	Stream	Sensitive Reaches				Insensitive Reaches								Summary	
		Pool-Riffle	Plane-Bed	Plane-Bed/ Pool-Riffle	Total	Bedrock	Bedrock/ Cascade	Bedrock/ Plane-Bed	Cascade	Cascade/ Step-Pool	Step-Pool	Step-Pool/ Plane-Bed	Total	Sensitive	Insensitive
San Joaquin River US Kerchkoff Powerhouse															
	San Joaquin River D/S of Confluence with SF SJR	6.50	2.30	8.00	16.80	5.90	-	-	-	-	-	-	5.90	74.01%	25.99%
	Rock Creek	0.00	0.00	0.00	0.00	0.48	-	-	-	-	-	-	0.48	0.00%	100.00%
	Ross Creek	0.00	0.00	0.00	0.00	0.87	-	-	-	-	-	-	0.87	0.00%	100.00%
South Fork San Joaquin River															
	SF San Joaquin River D/S of Florence Lake	0.80	6.10	3.90	10.80	0.40	-	-	-	-	-	16.70	17.10	38.71%	61.29%
	Bear Creek	0.00	0.10	0.00	0.10	0.20	-	-	-	-	1.23	-	1.43	6.54%	93.46%
	Bolsillo Creek	0.00	0.40	0.00	0.40	0.10	0.45		0.02	0.33	0.12	0.15	1.17	25.48%	74.52%
	Camp 62 Creek	0.00	0.20	0.00	0.20	0.15	-	-	0.27	0.32	0.14	0.23	1.11	15.27%	84.73%
	Chinquapin Creek	0.00	0.20	0.00	0.20					0.56		0.10	0.66	23.26%	76.74%
	Crater Creek	0.30	0.10	0.40	0.80	-	0.45	-	1.02	0.77	-	-	2.24	26.32%	73.68%
	Crater Diversion Channel	0.00	0.50	0.00	0.50	0.41	0.33	-	0.34	-	-	-	1.08	31.65%	68.35%
	Hooper Creek	0.00	0.20	0.00	0.20	-	-	-	0.08	0.45	-	-	0.53	27.40%	72.60%
	Mono Creek	0.00	0.00	1.80	1.80	-	-	-	-	1.21	-	2.78	3.99	31.09%	68.91%
	North Slide Creek	0.00	0.00	0.00	0.00	-	-	-	-	-	0.29	-	0.29	0.00%	100.00%
	South Slide Creek	0.00	0.00	0.00	0.00	0.05	0.27	-	-	-	-	-	0.32	0.00%	100.00%
	Tombstone Creek	0.00	0.00	0.60	0.60	-	-	-	0.36	-	-	0.07	0.43	58.25%	41.75%
Big Creek															
	Big Creek D/S of Huntington Lake	0.00	1.40	0.00	1.40	6.75	-	0.50	0.13	-	0.50	0.25	8.13	14.69%	85.31%
	Adit 8 Creek	0.00	0.00	0.00	0.00	0.50	-	-	0.20	0.26	-	-	0.96	0.00%	100.00%
	Balsam Creek	0.00	0.00	0.00	0.00	-	0.70	-	-	-	-	-	0.70	0.00%	100.00%
	Ely Creek	0.00	0.10	0.00	0.10	0.53	0.40	-	-	-	-	-	0.93	9.71%	90.29%
	Pitman Creek	0.00	0.00	0.00	0.00	1.52	-	-	-	-	-	-	1.52	0.00%	100.00%
Stevenson Creek															
	Stevenson Creek D/S of Shaver Dam	0.00	0.40	0.50	0.90	3.10	-	-	-	0.30		-	3.40	20.93%	79.07%
	North Fork Stevenson Creek	0.10	0.00	0.60	0.70	1.76	-	-	-	0.10	0.09	-	1.95	26.42%	73.58%
	Subtotals=	7.7	12.0	15.8	35.5	22.7	2.6	0.5	2.4	4.3	2.4	20.3	55.2	39.1%	60.9%

[a]Responsive reaches include pool-riffle and plane-bed channel types and non-responsive reaches include bedrock, cascade, and step-pool channel types.

Table CAWG-2-14. Responsive and Non-Responsive Project Affected Stream Reaches (miles) Based on Rosgen Channel Types [a]

Watershed	Stream	Sensitive Reaches						Insensitive Reaches										Summary	
		B3/B4/B5	B/C-Channels	C-Channels	E-Channels	G3/G4/G5	Total	Aa+-Channels	A-Channels	A/B-Channels	B1/B2	B2/B3	B2/B5	G1/G2	G2/G3	G2/G5	Total	Sensitive	Insensitive
San Joaquin River US Kerchkoff Powerhouse																			
	San Joaquin River D/S of Confluence with SF SJR	1.00	-	-	-	2.30	3.30	-	-	-	4.40	-	-	12.20	2.80	-	19.40	14.54%	85.46%
	Rock Creek	-	-	-	-	-	0.00	0.48	-	-	-	-	-	-	-	-	0.48	0.00%	100.00%
	Ross Creek	-	-	-	-	-	0.00	0.87	-	-	-	-	-	-	-	-	0.87	0.00%	100.00%
South Fork San Joaquin River																			
	SF San Joaquin River D/S of Florence Lake	4.60	1.60	0.80	-	-	7.00	-	-	-	1.80	4.70	-	14.40	-	-	20.90	25.09%	74.91%
	Bear Creek						0.00	-	1.43	-	0.14	-	-	-	-	-	1.57	0.00%	100.00%
	Bolsillo Creek	0.23	-	-	0.10	-	0.33	0.67	-	0.12	-	-	0.15	-	-	0.30	1.24	21.02%	78.98%
	Camp 62 Creek						0.00	0.47	0.27	-	0.23	0.38	-	-	-		1.35	0.00%	100.00%
	Chinquapin Creek	0.16	-	-	-	-	0.16	0.59	0.10	-	-	-	-	-	-	0.05	0.74	17.78%	82.22%
	Crater Creek	0.33	0.11	-	0.20	-	0.64	2.33	-	-	-	0.07	-	-	-	-	2.40	21.05%	78.95%
	Crater Diversion Channel	0.11	-	-	-	-	0.11	0.75	0.19	-	0.17	-	0.07	0.23	-	-	1.41	7.24%	92.76%
	Hooper Creek	0.17	-	-	-	-	0.17	0.45	-	-	-	-	-	-	-	-	0.45	27.41%	72.59%
	Mono Creek	0.65	-	-	-	-	0.65		0.11	-	5.03	-	-	-	-	-	5.14	11.23%	88.77%
	North Slide Creek	-	-	-	-	-	0.00	0.29	-	-	-	-	-	-	-	-	0.29	0.00%	100.00%
	South Slide Creek	-	-	-	-	-	0.00	0.32	-	-	-	-	-	-	-	-	0.32	0.00%	100.00%
	Tombstone Creek	-	-	-	0.55	-	0.55	0.36	-	-	-	-	0.07	-	-	-	0.43	56.12%	43.88%
Big Creek																			
	Big Creek D/S of Huntington Lake	0.33	-	-	-	0.17	0.50	2.18	5.60	0.25	0.72	-	0.25	-	-	-	9.00	5.26%	94.74%
	Adit 8 Creek	-	-	-	-	-	0.00	0.96	-	-	-	-	-	-	-	-	0.96	0.00%	100.00%
	Balsam Creek	-	-	-	-	-	0.00	0.70	-	-	-	-	-	-	-	-	0.70	0.00%	100.00%
	Ely Creek	-	-	-	-	-	0.00	0.93	-	-	-	0.05	-	-	-	-	0.98	0.00%	100.00%
	Pitman Creek	-	-	-	-	-	0.00	1.43	-	-	0.09						1.52	0.00%	100.00%
Stevenson Creek																			
	Stevenson Creek D/S of Shaver Dam	1.12	-	-	-	-	1.12	2.40	0.70	-	0.08	-	-	-	-	-	3.18	26.05%	73.95%
	North Fork Stevenson Creek	0.30	-	0.40	-	-	0.70	1.41	0.10	-	0.14	-	-	0.30	-	-	1.95	26.42%	73.58%
	Subtotals=	9.0	1.7	1.2	0.9	2.5	15.2	17.6	8.5	0.4	12.8	5.2	0.5	27.1	2.8	0.4	75.3	16.8%	83.2%

[a]Responsive reaches include B3/B4/B5 channel types, B/C-channel types, C-channel types, E-channel types, and G3/G4/G5 channel types and non-responsive reaches include Aa+ channel types, A-channel types, A/B-channel types, B1/B2 channel channel types, B2/B3 channel types, B2/B5 channel types, G1/G2 channel types, G2/G3 channel types, and G2/G5 channel types.

Table CAWG-2-15. Discrete Mass-Wasting Locations Observed in the San Joaquin River Project Watershed

	Type[1]	Location
So. Fk. San Joaquin Drainage		
Hooper	DF	Above diversion, at least RM 1.6
North Slide	DF	RM 0.2, below diversion
South Slide	DF	RM 0.2, below diversion
Chinquapin	DF	Above diversion, at least RM 1.4
Camp 62	DF	Above diversion, at least RM 2.0
Tombstone Creek	DF	Debris fan at RM 0.6
Big Creek Drainage		
Big Creek	LS	RM 0.1, below Huntington Lake
Ely	DF	RM 0.6, below diversion
San Joaquin River Drainage		
San Joaquin River	LS	RM 23.8, near Horsethief Ck confluence
Fish Creek	LS	RM 3.9 (7.2 miles above the So. Fk. SJR confluence at RM 48.7)

[1] DF = Debris flow   LS = Landslide

Table CAWG-2-16. Summary of Streambank Erodibility Results from Aerial and Ground Reconnaisance Surveys

Watershed	Subwatershed	Summary of Streambank Erodibility Results Upstream of Project Facilities				Summary of Streambank Erodibility Results Downstream of Project Facilities			
		Non-Erodible		Erodible		Non-Erodible		Erodible	
		Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles
San Joaquin River									
	San Joaquin River (between Kerchkoff Powerhouse and Confluence with SF San Joaquin River)*	NA	NA	NA	NA	22.69	100.0%	0.0	0.0%
	Rock Creek	0.43	100.0%	0.00	0.0%	0.48	100.0%	1.0	0.0%
	Ross Creek	1.30	100.0%	0.00	0.0%	0.87	100.0%	1.0	0.0%
South Fork San Joaquin River									
	South Fork San Joaquin River (between confluence with San Joaquin River and Florence Lake)	2.60	66.7%	1.30	33.3%	15.76	56.5%	12.14	43.5%
	Bear Creek	3.82	97.4%	0.1	2.6%	1.57	100.0%	0.0	0.0%
	Bolsillo Creek	0.46	73.0%	0.17	27.0%	0.67	42.7%	0.90	57.3%
	Camp 62 Creek	0.50	100.0%	0.00	0.0%	0.74	54.8%	0.61	45.2%
	Chinquapin Creek	0.50	100.0%	0.00	0.0%	0.56	62.2%	0.34	37.8%
	Crater Creek	0.40	85.1%	0.07	14.9%	2.33	76.6%	0.71	23.4%
	Crater Diversion Channel	NA	NA	NA	NA	0.96	61.9%	0.59	38.1%

Table CAWG-2-16. Summary of Streambank Erodibility Results from Aerial and Ground Reconnaisance Surveys (continued)

Watershed	Subwatershed	Summary of Streambank Erodibility Results Upstream of Project Facilities				Summary of Streambank Erodibility Results Downstream of Project Facilities			
		Non-Erodible		Erodible		Non-Erodible		Erodible	
		Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles
South Fork San Joaquin River (continued)									
	Hooper Creek	0.90	100.0%	0.00	0.0%	0.47	75.7%	0.15	24.3%
	Mono	0.50	100.0%	0.00	0.0%	5.14	88.8%	0.65	11.2%
	North Slide Creek	0.21	100.0%	0.0	0.0%	0.00	0.0%	0.29	100.0%
	South Slide Creek	0.18	100.0%	0.00	0.0%	0.05	15.6%	0.27	84.4%
	Tombstone Creek	1.32	93.0%	0.10	7.0%	0.36	36.7%	0.62	63.3%
Big Creek									
	Big Creek (between San Joaquin River and Huntington Lake)	3.60	100.0%	0.00	0.0%	9.15	92.4%	0.75	7.6%
	Adit 8 Creek	0.34	100.0%	0.00	0.0%	0.79	82.3%	0.17	17.7%
	Balsam Creek	0.40	80.0%	0.1	20.0%	0.70	100.0%	0.0	0.0%
	Ely Creek	0.32	61.5%	0.20	38.5%	0.93	94.9%	0.05	5.1%
	Pitman Creek	0.38	43.2%	0.5	56.8%	1.52	100.0%	0.0	0.0%
Stevenson Creek									
	Stevenson Creek (between San Joaquin River and Shaver Lake)	NA	NA	NA	NA	3.32	77.2%	0.98	22.8%
	North Fork Stevenson Creek	0.25	50.0%	0.25	50.0%	1.85	69.8%	0.80	30.2%
	Totals =	**18.41**	**86.8%**	**2.79**	**13.2%**	**70.91**	**76.3%**	**22.02**	**23.7%**

*Note: The results exclude Redinger Lake, Dam 6 Lake, and Mammoth Pool which comprise approximately 15.71 miles.

Table CAWG-2-17. Summary of Streambank Stability Results of Project Affected Reaches from Ground Reconnaisance Surveys

Watershed	Subwatershed	Summary of Streambank Stability Results Upstream of Project Facilities from Ground Surveys						Summary of Streambank Stability Results Downstream of Project Facilities from Ground Surveys					
		Stable		Vulnerable		Unstable		Stable		Vulnerable		Unstable	
		Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles
San Joaquin River													
	San Joaquin River (between Kerchkoff Powerhouse and Confluence with SF San Joaquin River)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Rock Creek	0.22	100.00%	0.00	0.00%	0.00	0.00%	0.08	100.00%	0.00	0.00%	0.00	0.00%
	Ross Creek	0.33	100.00%	0.00	0.00%	0.00	0.00%	0.17	100.00%	0.00	0.00%	0.00	0.00%
South Fork San Joaquin River													
	South Fork San Joaquin River (between confluence with San Joaquin River and Florence Lake)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bear Creek	0.22	68.75%	0.10	31.25%	0.00	0.00%	0.47	100.00%	0.00	0.00%	0.00	0.00%
	Bolsillo Creek	0.36	72.00%	0.14	28.00%	0.00	0.00%	0.73	46.50%	0.39	24.84%	0.45	28.66%
	Camp 62 Creek	0.45	90.00%	0.05	10.00%	0.00	0.00%	0.69	51.11%	0.34	25.19%	0.32	23.70%
	Chinquapin Creek	0.45	90.00%	0.05	10.00%	0.00	0.00%	0.57	63.33%	0.28	31.11%	0.05	5.56%
	Crater Creek	0.43	86.00%	0.00	0.00%	0.07	14.00%	1.28	57.14%	0.13	5.80%	0.83	37.05%
	Crater Diversion Channel	NA	NA	NA	NA	NA	NA	0.97	62.58%	0.47	30.32%	0.11	7.10%
	Hooper Creek	0.50	100.00%	0.00	0.00%	0.00	0.00%	0.47	75.70%	0.15	24.30%	0.00	0.00%
	Mono	0.34	100.00%	0.00	0.00%	0.00	0.00%	0.50	100.00%	0.00	0.00%	0.00	0.00%
	North Slide Creek	0.21	100.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.19	65.52%	0.10	34.48%
	South Slide Creek	0.18	85.71%	0.00	0.00%	0.00	0.00%	0.30	93.75%	0.02	6.25%	0.00	0.00%
	Tombstone Creek	0.40	80.00%	0.10	20.00%	0.00	0.00%	0.36	36.73%	0.34	34.69%	0.28	28.57%

Table CAWG-2-17. Summary of Streambank Stability Results of Project Affected Reaches from Ground Reconnaisance Surveys (continued)

Watershed	Subwatershed	Summary of Streambank Stability Results Upstream of Project Facilities from Ground Surveys						Summary of Streambank Stability Results Downstream of Project Facilities from Ground Surveys					
		Stable		Vulnerable		Unstable		Stable		Vulnerable		Unstable	
		Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles	Total Surveyed Stream Miles	Percentage of Surveyed Stream Miles
Big Creek													
	Big Creek (between San Joaquin River and Huntington Lake)	NA	NA	NA	NA	NA	NA	2.08	69.33%	0.72	24.00%	0.20	6.67%
	Adit 8 Creek	0.34	100.00%	0.00	0.00%	0.00	0.00%	0.79	82.29%	0.17	17.71%	0.00	0.00%
	Balsam Creek	0.40	80.00%	0.10	20.00%	0.00	0.00%	0.63	90.00%	0.03	4.29%	0.04	5.71%
	Ely Creek	0.32	61.54%	0.05	9.62%	0.15	28.85%	0.55	100.00%	0.00	0.00%	0.00	0.00%
	Pitman Creek	0.46	92.00%	0.14	28.00%	0.00	0.00%	0.42	100.00%	0.00	0.00%	0.00	0.00%
Stevenson Creek													
	Stevenson Creek (between San Joaquin River and Shaver Lake)	NA	NA	NA	NA	NA	NA	0.04	10.00%	0.26	65.00%	0.10	25.00%
	North Fork Stevenson Creek	0.25	50.00%	0.25	50.00%	0.00	0.00%	0.40	80.00%	0.00	0.00%	0.10	20.00%
	Totals =	**5.86**	**83.0%**	**0.98**	**13.9%**	**0.22**	**3.1%**	**11.50**	**66.7%**	**3.49**	**20.2%**	**2.58**	**15.0%**

*Note: Ground surveys were not conducted along the San Joaquin River or the South Fork San Joaquin River.

Table CAWG-2-18. Percentage of Sand Deposition in Pools[a]

San Joaquin River Streams

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Ross Creek d/s of Div.	0.75	0.82	5
Ross Creek u/s of Div.	0.99	1.02	10
Rock Creek d/s of Div.	0.38	0.48	5
Rock Creek u/s of Div.	0.50	0.60	15
Rock Creek u/s of Div.	0.60	0.70	15

Big Creek Streams

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Big Creek d/s HL	7.85	7.90	90
Big Creek d/s HL	7.92	7.97	NP
Big Creek d/s HL	8.08	8.13	NP
Big Creek d/s HL	8.27	8.31	NP
Big Creek d/s HL	8.45	8.50	NP
Big Creek d/s HL	8.60	8.70	NP
Big Creek d/s HL	8.70	8.75	NP
Big Creek d/s HL	8.79	8.85	20
Big Creek d/s HL	9.06	9.14	50
Big Creek d/s HL	9.29	9.39	90
Big Creek d/s HL	9.47	9.51	90
Big Creek d/s HL	9.58	9.64	90
Big Creek d/s HL	9.70	9.74	30
Big Creek d/s HL	9.87	9.90	0
Big Creek d/s Dam 5	1.45	1.55	10
Big Creek d/s Dam 5	1.60	1.70	10
Big Creek u/s Dam 5	2.00	2.07	25
Big Creek u/s Dam 5	2.16	2.20	5
Adit 8	0.50	0.53	10
Adit 8	0.53	0.60	60
Adit 8	0.65	0.70	40
Adit 8	0.70	0.75	15
Adit 8	0.83	0.88	60
Adit 8	1.00	1.10	no data
Adit 8	1.20	1.30	no data
Ely Creek d/s of Div.	0.54	0.57	10
Ely Creek d/s of Div.	0.64	0.68	10
Ely Creek d/s of Div.	0.78	0.82	NP
Ely Creek d/s of Div.	0.93	0.96	15
Ely Creek u/s of Div.	1.10	1.14	25
Ely Creek u/s of Div.	1.38	1.40	90
Ely Creek u/s of Div.	1.41	1.45	95
Ely Creek u/s of Div.	1.53	1.56	90

Table CAWG-2-18. Percentage of Sand Deposition in Pools[a] (continued)

Big Creek Streams

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Balsam Creek d/s of Div.	0.00	0.03	20
Balsam Creek d/s of Div.	0.05	0.10	2.5
Balsam Creek d/s of Div.	0.13	0.16	10
Balsam Creek d/s of Div.	0.46	0.50	15
Balsam Creek u/s of Div.	0.60	0.70	80
Balsam Creek u/s of Div.	0.75	0.80	90
Balsam Creek u/s of Div.	0.85	0.91	80
Balsam Creek u/s of Div.	1.00	1.05	65

Pitman Cr. d/s Div.	1.30	1.35	5
Pitman Cr. d/s Div.	1.43	1.52	5
Pitman Cr. u/s Div.	1.60	1.65	5
Pitman Cr. u/s Div.	1.65	1.75	10
Pitman Cr. u/s Div.	1.75	1.85	5
Pitman Cr. u/s Div.	1.93	1.95	10
Pitman Cr. u/s Div.	1.98	2.00	2
Pitman Cr. u/s Div.	2.10	2.12	75

Stevenson Creek Streams

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Stevenson Ck d/s Shaver	3.85	3.90	15
Stevenson Ck d/s Shaver	4.00	4.04	100
Stevenson Ck d/s Shaver	4.08	4.10	85
Stevenson Ck d/s Shaver	4.18	4.20	70
Stevenson Ck d/s Shaver	4.24	4.25	no data
Stevenson Ck d/s Shaver	4.26	4.30	5

NFk Stevenson d/s Tnl 7	3.12	3.18	5
NFk Stevenson d/s Tnl 7	3.25	3.34	2
NFk Stevenson u/s Tnl 7	3.55	3.63	65
NFk Stevenson u/s Tnl 7	3.63	3.71	10
NFk Stevenson u/s Tnl 7	3.81	3.86	75
NFk Stevenson u/s Tnl 7	3.90	3.97	90
NFk Stevenson u/s Tnl 7	3.97	4.05	90

South Fork San Joaquin Streams

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Hooper Cr. d/s Div.	0.00	0.04	80
Hooper Cr. d/s Div.	0.04	0.08	80
Hooper Cr. d/s Div.	0.20	0.25	NP
Hooper Cr. d/s Div.	0.25	0.30	40
Hooper Cr. d/s Div.	0.30	0.35	40
Hooper Cr. d/s Div.	0.45	0.50	20
Hooper Cr. d/s Div.	0.52	0.54	40
Hooper Cr. d/s Div.	0.62	0.65	15
Hooper Cr. u/s Div.	0.73	0.76	5

Bolsillo Cr. d/s of Div.	0.00	0.05	5
Bolsillo Cr. d/s of Div.	0.10	0.12	100

Table CAWG-2-18. Percentage of Sand Deposition in Pools[a] (continued)

South Fork San Joaquin Streams (continued)

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Bolsillo Cr. d/s of Div.(continued)	0.12	0.14	100
Bolsillo Cr. d/s of Div.	0.15	0.20	100
Bolsillo Cr. d/s of Div.	0.20	0.25	0
Bolsillo Cr. d/s of Div.	0.25	0.30	10
Bolsillo Cr. d/s of Div.	0.30	0.35	10
Bolsillo Cr. d/s of Div.	0.45	0.50	10
Bolsillo Cr. d/s of Div.	0.55	0.60	10
Bolsillo Cr. d/s of Div.	0.60	0.65	95
Bolsillo Cr. d/s of Div.	0.67	0.68	20
Bolsillo Cr. d/s of Div.	0.68	0.70	20
Bolsillo Cr. d/s of Div.	0.85	0.89	50
Bolsillo Cr. d/s of Div.	0.92	0.96	80
Bolsillo Cr. d/s of Div.	0.98	1.06	50
Bolsillo Cr. d/s of Div.	1.12	1.14	100
Bolsillo Cr. d/s of Div.	1.17	1.23	50
Bolsillo Cr. d/s of Div.	1.27	1.31	80
Bolsillo Cr. d/s of Div.	1.46	1.48	100
Bolsillo Cr. d/s of Div.	1.50	1.52	100
Bolsillo Cr. d/s of Div.	1.52	1.55	70
Bolsillo Cr. u/s of Div.	1.57	1.58	100
Bolsillo Cr. u/s of Div.	1.58	1.62	100
Bolsillo Cr. u/s of Div.	1.65	1.69	100
Bolsillo Cr. u/s of Div.	1.69	1.75	100
Bolsillo Cr. u/s of Div.	1.75	1.82	20
Bolsillo Cr. u/s of Div.	1.94	2.00	20
Bolsillo Cr. u/s of Div.	2.15	2.20	30

Crater Div. Channel	0.70	0.72	NP
Crater Div. Channel	0.76	0.78	NP
Crater Div. Channel	0.80	0.84	NP
Crater Div. Channel	0.86	0.88	NP
Crater Div. Channel	0.88	0.92	NP
Crater Div. Channel	0.98	1.02	NP
Crater Div. Channel	1.10	1.13	NP
Crater Div. Channel	1.20	1.24	NP
Crater Div. Channel	1.30	1.34	NP
Crater Div. Channel	1.38	1.42	NP
Crater Div. Channel	1.53	1.58	NP
Crater Div. Channel	1.60	1.62	NP
Crater Div. Channel	1.70	1.74	100
Crater Div. Channel	1.76	1.78	NP
Crater Div. Channel	1.90	1.98	85
Crater Div. Channel	2.00	2.09	NP
Crater Div. Channel	2.10	2.15	25
Crater Div. Channel	2.15	2.20	10

Table CAWG-2-18. Percentage of Sand Deposition in Pools[a] (continued)

South Fork San Joaquin Streams (continued)

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Bear Creek d/s of Div.	1.10	1.15	0
Bear Creek d/s of Div.	1.20	1.25	0
Bear Creek d/s of Div.	1.32	1.39	0
Bear Creek d/s of Div.	1.39	1.43	0
Bear Creek d/s of Div.	1.48	1.57	0
Bear Creek u/s of Div.	1.84	1.90	0
Bear Creek u/s of Div.	1.96	1.99	0
Bear Creek u/s of Div.	2.00	2.10	75
Chinquapin Creek d/s Div	0.00	0.10	55
Chinquapin Creek d/s Div	0.10	0.14	90
Chinquapin Creek d/s Div	0.14	0.19	50
Chinquapin Creek d/s Div	0.19	0.38	50
Chinquapin Creek d/s Div	0.38	0.50	80
Chinquapin Creek d/s Div	0.50	0.90	30
Chinquapin Creek u/s Div	0.90	0.94	5
Chinquapin Creek u/s Div	1.05	1.09	20
Chinquapin Creek u/s Div	1.16	1.22	10
Tombstone Cr. d/s Div.	0.04	0.07	NP
Tombstone Cr. d/s Div.	0.08	0.13	NP
Tombstone Cr. d/s Div.	0.20	0.25	NP
Tombstone Cr. d/s Div.	0.29	0.34	NP
Tombstone Cr. d/s Div.	0.38	0.43	NP
Tombstone Cr. d/s Div.	0.43	0.51	NP
Tombstone Cr. d/s Div.	0.53	0.60	NP
Tombstone Cr. d/s Div.	0.64	0.65	no data
Tombstone Cr. d/s Div.	0.66	0.70	40
Tombstone Cr. d/s Div.	0.81	0.85	10
Tombstone Cr. d/s Div.	0.95	1.00	2.5
Tombstone Cr. d/s Div.	1.05	1.10	5
Tombstone Cr. u/s Div.	1.10	1.15	80
Tombstone Cr. u/s Div.	1.20	1.25	80
Tombstone Cr. u/s Div.	1.27	1.30	80
Tombstone Cr. u/s Div.	1.46	1.48	0
Tombstone Cr. u/s Div.	1.50	1.60	70
Crater Creek d/s Div	0.02	0.05	60
Crater Creek d/s Div	0.14	0.23	100
Crater Creek d/s Div	0.33	0.35	100
Crater Creek d/s Div	0.40	0.45	95
Crater Creek d/s Div	1.50	1.56	50
Crater Creek d/s Div	1.60	1.62	25
Crater Creek d/s Div	1.76	1.82	75
Crater Creek d/s Div	1.87	1.93	25
Crater Creek d/s Div	1.99	2.03	10
Crater Creek d/s Div	2.23	2.26	30
Crater Creek d/s Div.	2.45	2.55	20

Table CAWG-2-18. Percentage of Sand Deposition in Pools[a] (continued)

South Fork San Joaquin Streams (continued)

Stream	Stationing		% Sand in Pools
	d/s RM	u/s RM	
Crater Creek d/s Div. (continued)	2.62	2.65	25
Crater Creek d/s Div.	2.70	2.75	25
Crater Creek d/s Div.	2.75	2.85	30
Crater Cr. u/s of Div.	2.91	2.96	NP
Crater Cr. u/s of Div.	3.10	3.15	50
Crater Cr. u/s of Div.	3.33	3.35	40
N. Slide Cr. d/s Div.	0.00	0.03	95
N. Slide Cr. d/s Div.	0.03	0.04	50
N. Slide Cr. d/s Div.	0.07	0.10	30
N. Slide Cr. d/s Div.	0.15	0.17	60
N. Slide Cr. d/s Div.	0.20	0.22	45
N. Slide Cr. u/s Div.	0.22	0.26	25
S. Slide Cr. d/s Div.	0.05	0.10	80
S. Slide Cr. d/s Div.	0.25	0.28	15
S. Slide Cr. u/s Div.	0.32	0.34	15
Camp 62 d/s of Div.	0.00	0.03	10
Camp 62 d/s of Div.	0.04	0.08	5
Camp 62 d/s of Div.	0.12	0.16	20
Camp 62 d/s of Div.	0.21	0.23	10
Camp 62 d/s of Div.	0.26	0.31	25
Camp 62 d/s of Div.	0.35	0.38	30
Camp 62 d/s of Div.	0.40	0.45	25
Camp 62 d/s Div.	0.91	0.87	5
Camp 62 d/s Div.	0.99	1.06	10
Camp 62 d/s Div.	1.14	1.08	10
Camp 62 d/s Div.	1.19	1.17	5
Camp 62 d/s Div.	1.20	1.22	10
Camp 62 d/s Div.	1.25	1.30	50
Camp 62 Cr. u/s Div.	1.36	1.39	15
Camp 62 Cr. u/s Div.	1.57	1.60	5
Camp 62 Cr. u/s Div.	1.65	1.70	5
Mono Cr. d/s Div.	5.29	5.33	5
Mono Cr. d/s Div.	5.74	5.79	40
Mono Cr. u/s div.	5.98	6.21	5

Note: NP = No Pools in reach

[a]Percentage of sand deposition of pools as determined during ground surveys that estimated the % sand covering the pool bottom.

FIGURES

Placeholder for Figures CAWG 2-1a through 3d

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Figure CAWG-2-4. Example of limited and discontinuous potential encroachment along North Fork Stevenson Creek (RM 2.2). Willows and conifers growing on the 8 ft high gravel bar shown in photograph. It is likely that this gravel bar was not a natural feature of the channel.

Figure CAWG-2-5. Dense and continuous potential encroachment on Big Creek below Huntington Lake. This is a steep gradient bedrock and boulder section of the channel with an A1/A2 classification (approximately RM 9.1 is shown).

Placeholder for Figures CAWG 2-6a through 6d

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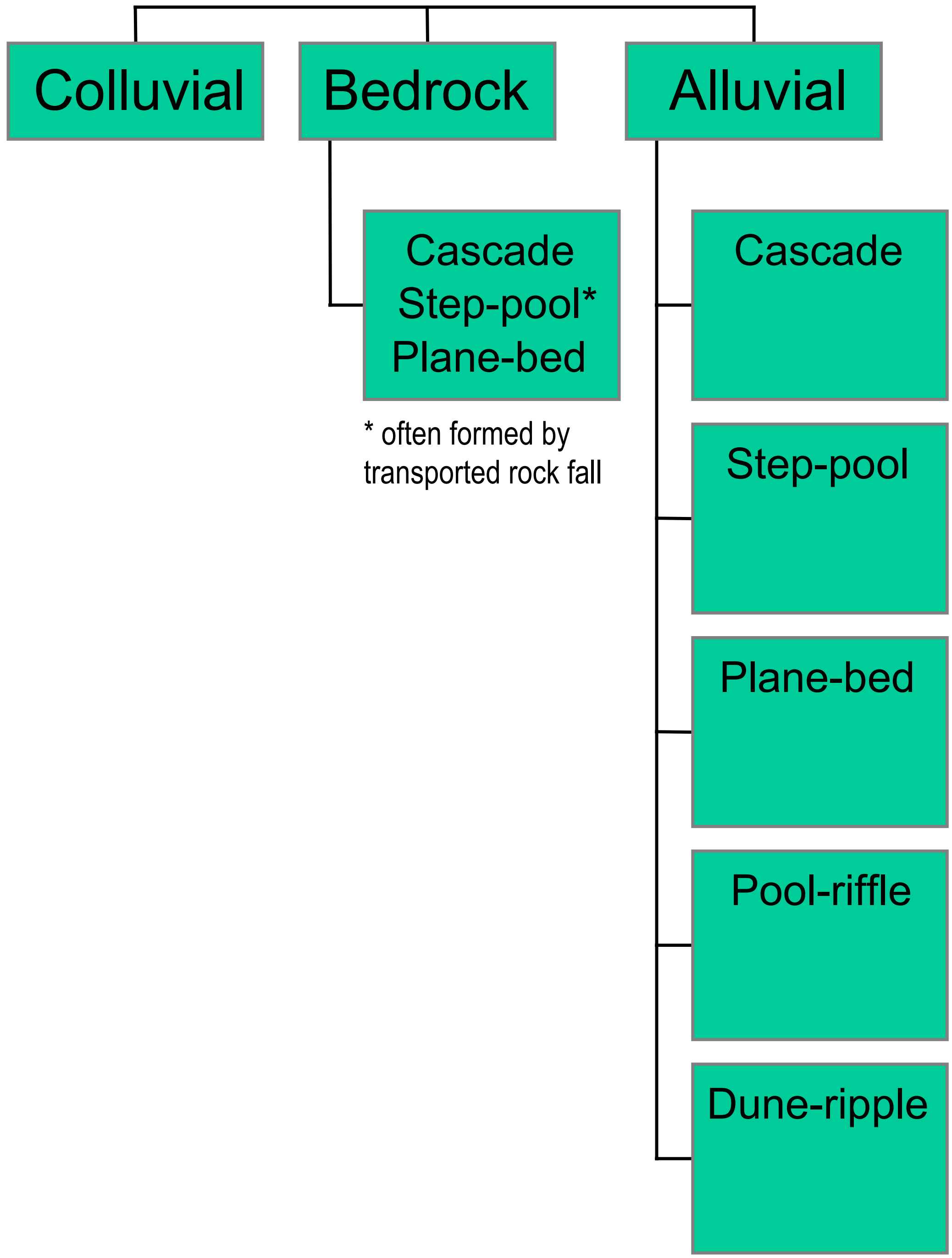

Figure CAWG-2-7. Montgomery and Buffington Channel Classification System

Placeholder for Figures CAWG 2-8a through 8d

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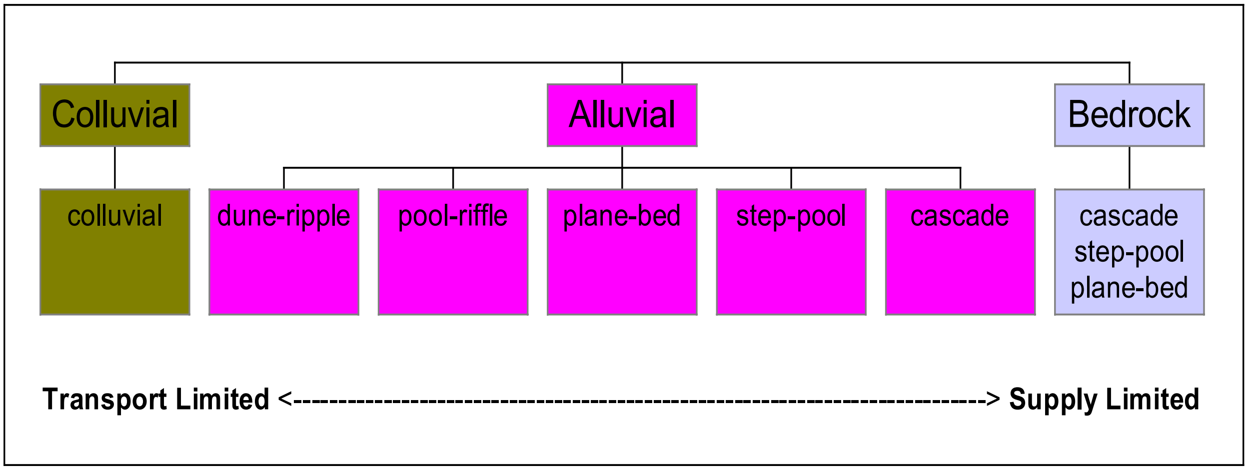

Figure CAWG-2-9. Schematic Illustration of Transport Capacity Relative to Sediment Supply

APPENDIX A

Compilation of Photographs Collected During 2002 Ground Surveys

Placeholder for Appendix A

To keep file size manageable, this information is being provided as a separate file.
Please refer to the file named "02CAWG-02_Appendix_A.pdf"

APPENDIX B

Level I Geomorphic Classification and Candidate Reference Reach Assessment (All tables, figures, and readme files from the CD were distributed to the CAWG on June 2002)

APPENDIX B

BIG CREEK LEVEL I GEOMORPHIC CLASSIFICATION
and
CANDIDATE REFERENCE REACH ASSESSMENT

1.0 Information Provided on Disk

The included files provide the Rosgen Level I geomorphic classification for project streams and candidate reference streams in the Big Creek Watershed. The results and supporting data are presented in three summary tables, and a series of graphic plots. In addition, there is an interactive watershed map. The map uses the same river mile stationing provided in the tables and graphs. A given reach of stream can be located on the watershed map using the upstream and downstream river stationing appearing in the tables and/or graphs. The tables, graphs, and maps provided for this appendix are:

(1) Geomorphic Watershed Parameters (file: BC_geomorph_watersheds.pdf)
(2) Geomorphic Reach Parameters (file: BC_geomorph_reaches.pdf)
(3) Geomorphic Candidate Reference Reaches (file: BC_geomorph_references.pdf)
(4) Stream Profile-Valley Width (folder: Stream_Profiles)
(5) Stream Reach Map (file: INDEX_MAP.pdf)
(NOTE: Stream profile graphs and interactive maps were provided digitally to the CAWG June 2002. They are available upon request.)

The purpose and intended use of the Level I classification and reference reach results is discussed below in Section 2.0. A detailed description of the type of data included in each of the tables, graphs, and map is provided in section 3.0.

2.0 Purpose and Use of Level I Classification and Reference Reach Results

The Level I stream classification and candidate reference reach assessment fulfills three purposes:

(a) provides essential input for Level 1.5 classification of project-affected streams
(b) provides essential geomorphic information for identifying stream reaches most likely to be adversely affected by project operations
(c) identifies candidate reference reaches that may later be compared to project streams to assist with characterizing and quantifying project influences

The Rosgen Level I classification data for all project-affected streams will be validated and, as appropriate, revised to determine a Level 1.5 classification based on field surveys to be conducted during summer 2002. The Rosgen Level I classification data for the candidate reference reaches will not be field validated unless the candidate reference reach is chosen for quantitative analysis.

A given reference reach may be used, if deemed suitable, to assess project effects and will be selected from the pool of candidate reference reaches after the field surveys of project-affected reaches are completed. Field inspection of channel morphology and surrounding land-use for candidate reaches will be completed before recommending to the CAWG that a particular candidate reference stream be used as a basis for quantitative comparison or assessment to identify project related effects. The CAWG will participate in selecting reference reach(es).

APPENDIX B (continued)

3.0 Description of Data Provided in Reference Reach and Level I Tables and Graphs

3.1 Geomorphic Watershed Characteristics

The *Big Creek Project Watersheds and Sub-Watersheds* table displays various watershed-scale parameters useful for describing and comparing the geomorphic characteristics of the major basins and sub-basins of the Big Creek project area. In addition to all of the Big Creek project affected streams, the table includes characteristics for numerous other non-project streams in the upper San Joaquin River watershed. Sub-watersheds with streams that are not regulated by project operations were selected for analysis because of their potential to serve as geomorphic reference sites. The table is organized in a hierarchy that begins with the highest order streams progressing upstream to the lowest order streams in the upper reaches of the project watershed. The general order of sequence in the table is: 1) San Joaquin River (SJR) beginning at Powerhouse 4, 2) Stevenson Creek, 3) Big Creek, 4) SJR between Big Creek and the South Fork San Joaquin River (SFSJR), 5) SFSJR, and 6) SJR upstream of the SFSJR, including the Middle and North Forks of the SJR.

The first two columns of the table list the major watersheds and sub-watersheds analyzed. A series of watershed variables were calculated for each entry in the table. The following is a description of the watershed variables:

Project Reach Code: Lists whether stream segments for a particular watershed are unaltered (U), flow augmented (A), or bypassed due to project facilities. The bypassed stream segments are described as; small tributary bypasses (S), moderate tributary bypasses (M), or large bypasses (L). In some instances, more than one code is listed for a particular entry, such as when a stream segment extends from a project reach into a non-project reach. Information for project reach codes was obtained from the *Project Nexus Matrix*, S. Rowan, SCE, November 2000.

- **Stream Order:** The Strahler method was used to identify stream order. In cases where streams were shown as intermittent on USGS topographic maps, a stream order of zero was assigned.
- **Drainage Area:** Drainage area was delineated in a GIS format utilizing US Geological Survey (USGS) 7.5-minute, 10-meter resolution Digital Elevation Models (DEMs) that covered the entire watershed area. DEMs are a digital representation of the topography depicted on traditional 7.5-minute USGS quadrangle map. When possible, the drainage area calculations derived from the DEM analysis were compared with values for drainage area reported by the USGS. Results from such comparisons showed nearly identical values.
- **Elevation Values:** Minimum and maximum elevations were calculated within a GIS format, utilizing the DEMs. Minimum and maximum elevations correspond to the channel invert at it's downstream confluence, and the watershed crest, respectively. Elevation range is simply the difference between maximum and minimum elevations. The Median Zone category, also determined from DEM analysis, reports the median elevation zone for a given watershed. For example, a Median Zone value of eight is defined as a median elevation of 8,000 to 9,000 ft.
- **Aspect:** Watershed aspect was calculated from the DEM data, and is reported in one of eight azimuth directions (N, NE, E, SE, S, SW, W, and NW). The Primary and Secondary Aspects

APPENDIX B (continued)

are the azimuth directions associated with the two highest percentages, respectively, within a given watershed. Flat-water areas are indicated with an aspect value of zero.

- **Median Hillslope Class:** Watershed hillslope gradient was generated from DEM analysis. The median hillslope gradient is reported as a percent, and is grouped into one of seven slope categories (0-1, 1-5, 5-10, 10-25, 25-50, 50-100, and >100).
- **Geology:** The geology data is based on the 1:750,000 Geologic Map of California, distributed in GIS format on CD-ROM (Source data modified from, *Division of Mines and Geology, CD-ROM 2000-007 (2000), GIS Data for the Geologic Map of California)*. Geologic types derived from the source data are grouped into 5 categories:

1) Glacially eroded granitic rock
1a) Glacially eroded granitic and metamorphic rocks
2) Glacial till deposits
3) Non-glaciated granitic rock
4) Non-glaciated metamorphic rock

The Dominant Geology / Landform Process category is the predominant geologic type for a given watershed. Sub-dominant Geology / Landform Processes is indicated only in cases when a second geologic type accounts for at least 20 percent of the watershed area.

Italicized values in the table refers to data that was derived from hardcopy maps, rather than GIS analysis.

3.2 Geomorphic Reach Parameters

The *Big Creek Project Area Geomorphic Reaches* table includes data for various geomorphic parameters at both the watershed and stream reach scales. Nearly all of the geomorphic data within the table was generated using GIS analysis that incorporated DEMs and 7.5-minute USGS topographic quadrangles. This table summarizes data for all project affected stream reaches, and also for stream reaches and tributaries unaffected by project operations. The criteria for deciding which non-project stream reaches to include in the table was based in part on their size, location within the Big Creek project watershed, and potential to serve as a reference stream. While not all named streams in the project watershed are included in the table, a significant effort was made to gather geomorphic information on as many streams as was feasible. Over forty different stream segments are identified as candidate reference reaches, providing a relatively large pool of candidate reference streams for consideration and selection. In several instances, preliminary geomorphic data (i.e. stream profile and drainage area) collected for a non-project stream indicated that the stream reach would not likely be suitable as a reference stream. In such cases, no additional geomorphic data was collected for the stream reach, as indicated by gray boxes in the table.

The initial step for delineating geomorphic reaches defined in the table was to calculate longitudinal profile (i.e., channel slope) and valley width for each stream evaluated. Longitudinal profiles were created from GIS digitized stream channels and USGS 7.5-minute, 10-meter resolution Digital Elevation Models. The channel centerline was digitized along the entire project-affected reach and continuing approximately a few miles upstream of project facilities. On non-project streams (i.e., potential reference streams), approximately three to five miles of channel centerline, on average,

APPENDIX B (continued)

was digitized so that longitudinal profile and valley width could be analyzed. Stream reach geomorphic attribute data was collected for stream length digitized.

Stream profiles plot the channel bed elevation at intervals of every tenth-mile. Valley width was determined by using the DEMs to locate the transition point from the valley floor to the valley hillslope. Stream longitudinal profiles and valley width data were examined and were the primary parameters used to determine the placement of Level I geomorphic reach breaks. However, reach breaks also took into consideration changes in geology, basin hillslope gradient, drainage area, and other factors such as the presence of road crossings.

The hierarchy of stream reaches presented in the table is the same as that presented in the *Big Creek Project Watersheds and Sub-Watersheds* table, whereby stream reaches in the first column begin with the San Joaquin River at Powerhouse 4 and progress upstream through the project watershed, ending at the Middle and North Forks of the SJR. The following is a description of the geomorphic reach parameters contained within the table and the procedures used to calculate their values:

- **Project Reach Code:** see discussion in Section 3.1
- **Stream ID Code:** A brief name given to each reach to identify its stream name
- **River Stationing:** The stream channel is assigned a river station value every tenth of a mile. For each named stream, river stationing begins at the confluence (River Mile 0.0) and extends upstream to the limit of the digitized stream segment. In several cases, stationing is extended through reservoirs in order to maintain a continuous river stationing sequence. Stream reaches are defined by an upstream and downstream river station.
- **Cumulative Drainage Area:** Values reported in this column refer to the total area draining to the downstream river station.
- **Unit Drainage:** Represents the additional, incremental drainage area between the given upstream and downstream river stations.
- **Stream Order:** see discussion in Section 3.1
- **Elevation at Geomorphic Reach Break:** Values in this category correspond to the elevation at the downstream river station for a given stream reach.
- **Stream Profile Slope:** Slope is calculated for the reach from the longitudinal profile.
- **Rosgen Level I:** Rosgen stream type for this portion of the study is based primarily on channel slope data. Entrenchment ratio, width-depth ratio, and sinuosity, which are also parameters used to define a Level I classification cannot be readily determined from the map and DEM data, therefore slope is the primary determinant for possible Level I stream types. Slope categories and corresponding Rosgen channel type is displayed in the table below. There are overlapping slope categories that define the same stream type, so that more than one channel type may be listed in the *Big Creek Project Area Geomorphic Reaches* table for a given channel segment. The Rosgen Level I column lists all potential stream types for the reach based on the slope parameter.

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	Channel Slope (%)	
Level I Rosgen Type	**Lower Limit**	**Upper Limit**
Aa+	> 10	-
A	4	10
B	<2	10
C	<0.1	4
E	<2	4
F	<2	4
G	<2	4

- **Watershed Crest Elevation:** The peak elevation in the drainage defined for the downstream river station of the given reach.
- **Valley Width:** Valley width was measured every two-tenths of a mile along the channel. Large valley widths were usually generated by the GIS analysis at the location of project reservoirs, which were excluded in the computation of maximum and average width values.
- **Reach and Sub-Basin Geology:** Geologic types are discussed in Section 3.1. The reach geology refers specifically to the geologic type along the defined stream reach (i.e., between the upstream and downstream river mile stations). The reach geology may be different from that determined for the drainage basin as a whole.

Italicized values in the tables refer to data that was derived from hardcopy maps, rather than GIS analysis.

3.3 Geomorphic Reference Reaches

The *Candidate Geomorphic Reference Reaches* table lists the geomorphic reaches of project-affected streams and compares them to possible candidate reference streams. Candidate reference streams were identified using the *Big Creek Project Watersheds and Sub-Watersheds* and *Big Creek Project Area Geomorphic Reaches* tables to search for non-project stream reaches with reasonably similar geomorphic characteristics as the project affected reaches. Similarities in stream profile and drainage area were first sought in the initial phase of the search. After finding preliminary reference stream reaches that had comparable stream profiles and drainage areas to the project-affected streams, additional geomorphic attributes were analyzed to selectively reduce the number of non-project stream reaches that could serve as candidate reference reaches.

Several potential reference reaches were usually considered for each project reach, but the table only displays those candidate reference reaches that were most similar to the project streams. A candidate reference reach can be on the same stream as the project affected reach (i.e., above all project facilities), or it may be in a different drainage basin. First priority was given to evaluating potential references from the same stream, above all diversions. However, if no suitable reference matches could be found on the same stream, then other basins were considered.

A series of 10 geomorphic variables are listed in the table, from stream profile to basin hillslope. For each of these categories, a rating is assigned, indicating that the reference stream is similar

APPENDIX B (continued)

("+") or dissimilar ("-") to the project stream for that particular category. The hierarchy of stream reaches presented in the table is the same as that presented in the *Big Creek Project Watersheds and Sub-Watersheds* and *Big Creek Project Area Geomorphic Reaches* tables. Note that some of the project reaches listed in the table have more than one candidate reference stream For example Stevenson Creek downstream (DS) Shaver Lake (RM 2.43 – 4.23), is listed twice, once with the candidate reference stream located on Stevenson Creek above Shaver Lake (RM .3-11.5), and once with Kaiser Creek (RM .45-3.45) listed as the candidate reference stream. The following is a description of the *Candidate Geomorphic Reference Reaches* table, including the guidelines used to determine the ratings of similarity or dissimilarity:

- **Project Reach Code:** see discussion Section 3.1
- **River Stationing:** see discussion Section 3.2
- **Rosgen Level I:** see discussion Section 3.2
- **Above Diversion?:** If Yes, than the reference reach in on the same stream as the project reach, but above all project facilities. If , No, then the reference reach is located on another stream.
- **Other Sub-basin?:** Lists the sub-basin for a reference reach that is not located on the same stream as the project reach.
- **River Stationing:** Indicates the downstream and upstream river station that delineates the reference reach.

Comparison of Project-Affected Streams and Candidate Reference Reach Geomorphic Characteristics

A discussion of comparative ratings for similarity ("+") and dissimilarity ("-") is provided for each of the 10 geomorphic parameters:

- **Stream Profile / Rosgen Level I Stream Type**: If candidate reference and project-affected streams have the same Rosgen Level I classification, based on slope categories, then a "+" rating is assigned. If candidate reference and project-affected streams fall into different Rosgen Level I classifications, then a "-" rating is assigned.
- **Drainage Area:** If the drainage areas are within a factor of two, then a plus is given. Drainage areas different by more than a factor of two are assigned a minus.
- **Elevation at Geomorphic Reach Break:** If the downstream reach elevation of the project and reference stream is within 1,000 ft, then a plus is assigned. Differences greater than 1,000 ft are assigned a minus rating.
- **Maximum Basin Elevation:** If the maximum elevation of the project and reference reach upstream drainage area is within 1,000 ft of each other, than a plus is given.
- **Stream Order:** A plus is given to streams that have the same order. A plus is also assigned for differences up to one stream order for 1 versus a stream order 2, or a stream order 2 versus an order 3. Any differences in stream order above a 3 are given a minus. This is based on the

APPENDIX B (continued)

recognition that differences in magnitude between an order 1 and 2, or order 2 and a 3, are not as great as differences in stream orders of 3 or above. Stream orders of 1 or greater compared with intermittent streams were assigned a minus.

- **Reach Geology:** If the primary reach geology is the same, a plus designation is assigned. A negative designation is given if the primary geology is different. Secondary geology values are not considered in this table.
- **Basin Geology:** If basin primary geology is the same, a plus designation is assigned. Secondary geology values are not considered in this table.
- **Basin Aspect:** If primary azimuth directions are within 135 degrees of each other, then a plus was assigned.
- **Valley Width:** If average valley widths are within a factor of two between project-affected and candidate reference streams, then a plus is given. If average valley widths are greater than a factor of two, then a negative rating is assigned.
- **Basin Hillslope:** A plus rating is assigned if the median basin slope values between the project and reference stream reach are in the same slope category. If the median basin slope was in different categories, then a dissimilar rating ("-") was assigned.

3.4 Stream Profile-Valley Width Graphic Plots and Level I Classification

Graphic plots of the longitudinal stream profile and valley width for both project and candidate reference streams. River stationing is plotted on the X-axis, beginning with zero at the downstream confluence. Valley width is shown on the primary Y-axis, indicated by aqua blue bars on the graph. The secondary Y-axis plots elevation of the stream channel at a given river station, and is shown by a navy blue line.

Geomorphic reach breaks are defined between red vertical lines with the range of possible Rosgen Level I stream classifications indicated between each reach break. Locations of diversions are shown with navy blue diamonds.

3.5 Stream Reach Maps

Any stream reach defined on the tables or longitudinal stream profiles can be located on the maps which show the stream stationing. Start by opening the file named INDEX_MAP.pdf. You will see a map of the entire watershed with a grid overlay. This map is 44"x 34" and is suitable for printing to a large-format output device such as a plotter.

On the left side of the screen there is a list of streams featured on the Index Map. Simply click on the name of the stream on the list, and the map window will zoom to the area of the map containing that stream channel. Click on the stream itself and you will be presented with a detailed topographic map of the region surrounding that stream, suitable for output to a desktop printer (must be capable of 11" x 17" format). To return to the main Index Map, use the hand tool to click on the gray bar at the top of the map that says, "CLICK HERE TO RETURN TO INDEX MAP".

Big Creek Project Watersheds and Sub-Watersheds

Big Creek Project Watersheds and Sub-Watersheds			Size		Elevation				Orientation		Hillslopes	Geology	
Major Watershed	Sub-Watershed	Project Reach Code	Stream Order	Drainage Area (mi^2)	Min (ft)	Max (ft)	Range (ft)	Median Zone (ft)	Primary Aspect	Secondary Aspect	Median Class (%)	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process
San Joaquin River Kerckhoff PH to SF Confluence		L	6	1,443.0	994	13,858	12,864	7	W	SW	25-50	1	3
	Saginaw Creek	U	1	6.2	1,401	6,378	4,977	4	S	SW	25-50	3	-
	Jose Creek	U	2	30.0	1,411	6,470	5,059	4	N	NW	10-25	3	-
	Stevenson Creek @ SJR	M	3	35.6	1,637	7,910	6,273	5	W	SW	10-25	3	1
	Stevenson US @ Shaver dam	U/A	3	29.4	5,259	7,910	2,651	5	W	SW	10-25	1	3
	NF Stevenson	A	2	5.9	5,371	7,815	2,444	6	W	NW	10-25	1	-
	Azalea Creek	U	1	1.6	5,371	7,910	2,539					1	-
	Stevenson Creek US Shaver Lake	U	3	8.0	5,371	7,900	2,529	6	W	SW	10-25	1	-
	Hookers Creek	U	3	5.6	1,870	6,188	4,318	4	S	SE	25-50	3	-
	Big Creek @ SJR	M	5	133.5	2,221	10,636	8,415	8	SW	W	10-25	1	3,2
	Ordinance Creek	U	1	2.3	3,015	8,110	5,095					1	-
	Ely	S	2	2.7	3,432	6,890	3,458	5	N	N	25-50	3	1
	Balsam	A	3	3.9	4,108	7,930	3,822	6	W	NW	25-50	1	3
	Pitman Creek	S	4	25.1	4,829	9,882	5,053	7	W	SW	10-25	1	2
	Tamarack Creek	U	3	12.3	7,116	9,882	2,766	8	SW	W	10-25	1	2
	Coon	U	1	2.2	6,952	8,911	1,959	8	NW	N	10-25	1	2
	Big Creek US of Huntington Lake	U	4	41.7	6,949	10,643	3,694	9	SW	W	10-25	1	2
	Coyote Creek	U	2	5.0	8,087	9,774	1,687						
	South Fork Big Creek	U	3	13.3	8,540	10,095	1,555						
	East Fork Big Creek	U	3	11.2	8,533	10,643	2,110						
	Rancheria	U	3	13.0	6,942	10,446	3,504	8	S	W	25-50	1	2
	Billy Creek	U	1	0.7	6,952	8,406	1,454	7	SE	S	25-50	1	-
	Home Camp Creek	U	3	6.4	6,955	9,649	2,694	7	S	SE	10-25	1	-
	Ross Creek	S	2	6.5	2,280	6,378	4,098	4	SE	NE	25-50	3	-
	Douglas Fir Creek	U	2	3.2	2,530	8,550	6,020	6	NW	W	25-50	3	-
	Fish Creek @ SJR	U	2	5.8	2,556	6,870	4,314	5	SE	S	10-25	3	-
	Slot Creek	U	2	1.6	2,566	9,134	6,568	6	SW	W	25-50	3	1,1a
	Rock Creek	S	3	16.4	2,677	8,343	5,666	5	S	E	25-50	3	1
	Aspen Creek	U	2	2.5	2,680	8,602	5,922	5	W	SW	50-100	3	1
	Horsethief Creek	U	1	1.7	2,795	9,245	6,450	6	W	NW	25-50	1	3
	Saddle Creek	U	1	1.6	2,835	7,628	4,793	5	W	SW	25-50	3	1
	Shakeflat	U	2	3.4	2,910	7,159	4,249	5	E	NE	25-50	3	4
	Camp Creek	U	1	0.4	2,972	6,959	3,987	4	NW	N	25-50	3	-
	Daulton Creek	U	3	6.7	3,363	9,498	6,135	5	NW	W	25-50	3	1
	Chiquito Creek	U	5	96.6	3,350	10,518	7,168	6	SE	E	25-50	1	3
	West Fork	U	4	*19.0*	*3,920*	*8,353*	*4,433*					1	3
	Chiquito Creek US West Fork	U	5	*73.0*	*3,920*	*10,509*	*6,589*					1	3
	Kaiser Creek	U	3	46.2	3,337	10,312	6,975	7	W	NW	25-50	1	2,3
	Westfall	U	2	5.9	4,616	9,646	5,030					-	2,1,3
	Mill Creek	U	2	5.8	3,333	7,526	4,193	5	W	NW	25-50	3	1
	Jackass Creek	U	4	33.2	3,333	10,039	6,706	6	SE	S	10-25	1	3
	Reconnassiance Creek	U	3	4.0	3,642	7,740	4,098	6	SE	S	10-25	1	3

Big Creek Project Watersheds and Sub-Watersheds

Big Creek Project Watersheds and Sub-Watersheds			Size		Elevation				Orientation		Hillslopes	Geology	
Major Watershed	Sub-Watershed	Project Reach Code	Stream Order	Drainage Area (mi^2)	Min (ft)	Max (ft)	Range (ft)	Median Zone (ft)	Primary Aspect	Secondary Aspect	Median Class (%)	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process
South Fork San Joaquin River @ SJR		L	5	463.4	3,698	13,858	10,160	9	W	SW	25-50	1	-
	Hoffman Creek	U	2	4.3	5,092	9,065	3,973	6	E	NW	10-25	1	-
	Four Forks	U	3	19.7	5,591	11,191	5,600	8	W	SW	25-50	1	2
	Four Forks DS of Rock	U	3	*19.7*	*5,594*	*11,189*	*5,595*					1	-
	Rock Creek on Four Forks	U	2	*5.0*	*5,955*	*10,401*	*4,446*					1	2
	Four Forks US of Rock	U	2	*14.0*	*5,595*	*11,189*	*5,594*					1	2
	Rattlesnake Creek (I)	U	0	4.5	6,102	9,377	3,275	7	N	NW	10-25	2	1
	Mono Creek @ SFSJR	M	4	101.9	6,289	13,704	7,415	9	SW	W	25-50	1	-
	Mono Creek US Diversion	U	4	93.9	7,333	13,704	6,371		SW	W	25-50		
	Camp 61 Creek	S	1	7.9	6,421	10,650	4,228	8	N	NE	10-25	2	1
	West Fork Camp 61 (I)	U	0	2.9	7,182	10,167	2,985	8	NE	E	25-50	2	1
	East Fork Camp 61 (I)	U	0	2.2	7,185	10,650	3,465	8	NW	NE	25-50	2	1
	Bolsilio Creek	S	1	2.0	6,516	10,650	4,134	8	NE	N	25-50	2	1
	Camp 62 @ SFSJR	S	2	4.9	6,516	10,610	4,094	8	NE	N	25-50	1	2
	Camp 62 US of Chinquapin	S/U	1	2.2	7,018	10,604	3,586	8	NE	E	25-50	1	2
	Chinquapin	S/U	1	2.3	7,018	10,607	3,589	9	NE	NW	25-50	1	2
	Bear Creek	M	4	53.7	6,677	13,711	7,034	10	W	SW	25-50	1	-
	Crater Creek (I)	S	0	4.1	6,781	10,620	3,839	8	E	NE	25-50	1	2
	SFSJR to DIV	S	0	*1.0*	*6,781*	*10,245*	*3,464*						
	Crater Creek US of DIV	U	0	*3.1*	*8,590*	*10,621*	*2,031*						
	DIV to Florence Lake	A	0	0.7	7,329	9,117	1,788					1	-
	Hooper Creek	S	3	7.4	7,008	12,346	5,338	10	W	SW	25-50	2	1
	N. Slide Creek (I)	S	1	0.3	7,156	10,636	3,480	9	NW	N	50-100	2	-
	S. Slide Creek (I)	S	1	0.4	7,159	10,699	3,540	9	W	NW	50-100	2	1
	Tombstone Creek (I)	S	1	2.1	7,195	11,204	4,009	9	W	SW	25-50	1	2
	Boulder	U	3	11.9	7,339	10,981	3,642	9	N	NE	10-25	1	2
	Alder Creek	U	2	2.2	7,638	12,329	4,691	10	S	W	25-50	1	2
	Sallie Keyes Creek	U	1	2.8	7,638	12,057	4,419	10	S	SW	25-50	1	1a,2
SJR US of SFSJR		U	5	329.1	3,698	13,146	9,448	9	SW	W	25-50	1	1a
	Granite Creek	U	4	64.1	4,022	11,608	7,586	8	SE	E	10-25	1	1a,2
	Granite Creek DS of Miller	U	4	*61*	*4,037*	*11,611*	*7,574*					2	1
	Miller Creek	U	2	*9*	*5,790*	*7,204*	*1,414*					2	1a
	Granite Creek US of Miller	U	4	*51*	*5,790*	*11,611*	*5,821*					1	1a
	North Fork San Joaquin River	U	4	57.0	4,846	13,146	8,301	9	SW	E	25-50	1a	1
	Middle Fork San Joaquin River	U	5	189.0	4,842	13,143	8,301	9	SW	W	25-50	1	1a
	Fish Creek (on MFSJR)	U	4	89.3	5,354	13,133	7,779	9	SW	W	25-50	1	-

Project Reaches are indicated by Bold. All named USGS perennial streams, plus intermittent (I) if Project or potential reference.

[shaded cells] = Not determined

italic = added from maps (not GIS)

Project Reach Codes (per Project Nexus Matrix, S. Rowan Nov 2000):

(Lists whether bypassed or augmented, by tributary size)

- U = Unaltered
- A = Flow Augmented
- S = Bypass reach, small tributary
- M = Bypass reach, moderate tributary
- L = Bypass reach, San Joaquin River

Zones: in 1,000 ft intervals (9 = 9,000 to 10,000)

Aspect: Which of 8 directions that hillslopes face; zero for flat water

Geology/Landform Process Groups

- 1 Glacially eroded granitic rock
- 1a Glacially eroded granitic and metamorphic rocks
- 2 Glacial till deposits
- 3 Non-glaciated granitic rock
- 4 Non-glaciated metamorphic rock

Big Creek Project Area Geomorphic Reaches

Big Creek Project Area Geomorphic Reaches				Reach Length		Reach Area				Stream Morphology			Reach Valley Confinement **			Reach Geology		Sub-basin Geology	
Major Watershed	Sub-Watershed	Project Reach Code	Stream ID Code	Reach Downstream Station (mi)	Reach Upstream Station (mi)	Cumulative Drainage Area (mi^2)	Unit Drainage Area (mi^2)	Stream Order	Elevation at Geomorphic Reach Break (ft)	Stream Profile Slope	Rosgen Level I *	Watershed Crest Elevation (ft)	Valley Width Min (ft)	Valley Width Max (ft)	Valley Width Ave (ft)	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process
SJR Reach 1 Powerhouse 4 to US of Jose		L	**SJR**	0	12.05	1,443.0		6	994	0.7%	B/C/E/F/G	13,858	43	509	125	*3*	-	1	3
	Saginaw Creek	U	**Sag**	0.08	0.98	6.2	1.8	1	1,421	36.5%	Aa+	6,378	36	181	106	*3*	-	3	-
		U	**Sag**	0.98	2.08	4.5	0.6	1	3,156	9.4%	A/B		50	104	74	*3*	-	3	-
		U	**Sag**	2.08	3.08	3.9	3.9	1	3,701	4.9%	A/B		62	115	80	*3*	-	3	-
	Jose Creek	U	**Jose**	0.06	1.2	30.0	4.5	3	1,407	11.1%	Aa+	6,470	72	197	122	*3*	-	3	-
		U	**Jose**	1.2	1.7	25.6	21.3	3	2,077	31.2%	Aa+		60	200	119	*3*	-	3	-
		U	**Jose**	1.7	2.7	4.2	4.2	2	2,900	4.6%	A/B		77	1202	463	*3*	-	3	-
SJR Reach 2 US Jose to Slot Creek		L	**SJR**	12.05	21.65			6	1,434	2.2%	B/C/E/F/G	13,858	39	236	101	*3*	*1,2*	1	3
	Stevenson Creek	M	**Stev**	0	0.73	35.6	1.2	3	1,637	44.6%	Aa+	7,910	43	80	64	3	-	3	1
		M	**Stev**	0.73	1.33	34.4	0.8	3	3,356	7.0%	A/B		77	96	85	3	-	3	1
		M	**Stev**	1.33	2.43	33.6	1.9	3	3,579	11.4%	Aa+		66	365	139	3	-	3	1
		M	**Stev**	2.43	4.23	31.7	2.3	3	4,242	10.4%	Aa+		37	372	183	3	-	3	1
	Stevenson Shaver @ Dam and Lake	R	**Stev**	4.23	8.11	29.4	29.4	3	5,259	0.8%	Lake	7,910	272	7323	3748	3	1	3	1
	Stevenson Creek US Shaver	U	**Ste us Shav**	8.11	8.8	8.0	8.0	3	5,390	3.3%	B/C/E/F/G	7,900	107	188	146	*3*	-	1	3
		U	**Ste us Shav**	8.8	9.3			3	5,509	0.3%	B/C/E/F/G		465	614	540	*3*	-	1	3
		U	**Ste us Shav**	9.3	11.5			2	5,518	8.1%	A/B		44	229	105	*3*	*1*	1	-
	NF Stevenson	A	**Ste NF**	0.98	1.58	5.9	5.9	2	5,371	11.1%	Aa+	7,815	41	114	90	*3*	-	1	3
		A	**Ste NF**	1.58	2.48			2	5,722	4.0%	A/B/C/E/F/G		32	125	91	*3*	-	1	3
		A/U	**Ste NF**	2.48	3.78			2	5,912	14.6%	Aa+		41	175	101	*1*	-	1	-
		U	**Ste NF**	3.78	4.58			2	6,916	5.4%	A/B		72.8	113	103	*1*	-	1	-
	Azalea Creek	U	**Azalea**			1.6	1.6	1	5,371			7,910				*1*	-	1	3
	Hookers Creek	U	**Hook**	0	0.9	5.6	0.6	3	1,864	32.1%	Aa+	6,188	47	228	123	*3*	-	3	-
		U	**Hook**	0.9	2.4	5.0	5.0	3	3,389	4.7%	A/B		60	335	170	*3*	-	3	-
	Big Creek SJR to DS of Dam 5	M	**Big**	0	0.5	133.5	2.4	5	2,221	12.1%	Aa+	10,636	63	146	103	*3*	-	1	3,2
	BC DS Dam 5 to Sheep Thief	M	**Big**	0.5	4.4	131.1	21.2	5	2,539	6.4%	A/B		52	221	196	*3*	-	1	3,2
	Ordinance Creek	U	**Ordin**			2.3	2.3	1	3,015			8,110				*3*	*4*	3	4
	Ely	S	**Ely**	0	0.58	2.7	0.8	2	3,428	26.9%	Aa+	6,890	54	168	102	*3*	-	3	1
		S/U	**Ely**	0.58	1.38	1.9	0.2	1	4,252	25.2%	Aa+		40	103	65	*3*	-	3	1
		U	**Ely**	1.38	1.78	1.7	0.1	1	5,318	6.5%	A/B		75	81	78	*3*	-	3	1
		U	**Ely**	1.78	2.08	1.6	1.6	1	5,456	1.5%	B/C/E/F/G		501	522	512	*3*	*1*	3	1
	BC SJR Sheep Thief to Dam 4	M	**Big**	4.4	6.3	109.9	31.6	5	3,865	9.5%	A/B		33	299	112	*3*	-	1	2
	Balsam	S	**Bal**	0	0.54	3.9	0.2	3	4,114	16.8%	Aa+	7,930	39	112	73	*3*	-	1	3
		A/S	**Bal**	0.54	1.74	3.7	1.2	3	4,593	20.2%	Aa+		28	57	45	*3*	-	1	3
		A	**Bal**	1.74	2.64	2.5	2.5	2	5,873	13.5%	Aa+		36	127	72	*1*	*4*	1	4
	BC SJR Dam 4 to US Pitman	M	**Big**	6.3	7.8	78.3	0.7	4	4,823	19.7%	Aa+		40	143	71	*1*	*3*	1	2
	Pitman Creek	S	**Pitm**	0.04	1.37	25.1		4	4,829	29.9%	Aa+	9,882	91	138	106	*3*	-	1	2
		S/A	**Pitm**	1.37	2.41			3	6,932	3.4%	B/C/E/F/G		119	464	447	*1*	-	1	2
	Tamarack Creek	U	**Tama**	0	3.4	12.3		3	7,116	3.0%	B/C/E/F/G	9,882	46	709	230	*1*	*2*	1	2
	BC US Pitman to Huntington Lake	M	**Big**	7.8	9.8	77.6	36.2	4	6,450	3.9%	B/C/E/F/G		49	615	157	*1*	*2*	1	2
	Grouse Creek	U	**Grou**					2	6,620							*1*	-	1	-
	BC US of Huntington Lake	U	**Big us Hunt**	13.09	13.69	41.4	41.7	4	6,949	2.7%	B/C/E/F/G	10,643	92	379	255	*1*	-	1	2
		U	**Big us Hunt**	13.69	14.29			4	7,034	1.9%	B/C/E/F/G		642	1112	913	*1*	-	1	2

Big Creek Project Area Geomorphic Reaches

Big Creek Project Area Geomorphic Reaches				Reach Length		Reach Area				Stream Morphology			Reach Valley Confinement **			Reach Geology		Sub-basin Geology	
Major Watershed	Sub-Watershed	Project Reach Code	Stream ID Code	Reach Downstream Station (mi)	Reach Upstream Station (mi)	Cumulative Drainage Area (mi^2)	Unit Drainage Area (mi^2)	Stream Order	Elevation at Geomorphic Reach Break (ft)	Stream Profile Slope	Rosgen Level I *	Watershed Crest Elevation (ft)	Valley Width Min (ft)	Valley Width Max (ft)	Valley Width Ave (ft)	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process
		U	**Big us Hunt**	14.29	15.89			4	7,093	5.3%	A/B		130	543	226	*1*	-	1	2
		U	**Big us Hunt**	15.89	16.29			4	7,543	16.9%	Aa+		58	503	281	*1*	-	1	2
		U	**Big us Hunt**	16.29	16.59			4	7,900	3.5%	B/C/E/F/G		99	100	100	*1*	-	1	2
	Coon	U	**Coon**	0.34	1.04	2.2	2.2	1	6,952	15.5%	Aa+	8,911	116	178	143	*1*	-	1	2
		U	**Coon**	1.04	1.84			1	7,523	5.7%	A/B		124	737	437	*2*	-	1	2
		U	**Coon**	1.84	3.34			1	7,762	7.4%	A/B		72	952	279	*1*	*2*	1	2
	Rancheria	U	**Ranch**	2.01	2.51	13.0	13.0	3	6,942	2.1%	B/C/E/F/G	10,446	264	491	382	*1*	*2*	1	2
		U	**Ranch**	2.51	3.1			3	6,998	4.8%	A/B		135	243	183	*1*	*2*	1	2
	Billy Creek	U	**Billy**	0.28	1.58	0.7	0.7	1	6,952	13.9%	Aa+	8,406	48	371	164	*1*	-	1	-
	Home Camp Creek	U	**HomeCmp**	1.24	1.74	6.4	6.4	3	6,952	9.3%	A/B	9,649	135	222	191	*1*	-	1	-
		U	**HomeCmp**	1.74	2.84			3	7,198	2.5%	B/C/E/F/G		122	527	301	*1*	-	1	-
		U	**HomeCmp**	2.84	4.24			2	7,346	6.1%	A/B		66	143	114	*1*	-	1	-
	Ross Creek	S/U	**Ross**	0	1.25	6.5	0.7	2	2,280	25.7%	Aa+	6,378	66	197	125	*3*	-	3	-
		U	**Ross**	1.25	1.75	5.8	5.8	2	3,973	6.4%	A/B		118	144	131	*3*	-	3	-
	Douglas Fir Creek	U	**Doug**			3.2	3.2	2	2,530			8,550				*3*	-	3	-
	Fish Creek (SJR)	U	**Fish _SJR**			5.8	5.8	2	2,556			6,870				*3*	-	3	-
SJR Reach 3 Slot to SFSJR		L	**SJR**	21.65	38.4			6	2,566	1.3%	B/G/F	13,858	49	322	132	*1*	*2,3*	*1*	
	Slot Creek	U	**Slot**			1.6	1.6	2	2,566			9,134				*3*	*1,1a*	*3*	*1,1a*
	Rock Creek	S	**Rock**	0	0.29	16.4	0.1	3	2,677	32.2%	Aa+	8,343	34	37	36	*3*	-	3	1
		S/U	**Rock**	0.29	1.19	16.3	1.5	3	3,169	16.6%	Aa+		67	122	97	*3*	-	3	1
		U	**Rock**	1.19	1.29	14.8	14.8	3	3,957	19.9%	Aa+		157	157	157	*3*	-	1	3
	Aspen Creek	U	**Aspen**			2.5	2.5	2	2,680			8,602				*3*	*1*	3	1
	Horsethief Creek	U	**Horse**			1.7	1.7	1	2,795			9,245				*1*	*3*	1	3
	Saddle Creek	U	**Sadd**			1.6	1.6	1	2,835			7,628				*3*	*1*	3	1
	Shakeflat	U	**Shake**	0	1	3.4	0.9	2	2,910	14.5%	Aa+	7,159	37	172	76	*3*	-	3	4
		U	**Shake**	1	2.1	2.6	1.9	2	3,678	17.0%	Aa+		89	302	180	*3*	-	3	4
		U	**Shake**	2.1	3.8	0.6	0.6	1	4,665	15.5%	Aa+		41	415	159	*3*	*4*	4	-
	Camp Creek	U	**Camp**			0.4	0.4	1	2,992			6,959				*3*	-	3	-
	Daulton Creek	U	**Dault**			6.7	6.7	3	3,363			9,498				*3*	*1*	3	1
	Chiquito Creek	U	**Chiq**	0.6	0.8	96.6	-	5	3,350	14.0%	Aa+	10,518	53	77	65	*3*	-	1	3
		U	**Chiq**	0.8	2.5	96.6	2.3	5	3,491	1.6%	B/C/E/F/G		93	577	253	*3*	-	1	3
		U	**Chiq**	2.5	3.3	94.2	28.5	5	3,639	5.1%	A/B		39	184	92	*3*	-	1	3
		U	**Chiq**	3.3	3.8	65.7	65.7	5	3,855	3.7%	B/C/E/F/G	10,510	42	123	77	*3*	-	1	3
	Kaiser Creek	U	**Kais**	0.45	3.45	46.2	40.2	3	3,337	11.9%	Aa+	10,312	38	331	104	*3*	-	1	2,3
		U	**Kais**	3.45	7.35			3	5,223	3.9%	B/C/E/F/G		43	722	447	*3*	-	1	3
		U	**Kais**	7.35	10.65	20.4	9.8	3	6,030	9.9%	A/B		52	405	148	*1*	*2*	1	2
		U	**Kais**	10.65	12.65	10.6	10.6	3	7,753	1.4%	B/C/E/F/G		174	1589	853	*2*	*1*	2	1
	Westfall	U	**West**	0	1.8	5.9	5.9	2	4,616	8.9%	A/B	9,646	65	299	162	*3*	-	3	2
		U	**West**	1.8	2.8			1	5,469	16.2%	Aa+		36	168	104	*3*	-	2	1
		U	**West**	2.8	4.2			1	6,322	18.5%	Aa+		76	298	207	*2*	-	2	1
	Mill Creek	U	**Mill**	0.22	1.42	5.8	5.8	2	3,337	8.2%	A/B	7,526				*3*	*1*	3	1
		U	**Mill**	1.42	3.82				3,858	12.8%	Aa+								
		U	**Mill**	3.82	4.32				5,476	32.0%	Aa+								
		U	**Mill**	4.32	5.72				6,322	3.6%	B/C/E/F/G								
	Jackass Creek	U	**Jack**	0.47	1.37	33.2	11.4	4, 3	3,333	4.8%	A/B	10,039	48	398	144	*3*	-	1	3
		U	**Jack**	1.37	4.57	21.8	21.8	3	3,559	13.0%	Aa+		40	152	74	*1*	-	1	-
	Reconnassiance Creek	U	**Recon**	0	2.2	4.0	4.0	3	3,632	25.1%	Aa+	7,740				*1*	*3*	1	3
		U	**Recon**	2.2	4.7			3	6,549	3.8%	B/C/E/F/G	7,740							

Big Creek Project Area Geomorphic Reaches

Big Creek Project Area Geomorphic Reaches				Reach Length		Reach Area				Stream Morphology			Reach Valley Confinement **			Reach Geology		Sub-basin Geology	
Major Watershed	Sub-Watershed	Project Reach Code	Stream ID Code	Reach Downstream Station (mi)	Reach Upstream Station (mi)	Cumulative Drainage Area (mi^2)	Unit Drainage Area (mi^2)	Stream Order	Elevation at Geomorphic Reach Break (ft)	Stream Profile Slope	Rosgen Level I *	Watershed Crest Elevation (ft)	Valley Width Min (ft)	Valley Width Max (ft)	Valley Width Ave (ft)	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process	Dominant Geology / Landform Process	Sub-Dominant Geology / Landform Process
*****SJR Mammoth Pool Res to SFSJR**		L	**SJR**	35.35	38.4	800		6	3,389	1.9%	B/C/E/F/G	13,858	59	279	111	*3*	-	1	-
	SFSJR Reach 1.1 SJR to US Hoffman	L	**SFSJR**	0	6.65	463.4	33.2	5	3,701	4.0%	A/B/C/E/F/G	13,858	32	520	130	*3*	-	1	-
	Hoffman Creek	U	**Hoff**	0	0.7	4.3	4.3	2	5,092	38.6%	Aa+	9,065	49	116	80	*3*	-	1	-
		U	**Hoff**	0.7	2.9			2	6,512	2.5%	B/C/E/F/G		42	856	317	*1*	-	1	-
		U	**Hoff**	2.9	4.2			2	6,808	21.2%	Aa+		30	208	106	*1*	-	1	-
	SFSJR Reach 2 US Hoff to DS of Ratt	L	**SFSJR**	6.65	13.25	430.2	38.8	5	5,115	2.5%	B/C/E/F/G	13,858	46	269	110	*1*	*2*	1	-
	Four Forks	U	**Ffork**	0	0.8	19.7	19.7	3	5,594	18.5%	Aa+	11,191	58	126	96	*3*	-	*1*	*2*
		U	**Ffork**	0.8	1.2			2	6,375	5.9%	A/B		92	108	100	*1*	-	1	2
		U	**Ffork**	1.2	3.5			2	6,499	11.5%	Aa+		36	179	77	*1*	-	2	1
	Rattlesnake Creek (I)	U	**Ratt**	0	0.6	4.5	4.5	0	6,102	17.7%	Aa+	9,377	38	114	78	*1*	-	2	1
		U	**Ratt**	0.6	0.9			0	6,657	3.5%	B/C/E/F/G		66	66	66	*1*	-	2	1
	SFSJR Reach 3 DS of Ratt to US of Bear	L	**SFSJR**	13.25	22.45	391.4	195.8	5	5,994	1.4%	B/C/E/F/G	13,858	65	827	174	*1*	*2*	1	-
	Mono SFSJR to Div	M	**Mono**	0	2.5	101.9	8.0	4	6,289	3.1%	B/C/E/F/G	13,704	33	201	94	*1*	-	1	-
		M	**Mono**	2.5	4.2			4	6,699	1.1%	B/C/E/F/G		34	642	145	*1*	-	1	-
		M	**Mono**	4.2	5.5			4	6,798	6.6%	A/B		41	128	77	*1*	-	1	-
	Mono Div to Lake T. Edison	M/A	**Mono**	5.5	7.39	93.9	2.9	4	7,333	3.9%	B/C/E/F/G	13,704	74	479	218	*2*	-	1	2
	Lake T. Edison	A/U	**Mono**	7.39	11.17	91.1	33.0	4	7,643		Lake								
	Mono US of Lake T. Edison Dam	U	**Mono**	11.17		58.1	58.1	4	7,643										
	Camp 61 Creek	S	**Cmp61**	0	1.84	7.9	2.8	1	6,421	4.8%	A/B	10,650	42	93.5	70	*1*	-	2	1
		S	**Cmp61**	1.84	2.01			1	7,133	8.5%	A/B		48	267	136	*1*	-	2	1
	West Fork Camp 61 (I)	U	**Cmp61W**	0.04	0.74	2.9	2.9	0	7,178	15.1%	Aa+	10,167	53	263	117	*2*	*1*	2	-
			Cmp61W	0.74	0.94			0	7,972	22.3%	Aa+	10,167	53	53	53	*2*	*1*	2	-
	East Fork Camp 61 (I)	U	**Cmp61E**	0.07	0.87	2.2	2.2	0	7,178	24.5%	Aa+	10,650	79	159	129	*2*	*1*	2	-
			Cmp61E	0.87	1.07			0	8,261	4.6%	A/B	10,650	40	79	60	*2*	*1*	2	-
	Bolsilio Creek	S	**Bols**	0	1.11	2.0	2.0	1	6,516	13.9%	Aa+	10,650	36	248	172	*1*	-	2	1
		S	**Bols**	1.11	1.81			1	7,326	9.8%	A/B		85	229	140	*1*	-	2	1
		S	**Bols**	1.81	2.41			1	7,687	27.7%	Aa+		29	409	170	*2*	-	2	1
		S	**Bols**	2.41	2.71			1	8,566	8.1%	A/B		84	84	84	*2*	-	2	1
	Camp 62	S	**Cmp62**	0	1.87	4.9	4.9	2	6,516	13.7%	Aa+	10,610	49	102	67	*1*	-	1	2
		S/U	**Cmp62**	1.87	2.27	2.2	2.2	1	7,871	30.4%	Aa+	10,604	40	145	74	*2*	-	1	2
	Chinquapin	S/U	**Chin**	0	0.81	2.3	2.3	1	7,018	14.6%	Aa+	10,607	82	264	192	*1*	-	1	2
		S/U	**Chin**	0.81	1.41			1	7,641	28.2%	Aa+		34	84	62	*1*	-	1	2
		U	**Chin**	1.41	1.71			1	8,533	5.2%	A/B		67	170	118	*2*	-	1	2
	Bear Creek	M	**Bear**	0	1.6	53.7	53.7	4	6,677	8.0%	A/B	13,711	27	125	67	*1*	-	1	-
		U	**Bear**	1.6	5.7			4	7,349	4.2%	A/B		57	1054	423	*1a*	-	1	-
	SFSJR Reach 4 US of Bear to US Sslide	L	**SFSJR**	22.45	26.15	195.6	18.2	5	6,680	2.6%	B/C/E/F/G	13,858	91	1487	296	*1*	*2*	1	-
	Crater Creek (I)	S	**Crat**	0	0.63	4.1	4.1	0	6,781	2.0%	B/C/E/F/G	10,620	556	739	643	*1*	-	1	-
		S	**Crat**	0.63	1.33			0	6,847	10.7%	Aa+		81	118	103	*1*	-	1	-
		S	**Crat**	1.33	1.63			0	7,244	22.3%	Aa+		65	65	65	*1*	-	1	2
		S	**Crat**	1.63	3.03			0	7,598	15.3%	Aa+		63	173	107	*1*	-	2	1
	Crater Creek US of DIV	U	**Crat**	3.03	3.83			0	8,730	8.3%	A/B		109	345	210	*2*	-	2	-
	DIV to Florence Lake	A	**Crat Div**	0.65	2.16	0.7	0.7	0	7,329	15.6%	Aa+	9,117	76	217	149	*1*	-	1	-
	Hooper Creek	S	**Hoop**	0	0.63	7.4	7.4	3	7,011	12.7%	Aa+	12,346	75	263	144	*1*	-	2	1
		S/U	**Hoop**	0.63	0.93			3	7,434	17.4%	Aa+		83	83	83	*2*	-	2	1
		U	**Hoop**	0.93	1.63			2	7,710	19.1%	Aa+		37	245	109	*2*	*1*	2	1

Big Creek Project Area Geomorphic Reaches

Big Creek Project Area Geomorphic Reaches				Reach Length		Reach Area				Stream Morphology			Reach Valley Confinement **			Reach Geology		Sub-basin Geology	
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	N. Slide Creek (I)	S/U	Nslid	0	0.44	0.3	0.3	1	7,159	29.4%	Aa+	10,636	76	389	222	*1*	-	2	1
		U	Nslid	0.44	0.94			1	7,841	53.9%	Aa+		88	98	93	*2*	-	2	-
		U	Nslid	0.94	1.14			1	9,265	28.6%	Aa+		108	108	108	*2*	-	2	-
	S. Slide Creek (I)	S/U	Sslid	0	0.43	0.4	0.4	1	7,162	24.3%	Aa+	10,699	70	117	98	*1*	-	2	1
		U	Sslid	0.43	1.03			1	7,713	47.8%	Aa+		48	80	64	*2*	-	2	-
		U	Sslid	1.03	1.23			1	9,229	45.7%	Aa+		453	453	453	*1*	*2*	1	2
	SFSJR Reach 5 US Sslide to US Blayney Mdw	L/U	SFSJR	26.15	34.9	177.4	44.2	5	7,195	1.0%	B/C/E/F/G	13,858	69	2388	971	*2*	*1*	1	-
	Tombstone Creek (I)	S	Tomb	0.01	0.5	2.1	2.1	1	7,195	0.0%	C/E/F	11,201	617	2087	1456	*1*	-	1	2
		S/U	Tomb	0.5	1.2			1	7,195	18.6%	Aa+		66	617	214	*1*	*2*	1	2
		U	Tomb	1.2	2			1	7,884	31.1%	Aa+		69	89	80	*2*	*1*	1	2
		U	Tomb	2	2.4			1	9,199	18.8%	Aa+		62	263	132	*1*	*2*	1	2
	Boulder	U	Boul	0.01	0.61	11.9	11.9	3	7,346	3.5%	B/C/E/F/G	10,981	275	857	618	*1*	-	1	2
		U	Boul	0.61	2.81			2	7,457	14.9%	Aa+		54	246	109	*1*	*2*	1	2
		U	Boul	2.81	2.91			2	9,193	3.0%	B/C/E/F/G		795	795	795	*2*	*1*	2	1
	Alder Creek	U	Alder	0	0.4	2.2	2.2	2	7,638	8.7%	A/B	12,329	545	1127	771	*1*	-	1	2
		U	Alder	0.4	1.8			2	7,818	26.2%	Aa+		72	422	212	*2*	-	1	2
		U	Alder	1.8	2.2			1	9,757	12.9%	Aa+		110	546	328	*1*	-	1	-
	Sallie Keyes Creek	U	Sallie	0	0.5	2.8	2.8	1	7,638	15.2%	Aa+	12,057	181	310	260	*1a*	-	1	1a,2
		U	Sallie	0.5	1.9			1	8,038	28.2%	Aa+		67	137	310	*1a*	*2*	1	2
		U	Sallie	1.9	2.2			1	10,121	2.5%	B/C/E/F/G		182	219	201	*2*	-	1	2
	SFSJR Reach 6 US of Blayney Mdw	U	SFSJR	*34.9*		133.3	133.3	5	7,674			13,858				*1*	-	1	-
SJR Reach 4 US of SFSJR		U	SJR	38.45	48.75	329.1	19.0	5	3,698	2.1%	B/C/E/F/G	13,146	30	1198	224	*1*	*1a*	1	1a
	Granite Creek	U	Gran	0	1.5	64.1	64.1	4	4,026	21.9%	Aa+	11,608	44	226	100	*3*	-	1	1a,2
	North Fork San Joaquin River	U	NFSJR			246.0	57.0	4	4,846			13,146				*1a*	-	1	1a
	Middle Fork San Joaquin River	U	MFSJR			246.0	189.0	5	4,843			13,143				*1*	*1a*	1	1a
	Fish Creek (MFSJR)	U	FISH MF	0	1.1	89.3	89.3	4	5,354	5.6%	A/B	13,133	152	1245	560	*1*	-	1	-
	DS of Fox Mdw	U	FISH MF	1.1	3.6			4	5,679	4.7%	A/B	13,133	86	512	206	*1a*	-	1	-
	Fox Mdw	U	FISH MF	3.6	5.4	63.6	63.6	4	6,296	3.8%	B/C/E/F/G	13,133	136	708	418	*1*	-	1	-
	US of Fox Mdw	U	FISH MF	5.4	7			3	6,660	11.2%	Aa+	13,133	41	118	92	*1*	*1a*	1	1a

* Possible Level I types based on available data

** Excludes valley widths in reservoirs

*** SJR Mammoth Pool to SFSJR is not a 'geomorphic' reach, but a project reach--data are cumulated from: SFSJR + SJR US of SFSJR + Reconnaissance Creek. [Aspect SW/W; Hillslopes 25-50%]

Project Reaches are indicated by Bold. All named USGS perennial streams, plus intermittent (I) if Project or potential reference.

(shaded) = Not determined

Project Reach Codes (per Project Nexus Matrix, S. Rowan Nov 2000):

(Lists whether bypassed or augmented, by tributary size)

- U = Unaltered
- A = Flow Augmented
- S = Bypass reach, small diversion facility
- M = Bypass reach, moderate diversion facility
- L = Bypass reach, large diversion facility

Geology/Landform Process Groups

- 1 Glacially eroded granitic rock
- 1a Glacially eroded granitic and metamorphic rocks
- 2 Glacial till deposits
- 3 Non-glaciated granitic rock
- 4 Non-glaciated metamorphic rock

Candidate Geomorphic Reference Reaches

Big Creek Project Reach						Candidate Reference Reach				Comparison of Geomorphic Stream Reach and Watershed Characteristics									
Major Watershed	Project Affected Stream Reach	Project Reach Code	DS Station (RM)	US Station (RM)	Rosgen Level I	Above Diversion?	Other Sub-basin?	DS Station (RM)	US Station (RM)	Stream Profile / Rosgen Level I Stream Type	Drainage Area	Elevation at Geomorphic Reach Break	Maximum Basin Elevation	Stream Order	Reach Geology	Basin Geology	Basin Aspect	Valley Width	Basin Hillslopes
San Joaquin River to SFSJR Confluence																			
	SJR BC PH4 to Redinger	L	0.00	6.15	B/C/E/F/G	N	N												
	SJR Redinger to Dam 6	L	6.15	17.05	B/C/E/F/G	N	N												
	SJR Dam 6 to Mammoth Pool Dam	L	17.05	26.55	B/C/E/F/G	N	N												
	SJR Mammoth Pool Reservoir to SFSJR	L	35.35	38.45	B/C/E/F/G	Y	N	38.45	41.65	+	-	+	+	-	-	+	+	-	+
	Stevenson Creek DS Shaver	M	0.00	0.73	Aa+	N	Jose	1.20	1.70	+	+	+	-	+	+	+	-	+	+
	Stevenson Creek DS Shaver	M	0.73	1.33	A/B	Y	N	9.30	11.50	+	-	-	+	+	+	-	+	+	+
	Stevenson Creek DS Shaver	M	1.33	2.43	Aa+	N	Jose	0.06	1.20	+	+	-	-	+	+	+	-	+	+
	Stevenson Creek DS Shaver	M	2.43	4.23	Aa+	Y	N	9.30	11.50	+	+	-	+	+	+	-	+	-	+
	Stevenson Creek DS Shaver	M	2.43	4.23	Aa+	N	Kaiser	0.45	3.45	+	+	+	-	+	+	-	+	+	-
	NF Stevenson Creek	A	0.98	1.58	Aa+	N	Stev US Shaver	9.30	11.50	+	+	+	+	+	+	+	+	+	+
	NF Stevenson Creek	A	1.58	2.48	A/B/C/E/F/G	Y	N	3.58	3.78	+	+	-	+	+	-	+	+	+	+
	NF Stevenson Creek	A	2.48	3.58	Aa+	Y	N	3.78	4.58	+	+	+	+	+	+	+	+	+	+
	Big Creek DS Huntington	M	0.00	0.50	Aa+	N	Chiquito	0.60	0.80	+	+	-	+	+	+	+	+	-	-
	Big Creek DS Huntington	M	0.50	4.40	A/B	N	Chiquito	2.50	3.30	+	+	-	+	+	+	+	+	-	-
	Big Creek DS Huntington	M	4.40	6.30	A/B	N	Kaiser	0.45	3.45	+	-	+	+	-	+	+	-	+	-
	Big Creek DS Huntington	M	6.30	7.80	Aa+	N	Granite	0.00	1.50	+	+	+	+	+	-	+	+	+	+
	Big Creek DS Huntington	M	7.80	9.80	B/C/E/F/G	Y	N	13.09	13.69	+	+	+	+	+	+	+	+	-	+
	Ely Creek	S	0.00	0.58	Aa+	Y	N	0.98	1.38	+	+	-	+	+	+	+	+	+	+
	Ely Creek	S	0.58	0.98	Aa+	Y	N	0.98	1.38	+	+	-	+	+	+	+	+	+	+
	Balsam Creek	S	0.00	0.54	Aa+	N	Reconnaissance	0.00	2.20	+	+	+	+	+	-	+	-	*	-
	Balsam Creek	S	0.00	0.54	Aa+	N	Mill Creek	1.42	3.82	+	+	+	+	+	+	-	+	*	+
	Balsam Creek	A	0.54	0.74	Aa+	N	Reconnaissance	0.00	2.20	+	+	+	+	+	-	+	-	*	-
	Balsam Creek	A	0.54	0.74	Aa+	N	Mill Creek	1.42	3.82	+	+	+	+	+	+	-	+	*	+
	Pitman Creek	S	0.04	1.37	Aa+	N	Kaiser	0.45	3.45	+	+	-	+	-	+	+	+	+	-
	Pitman Creek	S	0.04	1.37	Aa+	N	Rock	1.19	1.29	+	+	+	-	-	+	+	-	+	-
	Pitman Creek	S	1.37	1.57	B/C/E/F/G	Y	N	1.57	2.41	+	+	+	+	+	+	+	+	+	+
	Ross Creek	S	0.00	0.85	Aa+	Y	N	0.85	1.25	+	+	+	+	+	+	+	+	+	+
	Rock Creek	S	0.00	0.39	Aa+	N	Jose	1.20	1.70	+	+	+	-	+	+	+	-	-	-
	Rock Creek	S	0.00	0.39	Aa+	N	Jackass	1.37	4.57	+	+	+	-	+	-	-	+	+	-
	South Fork San Joaquin River																		
	SFSJR Reach 1 SJR to US Hoffman	L	0.00	6.65	A/B/C/E/F/G	N	SJR US SFSJR	38.45	48.75	+	+	+	+	+	-	+	*	-	*
	SFSJR Reach 2 US Hoff to DS of Ratt	L	6.65	13.25	B/C/E/F/G	N	SJR US SFSJR	38.45	48.75	+	+	-	+	+	-	+	*	-	*
	SFSJR Reach 3 DS of Ratt to US of Bear	L	13.25	22.45	B/C/E/F/G	Y	N	30.30	32.60	+	-	-	+	+	-	+	+	-	*
	SFSJR Reach 3 DS of Ratt to US of Bear	L	13.25	22.45	B/C/E/F/G	N	Fish (MFSJR)	0.00	1.10	-	-	+	+	-	+	+	*	+	*
	SFSJR Reach 4 US of Bear to US Sslide	L	22.45	26.15	B/C/E/F/G	Y	N	30.30	32.60	+	+	+	+	+	-	+	+	+	+
	SFSJR Reach 4 US of Bear to US Sslide	L	22.45	26.15	B/C/E/F/G	N	Fish (MFSJR)	3.60	5.40	+	-	+	+	-	+	+	*	+	*
	SFSJR Reach 5 US Sslide to US Blayney Mdw	L	26.15	28.50	B/C/E/F/G	Y	N	32.60	34.90	+	+	+	+	+	+	+	+	+	+
	SFSJR Reach 5 US Sslide to US Blayney Mdw	L	26.15	28.50	B/C/E/F/G	N	Fish (MFSJR)	3.60	5.40	+	-	+	+	-	-	+	*	-	*
	Mono Creek	M	0.00	2.50	B/C/E/F/G	N	SFSJR	30.30	32.60	+	+	+	+	-	+	+	+	-	*
	Mono Creek	M	2.50	4.20	B/C/E/F/G	N	SFSJR	30.30	32.60	+	+	+	+	-	+	+	+	-	*
	Mono Creek	M	4.20	5.50	A/B	N	Fish (MFSJR)	0.00	1.10	+	+	-	+	+	+	+	*	-	*
	Mono Creek	M	5.50	5.80	B/C/E/F/G	N	Fish (MFSJR)	3.60	5.40	+	+	+	+	+	-	+	+	-	*
	Camp 61 Creek	S	0.00	1.84	A/B	N	Kaiser	7.35	10.65	+	-	+	+	-	+	-	+	+	-
	Bolsilio Creek	S	0.00	1.11	Aa+	N	Coon	0.34	1.04	+	+	+	-	+	+	-	+	+	-
	Bolsilio Creek	S	1.11	1.81	A/B	N	Coon	1.84	3.34	+	+	+	-	+	+	+	+	-	-
	Camp 62 Creek	S	0.00	1.37	Aa+	N	Rattlesnake	0.60	0.90	-	+	+	+	+	+	-	+	+	-
	Chinquapin	S	0.00	0.81	Aa+	N	Camp 62	1.37	1.87	+	+	+	+	+	-	+	+	-	+

Candidate Geomorphic Reference Reaches

Big Creek Project Reach						Candidate Reference Reach				Comparison of Geomorphic Stream Reach and Watershed Characteristics									
Major Watershed	Project Affected Stream Reach	Project Reach Code	DS Station (RM)	US Station (RM)	Rosgen Level I	Above Diversion?	Other Sub-basin?	DS Station (RM)	US Station (RM)	Stream Profile / Rosgen Level I Stream Type	Drainage Area	Elevation at Geomorphic Reach Break	Maximum Basin Elevation	Stream Order	Reach Geology	Basin Geology	Basin Aspect	Valley Width	Basin Hillslopes
	Bear Creek	M	0.00	1.60	A/B	N	Fish (MFSJR)	0.00	1.10	+	+	-	+	+	+	+	*	+	*
	Crater Creek (I)	S	0.00	0.63	B/C/E/F/G	N	Hoffman	0.70	2.90	+	+	+	+	-	+	+	+	-	-
	Crater Creek (I)	S	0.63	1.33	Aa+	N	Homecamp	1.24	1.74	+	+	+	+	-	+	-	-	+	-
	Crater Creek (I)	S	1.33	1.63	Aa+	N	Hoffman	2.90	4.20	+	+	+	-	-	+	+	+	+	-
	Crater Creek (I)	S	1.33	1.63	Aa+	N	Chinquapin	0.81	1.41	+	+	+	+	-	+	+	+	+	+
	Crater Creek (I)	S	1.63	2.93	Aa+	N	Sallie Keyes	0.00	0.50	+	+	+	-	-	+	-	-	-	*
	Crater Creek (I)	S	1.63	2.93	Aa+	N	WF Camp 61	0.04	0.74	+	+	+	+	+	-	+	+	+	+
	Hooper Creek	S	0.00	0.63	Aa+	N	Tamarack	0.00	3.40	-	+	+	-	+	+	-	+	+	-
	N. Slide Creek (I)	S	0.00	0.24	Aa+	Y	N	0.24	0.44	+	+	+	+	+	+	+	+	+	+
	S. Slide Creek (I)	S	0.00	0.24	Aa+	N	N. Slide	0.24	0.44	+	+	+	+	+	+	+	+	+	+
	Tombstone Creek (I)	S	0.01	0.50	C/E/F	N	Kaiser	10.65	12.65	-	-	+	+	-	-	-	+	+	+
	Tombstone Creek (I)	S	0.01	0.50	C/E/F	N	Hoffman	0.70	2.90	-	+	+	-	+	+	+	-	+	+
	Tombstone Creek (I)	S	0.50	1.00	Aa+	N	Hooper	0.93	1.63	+	+	+	+	+	-	-	+	+	+
	Tombstone Creek (I)	S	0.50	1.10	Aa+	N	Hoffman	2.90	4.20	+	+	+	-	+	+	+	-	+	-
	Tombstone Creek (I)	S	0.50	1.10	Aa+	N	EF Camp 61	0.07	0.87	+	+	+	+	+	-	-	-	-	+

Project Reach Codes (per Project Nexus Matrix, S. Rowan Nov 2000):
(Lists whether bypassed or augmented, by diversion facility size)

U = Unaltered
A = Flow Augmented
S = Bypass reach, small diversion facility
M = Bypass reach, moderate diversion facility
L = Bypass reach, large diversion facility

(I) = intermittent stream

"+" Means good agreement between project & candidate reference reach
"-" Means weak agreement between project & candidate reference reach
"*" Not determined

Placeholder for Stream Reach Map

<u>Non-Internet Public Information</u>

This Figure has been removed in accordance with the Commission regulations at 18 CFR Section 388.112.

This Figure is considered Non-Internet Public information and should not be posted on the Internet. This information is provided in Volume 4 of the Application for New License and is identified as "Non-Internet Public" information. This information may be accessed from the FERC's Public Reference Room, but is not expected to be posted on the Commission's electronic library, except as an indexed item.

APPENDIX C

Aerial Reconnaissance Field Survey Data Form and Ratings/Guidelines

APPENDIX C-1

Field Reconnaissance Form: Aerial Survey

Stream: ________________________ **Reach:** ________________________

Observer: ________________________ **Date:** _________________________

Valley Shape: ____________ **Valley Material:** Bedrock Colluvium Alluvium

Rosgen Stream Type:______ **Structurally Controlled:** No Yes Rock Wood

Channel Entrenchment: High Moderate Low Uncertain

Bed Type: Braided Pool/Riffle Plane Bed Step-Pool Cascade

Bed Material: Bedrock Boulder Cobble/Rubble Gravel Sand Silt/Clay

Streambank Erosion: None Low Mod High Extreme

Large Woody Debris In-channel: None to Low Moderate to High

Flood Plain Development: None Low Mod High

Corridor Vegetation: None Low Mod High

	Sediment			LWD		
Corridor Recruitment:	Low	Mod	High	Low	Mod	High
Upslope Recruitment:	Low	Mod	High	Low	Mod	High
Tributary Recruitment:	Low	Mod	High			
	Active	Inactive				

Abnormal Channel/Corridor Conditions: ____________________________________

____

____

____

____

APPENDIX C-1

Field Reconnaissance Form: Aerial Survey

Stream: ________________________ **Reach:** ________________________

Observer: ________________________ **Date:** _________________________

LWD Jam **GPS:**____

Comment:____

Spoil Site **GPS:**____

Comment:____

Excess Sediment Deposition **GPS:**____

Comment:____

Possible Project Effects:

____

____

____

____

APPENDIX C-1

Field Reconnaissance Form: Aerial Survey

Additional Detailed Survey Data

Stream: ________________________ **Reach:** ________________________

Observer: ________________________ **Date:** ________________________

Streambank Erosion

Bank Material:	Bedrock	Boulder	Cobble/Gravel	Sand	
Streambank Vegetation Cover:	0-25%	25-50%	50-75%	75-100%	
Bank Erosion:	0-5%	5-20%	20-50%	50-75%	75-100%
Lateral Migration:	Yes	No			

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:	Bedrock	Boulder-talus	Exposed soil	Not Visible
Upslope vegetation:	Scant	Moderate	Dense	
Active Erosion:	Landslides	Gullies/rills	Other	None

APPENDIX C-2

Explanations and Guidelines to Accompany Aerial Survey Data Sheet

Stream: Provide common name

Reach: River Mile stationing on ALP Project Area map to which the data sheet applies

Observer: Name or initials of the individual making observations

Date/Time: Month, day, year and approximate time of day

Valley Shape: Provide a symbol to indicate the general cross sectional shape, valley bottom wide and side slopes

V = Narrow steep sided valley walls; valley bottom fully occupied or almost fully occupied by stream corridor

U = Steep to moderately steep valley walls; valley bottom not fully occupied by the stream corridor

⌣ = Broad valley bottom may or may not be fully occupied by stream and flood plain

___ = Very broad, almost flat valley bottom may have deeply incised channels or broad extensive flood plains or wetlands

Valley Material

Bed rock

Colluvium valley bottom material exists primarily as a result of surface erosional processes from adjacent hillslopes

Alluvium valley bottom material exists primarily as a result of down valley transport by the stream or former stream

Rosgen Stream Type see Rosgen, D. 1996. Applied River Morphology

Structurally Controlled

No or Yes – is channel profile, planform, or alignment controlled by bedrock, large boulders, or large woody debris/jams.

Channel Entrenchment

High: If the channel width and floodprone area are similar as in a narrow deep channel, the stream is highly entrenched.

Low: If the flood prone width is several times the channel width as may occur with a stream having low banks, flowing through a wide corridor the stream is not entrenched or slightly entrenched.

Moderate: A stream which falls between the two conditions described above is moderately entrenched.

Bed Type: Refers to Montgomery and Buffington 1993 bed-forms

APPENDIX C-2

Explanations and Guidelines to Accompany Aerial Survey Data Sheet

Bed Material: visually assess the bed material size categories

Bedrock	
Large Boulder	Over 48”
Boulder	20” to 48”
Small Boulder	10” to 20”
Cobble/Rubble	3” to 10”
Gravel	Less than 3”
Sand/Fines	Sand/silt, etc.

Streambank Erosion

None: no visible signs of streambank erosion; banks and hillslopes are bedrock or large boulder

Low: streambanks well vegetated and/or well armored by rock, little raw streambank visible in less than 20% of the reach

Moderate: streambanks may be vegetated or armored, however raw streambanks or slumping streambanks are present in the reach making up between 20%-50% of channel length. Erosion appears to be in balance with the channel geometry, and soil type.

High: over half of the streambank length shows signs of active erosion, high streambanks are being eroded at several locations or the channel pattern clearly indicates lateral migration is occurring

Extreme: large-scale failures of high streambanks or undercut hill slopes is common within the reach

Large Woody Debris In-Channel

None to Low: less than 5 pieces of LWD per mile

Moderate to High: 5 or more pieces of LWD per mile

LWD jams will be noted under the “Abnormal Channel/Corridor Conditions” section. The geomorphic function of LWD is noted under Structurally Controlled heading on inventory form.

Corridor Recruitment **Sediment**

Low: little to no sign of streambank erosion, little to no in-channel storage of sediment; no sediment sources.

Moderate: sediment recruitment from eroding streambanks, or in-channel storage appears to originate from 20% to 50% of the reach.

High: sediment recruitment from actively eroding streambanks, or in-channel storage exceeds 50% of reach length; or over-bank erosion is evident.

APPENDIX C-2

Explanations and Guidelines to Accompany Aerial Survey Data Sheet

Note tunnel boring sediment spoil sites recorded under "Abnormal Channel/Corridor Conditions" on inventory form and locate on map or GPS.

Corridor Recruitment **Large Woody Debris**

Low: little or no LWD growing within a distance of one half tree height from streambank or with no evidence of active recruitment processes.

Moderate: large woody debris is growing or deposited in the stream corridor but recruitment processes are not very active.

High: large woody debris is growing or readily available in the stream corridor, with active recruitment processes evident (lateral channel migration, over bank flow, land clearing etc).

Upslope Recruitment* **Sediment**

Low: no visible signs of upslope erosion; hillslopes are bedrock, large boulder, or well-vegetated.

Moderate: some visible signs of upslope erosion; hillslopes are partially exposed soils (areas with little or no vegetation)

High: active sediment recruitment is evident (rills & gullies, landslides, unstable roadways/drainage ditches, actively eroding fields, pastures, logging operations, etc) in conjunction with direct delivery to the channel.

***** There must be a direct delivery pathway from the sediment source to the channel for moderate and high ratings. If not, then recruitment is low.

Upslope Recruitment **Large Woody Debris**

Low: little to no LWD growing on adjacent slopes or slopes are a mild gradient or distant from channel providing very little opportunity for recruitment

Moderate: LWD is growing on steep slopes adjacent to channel with reasonably good chance of recruitment from small-scale processes (close to channel; windthrow, senescense, etc.)

High: LWD is growing on steep slopes adjacent to the stream with large-scale recruitment processes evident (ie, land-slides, debris-flows, etc.)

Tributary Recruitment **Sediment**

Low: No sediment deposition or change in streambed composition of receiving stream above and below tributary mouth

Moderate: Small deposition; some change in streambed composition below tributary mouth

High: Large deposition - lateral bar or sediments deposited below tributary mouth; distinct change in streambed composition below tributary confluence

Active: Indicators of active deposition/transport of sediments at tributary confluence (scour marks, organic debris)

Inactive: Indicators of lack of deposition/transport of sediments at tributary confluence (presence of vegetation)

Flood Plain Development

None: the narrow valley width precludes floodplain development throughout the reach

Low: the narrow valley width only permits development of discontinuous overbank flow areas typically one bankfull width or less in width

Moderate: the valley width permits development of contiguous overbank flow areas generally 3 bank full widths

High: contiguous overbank flow areas exist on one or both sides of the stream channel throughout the reach. These overbank flow areas typically exceed 3 channel widths.

Corridor Vegetation

Percent of the surface area within the stream corridor (defined as a minimum of 3 channel widths, or the floodprone area, whichever is greater).

None:	0-5%
Low:	5-25%
Moderate:	25-50%
High:	over 50%

Abnormal Conditions:

Note channel observations that are unique or of special interest. Make notification if flight altitude or vegetative cover diminishes visibility of channel geomorphic conditions.

Obtain GPS coordinates for such features as large debris jams, hillslope failure, tunnel boring sediment spoil sites.

Data Recording Frequency

Aerial Survey Data Sheets will be filled-out for each Rosgen Stream type identified during the reconnaissance, or for approximately every 3 miles of stream channel, whichever is less.

APPENDIX C-2

Explanations and Guidelines to Accompany Aerial Survey Data Sheet

STREAM REACH MAPS

Annotations to be placed onto stream reach maps (enlargement of topographic base maps) during the aerial surveys.

Location of Rosgen Geomorphic Reach Breaks

Rosgen Type, including Dominant Bed Particle Size

Bars

- type (lateral, point, mid-channel)
- stable or active
- vegetative cover
- dominant particle size (using the bed material categories)

Sediment Sources

- Identify location of large-scale sediment sources and erosion process (landslide, rockfall, large active gullies, roads, tunnel borings, or other anthropogenic sources, etc.)

Floodplain/Terraces

- Indicate general location of floodplain and terrace surfaces adjacent to channel

Vegetation Encroachment

- Identify reaches with indicators of possible vegetation encroachment in the low-flow channel

APPENDIX D

Ground Survey Reconnaissance Field Survey Data Form

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________________

Sheet_____ of ______

GPS Log

Date	Data Log ID #	Stream	Station	GPS N	GPS W	Feature

GPS coordinates recorded in UTM WGS 84

APPENDIX E

Completed Field Survey Data Forms
GROUND Completed Field Survey Data Forms
AERIAL Completed Field Survey Data Forms

AERIAL Completed Field Survey Data Forms

Field Reconnaissance Form: Aerial Survey

Stream: Adit 8 **Reach:** 0-1.2

Observer: Woody **Date:**

Valley Shape: V **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion:

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate to High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover:

Bank Erosion:

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Exposed soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Balsm | **Reach:** Can't see Dense Forest Cover

Observer: Woody | **Date:**

Valley Shape: | **Valley Material:**

Rosgen Stream Type: | **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation:

	Sediment	**LWD**
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Bear Creek **Reach:** Below Diversion

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: B **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Plane Bed – Boulder Run, Step-Pool

Bed Material: Bedrock, Boulder - Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None to Low

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low - Rockfall	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: A-1 channel first then a-2 channel.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder, Boulder

Streambank Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Bear Creek **Reach:** 1.75 – 5.7, Above Diversion

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: B1,2 **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Bedrock, Boulder, Cobble/Rubble, Sand – in big pools above RM 3

Streambank Erosion:

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Moderate	Moderate
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Sand deposition at impoundment. Great place to hike.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder, Boulder

Streambank Vegetation Cover: 25-50%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Dam 4 Pool

Observer: Woody **Date:** 7/16/2002

Valley Shape: **Valley Material:**

Rosgen Stream Type: **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bank Material: Bedrock, Boulder

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Shoreline Vegetation: High

	Sediment	LWD
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: No sign of erosion

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:
Lateral Migration:
Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Dam 4 Pool, Ground Servey

Observer: Woody **Date:**

Valley Shape: **Valley Material:** Boulder and Colluvium

Rosgen Stream Type: **Structurally Controlled:** Yes – Rock and Concrete

Channel Entrenchment: High

Bed Type:

Bank Material: Boulder and Rip Rap Concrete

Streambank Erosion: None to Low

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Sand from Big Creek Modest ?

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder and Rip Rap

Streambank Vegetation Cover: 50-75%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Few foot paths

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Above Power House 8 0.0-0.5

Observer: Woody **Date:** 7/16/2002

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low Mod High

Active Inactive

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil
Upslope vegetation: Moderate
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** 0.5, Power House 2 and 2A

Observer: Woody **Date:** 7/16/2002

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: A1 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Some Large Boulder – Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low Mod High

Active Inactive

Abnormal Channel/Corridor Conditions: Access 0.5 or Power House

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil

Upslope vegetation: Moderate to Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Above 2 and 2A to Dam 4, 2.1 – 6.1

Observer: Woody **Date:** 7/16/2002

Valley Shape: V **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: A1 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Plane Bed, Step-Pool

Bed Material: Bedrock, Boulder – Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate to High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low

Inactive Adit 8 and Ely

Abnormal Channel/Corridor Conditions: Very Small Deposit mouth Balsm, young Willows

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 25-50%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Sand

Upslope vegetation: Scant – South side, Dense – North side

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Above Power House 4 - 6.4 – 7.9

Observer: Woody **Date:** 7/16/2002

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Low	Moderate
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Kerokoff Dome

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek below Huntington **Reach:** 7.9 – 9.9 Huntington Dam

Observer: Woody **Date:** 7/16/2002

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: A or B2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Uncertain

Bed Type:

Bed Material: Bedrock, Boulder

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation: High (Extensive)

	Sediment	LWD
Corridor Recruitment:	Low	Low (no flow)
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Ground Truth needed because of extensive Vegetation

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** Above Huntington 13.1 - 16

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock, Alluvium

Rosgen Stream Type: B3, ¼ at Lake them B3 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Plane Bed

Bed Material: Bedrock, Boulder, Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation:

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Rip Rap at Ski Resort

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 75-100%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forest Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Big Creek **Reach:** 16 – 16.5

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: ___________ **Reach:** Billy

Observer:___ **Date:**

Valley Shape: V **Valley Material:**

Rosgen Stream Type: Aa+ **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation:

	Sediment	LWD
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Well Timbered, might have to visit on the ground

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Chiquito **Reach:**

Observer: **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type: B 4 or 5 **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: Limited

Corridor Vegetation: Moderate

	Sediment	LWD
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Moderate	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Can Drive In

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion: Moderate

Field Reconnaissance Form: Aerial Survey

Stream: Chiquito **Reach:**

Observer: **Date:**

Valley Shape:  **Valley Material:** Colluvium

Rosgen Stream Type: B **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle,Plane Bed

Bed Material: Cobble/Rubble, Mostly Gravel and Sand

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:	Active- small lake deposition	

Abnormal Channel/Corridor Conditions: Can Drive in

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Cobble/Gravel – Native Soil

Streambank Vegetation Cover: 50-75%

Bank Erosion: 20-50%

Lateral Migration: Yes

Describe indicators for lateral migration: Bank cutting evident

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Crater Diversion **Reach:**

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool - Possible, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: High

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Walk

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Crater Diversion **Reach:** 0 - 0.6

Observer: **Date:**

Valley Shape:  **Valley Material:** Collovium, Alluvium - Possible

Rosgen Stream Type: **Sructurally Controlled:** No

Channel Entrenchment: Uncertain

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation: High – Obscured View

	Sediment	**LWD**
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Visit on Ground

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Crater Diversion **Reach:** 0.6 – 3.1

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool - Possible, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Ely **Reach:** 0-.9

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ 0.0 – 0.3, A2 0.3 – 0.9 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 25-50%

Bank Erosion: 5-20% (Estimate)

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Exposed soil

Upslope vegetation: Moderate to Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Ely **Reach:** Above 0-0.9

Observer: Woody **Date:**

Valley Shape: U **Valley Material:**

Rosgen Stream Type: A or Aa **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Uncertain

Bed Type: Step-Pool, Cascade(suspect)

Bed Material: Bedrock, Boulder

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation: High – Very Dense

	Sediment	LWD
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Fish **Reach:**

Observer: **Date:**

Valley Shape: Series of Falls **Valley Material:**

Rosgen Stream Type:_________ **Structurally Controlled:**

Channel Entrenchment:

Bed Type: Bedrock

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: None

Corridor Vegetation: None

	Sediment	LWD
Corridor Recruitment:	Low	
Upslope Recruitment:	Low	
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Fish SJR **Reach:** SJR Fish Creek 0-1

Observer: Woody **Date:** 7/17/2002

Valley Shape: V **Valley Material:** Bedrock. Shallow Colluvium

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: None to Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Granite **Reach:** Above AA Falls into SJR

Observer: **Date:**

Valley Shape: U **Valley Material:**

Rosgen Stream Type AA **Structurally Controlled:**

Channel Entrenchment:

Bed Type: Bedrock, Cascade

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: None

Corridor Vegetation: None

	Sediment	LWD
Corridor Recruitment:	Low -Rockfall	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Heavily forested slope

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Granite **Reach:** Above Falls into SJR

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low to Moderate	Low
	Rockfall in Places	
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Falls evaporate – Low Flow

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: Other - Rockfall

Field Reconnaissance Form: Aerial Survey

Stream: ___________ **Reach:** Home Camp

Observer:___ **Date:**

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: B3 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: ?

Bed Material: Bedrock

Streambank Erosion: ?

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: Moderate to High

	Sediment	**LWD**
Corridor Recruitment:	Low	High
Upslope Recruitment:	Low	Moderate
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Lot of Blowdown, Ground Check

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Willow Growth and water may show what project effect is where water shut off due to diversion.

Field Reconnaissance Form: Aerial Survey

Stream: Hookers **Reach:** Above Powerline

Observer: **Date:**

Valley Shape: **Valley Material:** Bedrock

Rosgen Stream Type: B **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material:

Streambank Erosion: None to Low

Large Woody Debris In-channel: Low

Flood Plain Development: Moderate

Corridor Vegetation: Moderate

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Hookers **Reach:**

Observer: **Date:**

Valley Shape: U then V **Valley Material:**

Rosgen Stream Type:_ **Structurally Controlled:**

Channel Entrenchment:

Bed Type: Bedrock

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: None

Corridor Vegetation: None to Limited

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Hookers   **Reach:**

Observer: **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type: B above powerline   **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: Moderate

Corridor Vegetation: Moderate

	Sediment	**LWD**
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Hookers **Reach:**

Observer: **Date:**

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: Aa **Structurally Controlled:**

Channel Entrenchment: High

Bed Type: Step-Pool, Boulder

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation:

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

**Streambank
Vegetation Cover:**

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Hooper **Reach:** 0-0.7 Below Diversion

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: A or Aa **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: Uncertain

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:		
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Walk

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:

Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Hooper **Reach:** 0.7-1.6 Above Diversion

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: Aa+ **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	High	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Upper Slope Till exposed and eroding

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 75-100%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Till

Upslope vegetation: Scant

Active Erosion: Other – Eroding Till

Field Reconnaissance Form: Aerial Survey

Stream: Jack Ass **Reach:**

Observer: **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type: A2 **Structurally Controlled:**

Channel Entrenchment: High

Bed Type: Step-Pool

Bed Material: Boulder

Streambank Erosion:

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:	Low	
	Active – Small deposit in resavior	

Abnormal Channel/Corridor Conditions: Can Drive to upper creek

Streambank Erosion

Bank Material:

Streambank Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Jose **Reach:** 0 – 2

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock Shallow Alluvium

Rosgen Stream Type: A **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Mono Creek **Reach:** 0-2.4

Observer: **Date:** 7/19/2002

Valley Shape:  **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: B2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High – Lots of wood compared to other streams

Flood Plain Development: Low

Corridor Vegetation: High – Conifer

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Woody debris, dam common

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 25-50%

Bank Erosion: 5-20%

Lateral Migration: Not Apparent

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Mono Creek **Reach:** 2.4-2.8

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: B5 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Gravel, Sand

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Moderate
Upslope Recruitment:	Moderate	Moderate
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Lots of Wood

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Cobble/Gravel – Colluvium?

Streambank Vegetation Cover: 50-75%

Bank Erosion: 5-20%

Lateral Migration: Not Apparent

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Mono Creek **Reach:** 2.8 – 3.5

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: B2 **Structurally Controlled:** Yes Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed – Boulder Run

Bed Material: Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 50-75%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forest Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Mono Creek **Reach:** 3.5 – 5.8 (Dam)

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: B2 **Structurally Controlled:** Yes Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High –Not as much as downstream

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: B-5 first 0.2 mile all else same, Willow Bond/encroachment downstream diversion for about ½ mile

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forest Soil

Upslope vegetation: Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: North Fork Stevenson Above Shaver **Reach:** 1.0 –1.6

Observer: ________________________ **Date:** _________________________

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Poll, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Moderate

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions: Channel Scoured Out

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock
Streambank Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: No
Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock
Upslope vegetation: Moderate
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: North Fork Above Shaver **Reach:** 2.3 to 3.6 TNL #7

Observer: ________________________ **Date:** _________________________

Valley Shape:  **Valley Material:** Bedrock, Forested Colluvium

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment (at TNL 7)	**LWD**
Corridor Recruitment:	Low, High	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions: Below Tunnel 7, Channel Hosed, Stevenson above Shaver has potential to edentate North Fork Stevenson

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Cobble/Gravel
Streambank Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: No, incision and widening

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: North Slide **Reach:** 0-1.2

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock, Colluvium Big Debris Fan at bottom

Rosgen Stream Type: Aa+ **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock, Boulder - Rockfall

Streambank Erosion: None to Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Change at top 1.2

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 75-100%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: Landslides – Debris Fan 0 – 0.2 or 0.3 mile at bottom at hillslope

Field Reconnaissance Form: Aerial Survey

Stream: Pitman **Reach:** 0.0 – 1.4

Observer: Woody **Date:** 7/16/2002

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock, Some Boulder (0.0 –0.4)

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: None (0.6 – 1.4), Moderate (0.0 - 0.6)

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: High crossing point, No supply

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25% (Above 0.5), 25-50% (Road)

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Pitman **Reach:** 1.4 – 2.4

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Colluvium, Alluvium

Rosgen Stream Type: B **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: Moderate

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Tamerack joins Pitman 2.4

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 25-50%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forest soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Rancheria **Reach:** Hwy 168 to Surge Valve, 1.95 – 2.25

Observer: Woody **Date:**

Valley Shape:  **Valley Material:** Colluvium, Alluvium

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High – Excavated channel

Bed Type: Plane Bed, Pool/Riffle

Bed Material: Boulder – Rip Rap, Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: None to Low (Tailrace), High (Willow/Alder along and in channel)

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Moderate (Road cut)	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Portal Project Impacted

Streambank Erosion

Bank Material: Bedrock (Rip Rap), Sand (Forest Soil)

Streambank Vegetation Cover: 50-75%

Bank Erosion: 20-50%

Lateral Migration: Yes at Surge Valve

Describe indicators for lateral migration: over wide channel

Upslope Sediment Recruitment

Upslope Material: Forest Soil

Upslope vegetation: Dense

Active Erosion: Gullies/Rills – Road Cut

Field Reconnaissance Form: Aerial Survey

Stream: Rancheria **Reach:** Above Surge Valve, 2.25 – 3.?

Observer: Woody **Date:** 7/16/2002

Valley Shape:  **Valley Material:** Alluvium

Rosgen Stream Type: B2 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Plane Bed, Pool/Riffle

Bed Material: Boulder, Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Great Looking Stream

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Well Vegetated Forest Soil

Streambank Vegetation Cover: 75-100%

Bank Erosion: 20-50%

Lateral Migration: No - Sign

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Rock **Reach:** 0 – 0.45 Below Diversion

Observer: Woody **Date:** 7/19/2002

Valley Shape: V **Valley Material:** Well Forested Colluvium over Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Plane Bed – Rock Chute/Run, Cascade

Bed Material: Bedrock

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: None

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:	High	
	Active - Tailings	

Abnormal Channel/Corridor Conditions: Bedrock Channel, SJR 22.5

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock or Boulder

Streambank Vegetation Cover: 0%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Rock **Reach:** 0.45 – 0.6 Above Diversion

Observer: Woody **Date:** 7/19/2002

Valley Shape: V **Valley Material:** Colluvium, Bedrock

Rosgen Stream Type: A2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step-Pool

Bed Material: Rockfall Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low - uncertain

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:	High	
	Active - Tailings	

Abnormal Channel/Corridor Conditions: A_2 above Diversion in boulder patch 0.15 mile then Aa+ all else same but cascade.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 75-100%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Colluvium Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Ross **Reach:** Ross Below Diversion, 0 - 0.85

Observer: Woody **Date:** 7/19/2003

Valley Shape: V **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Plane Bed – Chutes, Cascade

Bed Material: Bedrock, Some Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: SJR 18.7

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock or Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Colluvium Exposed

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Ross **Reach:** Above Diversion, 0.85 – 1.0

Observer: Woody **Date:**

Valley Shape:  **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: A2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Step - Pool

Bed Material: Rockfall Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: A_2 above diversion 0.15 mile then Aa+ with cascade and bedrock to 1.3 watershed cover the same.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 75-100%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forested Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Saginaw **Reach:**

Observer: **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type: Aa, B upper channel **Structurally Controlled:**

Channel Entrenchment:

Bed Type: Cascade

Bed Material: Bedrock

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development: None

Corridor Vegetation: None

	Sediment	LWD
Corridor Recruitment:	Low	
Upslope Recruitment:	Low	
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** 0 – 3.3

Observer: Woody **Date:** 7/16/2002

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: G1 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle

Bed Material: Bedrock, Boulder - Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** 3.3 – 5.6, Below Willow Creek

Observer: Woody **Date:** 7/16/2002

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: G1 **Structurally Controlled:** Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed – Long Runs

Bed Material: Cobble/Rubble, Sand

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: None, Moderate (below Willow Creek)

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:	Moderate – Willow Creek Active	

Abnormal Channel/Corridor Conditions: Sand and Willows below Willow Creek in channel. Habitat no geomorph in flume.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, shallow soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** 5.6 – 6.1, Below Redinger Dam

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: G1 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Redinger Dam at 6.1

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Redinger Lake

Observer: Woody **Date:**

Valley Shape: **Valley Material:** Colluvium

Rosgen Stream Type: NA **Structurally Controlled:**

Channel Entrenchment: Reservoir

Bed Type:

Shoreline Material: Bedrock, Boulder overlain with colluvium

Streambank Erosion: High

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Shoreline Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: More Bank erosion than I expected to see 8 – 10 feet soil mantel over Rock

Field Reconnaissance Form: Aerial Survey

Shoreline Erosion

Bank Material: Bedrock, Boulder with deep Colluvium

Streambank Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Colluvium

Upslope vegetation: Scant to Moderate

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Head Redinger to Power House 3

Observer: Woody **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type: G2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder, Cobble/Rubble

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Above Power House 3 to RM 12

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle

Bed Material: Bedrock, Boulder, Cobble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Cobble bars first 0.2 miles

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock – Shallow Soils

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** 12.0-15 +, Million Mile Stevenson

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Bedrock, Sparse Colluvium

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle

Bed Material: Bedrock, Boulder – Blast Rock from Road Construction

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Gage at 15.5, Photo 3, Photos 5-10 7/21/2002 Roll 2.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock – Shallow Soils

Upslope vegetation: Scant

Active Erosion:

Rock fall and blast rock from road.

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Below Power House 8, Mile 17 is Dam, RM 15+ - 17

Observer: Woody **Date:**

Valley Shape: U **Valley Material:**

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle

Bed Material: Bedrock, Boulder – Blast Rock/ Rock fall

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: None to Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Photos of Rubble Training Dike

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock – Shallow Soils

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Dam 6 Pool

Observer: Woody **Date:**

Valley Shape: U **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: G1 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type:

Bed Material:

Shoreline Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Hillslope Vegetation: High – Oak, Savanna, Scattered Digger Pine

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:
Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: Ross **Reach:** Up Stream Dam 6 Pool to Fish Creek, 18 – 21.5

Observer: Woody **Date:**

Valley Shape:  **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: B2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed – Boulder Run

Bed Material: Boulder, Cobble/Rubble

Streambank Erosion: None – Bedrock Walls

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: None to Low – Moderate Hillslope Oak and Grass

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment:

Abnormal Channel/Corridor Conditions: Bors with Angular Boulder, Cobble Rubble, Channel Bed also Angular Material No deposition Fish Creek Aa into SJR.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock or Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Colluvium

Upslope vegetation: Moderate – Oak/Brush with sparse Digger Pine

Active Erosion: None

Photo 4 and Photo 5 below Fish Creek..

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Fish to Rock 12.5 – 22.6

Observer: Woody **Date:**

Valley Shape:  **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: B **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed – Boulder run

Bed Material: Boulder, Cobble/rubble

Streambank Erosion: None – Bedrock Boulder sidewalls

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Monster Tailing pile across Rock Creek went downstream and suspect aggradation of SJR to Mammoth

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock or Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Forested Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Rock Creek to Mammoth Dam

Observer: Woody **Date:** 7/16/2002

Valley Shape: V **Valley Material:** Shallow Colluvium, Bedrock

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder, Cobble

Streambank Erosion: None – Bedrock Sidewalls

Large Woody Debris In-channel: None to Low - uncertain

Flood Plain Development: None

Corridor Vegetation: Low – Channels, High- Hillslopes

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:	High	
	Active – Rock Creek	

Abnormal Channel/Corridor Conditions: Spillway impact on SJR below Mammoth Dam Debris in SJR for ½ mile down stream, see photos.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Colluvium Soil

Upslope vegetation: Dense

Active Erosion: Landslides

Hillside 1 to 2 Mile above Rock Creek

Mammoth Pool

Bank Erosion **Much** less then reported - only significant shoreline erosion is in vicinity of campground. 90% or so of shoreline is non-erodible.

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Above Mammoth Dam 35.5 – 37.6

Observer: Woody **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: G1&2 **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder - Rockfall, Bedrock

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: None

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Massive rockfall trigger upstream of channel change.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion:

Rockfall Deposition in channel at upper end of Mammoth Pool, wood at plunge line.

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** Rockfall – South Fork

Observer: Woody **Date:**

Valley Shape:  **Valley Material:** Bedrock, Alluvium

Rosgen Stream Type: B **Structurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle

Bed Material: Cobble/Rubble, Gravel, Sand

Streambank Erosion: Moderate

Large Woody Debris In-channel: Low to Moderate

Flood Plain Development: Moderate

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate to High	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:	Moderate	
	Active	

Abnormal Channel/Corridor Conditions: Deposition Area triggered by Rockfall near 37.6

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder, Sand

Streambank Vegetation Cover: 25-50%

Bank Erosion: 5-20% to 50-75% - Depends on location

Lateral Migration: Yes

Describe indicators for lateral migration: Active cutting of Large sand bars

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion:

Deep sand in Pools lots of young willow, site likely torn up, big time in flood.

Field Reconnaissance Form: Aerial Survey

Stream: Shankflat___ **Reach:**

Observer: **Date:**

Valley Shape: **Valley Material:**

Rosgen Stream Type:_________ **Structurally Controlled:**

Channel Entrenchment:

Bed Type:

Bed Material:

Streambank Erosion:

Large Woody Debris In-channel:

Flood Plain Development:

Corridor Vegetation:

	Sediment	LWD
Corridor Recruitment:		
Upslope Recruitment:		
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Heavily forested slope

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material:
Streambank
Vegetation Cover:

Bank Erosion:

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation:

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** Above San Joaquin about 1.5

Observer: **Date:** 7/16/2002

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: G2 some B **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Bedrock, Boulder - Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low – Sandbar	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Rockfall has big inflience

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion:

Massive Boulders Results from Rockfall

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** RM2 – R 140

Observer: **Date:**

Valley Shape: U **Valley Material:** Bedrock

Rosgen Stream Type: G **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Bedrock, Boulder – Rockfall impressive in several places

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Soil

Upslope vegetation: Scant

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: SJR **Reach:** 14.3-17.8, Rattlesnake crossing to Camp 61

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock walls, Alluvium corridor

Rosgen Stream Type: B **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Plane Bed

Bed Material: Boulder, Cobble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder, Cobble/Gravel

Streambank
Vegetation Cover: 25-50%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Soil

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** Camp 61 to Camp 62, 17.8 – 20.1

Observer: **Date:** 7/16/2002

Valley Shape: U **Valley Material:**

Rosgen Stream Type: B & G alternates **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High to Moderate (varies)

Bed Type: Pool/Riffle, Plane Bed – Boulder Runs

Bed Material: Bedrock, Boulder, Cobble

Streambank Erosion: None, Low (in places)

Large Woody Debris In-channel: None to Low

Flood Plain Development: None to Low

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:		Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Young Willows along margins at Camp 61

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder

Streambank
Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: Yes – very little

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Exposed Soil

Upslope vegetation: Scant

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 20.0 – 20.9

Observer: **Date:**

Valley Shape:  **Valley Material:** Alluvium

Rosgen Stream Type: C3 **Sructurally Controlled:**

Channel Entrenchment: Low

Bed Type: Pool/Riffle

Bed Material: Cobble/Rubble

Streambank Erosion: Low to Moderate

Large Woody Debris In-channel: None to Low

Flood Plain Development: Moderate

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Campground on flood plain/terrace

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Alluvium

Streambank
Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: Probable

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material:

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 20.9 – 21.8 South Fork above Mono

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock, Alluvium

Rosgen Stream Type: B 2&3 **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: Low, Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Boulder, Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Short G selection above Road Bridge

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder, Cobble/Gravel

Streambank
Vegetation Cover: 25-50%

Bank Erosion: 5-20%

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 22.0 – 23.4 Below Bear Creek to Poison Meadow

Observer: **Date:**

Valley Shape: U **Valley Material:** Bedrock, Shallow Colluvium

Rosgen Stream Type: B 3 **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: Moderate

Bed Type: Plane Bed – Boulder Run Rapids

Bed Material: Boulder, Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 23.4 – 26.1

Observer: **Date:**

Valley Shape:  **Valley Material:** Colluvium

Rosgen Stream Type: B 2 **Sructurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Plane Bed – Run Rapids

Bed Material: Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Moderate
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Gage Site 24.5 Campsite opposite Talus Slide 24.9

+ or -

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Cobble/Gravel, Sand Colluvium

Streambank Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil

Upslope vegetation: Moderate to Dense

Active Erosion:

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 26.1 – 27.7

Observer: **Date:**

Valley Shape: Flat **Valley Material:** Bedrock, Colluvium

Rosgen Stream Type: C5/B5 **Sructurally Controlled:** No

Channel Entrenchment: Moderate to Low

Bed Type: Plane Bed

Bed Material: Sand

Streambank Erosion: Low

Large Woody Debris In-channel: Moderate to High

Flood Plain Development: Moderate

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Moderate
Upslope Recruitment:	Low	Moderate
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Campground and Road Crossing

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Forest Soil

Streambank
Vegetation Cover: 75-100%

Bank Erosion: 5-20%

Lateral Migration: No – Not Apparent, Low energy

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Soil

Upslope vegetation: Dense

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Fork **Reach:** 27.7 – 27.9 Below Florence

Observer: **Date:**

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: G1 **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Pool/Riffle, Step-Pool

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Downstream of dam side cast tailings weir at downstream end

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank
Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: None

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: South Slide **Reach:** 0-1.2

Observer: **Date:**

Valley Shape: U **Valley Material:** Bedrock, Colluvium Big Debris Fan @ BTM

Rosgen Stream Type: Aa+ **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock, Boulder - Rockfall

Streambank Erosion: None to Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Moderate	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 75-100%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: Landslides – Debris Fan at bottom of slope, 0 – 0.2 or 0.3 mile

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Above Shaver **Reach:** 1.6-1.8

Observer: ______________________ **Date:** ______________________

Valley Shape: ____________ **Valley Material:** Bedrock

Rosgen Stream Type: G **Structurally Controlled:** Yes - Rock

Channel Entrenchment: High - Moderate

Bed Type: Pool/Riffle

Bed Material: Bedrock, Boulder

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Moderate	Low

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock
Streambank Vegetation Cover: 0-25%

Bank Erosion: 5-20%

Lateral Migration: No
Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Above Shaver **Reach:** 1.8 to 2.3

Observer: ________________________ **Date:** _________________________

Valley Shape:  **Valley Material:** Alluvium

Rosgen Stream Type: B_3 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Beds (Runs)

Bed Material: Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Moderate

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Moderate
Upslope Recruitment:	Moderate	Low-too far from Channel

Tributary Recruitment: Low Mod High

Active Inactive

Abnormal Channel/Corridor Conditions: Debris Flow deposition area, Good recovery underway

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Cobble/Gravel
Streambank Vegetation Cover: 75-100%

Bank Erosion: 0-5%

Lateral Migration:

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Below Shaver **Reach:** 0 to 0.7 Aa+, 0.7 to 1.4 A1, 1.4 to 2.2 Aa+

Observer: ________________________ **Date:** _________________________

Valley Shape: ____________ **Valley Material:** Bedrock

Rosgen Stream Type:_____ **Structurally Controlled:** Yes-Rock

Channel Entrenchment: Low

Bed Type: Cascade and Waterfall

Bed Material: Bedrock, Boulder Rockfall

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: None

		Sediment		LWD
Corridor Recruitment:		Low		Low
Upslope Recruitment:		Low		Low
Tributary Recruitment:	Low	Mod	High	
	Active	Inactive		

Abnormal Channel/Corridor Conditions: Blast Rock Below Read Tunnal Borings on valley walls

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock

Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Below Shaver **Reach:** 3.2 to 3.9

Observer: ________________________ **Date:** _________________________

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes

Channel Entrenchment: High

Bed Type: Cascade

Bed Material: Bedrock

Streambank Erosion: None

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	LWD
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Moderate	Low

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock
Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Shallow Soil
Upslope vegetation: Scant to Moderate
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Below Shaver **Reach:** 2.7-3.2

Observer: ________________________ **Date:** _________________________

Valley Shape:  ____________ **Valley Material:** Alluvium

Rosgen Stream Type: B_3 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Low-too flat

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder, Cobble/Gravel, Sand

Streambank Vegetation Cover: 25-50%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Below Shaver **Reach:** 2.5 – 2.7

Observer: ________________________ **Date:** _________________________

Valley Shape:  **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Structurally Controlled:** Yes

Channel Entrenchment: High

Bed Type: Step-Pool, Cascade

Bed Material: Bedrock, Boulder

Streambank Erosion: None

Large Woody Debris In-channel: None

Flood Plain Development: None

Corridor Vegetation: Low

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:	Low	Low

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder
Streambank Vegetation Cover: 0-25%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock, Forest Soil
Upslope vegetation: Moderate
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Stevenson Below Shaver **Reach:** 3.9-4.3

Observer: ________________________ **Date:** _________________________

Valley Shape:  **Valley Material:** Alluvium

Rosgen Stream Type: G or B **Structurally Controlled:** No

Channel Entrenchment: High

Bed Type: Pool/Riffle

Bed Material: Boulder, Sand

Streambank Erosion: Moderate

Large Woody Debris In-channel: Low

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	LWD
Corridor Recruitment:	Moderate	Low
Upslope Recruitment:	Low	Moderate

Tributary Recruitment: Low Mod High
Active Inactive

Abnormal Channel/Corridor Conditions: Immediately Below Dam, No Spillway

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Sand

Streambank Vegetation Cover: 75-100%

Bank Erosion: 5-20%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil
Upslope vegetation: Dense
Active Erosion: None

Field Reconnaissance Form: Aerial Survey

Stream: Tamerack **Reach:** 0 – 2.4

Observer:___ **Date:**

Valley Shape: U **Valley Material:** Alluvium

Rosgen Stream Type: B3 **Structurally Controlled:** No

Channel Entrenchment: Moderate

Bed Type: Pool/Riffle, Plane Bed

Bed Material: Cobble/Rubble

Streambank Erosion: Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: Low

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Moderate	Moderate
Upslope Recruitment:	Low	Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions:

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Bedrock, Boulder, Cobble/Gravel

Streambank Vegetation Cover: 25-50%

Bank Erosion: 5-20%

Lateral Migration: Yes – Isolated bank erosion

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Forest Soil

Upslope vegetation: Dense

Active Erosion: None

Moderate Wood above HWY 162

Field Reconnaissance Form: Aerial Survey

Stream: Tombstone **Reach:** 0.6 – 2.5, Above meadow

Observer: **Date:**

Valley Shape: V **Valley Material:** Bedrock

Rosgen Stream Type: Aa+ **Sructurally Controlled:** Yes - Rock

Channel Entrenchment: High

Bed Type: Cascade

Bed Material:

Streambank Erosion: None to Low

Large Woody Debris In-channel: None to Low

Flood Plain Development: None

Corridor Vegetation: High

	Sediment	**LWD**
Corridor Recruitment:	Low	Low
Upslope Recruitment:		Low
Tributary Recruitment:		

Abnormal Channel/Corridor Conditions: Could not see channel across meadow observed by Cotton Wood and Willow. Walk Lower 0.6 mile or so.

Field Reconnaissance Form: Aerial Survey

Streambank Erosion

Bank Material: Boulder

Streambank Vegetation Cover: 50-75%

Bank Erosion: 0-5%

Lateral Migration: No

Describe indicators for lateral migration:

Upslope Sediment Recruitment

Upslope Material: Bedrock

Upslope vegetation: Scant

Active Erosion: None

GROUND Completed Field Survey Data Forms

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB/JH

Date/Time: 8/19/2002 9:00 Sheet of

Stream: Adit 8

General Location: .5-1.3

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.5		37 11.501	119 17.750	start of survey, D/S of canyon Road, base of bedrock cascade	
1	2	0.52		37 11.450	119 17.833	SS#1, flow splits around lg bldr at station .53	
	3	0.53		37 11.404	119 17.710	culvert outlet D/S of canyon road	
	4	0.53		37 11.399	119 17.725	Canyon Road (crossing, WP site adit 8 site 1 ~50' U/S	
2	5	0.57		no gps coverage	no gps coverage	SS#2	
	6	0.6		no gps coverage	no gps coverage	potential RB, Base of BR cascade, WP site adit 8 site	
	7	0.65		no gps coverage	no gps coverage	small drainage enters channel, start survey segment	
3	8	0.68		37 11.140	119 17.780	SS3	
	9	0.7		37 11.463	119 17.680	Pot. RB, base of BR cascade	
4	10	0.75		no gps coverage	no gps coverage	SS4	
	11	0.83		no gps coverage	no gps coverage	RB form A2a+ to A1a+, gradient inc. sig. U/S	
5	12	0.88		37 11.123	119 17.806	SS5 in A1a+/A2a+	
	13	0.9		no gps coverage	no gps coverage	Spoils form tunnel along BR bank upslope	
	14	0.93		37 11.110	119 17.890	source of flow D/S originates from BR outcrop on LB, channel is dry U/S	
	15	0.95		37 11.041	119 17.899	Unpaved road , D/S of Proj. structure	
6	16	1.1		37 11.005	119 17.899	SS# 6 in ephemeral drainage	
	17	1.15		37 10.988	119 17.896	steel conveyance pipe crosses channel and goes subsurface in BR outcrop in RB	
7	18	1.3		37 10.299	119 17.975	End of survey, trans . Lines cross channel	
	19	0.95		37 11.022	119 17.887	gps check on unpaved road crossing (GPS 15)	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
.5-.53	1	3.5	0.8	1.2	5		1.4	4.38				x	M	M		2/3	A2a+	???break in slope, energy diss. area	2
.53-.6	2	2.5	0.4	0.6	5		2	6.25				x	H	H		2/4	A4/B4	A4a+?, check gradent poos. Aa+	5
.65-.7	3	4.3	0.4	0.6	5		1.16	10.75				x	H	H		2(4)	A2/A4/ A2a+/A4a+	check gradient, channel alternates between entrenced and mod. entrenched	8
.7-.75	4	4	0.6	0.8	7		1.75	6.67			x		H	H		2	A2a+	alternating area of high to mod. Entrenchment, measuered in mod entrenhed area	10
.83-.88	5	NA	--	--	--	--	--	--			x		--	--		2/3	A1a+/A2a+	no app. Indicators, steep BR/Bldr cascade	12
1.0-1.1	6	--	--	--	--	--	--	--			x		--	--		2	A1a+	Eph. Drainage poorly defined bed and bank	16
1.2-1.3	7	--	--	--	--	--	--	--			x		--	--		2	A1a+/A2a+	Eph. Drainage poorly defined BF indicators	18

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		5	60	20	10	3	2	
2		--	10	10		70	10	
3		--	--	40	10	40	10	
4		5	30	30	20	10	5	
5		40	40	10	2	4	4	
6		70	20	--	--	--	10	Org. mtl on bed
7		50	15	15	--	--	20	Org. mtl on bed

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	--	--	--	x	none	--	--	x	--	10	
2	none	--	--	x	x	none	--	x	x	--	60	
3	few	--	--	x	x	none	--	x	x	--	40	
4	few	--	--	--	x	none	--	--	x	--	10-20	
5	none	--	--	x	x	none	--	x	x	--	60	
6	--	--	--	--	--	--	--	--	--	--		
7	--	--	--	--	--	--	--	--	--	--		

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	
5	A	--	--	--	--	--	--	
6	A	--	--	--	--	--	--	
7	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1		
2	P	1	1	4	2		conifers within BF along channel margin
3	P	1	2	2/3	2		some alder within BF channel
4	P	1/2	maple	2	2		maple within BF channel and Margin
5	P	1/2	maple	2/3	2		few areas where maple growing within Boulder matrix within BF channel
6	P	1/2	thimbleberry	1	3		Thimbleberry growning in org mtl. On channel bed
7	P	1/2	1/2/5	1/2/3	3		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	0	STABLE	few intermittent areas where sand present and scour is evident
2	Y	3/4	3	2	VULNERABLE	veg provides stability
3	Y	2/3	3	2	VULNERABLE	course mtl and veg provide stability
4	N	1/2	3	2	STABLE	few intermitent areas where sand present and scour is evident
5	N	1	0	0	STABLE	
6	N	21	0	0	STABLE	poorly defined bed/bank -eph dom., coarse matl/BR provides stab.
7	N	1/2	0	0	STABLE	coarse matl. Provides stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	--	unit	6	sand/OM from upslope
2	4	1/2	unit	6	sand/OM from upslope
3	4	1/2	unit	6	sand/OM from upslope
4	4	1/2	50% unit	6	scoured/undercut banks where sand present ~50%
5	4	--	unit	6	sand/OM from upslope esp. in vicinty of area along RB
6	4	--	unit	6	sand/OM from upslope
7	4	--	unit	6	sand/OM from upslope

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	P (1)	x	x	x	6	H	mod-hig density of conifers, steep slopes
2	P	x	x	x	1/3/4	H	dens. conifers along channel, low slopes
3	P	x	x	x	3/6	H	mod - high dens. conifers along channel, low slopes
4	A	--	--	--	--	H	mod - high dens. conifers along channel, moderate steep slopes
5	P	x	x	x	3/6	H	dense conifers, steep slopes, fire area along RB
6	A	--	--	--	--	L	little to no trees due to BR
7	P	x	x	x	3/6	H	Dense Conifers, steep slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF Date/Time: 8/9/2002 Sheet of

Stream: Balsam General Location: Big Creek conf - RM 0.6

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Photos	NORTHING	WESTING	Feature	Comments
	1	0	45-46	37 11.775	119 15.670	Big Ck conf bar, lg mid channel bar D/S of mouth Aa+	
1	2	0.03		37 11.758	119 15.671	site 1 150' U/S in A2a+ (lower grad portion)	
2	3	0.1		37 11.695	119 15.690	site 2 570' in A1a+ (BR sheet and trench)	
	4	0.13		37 11.669	119 15.702	break (sm) to B? ~690' low grad	
3	5	0.15		37 11.647	119 15.695	site 3 ~810' in lwr gradient before huge Aa+ Falls	
	6	0.17	47	no gps	no gps	Break to Aa+ 100' U/S of site 3	
	7	0.29		37 11.537	119 15.697	top of falls and above gravel pipe @ 1550, sm B secion 100' length	
	8	0.37		37 11.480	119 15.646	1990' camp sierra rd culvert (Aa+ U/S and D/S) BR control, some bldr	
	9	0.44	48-2320'	37 11.486	119 15.642	top of falls / base of sm camp sierra swimming hole - concete w/ weir	
4	10	0.5	49	37 11.409	119 15.590	site 4 A 2670 U/S ~200' U/S of swimming hole/ Under transmissions lines	
	11	0.53		no gps	no gps	2782 Aa+ (A1a+) ~50 U/S of trans. Lines w/in B?	
	12	0.54		no gps	no gps	sm trib @ 2842 (A2a+ w/ much sand)	
	13	0.59		no gps	no gps	3125 break B to A1a+ - 100' bldr deposit and base of falls U/S powerlines / D/S of BC Rd	
	14	0.64		37 11.278	119 15.562	Big Cr Road Bridge	
						maybe flatter B above fall U/S of Rd	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______ Date/Time: ______ Sheet ____ of ____

Stream: ______ General Location: ______

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.03	1	6.75	**1**	**1.2**	**17**	**30**	2.5	6.75	4.4	x			M/L	M/L	M	2(3)	A2a+	High gradient cascade, site in lower grad. Deposition zone	2
.05-.1	2	4	0.5	1	8	30	2	8	7.5	x			M	M/L	M/L	2	A1a+	High gradient cascade, site in BR sheet riffle	3
.13-.16	3	12	0.4	0.9	17	30	1.4	30	2.5	x	x		M	M	M	4	B3	Low gradient ~4% riffle, dissip/dep zone below falls	5
.16-.5	4	11	0.5	0.9	17	--	1.5	22	--	x	x		M/L	M/L	--	4	B3/B2	WP site 1BD	10

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
2	1	--	60	10	5	5	20	Boulder only in cascade portions
3	2	85	5	5	2.5	--	2.5	all BR
5	3	--	5	10	50	25	10	
10	4	--	5	20	35	25	15	adj may be sidecast from road

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Sand Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	1	1	N	N	many	--	N	N	N	80	Not many pools
2	none	--		N	N	few	--	N	N	N	20	few pools
3	none	2	N	Y	Y	few	1	Y	Y	N	30	few pools
4	few	--	N	N	Y	few	1	N	Y few	N	65	sed in bldr shadow and pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	P	1		1		A	gravel (sand/cobble)	Bar is pool tail out 3x3
2	A	--	--	--	--	--	--	
3	P	2	1 sand	1 gvl		A	gravel/sand	gvl bar in shadow of LWD root mass
4	P	1			1	A	sand	assoc w/bldr shadow

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	none - few grasses on sm streamside deposits
2	A	--	--	--	--	--	none- few grasses and seedling in BR above BF
3	A	--	--	--	--	--	none- few grasses and ferns @ or above BF
4	P	1/3	5	1	POSSIBLE	N/A	grasses on bars and at BF encroach due to power line clearing (?)

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	0 (2)	Stable	heavily bldr armored some rot cur too
2	N	1 (BR)	0	0 (2)	Stable	all BR
3	Y	2/3	3	2	vuln	appears stable
4	Y	2/3/1	1/2/3	2/1/3	unstable	appears to be actively incising

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	1	unit	6	steep upslope w/ some loose soil covered w/ duff
2	4 minor	n/a	unit	6	non-erodible -some upslope or upstream sand
3	4	1	unit	6	sediment from upstream transport and upslope
4	1/4	1/2/3	75% unit	6	inscision causing loose unprotected banks to slump and slide

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	x		x	6	M/H	few LWD in channel
2	P					M	steep, some conifers from upslope
3	P	x	x	x	2/5	M	steep, some conifers form upslope; one root mass has gvl bar in shadow
4	P	x	x	x	5	M (due to line clearing)	transmission line clearing @ site

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 8/9/2002 8:00 Sheet of
Stream: Balsam Cr
General Location: .6-1.2

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.62		37 11.277	119 15.581	Big Creek Road crossing	
	2	0.69		37 11.250	119 15.524	gauging station road crossing	
1	3	0.7		37 11.271	119 15.491	gaging station / impoundment	
	4	0.75		no gps	no gps	RB form A1a+ to B2/B3?, same as unit 93 site 4?, Pink flagging 6/3/02, Small lake at top of cascade	
	5	0.77		37 11.193	119 15.496	small drainage flows in	
2	6	0.79		37 11.197	119 15.502	Data rec. location in B2/B3 channel - D/S of Balsam HP site 7	
	7	0.81		37 11.171	119 15.506	gradient increases and boulders more predominant	
	8	0.85		37 11.139	119 15.507	RB from B2/B3 to A1a+	
3	9	0.91		37 11.103	119 15.465	data Rec. location in A1a+	
4	10	1.03		37 11.044	119 15.401	data Rec. location in A1a+	
	11	1.09		37 11.037	119 15.371	Large LWD Jam - flow underneath- caused sediment deposition Upstream - sand, gravel, cobbles	
5	12	1.15		37 10.990	119 15.336	Data Rec. Location for 1.15-1.20 A1a+	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.60-.7	1	--	--	--	--	--	--	--	--		x		--	--	--	1/2	A1a+	No good indincators, bedrock, cascade, channel width ~10'	
.75-.8	2	11	0.9	1.4	17.3	--	1.73	12.2	--			x	H	H	--	4	B2/B3		
.85-.91	3	12.2	0.8	1.2	15	450	1.2	15.3	36.9		x		H	H	M	3	A1a+		
1.0-1.05	4	30	0.1	0.5	33	600	1.1	300	20	x			M	M	M	3	A1a+	difficult to measure due to sheet flow across bedrock	
1.15-1.20	5	--	--	--	--	300	--	--	NA	x			--	--	M	1/2	A1a+		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		85	14	--	--	--	1	
2		--	20	20	30	10	20	
3		60	15	10	2.5	2.5	10	
4		90	3	--	--	<1%	6	
5		90	5	2	--	1	2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	--	--	--	--	none	--	--	x	--	80	No gravel
2	few	--	--	--	x	few	--	x	x	--	80-100	
3	few	--	--	--	x	few	--	x	x	--	80	
4	none	--	--	--	x	none	--	--	x	--	60-70	gravel <1%
5	none	--	--	--	x	none	--	--	x	--	80	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	
5	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1	--	Interspersed alder and willow on channel margin; size class 1/2/3 (above Bf although indicators poor)
2	A	--	--	--	1	--	very little rip veg - some permininal herb/ alder (1/2/3) in Flood Plain area
3	A	--	--	--	1	--	very little rip veg - some permininal herb/ alder (1/2/3) in FP area 20%unit
4	A	--	--	--	1	--	very little rip veg - some permininal herb/ alder (1/2/3) in FP area
5	A	--	--	--	1	--	very little rip veg - some permininal herb/ alder (1/2/3) in FP area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	--	Stable	BR banks
2	Y	1/2/3	3	2	Vulnerable	Lg Bldr small bldr and veg provide stability but evidence of scour and undercut
3	N	1	--	--	Stable	some areas of scour where sand bank are present (under cut backs) <20%
4	N	1	--	--	Stable	some areas of scour where sand bank are present (under cut backs) <10%
5	N	1	--	--	Stable	--

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	--	200'x80' upslope	6	road fill contributes sand to reach, steep slope loose sand
2	4	1/2	unit	6	up slope - significant Sand deposts (loose)
3	4	1/2	<20% unit	6	upslope-sand and organic material -<20% of banks -sand with undercut
4	4	--	unit	6	upslope sand and organic material - steep slopes
5	4	--	unit	6	upslope sand and organic material - steep slopes

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
0.71	D	Inactive	12x6	small boulder	lg boulder/cobble sand present; 70% perennial veg cover

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	x	x	x	3/6	H	steep slopes w/ mod dens. trees adjacent to channel
2	P	x	x	x	3/6	H	abundant conifers along channel
3	P	x	x	x	3/6	H	abundant conifers along channel and steep slopes
4	P - very little	--	--	x	6	H	abundant conifers along channel and steep slopes
5	P	x	x	x	3/6	H	abundant conifers along channel and steep slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB Date/Time: 9/9/2002 8:45 Sheet 2 of 10

Stream: Bear Creek General Location: D/S of Div. Stations 1.1-1.57

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.57		37 20.151	118 58.529	diversion dam	
1	2	1.48		37 20.089	118 58.584	SS #1 in B2 reach	
	3	1.47		37 20.090	118 58.595	BR outcrop and rock fall confine channel	Pot. RB from B- A/G. Disregard- only 50 ft- still B
	4	1.43		37 20.074	118 58.616	Bedrock confines LB and RB. Gradient increases. RB from B2- A2	
	5	1.39		37 20.051	118 58.638	lose BR confinement on RB. Pod. RB from A2-B2?- disregard no RB	
2	6	1.41	no GPS coverage. Approx. 100 ft. D/S of GPS #5- SS#2 in A2 reach				
3	7	1.37		37 20.048	118 58.652	SS#3 in A2 (B2?) reach	
	8	1.33		no GPS coverage. Approx. 200 ft. D/S of GPS #7-gradient increase to 8-10%			
	9	1.25		37 19.977	118 58.732	channel widens, still A2- colluvium/large boulder confines channel	
4	10	1.21		37 19.937	118 58.737	valley widens-lose bedrock confinement on LB- Pot. RB A2-B2. Disregard no RB SS#4	
	11	1.16		37 19.952	118 58.793	Bedrock along valley walls less steep- pot. RB from A1/A2 - B1/B2? appears. similar to Pitman Ck. No RB.	
5	12	1.12		37 19.955	118 58.811	SS#5 in A1/A2	
	13	1.1		37 19.986	118 58.858	End of Survey	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB　　Date/Time: 9/9/2002　　Sheet 3 of 10

Stream: Bear Cr.　　General Location: D/S Div. Dam

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
1.57-1.48	1	36	1.2	3	62		1.72	30			X		M/H	M/H		4	B2	measurments collected in boulder riffle	2
1.39- 1.43	2	-	-	-	-	200	-	-		X			NA	N/A	H	3	A2	no apparent BF indicators. Large bldr. /step pool	6
1.32- 1.39	3	37	1.5	2.5	48	250	1.3	24.6	6.8		X		L/M	L/M	H	3/4	A2/B2?	BF indicators poor due to presence of lg. bldr./BR	7
1.20- 1.25	4	-	-	-	-	250	-	-	-		X		NA	NA	H	3	A2	No app. BF indicators. Lg. bldr./ bedrock	10
1.10- 1.15	5	40	2.4	2.9	55	500	1.38	13.8	12.5		X		L/M	L/M	H	3/4	A1/B1?	BF indicators poor. LB-BR/RB large bldr.	12

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB

Date/Time: 9/9/2002

Stream: Bear Creek

General Location: D/S of div.

DOMINANT STREAMBED PARTICLE SIZE

	Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
1		1	15	30	30	20	4	<1	
2		2	15	60	15	7	3	<1	
3		3	15	60	15	7	3	<1	
4		4	10	55	15	10	10	<1	
5		5	60	15	15	5	5	<1	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB | Date/Time: 9/9/2002 | sheet 5 of 10

Stream: Bear Creek | General Location: D/S div.

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	None	-	-	-	X	None	-	-	-	-	no pools	absense of sand in BF channel, some on FP
2	None	-	-	-	X	None	-	-	-	-	0	no sand
3	Few	-	-	-	X	None	-	-	-	-	0	no sand
4	Few	-	-	-	X	None	-	-	-	-	0	no sand
5	None	-	-	-	X	None	-	-	-	-	0	no sand

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	P	1	-	2	-	Inactive	small bldr./cobble	Visually appears to be 1 continuous bar. However there is flow between the bars. Each bar is approx. 10 X 4 ft. with dense willow veg (size class 1)
2	A	-	-	-	-	-	-	-
3	P	1	-	1	-	Inactive	small bldr./cobble	Downstream of large boulder with dense willow veg. (size class 1)
4	A	-	-	-	-	-	-	-
5	A	-	-	-	-	-	-	-

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002

sheet 6 of 10

Stream: Bear Creek

General Location: D/S div.

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	2	3	1	3		willow growing in thin wetted channel possibly associated with former extent of MCB as willows are situated imm. U/S & D/S of bars; some sparse herbaceous in wetted channel
2	P	1/2	3	1	2/3		willow within wetted channel and along channel margin in what appears to be BF channel; no good BF indicators so it is difficult to identify whether willows are in BF channel or above
3	P	1/2	3	1	2/3		willow within wetted channel and along channel margin in what appears to be BF channel; no good BF indicators so it is difficult to identify whether willows are in BF channel or above
4	P	1/2	3	1	2/3		willow within wetted channel and along channel margin in what appears to be BF channel; no good BF indicators so it is difficult to identify whether willows are in BF channel or above
5	P	1/2	3	1	2/3		willow within wetted channel and along channel margin in what appears to be BF channel; no good BF indicators so it is difficult to identify whether willows are in BF channel or above

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002 sheet 7 0f 10

Stream: Bear Creek

General Location: D/S div.

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1/2	0	-	Stable	Banks comprised of bedrock and bldr./cobble
2	N	1	0	-	Stable	Banks comprised of large bldr. and bedrock
3	N	1	0	-	Stable	Banks comprised of large bldr. and bedrock
4	N	1	0	-	Stable	Banks comprised of large bldr. and bedrock
5	N	1	0	-	Stable	Banks comprised of large bldr. and bedrock

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB

Date/Time: 9/9/2002

Stream: Bear Creek

General Location: D/S Div.

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	2	-	50% of unit	2/3/4	rockfall present along toe of bedroxk outcrop; small boulder/cobble due to road and dam construction
2	2	-	unit	2	large boulders along toe of bedrock
3	2	-	unit	2	large boulders along toe of bedrock
4	2	-	unit	2	large boulders along toe of bedrock
5	2	-	50% of unit	2/3	large boulders along toe of bedrock

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002 sheet 9 of 10

Stream: Big Creek

General Location: D/S div.

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	-	-	X	6	High	Mod. density of conifers along channel with areas of steep slope
2	P	-	-	X	6	Mod.	low-mod. dnesity of trees along channel, steep slopes
3	P	-	X	X	6	Mod.	low-mod. dnesity of trees along channel, steep slopes
4	P	-	-	X	6	Mod.	low-mod. dnesity of trees along channel, steep slopes
5	P	-	-	X	6	Mod.	low-mod. dnesity of trees along channel, steep slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002

Sheet 2 of 10

Stream: Bear Creek

General Location: U/S Div.

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.78		37 20.301	118 58.432	U/S end of impound	start U/S survey
	2	1.8		37 20.316	118 58.428	Base of bedrock cascade	A1a+
	3	1.82		37 20.345	118 58.398	Top of Bedrock cascade	A1a+
	4	1.86		37 20.359	118 58.379	Gaging station	
1	5	1.89		37 20.382	118 58.368	SS#1- B1	
	6	1.96		37 20.424	118 58.322	start of survey segment #2	boulder and sand more predominant
2	7	1.99		37 20.434	118 58.319	SS #2	
	8	2		37 20.446	118 58.206	Substrate transitions from bldr/bedrock to cobble U/S	
	9	2.1		37 20.494	118 58.229	end of survey	
3	10	2.08		37 20.503	118 58.240	SS #3	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002

Stream: Bear Cr.

General Location: U/S div.

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
1.84- 1.90	1	56	0.6	1	65		1.16	93.3				X	H	H		4	B1 (F1?)	BF- measurement in BR riffle at break in slope with fresh sand deposit on RB	5
1.96- 1.99	2	68	0.7	1.8	81		1.2	97.1				X	H	H		4	B1/B2	(F1/F2?)	7
2.0- 2.10	3	56	1.3	1.8	75		1.33	43.1				X	M	M		4	B2/B3	(F2/F3?) Evidence of recent flow in floodplain area.	10

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002

Stream: Bear Cr.

General Location: U/S div.

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
1		90	3	2	1	3	1	
2		55	20	10	5	5	5	
3		10	15	25	30	5	15	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC
Date/Time: 9/9/2002

Stream: Bear Cr.
General Location: U/S div.

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	None	-	-	-	X	None	-	-	-	-	No pools	
2	Few	-	-	-	X	Many	-	-	X	-	No pools	sand present in velocity shadows D/S of high bedrock areas.
3	Few	-	-	-	X	Many	1	X	X	-	70-80%	1 pool

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	
2	A	-	-	-	-	-	-	
3	P	2	2	-	-	active	1- 70' X 30' cobble, 1 - 60' X 10' sand	situated D/S of LWD jams. no veg. on bars

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 9/9/2002 sheet 6 of 10

Stream: Bear Cr.

General Location: U/S div.

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1		Rip. veg. on banks between BF and FP
2	A	-	-	-	1		Rip. veg. on banks between BF and FP
3	A	-	-	-	1		Rip. veg. on banks between BF and FP

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 9/9/2002 sheet 7 of 10

Stream: Bear Cr.

General Location: U/S div.

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N (Y)	1/2	0 (3)	- (2)	stable	Primarily bedrock with 200' along RB composed of boulder/sand which shows evidence of scour
2	N	1/2	0	-	stable	
3	Y	2/3	3	2	vuln/stable	Evidence of scour, but root mass and coarse material provide stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 9/9/2002

Stream: Bear Cr.

General Location: U/S div.

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	2/4	1	rockfall (2) unit - 1/2 streambank (1)- 200' along RB	6	
2	4	-	unit	6	
3	4	1	unit	6	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002 sheet 9 of 10

Stream: Bear Cr.

General Location: U/S div.

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	6	High	Abundant conifers along channel. Low slopes
2	P	-	X	X	6	High	Abundant conifers along channel. low to mod. slopes.
3	P	X	X	X	2/6	High	Abundant conifers along channel. Low slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB Date/Time: 09/10/2002 13:00 Sheet 2 of 10

Stream: Big Creek General Location: Stations 1.2 to 2.2

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
Stations 1.2 -1.7 (D/S of Dam 5)							
	1	1.7	1.7			Dam 5	
1	2	1.6	1.6	37 12.071	119 18.596	SS#1	
	3	1.55	1.55	37 12.068	119 18.672	Start survey segment	
2	4	1.45	1.45	37 12.062	119 18.756	SS#2	
Stations 1.9-2.2 (U/S dam5)							
	1	1.9	1.9	37 11.974	119 18.309	U/S end of Dam 5 impoundment /PH#2a - Start survey	
	2	1.95	1.92	37 11.973	119 18.277	Bridge crossing	
1	3	1.97	1.94	37 11.983	119 18.255	SS#1	
	4	2	1.97	37 11.991	119 18.230	Channel gradient increases	
2	5	2.05	1.99	37 12.006	119 18.169	SS#2	
		2.09	2			Reach break to B2 at concrete check dam	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Stream: Big Creek

Date/Time: 09/10/2002 13:00

General Location: Stations 1.2 to 2.2

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
Stations 1.2 -1.7 (D/S of Dam5)																			
1.6-1.7	1	23	0.9	1.6	30	300	1.3	25.6	13.04	x			L/M	L/M	M/H	4	A1/A2 (B1/B2)	Flow at or near BF, poor BF indicators due to large bldr. elements, alternate areas of moderate and high entrenchment.	2
1.45-1.55	2	25	0.8	2	32		1.3	12.5			x		L/M	L/M	--	4	A1/A2 (B1/B2)	Flow at or near BF, poor BF indicators due to large bldr. elements, alternate areas of moderate and high entrenchment.	4
Stations 1.2 -1.7 (D/S of Dam5)																			
1.9-1.95	1	32	1.3	1.7	34	250	1.1	24.6	7.8		x		M	M	--	4	A2 (B2)	Channel impacted by construction activities, sand input from road/bridge	3
1.95-2.0	2	23	1.5	2.2	27		1.2	15.3			x		L	L	--	2/4	A2 (B2)	HGR w/some pools, channel gradient increases, channel braids around lg bldr and 2 mid-channel bars	5

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 09/10/2002 13:00

Stream: Big Creek

General Location: Stations 1.2 to 2.2

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
Stations 1.2 -1.7 (D/S of Dam5)								
1		45	20	25	5	4	1	
2		50	20	20	5	4	1	
Stations 1.2 -1.7 (D/S of Dam5)								
1		--	30	40	10	10	10	
2		10	50	30	5	3	2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 09/10/2002 13:00   Sheet 5 of 10
Stream: Big Creek   General Location: Stations 1.2 to 2.2

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
Stations 1.2 -1.7 (D/S of Dam5)												
1	none	--	--	--	x	none	--	--	--	--	<10	very little to no sand
2	few	--	--	--	x	none	--	--	--	--	<10	very little to no sand
Stations 1.2 -1.7 (D/S of Dam5)												
1	few	--	--	--	x	few	--	--	x	--	20-30	
2	few	--	--	--	x	none	--	--	x	--	20-30	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
Stations 1.2 -1.7 (D/S of Dam5)								
1	A	--	--	--	--	--	--	
2	P	1	--	1	--	Inactive	Large and small boulder	size- 50' x 20' with 50% veg. cover
Stations 1.2 -1.7 (D/S of Dam5)								
1	A	--	--	--	--	--	--	
2	P	2	--	2	--	Inactive	Large boulder	sizes- 20'x5' & 80' x 50' with 75% veg. cover

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 09/10/2002 13:00

Stream: Big Creek

General Location: Stations 1.2 to 2.2

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
Stations 1.2 -1.7 (D/S of Dam5)							
1	Existing -A Relict - P	--	Existing - NA Relict - 2/3/5	Existing - NA Relict - 1/2/3	Existing - 1 Relict - 3	1/2/3	Alder, willow, herb. in relict BF. Existing floodprone area includes dense blackberry.
2	Existing -A Relict - P	--	Existing - NA Relict - 2/3/5	Existing - NA Relict - 1/2/3	Existing - 1 Relict - 3	1/2/3	Alder, willow, herb. in relict BF. Existing floodprone area includes dense blackberry.
Stations 1.2 -1.7 (D/S of Dam5)							
1	Existing -A Relict - P	--	Existing - NA Relict - 2/3/5	Existing - NA Relict - 1/2/3	Existing - 1 Relict - 3	1/2/3	A small isolated area w/reeds in existing channel. Alder, willow, herb., and dense blackberry in relict BF & FP area.
2	Existing -P Relict - P	--	Existing - 3 Relict - 2/3/5	Existing - 3 Relict - 1/2/3	Existing - 2 Relict - 3	1/2/3	Some mature alder within low flow area. Alder, willow, herb., and dense blackberry in relict BF & FP area.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 09/10/2002 13:00 Sheet 7 of 10

Stream: Big Creek

General Location: Stations 1.2 to 2.2

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
Stations 1.2 -1.7 (D/S of Dam5)						
1	N	1/2	0	--	Stable	Bedrock and boulder banks.
2	N	1/2	0	--	Stable	Bedrock and boulder banks.
Stations 1.9 -2.2 (D/S of Dam5)						
1	N	1/2	0	--	Stable	Right bank consists of bedrock and left bank consists of a boulder revetment associated with the road
2	N	1/2	0	--	Stable	Primarily large boulder on banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB | Date/Time: 09/10/2002 13:00 | Sheet 8 of 10

Stream: Big Creek | General Location: Stations 1.2 to 2.2

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
Stations 1.2 -1.7 (D/S of Dam5)					
1	2	--	25% of survey segment	2/3	Sporadic rockfalls where bedrock is present
2	2	--	25% of survey segment	2/3	Sporadic rockfalls where bedrock is present
Stations 1.2 -1.7 (D/S of Dam5)					
1	4	--	Length of survey segment along left bank (road)	6	Sand input from road along left bank
2	2/4	--	Length of survey segment	2/3	Material from road fill and bank slumping

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 09/10/2002 13:00

Sheet 9 of 10

Stream: Big Creek

General Location: Stations 1.2 to 2.2

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
Stations 1.2 -1.7 (D/S of Dam5)							
1	P	--	X	X	6	Low	Low density of woody veg. due to bedrock
2	P	X	X	X	6	High	Dense conifers and steep slopes
Stations 1.2 -1.7 (D/S of Dam5)							
1	P	--	--	X	6	Low	Low density of woody veg. due to bedrock on right bank and road on left bank. LWD jam on upstream side of bridge pier.
2	P	--	--	X	6	Moderate	Moderate density of mature trees along channel margin, but low slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Stream: Big Creek Dam 5 Vicinity

Date/Time: 9/10/2002 13:00

General Location: Stations 1.2-2.2

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
Stations 1.2 -1.7 (D/S of Dam 5)							
	1	1.2	1.2	37 12.077	119 18.930	D/S end of survey	
	2	1.3	1.3	37 12.072	119 18.812	A1 section	
Stations 1.9-2.2 (U/S dam5)							
	3	2.2	2.2	37 11.905	119 18.098	U/S extent of survey work D/S	
	4	2.18	2.15	37 11.903	119 18.122	107' D/s of 2.2 site 1 U/S	
	5	2.12	2.08	37 11.960	119 18.142	439' D/S of 2.2, U/S end of Picnic area retaining wall	
	6	2.09	2	37 11.972	119 18.174	579' Downstream of 2.2, downstream end wall at 2 weirs	
						end of survey chaip and JC doing site ~100' D/S	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: ############

Sheet of

Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
Stations 1.2 -1.7 (D/S of Dam 5)																			
1.2	1	21	1	2.2	28		1.33	21		x	x		L	L	--	1/(4)	A1/B1 (A2/B2)		1
Stations 1.9-2.2 (U/S dam5)																			
2.2-1.16	1U/S	21	0.9	1.3	31		1.47	23.3		x	x		L/M	L/M	--	4	B2	Bedrock banks with large boulder and large boulder pool control. Small boulder/cobble bed.	4

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/10/2002 13:00

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Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
Stations 1.2 -1.7 (D/S of Dam 5)								
Stations 1.9-2.2 (U/S dam5)								
1		5	20	45	25	2.5	2.5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF | Date/Time: 9/10/2002 13:00 | Sheet of

Stream: Big Creek Dam 5 Vicinity | General Location: Stations 1.2-2.2

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
Stations 1.2 -1.7 (D/S of Dam 5)												
Stations 1.9-2.2 (U/S dam5)												
1 U/S	none	0	N	N	Y	none	0	N	Y (some)	N	5	

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**		**Bar Particle Size Comp**		**Comments**
			Lateral	**Mid-channel**	**Point**					
Stations 1.9-2.2 (U/S dam5)										
1 U/S	A	--	--	--	--	--		--		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/10/2002 13:00 Sheet of

Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
Stations 1.2 -1.7 (D/S of Dam 5)							
Stations 1.9-2.2 (U/S dam5)							
1	P	1	2/3/5	1	2	2/3	Mature alder in relict bankfull

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/10/2002 13:00 Sheet of

Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
Stations 1.2 -1.7 (D/S of Dam 5)						
Stations 1.9-2.2 (U/S dam5)						
1	N	1 (2)	0	2	Stable	Bedrock and large/small boulder armor banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/10/2002 13:00 Sheet of

Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
Stations 1.2 -1.7 (D/S of Dam 5)					
Stations 1.9-2.2 (U/S dam5)					
1	4 (if any)	1 (if any)	<5% of survey segment	Sand	Not much erosion, no deposits

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/10/2002 13:00

Sheet of

Stream: Big Creek Dam 5 Vicinity

General Location: Stations 1.2-2.2

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
Stations 1.2 -1.7 (D/S of Dam 5)							
Stations 1.9-2.2 (U/S dam5)							
1 U/S	P		x	x	6	L	Not much LWD and no function as the LWD stranded on banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/8/2002 9:15

Sheet of

Stream: Big Creek

General Location: Station 7.9-9.9

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	7.85		37 13.215	119 13.748	Start of survey in A1a+ channel	
1	2	7.9		37 13.173	119 13.649	SS#1 in A1a+ reach	
	3	7.92		37 13.165	119 13.627	Reach break from A1a+ (D/S) to B2 (U/S)	
	4	7.94		37 13.150	119 13.602	Rockfall (approx. 100' long & extending 150' upslope) consisting of large and small boulder extending to the channel with riparian veg. at channel margin (approx. 10 ft. wide).	
2	5	7.96		37 13.169	119 13.582	SS#2	
	6	7.67		37 13.154	119 13.562	Rockfall (approx. 200' long & extending 200' upslope) consisting of large bldr. extending to channel with riparian veg. at channel margin (approx. 10 ft. wide)	
	7	8.05		37 13.168	119 13.496	Transition transition from B2 to B1 with A1 inclusions	
	8	8.06		37 13.144	119 13.480	Rockfall(approx. 50' long & extending 100' upslope) consisting of large boulder extending to channel	
3	9	8.13		37 13.130	119 13.418	SS#3 in B2	
	10	8.13		37 13.122	119 13.408	Rock fall (approx. 50' long & extending 50' upslope) consisting of large boulder extending to channel	
	11	8.17		37 13.087	119 13.383	Channel filled with large boulder (Avg. size 10' by 10') with flow within/under boulders. Dimensions of rockfall - approx. 200 feet long by 50 feet wide.	
	12	8.27		no gps	no gps	Possible reach break from B2 to C5 (B5?)	
4a	13	8.3		37 13.122	119 13.254	SS#4a in C5 (B5?)	
4b	14	8.35		37 13.076	119 13.254	SS#4b in C5 (B5?)	
5	15	8.5		37 13.096	119 13.095	SS#5 in in C5 (B5?)	
	16	8.6		37 13.155	119 13.017	Possible RB from C5 (B5?) to ? - gradient increases	
6a	17	8.65		37 13.171	119 12.992	SS#6a in C2/C5 (B2/B5?)	
6b	18	8.7		37 13.180	119 12.973	SS#6b in C2/C5 (B2/B5?)	
7	19	8.75		37 13.157	119 12.925	SS#7 in D2/D5 (C2/C5 or B2/B5?)	
8	20	8.85		37 13.183	119 12.8.2	SS#8 and Reach break from D2/D5 (C2/C5 or B2/B5?) to A2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 8/8/2002 9:15   Sheet   of   Sheet   of

Stream: Big Creek   General Location: Station 7.9-9.9

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence							
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	‿	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
7.85-7.90	1	20	2-3 ft. in riffles	3 to 4 ft. in riffles	20	200	~1	~10	~10	x			L	L	H	3	A1a+	Bedrock gorge. Visually estimate parameters as there are no good BF indicators and too dangerous to collect measurements due to polished bedrock. Channel alternates between narrow high energy sections and broad pool areas.	
7.92-7.97	2	14.4	1.2	1.8	27	200	1.96	12	13.9	x			M	M	H	4	B2	Very low visibility due to dense overhanging veg.	
8.08-8.13	3	22.5	1.2	2	33	300	1.47	18.75	13.3	x			M	M	M	4	B2	Intermittent A2 sections where bedrock is present	
8.27-8.31	4a	19	1	1.3	42	--	2.2	19			x		M	M		4	C5 (B5?)		
8.31-8.35	4b	14.3	1.4	2.2	43	--	3	10.2			x		M	M		4	C5 (B5?)		
8.45-8.50	5	14	1	1.4	50	--	3.6	14			x		H	M		4	C5 (B5?)	Sample site at siphon crossing	
8.60-8.70	6a	14.5	1	1.4	47	--	3.2	14.5			x		M	M		4	C2/C5 (B2/B5?)	Higher gradient than previous survey reach	
	6b	15.5	1.2	2	43	--	2.78	12.92			x		M	M		4	C2/C5 (B2/B5?)	Higher gradient than previous survey reach	
8.70-8.75	7	na	na	na	na	--					x					4	D2/D5 (C2/C5 or B2/B5?)	No good BF indicators - channel is relatively high gradient with boulder substrate, braids in areas, and is relatively unentrenched	
8.85-8.90	8	na	--	--	--	--					x					2	A2	No good BF indicators - channel consists of large boulder with flow in between and around	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/8/2002 9:15

Sheet of

Stream: Big Creek

General Location: Station 7.9-9.9

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		80	15	--	--	--	5	
2		--	50	40	--	--	10	
3		20	60	5	--	--	15	
4a		--	10	10	--	--	80	
4b		--	20	10	--	--	70	
5		--	--	20	--	--	80	
6a		--	20	40	10	--	30	
6b		--	20	40	10	--	30	
7		--	70	--	--	--	30	
8		--	30	70	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 8/8/2002 9:15
Sheet of
Stream: Big Creek
General Location: Station 7.9-9.9

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	--	--	--	--	many	--	--	--	--	80-100	No gravel observed
2	none	--	--	--	--	many	--	--	x	--	no pools observed	No gravel observed
3	none	--	--	--	--	many	--	--	x	--	70	No gravel observed
4a	none	--	--	--	--	none	--	--	x	x	no pools observed	No gravel observed
4b	none	--	--	--	--	none	--	--	x	x (in areas)	no pools observed	No gravel observed
5	none	--	--	--	--	none	1	--	--	x	no pools observed	No gravel observed
6a	none	--	--	--	--	few	--	--	x	--	no pools observed	No gravel observed
6b	none	--	--	--	--	few	--	--	x	--	no pools observed	No gravel observed
7	none	--	--	--	--	many	--	--	x	--	no pools observed	
8	none	--	--	--	--	none	--	--	x	--	no pools observed	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	P	1		1		Inactive	Large boulder	Vegetated with alder (1/2 age class) and herbaceous veg.
4a	A	--	--	--	--	--	--	
4b	A	--	--	--	--	--	--	
5	P	1	1	--	--	Active	Sand	At siphon crossing
6a	A	--	--	--	--	--	--	
6b	A	--	--	--	--	--	--	
7	A	--	--	--	--	--	--	
8	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/8/2002 9:15 Sheet of

Stream: Big Creek

General Location: Station 7.9-9.9

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A (high energy areas)/P (low energy areas)	1	2/3/5	1/2	2	--	BF indicators are poor but veg. rooted in low energy areas (approx. 25-50% of survey segment) possibly within BF channel
2	A	--	--	1/2	3	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
3	A	--	--	1/2	3	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
4a	A	--	--	1/2	3	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
4b	A	--	--	1/2	3	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
5	A	--	--	1/2	3	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
6a	A	--	--	1/2	3	2/5	Alder/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
6b	A	--	--	1/2	3	2/5	Alder/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
7	A	--	--	1/2	3	2/5	Alder/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).
8	A	--	--	--	--	2/3/5	Alder/willow/herb. rooted (1/2 size class) at or above existing bankfull within relict bankfull channel (existing floodprone area).

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB　　Date/Time: 8/8/2002 9:15　　Sheet　　of

Stream: Big Creek　　General Location: Station 7.9-9.9

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	No	1	0	--	Stable	Bedrock banks
2	No	1	0	--	Stable	Banks stabilized by large/small boulder and veg. with fine sand in interstitital spaces with evidence of scour
3	No	1	0	--	Stable	Banks stabilized by large/small boulder and veg. with fine sand in interstitital spaces with evidence of scour
4a	Yes	2/3	3	2	Vulnerable	Evidence of scour but veg. provides stability
4b	Yes	2/3	3	2	Vulnerable	Evidence of scour but veg. provides stability
5	Yes	2/3	3	2	Vulnerable	Evidence of scour but veg. provides stability
6a	Yes	2/3	3	2	Vulnerable	Evidence of scour but veg. provides stability
6b	Yes	2/3	3	2	Vulnerable	Evidence of scour but veg. provides stability
7	Yes	1/3	3	2	Vulnerable	Veg. and large boulder (where present) provide stability
8	No	1	0	--	Stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/8/2002 9:15 Sheet of

Stream: Big Creek

General Location: Station 7.9-9.9

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	2	--	~ 500 ft.	2	Rockfall
2	2	--	~100 ft.	2	Rockfall
3	2	--	~50 ft.	2	Rockfall
4a/4b	--	1	Length of survey segment	6	
5	4	1/2	Length of survey segment	6	Upslope - sand being delivered from upslope along siphon corridor with deposit at base of slope
6a	--	1	Length of survey segment	6	
6b	--	1	Length of survey segment	6	
7	--	1	Intermittent throughout unit	6	
8	2	--	Length of survey segment	2	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/8/2002 9:15

Sheet of

Stream: Big Creek

General Location: Station 7.9-9.9

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	6	H	Steep slopes with moderate density of woody veg.
2	A	--	--	--	--	L	Not much large woody veg. along channel and dense riparian corridor
3	A	--	--	--	--	M	Low density of large woody veg., steep slopes
4a	A	--	--	--	--	M	Mod. density of large woody veg. along channel
4b	P (1 piece)	X	X	X	6	M	Mod. density of large woody veg. along channel
5	P	X	--	--	6	M	High density of woody veg. trees but shallow slopes
6a/6b	P	X	X	X	6	M	Low density of large woody veg.
7	P	--	--	--	6	M	Low density of large woody veg.
8	A	--	--	--	--	M	Low density of large woody veg.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF | Date/Time: 8/8/2002 10:30 Sheet of

Stream: Big Creek | General Location: 9.9-7.9

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	9.9		37 14.001	119 12.954	Huntington spillway - all flow from spillway leakage	
1	2	9.88		37 13.969	119 12.846	SS#1 ~110' Downstream of spillway	
	3	9.87		37 13.970	119 12.887	165' - Reach break to Aa+	
	4	9.84		37 13.940	119 12.862	365' Downstream end Aa+	
	5	9.82		no gps	no gps	477" Downstream - end braided thicket (RM 9.0 reach break to single thread)	
	6	9.79		37 13.907	119 12.817	590' Downstream end of 5% Bedrock sheet - begin steep Aa+	
	7	9.75		37 13.903	119 12.783	788' Downstream end of Aa+ at conflance with old Big Creek	
	8	9.74		37 13.901	119 12.810	841' Downstream of Dam - true Big Creek conflance, (Big Creek has = flow) Break	
2	9	9.72		37 13.898	119 12.789	953' Downstream of dam SITE 2 - flow at bankfull	
3	10	9.58		37 13.824	119 12.856	1692' Downstream site #3- flow at bankfull deep run	
	11	9.54		37 13.789	119 12.843	1899 Downstream Break - gradient flattens; boulders at Head	
4	12	9.47		37 13.722	119 12.854	2295 site 4 in low gradient G5	
	13	9.39		no gps	no gps	295 third boulder strewn Cascade	
5	14	9.29		37 13.608	119 12.870	3250 site 5	
	15	9.25		37 13.571	119 12.866	Transition to Bedrock treanch 5-10% slope (~3470') Break	
	16	9.13		37 13.484	119 12.838	(4104)Bedrock/boulder trench entrenched and high gradient can't safely access to measure Photo #43	
6	17	9.06		37 13.448	119 12.817	site 6 Bedrock at 4454 in Bedrock trench	
	18	9.01		37 13.359	119 12.812	Break 4723' - opens up lower grade	
	19	8.93		37 13.346	119 12.817	Bedrock valley wall pinch/massive Boulder plug (5129) photo 44, inaccesible to measure	
	20	8.88		37 13.307	119 12.773	5403 end Bedrock/boulder trench - flattens inaccessible to before gage measurement	
	21	8.85		37 13.276	119 12.769	5585 gauge house	
	22	8.84		37 13.265	119 12.867	site 7 - 20' below gage wier	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
9.90-9.87	1	9	**0.2**	**0.6**	**20**	**25**	2.2	45	2.8	x	x		M	M	M	4	C3	Riparian Vegatation cut mostly grasses and seedling alder/willow in bedrock canyon	2
9.74-9.70	2	9	0.4	0.8	15	--	1.67	22.5	--		x		M	M		4	B3		9
9.64-9.58	3	7.5	0.9	1.2	9.5	--	1.26	8.3	--		x		M	L		4	G5/A5	slope is borderline	10
9.51-9.47	4	9.5	0.8	0.9	10	--	1.1	11.8	--		x		M	L		4	G5	flow at Bankfull/ low gradient, all run	12
9.39-9.29	5	8.5	0.6	1	16	--	1.9	14.2	--	x	x		M	L		4	B2	boulder strewn separates unit	14
9.14-9.06	6	8	1	2.2	12	--	1.5	8	--	x	x		L	L		4(3)	A1/A2	~ 5% slope some B1/B2 less entrenched	17
8.85-8.79	7	5.5	0.8	1	9	--	1.63	6.9	--		x		M	M		4	B2	20' Downstream of gage wier - meaured at run - low Width to deepth ratio	21

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	5	10	20	55	5	5	dam stops gravel
9	2			5	50	10	35	flow at BF
10	3			10	10	10	60	
12	4			5	5	10	80	
14	5	20	35		5	5	35	
17	6	55	40				5	
21	7		80	5	5	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	--	--	--	Y	none	--	--	--	N	0	
2	none	--	N	N	Y	none	--	N	Y	N	30	STRAIGHT RUN - FEW POOLS
3	none	--	N	N	Y	few	--	N	Y	Y	90	
4	none	--	N	N	Y	none	--	N	Y	Y	90	
5	Few	--	N	N	Y	many	--	N	Y	N	90	
6	none	--	--	--	--	few	--	N	N	N	50	MOST BEDROCK/ HIGH VELOCITY
7	none	--	--	--	--	--	--	--	--	--	20	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	
5	A	--	--	--	--	--	--	
6	A	--	--	--	--	--	--	
7	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/2	5	1	possible	--	alder/willow seedings at bankfull
2	A	--	--	--	possible	2 willow/alder	no relict indicators - vegetation at bankfull interface
3	A	--	--	--	possible	2 alder	few alder root mass have temporary occupying of midchannel; not rooted to bed
4	A	--	--	--	possible	2 alder	some grass on bed - alder in relict; grass/alder at bankfull interface
5	A	--	--	--	possible	2 alder/willow	grass/fern in flood plain - (2) alder in relict channel
6	A	--	--	--	--	--	alder / grass maybe in relict
7	A	--	--	--	possible	2 alder / willow	grass, alder at bankfull interface

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	2/3	1/3	1/2	Unstable	upslope slide on margin next to site30'x15'x8'thick
2	N	2/3	0 (3)	na (2)	Stable	due to 100% root cover
3	Y	3 alder rooted	3	2	Unstable/Vulnerable	however bank has >90% heavy alder root cover
4	Y	3	3	2	Unstable	root cover good but not as good as upstream - more exposed with grass bank
5	Y	3/1	3	2	Vulnerable	1/2 unit is sand bank and susceptible, most boulder
6	N	1	0	2	Stable	all bedrock/boulder
7	N	1	0 (3)	2	Stable	few banks with root cover 90% boulder banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	1/2	1	15'h x30'wx8'thick	6	rockfall/landslide
2		none (1)	na	6	none appears
3		2/3	--	6	only bank scour / unercut - not bad
4		2/3	unit	6	root cover lacking
5		1/2	1/2 unit	6	relatively good root cover
6		none	0	0	all Bedrock / Boulder
7		none (1)	0	6	mostly boulder

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A					--	
2	A					L	none in zone
3	A					L	
4	A					L	some in relict flood plain
5	A					L/M	occasional upslope
6	P	X	X		6	L/M	few LWD - no function
7	P			X	6	L/M	most LWD in relict Flood plain

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 8/5/2002 Sheet of

Stream: Bosillo Creek

General Location: Conf. W/SFSJR (Station 0) -> Diversion

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0	0	37 19.766	119 01.980	Confluence with South Fork San Joaquin River	
1	2	0.03		37 19.740	119 01.993		Data collection point
	3	0.1		37 19.702	119 02.026	Possible Right bank from Aa+ to G?	
2	4	0.12		37 19.693	119 02.065	E - Channel segment	
3	5	0.12 ~20'U/S		37 19.695	119 02.045		
	6	0.14		37 19.685	119 02.040	Bedrock outcrop -> no defined channel for Bosillo Ceek ~ 50 feet	
	7	0.15		37 19.684	119 02.042	Start of E - Channel Upstream of BR	
	8	0.16		37 19.691	119 02.082	E5 start? -> Right bank - Upstream E	
4	9	0.18		37 19.689	119 02.111	Data Recording	
	10	0.19		37 19.696	119 02.112	Scour Pool and Headcut	
	11	0.2		37 19.681	119 02.133	Downstream right bank of A1a+	
5	12	0.25		37 19.640	119 02.157	Upstream Rightbank of A1a+	
6	13	0.29		37 19.633	119 02.190	Data Recording for reach G2/G3 between 0.25 - 0.30	
	14	0.3		37 19.630	119 02.193	Right bank from G2/G3 to Aa+ (Upstream)	
7	15	0.35		37 19.583	119 02.248	Data Recorded Location in Aa+	
8	16	0.5		37 19.515	119 02.393	Data Recorded Location in Aa+	
9	17	0.6		32 19.415	119 02.497	Data Recorded Location in Aa+	
	18	~ 0.60		32 19.434	119 02.496	Right bank from Aa+ (D/S) to ?	
10	19	0.65		32 19.396	119 02.521	Recording location for B5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.0 - 0.05	1	7.3	**0.8**	**1.3**	**9.7**	**Map**	1.33	9.125	Map			X	H	H	Map	2	A1a+		2
0.10 - 0.12	2	3.5	1	1.3	14	Map	4	3.5	Map			X	H	H	Map	4	E5		
0.12 - 0.14	3	8	1.2	1.6	16	Map	1.63	6.67				X	M	M	Map	4	B5		
0.12 - 0.14	3a	9.5	1	1.5	18	Map	1.89	9.5				X	M	M	Map	4	B5		
0.15 - 0.2	4	3.5	0.4	0.6	18	Map	5.14	8.75				X	M	M	Map	4	E5		
0.20 - 0.25	5	NA	NA	-	-	-						X	-	-	Map	1	A1a+	Bedrock channel/Cascade channel not well refined	
0.25 - 0.30	6	7.2	0.7	1	8.5	Map	1.2	10.28	Map			X	H	H	Map	4	G3/G4		
0.30 - 0.35	7	4.7	0.7	1.1	9.3	Map	1.98	6.7			X		L	L	Map	2	A1a+ /A2a+		
0.45 - 0.5	8	NA	-	-	-	-	-	-	-		X					2	A1a+ /A2a+	Bedrock / Boulder cascade, no good indicators	
0.55 - 0.6	9	7.3	0.4	0.8	8.1	Map	1.1	18.25	-		X		M	M	Map	2	A2a+		
0.60 - 0.65	10	5.6	0.4	0.6	9	Map	1.6	14	-			X	H	H	Map	4	B5		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
1		85	5	5	-	-	5	
2		-	-	-	-	-	100%	
3		-	-	-	-	-	100%	
4		-	-	-	-	-	100%	
5		90	10	-	-	-	-	
6		5	2.5	2.5	25	50	10	
7		40	30	10	5	5	10	
8		40	30	20	-	-	10	
9		20	30	30	10	-	10	
10		-	-	-	-	5	95	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______ Date/Time: ______ Sheet ____ of ____

Stream: ______ General Location: ______

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	none	-	-	-	none	none	-	-	X	-	50	
2	none	-	-	-	none	none	-	X	-	X	100	
3	none	-	-	-	-	-	-	X	-	X	100	
4	none	-	-	-	-	none	-	X	-	X	100	
5	none	-	-	-	-	none	-	-	X	-	no pools	
6	none	-	-	-	X	none	-	-	X	-	10	very few pools
7	none	-	-	-	X	none	1	X	X	-	50	SWD jams
8	none	-	-	-	-	none	-	X	X	-	50	
9	none	-	-	-	-	none	-	X	X	-	35	
10	none	-	-	-	-	none	2	X	-	X	100	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	-	-	-	-	-	-	
2	A	-	-	-	-	-	-	
3	A	-	-	-	-	-	-	
4	A	-	-	-	-	-	-	
5	A	-	-	-	-	-	-	
6	A	-	-	-	-	-	-	
7	P	1	-	1	-	Active	Sand (6)	Downstream of scour pool at Downstream end of reach
8	A	-	-	-	-	-	-	
9	A	-	-	-	-	-	-	
10	P	3	2	-	-	Active	Sand (6)	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1	5	1	1	-	Note: near confluence 2 mature conifers within low flow channel
2	A	-	-	-	1	-	Perrinneal herb along bank upslope of bank full
3	A	-	-	-	1	-	
4	P	1	5	1	1	-	
5	A	-	-	-	1	-	
6	A	-	-	-	1	-	Herb and Alder on channel margin between FP & BF
7	A	-	-	-	1	-	Herb and Alder on channel margin between FP & BF
8	A	-	-	-	1	-	Herb and Alder and Cottonwood on channel margin between FP & BF
9	A	-	-	-	1	-	Herb and Alder on channel margin between FP & BF
10	P	1	5	1	1	-	Herb and Alder on channel margin between FP & BF

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ______ of ______

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	-	-	STABLE	
2	Y	3/4	3	2	VULNERABLE	Significant Vegetation Cover
3	Y	3/4	3	2	UNSTABLE	Evidence of scour <75% cover
4	Y	3/4	3	2	VULNERABLE	Vegetation Stabilizes bank
5	N	1	-	-	STABLE	
6	Y	3/4	3	2	UNSTABLE	Bank scour and undercutting throughout reach
7	N	1	-	-	STABLE	
8	N	1	-	-	STABLE	some intermittent areas with sand make vulnerable to scour -> some scour and undercut present
9	N(Y)	1(3)	3	2	STABLE	some intermittent areas with sand make vulnerable to scour -> some scour and undercut present
10	Y	3/4	3	2	VULNERABLE	Vegetation Stabilizes bank

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	-	organic/ sand mantel	From upslope along channel bank (outside bank full channel)
2	-	2	unit	6	
3	-	1/2	unit	6	
4	-	1	unit	6	
4	-	Scour Pool	8X16'x3.5'D	6	Scour pool immediately downstream of headcut at station 0.14
5	-	-	-	-	
6	-	1/2	unit	6	
7	-	-	-	-	
8	4	1/2 in localized areas	-	6	
9	4	1/2 in localized areas	-	6	
10	-	1/2 in localized areas	-	6	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
station 0.0	Deposition	Inactive*	30x20	2	Confluence with SFSJR
					Large boulders with some small boulders
					some vegetation with in boulder matrix

* - inactive due to size of material and the material shielded by a ~ 20 x 30 boulder structure

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	 BF	 FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	3	Mod.	Shallow slopes, banks stable - conifers with in 10 feet of channel - low density
2	P	X	X	X	3	Mod.	Shallow slope
3	P	X	X	X	3/4/5/6	Mod. - High	
4	P	X	X	X	3/4/5/6	High	
5	A	-	-	-	-	Mod.	Low slope but trees
6	P	X	X	X	5	Mod.	Low slope but trees
7	A - but several SWD jams	X	X	X	3	Mod.	Low slope but trees
8	P	X	X	X	3/6	Mod. - High	Low slope but trees
9	P	X	X	X	3	High	Many trees, some areas of high bank slope
10	P	X	X	X	3/6	Mod.	Shallow slope

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF   Date/Time: 8/5/2002   Sheet   of

Stream: Bolsillo   General Location: D/S from Dam

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
0	1	1.55		37 18.731	119 02.462	Aa+ break to B	Same as Aa+ upstream of Diversion
1	2	1.52		37 18.740	119 02.459	Site 1 B/G	
2	3	1.5		37 18.748	119 02.430	Site 2 B5	290' D/S of Div,
	4	1.48		37 18.763	119 02.453	B2/390' Downstream of Diversion	Where subsurface flow emerges - different from upstream
3	5	1.46		37 18.771	119 02.457	G5 Site 500' Downstream	
	6	1.41		37 18.813	119 02.475	B/A Transition 750' downstream	gradient steepens
4	7	1.34		37 18.855	119 02.473	B Site 1150' downstream	
	8	1.27		37 18.906	119 02.517	Kaiser Pass Rd. 1530' downstream	Still B upstream - some anthropogenic processes
5	9	1.29		37 18.899	119 02.501	B Site in campground	Entrix flag - B0 - 1 SMPL
	10	1.21		37 18.966	119 02.510	Large LWD formed debris dam	300' downstream of road- see notes
6	11	1.17		37 18.984	119 02.517	~500' downstream of bridge (2026')	Site 6
	12	1.14		37 19.005	119 02.519	Downstream end of braiding (2188')	Downstream of site 6 - Braid and subsurface
7	13	1.12		37 19.019	119 02.511	Site 7 - G (2270')	sand rich - Dams too
	14	1.06		37 19.075	119 02.533	B/A Break from G? (2500')	Steepens B2? Or A2?
8	15	0.98		37 19.093	119 02.575	Site 8 (2930')	
9	16	0.92		37 19.140	119 02.566	Site 9 (3245')	
	17	0.9		37 19.116	119 02.535	Reach Break to A or Aa+	@ 3575' downstream of Diversion
10	18	0.85		37 19.196	119 02.520	Site 10 (3825')	
	19	0.8		37 19.280	119 02.534	Aa+ break (4275')	Begin Aa+ A1a+
	20	0.75		37 19.310	119 02.545	Aa+ A2a+ Break	
	21	0.7		37 19.323	119 02.544	End A2 at ?	
11	22	0.69		37 19.340	119 02.541	In A2/B2	
	23	0.67		37 19.358	119 02.543	B2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	**V**	**U**	**‿**	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.51 - 1.55	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Aa+ Break to B	1
1.55 - 1.52	1	4	0.5	0.8	8.5	-	2.4	14	-			X	M	M	-	4	B3/G3	Low gradient	2
1.52 - 1.50	2	6	0.5	1	11	-	1.8	12	-			X	H	M	-	4	B5	Low gradient	3
1.48 - 1.46	3	5.5	0.7	0.9	8	-	1.45	7.8	-			X	H	M	-	4	G5		5
1.41 - 1.34	4	8.5	0.7	1	11	-	1.41	12.1	-			X	M	M	-	4	B2/B5	G-like -Some gradient > 4%	7
1.31 - 1.27	5	8	0.5	1	11.5	-	1.43	16	-			X	H	M	-	4	B2/B5	B in Bolsillo campground	9
1.23 - 1.17	6	5.5	0.8	1	5.5	-	1	6.9	-			X	H	M	-	4	G2/G5	Downstream of Debris jam	11
1.14 - 1.12	7	4.5	0.4	0.55	5.5	-	1.22	11.25	-			X	H	M	-	4	G5	lots of sand	12
1.06 - 0.98	8	6.5	0.8	1	8.5	-	1.3	8.1	-			X	H	M	-	4	G5	with bedrock and boulder	15
0.96 - 0.92	9	4.2	0.6	0.7	7	-	1.67	7	-			X	M	L	-	4	G1/B1	Bedrock - low W-D ratio, mud entrench	16
0.89 - 0.85	10	3.5	0.5	0.7	5.5	-	1.57	7	-			X	M	L	-	3	A2/B2		
0.70 - 0.68	11	2	0.4	0.8	3	-	1.5	5	-		X		M	L	-	3	A2/B2	fairly entrenched	
0.8	No Measure in A1a+																	No Measure in A1a+	
0.75	No Measure in A2a+																	No Measure in A2a+	
0.67	12	5.5	0.4	0.6	7.5	-	1.36	13.75	-		X		M	M	-	HGR	B2		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
2	1	-	10	15	50	5	20	sand in pools
3	2	-	-	-	10	10	80	sandy
5	3	10	-	-	-	10	80	
7	4	5	20	20	10	-	45	sand and boulder
9	5	-	30	10	10	-	50	sand and bouldrer
11	6	-	45	10	5	-	40	sand and boulder
12	7	-	15	10	-	-	75	most sand
15	8	15	20	-	-	-	65	some bedrock bed
16	9	50	25	5	-	-	20	
17	10	-	45	20	5	-	30	
18	11	-	80	10	5	-	5	
23	12		50	30	15	-	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	-	-	-	Y	none	-	-	Y	few	70	
2	none	-	-	-	Y	none	2	Y	Y	Y	100	
3	none	-	-	-	Y	none	3	Y	Y	Y	100	
4	none	-	-	-	Y	few	2	Y	Y	few	80	
5	none	-	-	-	-	many	1	Y	Y	Y	80	
6	none	-	-	-	-	many	2	Y	Y	Y	50	
7	none	-	-	-	-	few	2	Y	Y	Y	100	
8	none	-	-	-	-	few	1	Y	Y	Y	50	some bedrock bed
9	none	-	-	-	-	many	-	Y	Y	N	80	some bedrock
10	none	-	-	-	-	few	-	Y	Y	N	50	With boulder
11	none	-	-	-	-	none	-	-	Y	N	20	
12	none	-	-	-	-	none	-	-	Y	N	20	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	
2	P	2	X	-	-	active	sand	
3	P	3	X	-	-	active	sand	
4	P	2	X	-	-	active	sand	small bars
5	P	1	X	-	-	active	sand	small bar next to campsite
6	P	2	X	-	-	active	sand	large (4x10x12")
7	P	2	X	-	-	active	sand	2x10x4"
8	P	1	X	-	-	active	sand	6x3x3"
9	A	-	-	-	-	-	-	
10	A	-	-	-	-	-	-	
11	A	-	-	-	-	-	-	
12	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	-	-	
2	A	-	-	-	-	-	
3	A	-	-	-	-	-	
4	A	-	-	-	-	-	
5	A	-	-	-	-	-	
6	A	-	-	-	-	-	
7	A	-	-	-	-	-	
8	P	1/2	5	1	2	-	GRASS ON SLUMPS
9	A	-	-	-	-	-	
10	A	-	-	-	-	-	
11	A	-	-	-	-	-	
12	A	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ________________ Date/Time: ________________ Sheet ____ of ____

Stream: ________________ General Location: ________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	2/3	3	2	Vulnerable	Fair Cover Minor scour evidence
2	Y	3	3	2	Unstable	lacks cover - some scour
3	Y	3	3	2	Unstable	lacks cover - some scour
4	Y	1/2/3	3	2/1	Vulnerable	some instability - OK cover
5	Y	1/3	3	2/3D	Vulnerable	OK cover - some scour, some instability downstream to bridge
6	Y	1/3	3	2	Vulnerable	maybe unstable - good boulder/root cover - some exposed bank
7	Y	3/1	3	2	Unstable	very exposed banks
8	Y	3/4/1	2/3	2	Unstable	slumping / undercut
9	Y	3/1	2/3	2	Unstable	slumping / undercut
10	Y	3/1	2/3	2	Unstable	some boulder protection
11	N	1	0	2	Stable	boulder armor
12	N	1	0	2	Stable	boulder armor

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	-	1/2	1/2 unit	6	scour at sand banks
2	-	1/2	unit	6	scour and bars
3	-	1/2	unit	6	scour and 3 bars
4	4	1/2	1/2 unit	6	scour and deposition
5	4	1/2	100'	6	scour/campsite
6	-	1/2	1/2 unit	6	bank scour and sand bar (LWD jams)
7	-	1/2	1/2 unit	6	bank scour and sand bar (LWD jams)
8	-	1/2/3	unit	6	scour and slumping
9	-	1/2/3	unit	6	scour and slumping
10	-	1/2/3	unit	6	scour and slumping
11	4/2	1	unit	3	next to bedrock face
12	4	1	unit	6	-

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	A	-	-	-	-	M	not any wood in channel
2	P	X	X	X	3	L	some debris jams
3	P	X	X	X	3/5	M	
4	P	X	X	X	3/5	H	good LWD
5	P	X	X	X	3/5	M	lacks good LWD reer
6	P	X	X	X	3/5	M	very large LWD - dams
7	P	X	X	X	3/5	M	very Large LWD - dams
8	P	X	X	X	3/5	M	much wood / low slope
9	P	X	X	X	3/5	M	
10	P	X	X	X	3/5	M/H	
11	P	X	X	X	6	M	sporadic
12	A	-	-	-	-	-	not present

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/CB/RF

Date/Time: 8/5/2002 Sheet of

Stream: Bolsillo Creek

General Location: Upstream of Diversion (RM 1.57 to 2.2)

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.57		37 18.693	119 02.430	Bolsillo Creek Diversion	
	2	1.6		37 18.668	119 02.439	Flume with bar downstream,	180' upstream of diversion
2	~~3~~	1.62		37 18.671	119 02.432	Upstream of flume G5/Station 2	Influenced by flume ~ 50' downstream
1	4	1.58		37 18.695	119 02.438	Upstream of diversion Aa+ break	Aa+ top above diversion
	5	1.65		37 18.648	119 02.412	Break G5 to…	Valley flat and open
	6	1.69		37 18.621	119 02.386	Break to B	200' upstream of GPS 5
3	7	1.67		37 18.640	119 02.385	Site 3 in C type	100; downstream of GPS 6
4	8	1.75		37 18.582	119 02.328	Site 4 in B	Reach break to Aa+?
5	9	1.82		37 18.574	119 02.475	Site 5 in Aa+	Cascade with in Aa+
6	10	2		37 18.467	119 02.438	Site 6 in Aa+	Cascade with in Aa+, ~ 2300' upstream of diversion
7	11	2.2		37 18.376	119 02.519	Site 7 in Aa+	Cascade with in Aa+, ~ 3000' upstream of diversion

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/CB/RF

Date/Time: #######

Sheet of

Stream: Bolsillo Creek

General Location: Upstream of Diversion (RM 1.57 to 2.2)

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth** ($AveD_{bf}$)	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.58 - 1.62	2	7.3	0.67	0.7	9	--	1.23	10.9	--			X	H	M	--	4	G5/G2	Influenced by parshall flume/gauge which is ~50' D/S of sample site	2
1.57 - 1.58	1	7.8	1	1.3	9	--	1.15	7.8	--			X	L	L	--	2	A2a+	Short cascade upstream of diversion	4
1.65 - 1.69	3	9	0.8	0.9	35	--	3.9	11.25	--			X	H	M	--	4	C4/C5	Broad low gradient with gravel bars	7
1.69 - 1.75	4	17	0.7	1.1	21	--	1.23	24.3	--			X	H	M	--	4	B2/B3	Debris jams control small cascades/ sand in pools	8
1.75 - 1.82	5	8	1.25	2.5	10.6	--	1.3	6.4	--			X	M	M	--	3	A2a+	Cascade within A2a+	9
1.94 - 2.0	6	8	1	1.8	12	--	1.5	8	--			X	M	M	--	2	A2a+	Cascade within A2a+	10
2.15 - 2.20	7	9	1.3	2	14	--	1.56	6.9	--			X	M	M	--	2	A2a+	Cascade within A2a+	11

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/CB/RF

Date/Time: 8/5/2002 Sheet of

Stream: Bolsillo Creek

General Location: Upstream of Diversion (RM 1.57 to 2.2)

DOMINANT STREAMBED PARTICLE SIZE

GPS Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
3	2	-	25	15	-	5	55	mixed sand/boulders
4	1	-	70	25	2	-	3	
7	3	-	-	-	5	35	60	sand bed/gravel bars
8	4	-	10	40	30	5	15	sand in pools
9	5	-	60	25	10	2.5	2.5	
10	6	-	55	30	10	2.5	2.5	
11	7	-	40	30	15	10	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/CB/RF   Date/Time: 8/5/2002   Sheet   of

Stream: Bolsillo Creek   General Location: Upstream of Diversion (RM 1.57 to 2.2)

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
2		-	-	-	-	few	4	Y	Y	Y	100%	
1		-	-	-	-	few	-	-	Y	-	100%	One pool in unit
3		3	-	-	Y	none	5	Y	Y	Y	100%	
4	few	-	-	-	Y	few	-	Y	Y	N	100%	sand with LWD
5	none	-	-	-	Y	none	-	-	Y	N	20%	
6	none	-	-	-	Y	none	-	-	Y	N	20%	
7	none	-	-	Y	Y	none	-	Y	Y	N	30%	sand only in pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
2	P	4	X			Active	sand	GPS 2
1	A	-	-	-	-	-	-	
3	P	8	4	4	-	Active	sand - 5/ Gravel - 3	
4	P	2	1	1	-	Active	Cobble	30 - 50ft^2 each
5	A	-	-	-	-	-	-	
6	A	-	-	-	-	-	-	
7	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	GPS 4
2	P	1	5	1	1	-	GPS 2
3	P	1/3	5	1	1	-	GPS 7 - bars active
4	P	1/2/3	5	1	1	-	On bars mostly - sporadic
5	A	-	-	-	-	-	
6	A	-	-	-	-	-	
7	A	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
2	Y	3/1	3	2	Vulnerable	Stable/evidence of scour -> portions of reach armored in boulder/but sand dom.
1	N	1	0	2	Stable	No instability Features
3	Y	3/4	3	2	Vulnerable	mostly stable but lacks cover
4	Y	1/3	3	2	Vulnerable	good cover but evidence of scour
5	N	1	0	-	Stable	Large boulder
6	N	1	0	-	Stable	Large boulder
7	N	1	0	-	Stable	Boulder cascade

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
2	-	1/2	1/2 unit	6	1/2 unit is composed of boulder armor which is stable
1	-	none	-	-	banks armored with boulder, some minor local undercut
3	-	1	bar ~50 $ft.^2$ area	5/6	Lateral and mid-channelbars present - Bank scour evident
4	-	1	$150ft^2$ sand behind LWD	6	Sand behind LWD/ some bank scour
5	4	-	-	6	Organic mantel/miminal sand upslope of bank
6	-	-	-	-	
7	-	-	-	-	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	Channel Zone BF	Channel Zone FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
2	P	X	X	X	3/4/5	H	Low bank slope/high density
1	A	-	-	-	-	L	conifers along channel, but low slope
3	A	-	-	-	-	L	low slope/ transport
4	P	X	X	X	3/5	M	low slope / many trees - debris dam
5	P	X	X	X	6	M	low slope - some trees
6	A	-	-	-	-	L	low slope - few trees
7	P	X	X	X	3	M	low slope/many treea

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF
Date/Time: 8/6/2002 Sheet of
Stream: Camp 62
General Location: above Chinquapin - below camp 62 Div

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	a			37 18.759	119 01.468	suspected chinquapin/Camp 62 confulence imditly downstream Ward trunnel pipe	
	b			37 18.715	119 01.518	sidecast in channel ~400' upsteam of confluence with chinquapin	
	c			37 18.699	119 01.555	sidecast in channel ~ 700' upstream of confluance	
	1	1.2		37 18.630	119 01.621	kaiser pass road crossing walk upstreams to diversion (HC 0.0)	
	2	1.22	8	37 18.611	119 01.624	check dam upstream of kaiser pass road (100' upstream)	
	3	1.25		37 18.600	119 01.628	to falls 190' upstream kaiser - reach break to A2a+ /A1a+ cascade	
1	4	1.27		37 18.593	119 01.646	255' upstream at site 1	
	5	1.32	9	37 18.539	119 01.654	reach break from Aa+ ~ 100' downstream diversion (670' upstream of kaiser road)	
	6	1.35		37 18.530	119 01.667	diversion 775' upstream of kaiser Rd	
2	7	1.21		no gps	no gps	30' upstream of kaiser road Site 2	
3	8	1.19	11	37 18.651	119 01.637	140' downstream of kaiser road site 3 - channel shoaled with cobble angular	
	9	1.14	12	37 18.647	119 01.607	325' downstream - reach break to highgradient - dry boulder	
4	10	1.08		37 18.705	119 01.601	611' downstream in dry high gradient reach site 4	
	11	1.06		37 18.718	119 01.568	760' downstream of kaiser road - confluance w/? Reach break	
5	12	1.04		37 18.744	119 01.566	850' downstream site 5	
	13	0.99		37 18.776	119 01.546	1110' downstream of kaiser Rd - possible berak - transforms to lower gradient	
	14	0.95		37 18.818	119 01.541	1327' downstream reach break to Aa+	
	15	0.91		37 18.818	119 01.518	1520' d/s reach break to ???	
6	16	0.9		37 18.833	119 01.513	1588' downstream site 6	
	17	0.87	13,14	37 18.835	119 01.498	1750' downstream chinquapin confluance - small boulder/cobble delta and bar	
						No fines in confluencce delta - unsure which is the Tributary	
						photo 13 downstrean at confluence from Chinqupin and photo 14 upstream at confluence (Chinqupin left/62 right)	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
1.25-1.30	1	10	**1.5**	**2.5**	**12**	**25**	1.2	6.7	2.5	x			L/M	L/M	M	2/3	A2a+	>10% (~30%) slope -confined by bedrock valley walls	4
1.20-1.22	2	15	1.2	2	16	--	1.23	10.8	--	x			M	M	--	3	A2	Maybe Aa+ - Not as steep as above - 30' upstream of Kasier road	7
1.19-1.17	3	19	0.6	1.1	25	--	1.3	31.7	--		x	x	L	L	--	4	B3	borderline entrenchment	8
1.14-1.08	4	9	0.6	1	16	--	1.8	15	--			x	L	L	--	3/4	B2/B1	many gravel/cobble bedrock controls and drops	10
.99-1.06	5	7.5	0.6	1	9	--	1.2	12.5	--	x			M	M	--	4	A2	some Bedrock maybe B2	12
.90-.87	6	10	0.6	1.2	12.5	--	1.25	16.7	--			x	M	M	--	4	B2/G2	incised	16

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
4	1	10	70	10	2.5	5	2.5	B and massive bldr
7	2	--	40	40	15	--	5	
8	3	5	5	20	50	15	5	angular granitic cobble
10	4	30	40	10	5	10	5	
12	5	20	20	30	15	10	5	
17	6	10	40	25	15	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	few	1	--	y	y	few	--	--	few/no	n	50	
2	--	--	--	--	y	--	--	--	few	n	10	mostly coarse
3	--	2	--	--	y	none	--	--	few/y	n	5	most cobble
4	none	4	y	n	y	few	--	--	y	n	10	
5	none	1	y	y	y	none	--	--	y	n	10	
6	few	4	n	n	y	none	--	--	few	n	5	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	P	1		X		active	gravle	upstream of LWD/boulder jam (20'x8')
2	A							
3	P	2	X	X		apperar inactive	cobble to gravel	
4	P	4	1	2	1	active	gravel	not very active
5	P	1	1			active	gravel	small 6'x3'
6	P	4	4			active	gravel	small 3'x10'

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	
2	P	1	5 (timbleberry)	1	none	--	thimbleberry
3	P	3	3/5	1	possibly	--	some fern in channel - one large conifer in channel
4	P	1/2/3	3/5	1	possibly	--	
5	A	--	--	--	--	--	
6	P	1	2/3	1	no	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	rockfall - flow if any - none	stable	Bedrock/boulder armored
2	N	1	0	none/2	stable	Bedrock/boulder armored
3	Y	4	3	2	unstable	
4	Y	1/2/3	3	1/2	stable/vulnurable	talus feeds channel - bedrock/Boulder armor
5	Y	1/3	3	2	unstable	one bank some bedrock other is sandy incised
6	N	1/3	0	2	stable/vulnurable	predom. Boulder cover - few exposed sand banks spots

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	--	--	none	--	
2	--	--	none	--	
3	--	1/2	unit	6	sand banks - infrequent scour
4	2	1	1/2 unit	4/5	sidecast adjacent feeds channel
5	--	1/2	1/2 unit	6	
6	--	1/2	1/4 unit	6	infrequent sand banks

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	p	X			6	L	very little wood - short pieces transported from upstream
2	A					L	
3	A					M	
4	A					L	none present
5	P	X	X	X	1/3/5	M	
6	P	X	X	X	6	M	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/TB Date/Time: 8/22/2002 14:45 Sheet of

Stream: Camp 62 General Location: Above Diversion 1.35-1.85

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.35		37 18.514	119 01.670	Camp 62 diversion	
1	2	1.39		37 18.490	119 01.686	site 1 (same as WP site) 215' upstream	
	3	1.41		37 18.476	119 01.691	313' old diversion site - conerete dam to bedrock on leftbank filled with sediment - 10' drop	
	4	1.435		37 18.460	119 01.695	450' break to A2a+ - B2/3 from diversion to break	
	5	1.57		37 18.335	119 01.767	1375' top of debris jam/fan - braided (3+ braids with good bed elements)	
2	6	1.59		37 18.329	119 01.775	site 2 single thread A2a+	
	7	1.68		37 18.132	119 01.778	1738' top of large braided section (bottom at 1.66/1662')	
3	8	1.7		37 18.293	119 01.806	1857' site 3 in A2a+ that splits off and on	
	9	1.83		37 18.169	119 01.052	2527' End survey - still A2a+	
						above to RM 1.9 is boulder strewn ala crater photo 4; 40% slope cascade	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.36-1.39	1	10.4	1.1	1.5	13	--	1.25	9.4	--			x	L/M	L/M	--	4(3)	A2(G2)	site in incised channel wwith scoured bank - entrenched 5-10% slope	2
1.57-1.60	2	10.5	1.7	2.7	17	--	1.6	6.2	--			x	L/M	L/M	--	2/3(4)	A2a+	B entrechment /A with to depth ratio, some ability to over flow boulder banks like an E	6
1.65-1.70	3	not measurable			--	--	--	--	--			x	--	--	--	2/3	A2a+	incised in parabola split channels	8

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1		20	40	20	10	10	
6	2		60	20	10	8	2	
8	3		50	20	10	15	5	gravel in pools

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ________________ Date/Time: ________________ Sheet ____ of ____

Stream: ________________ General Location: ________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	few	--	n	y	y	few	--	y	y	n	15%	
2	few	--	n	n	y	none	--	n	y	n	5%	sand interstitial
3	many	--	n	n	y	none	--	n	n	n	5%	sand interstitial sometimes

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	large split channel bars with alder - debris formed

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	bank scoured - alder between bankfull and flood plain
2	A	--	--	--	--	--	alder at flood plain; few grasses / herbs at bankfull only
3	A	--	--	--	--	--	alder at flood plain; few grasses / herbs at bankfull only

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	y	3 (1)	3	2	unstable	banks scoured and lack adequate root and boulder cover
2	n	1	0	0(2)	stable	large boulder banks
3	n	1	0	0(2)	stable	large boulder banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4 (few)	1/2	70% unit	6	banks most sand with boulder - scoured and undercut
2	4 (if any)	1 (if any)	<5% unit (0)	6	no erosion or depostion in bankfull channel
3	4 (if any)	1 (if any)	<5% unit (0)	6	no erosion or depostion in bankfull channel

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	P	X	X	X	3/5	M	few log jams with sand retention and bank scour
2	P	X	X	X	3	H	few pieces; boulders doing work; some LWD control on boulder/cobble
3	P	X	X	X	3	H	few pieces; boulders doing work; some LWD control on boulder/cobble

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF
Date/Time: 8/6/2002 15:50 Sheet of
Stream: Camp 26
General Location: SFSJR conf. To Chinquapin Conf

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0		37 19.544	119 01.519	SFSJR confluence/delta RM 0.0, 35' with delta to 20' upstream	
1	2	0.0-0.03		37 19.521	119 01.536	150' upstream of SFSJR, site 1	
		0.04		no gps	no gps	60' upstream of site 1 break to Aa+ (A2a+) cascade	
2	3	0.08		37 19.489	119 01.567	435' upstream of SRSJR with in A2a+/A1a+, site 2	
	4	0.12		37 19.466	119 01.575	Aa+ break to ? B/G /large sediment deposit near top of Aa+ with braid	
3	5	0.16		37 19.444	119 01.610	875' upstream with in B2/3 ?, Site3 - some entrenchment in unit	
	6	0.21		37 19.416	119 01.610	1130' U/S - break to G2? - more entrenched	
4	7	0.23		37 19.406	119 01.626	1200" upstream site 4 entrenched (G/B)	
	8	0.26		37 19.387	119 01.600	Possible break to A2/B2 ~Aa+?	
5	9	0.31		37 19.340	119 01.591	site 5	
	10	0.35		37 19.313	119 01.622	break to low gradient with large gravels bars	
6	11	0.38		37 19.301	119 01.616	site 6 B2	
		0.4		no gps	no gps	break to high gradient A2/B2 - boulder strewn(Aa+)	
7	12	0.45		37 19.250	119 01.587	site 7	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	‿	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.0-.03	1	11.5	0.6	0.9	15		1.3	19.2				x	M	M		4	B2	adjacent floodplain may cause less entrenchment	2
.04-.08	2	11	1	2	17		1.54	11				x	M	M		2/3	A2a+	some A1a+ too	6
.12-.16	3	12	0.6	1	23		1.9	20		sort of	x		M	M		4	B2/B3	5% slope?	5
.21-.23	4	13	0.6	1.9	14.5		1.1	21.6				x	M	M		4	B2/G2	F2?	7
.26-.31	5	5	0.9	2	11.5		2.3	5.5				x	L	L		3	A2/B2	high gradient - Boulder step pool	9
.35-.38	6	18	0.4	0.6	26		1.44	45			x		H	M		3/4	B2	Large boulder with gravel deposits some drops too	11
.40-.45	7	12.5	0.6	0.9	15.5	30	1.24	20.8		x			L	L		2/3	A2a+	Width to depth ratio skewed due to massive boulder in cascade/step pool	12

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1		40	30	20	5	5	
3	2	30	50	10	5	2.5	2.5	
5	3	10	20	30	20	10	10	
7	4	5	40	20	10	15	10	
9	5	5	60	10	5	10	10	
11	6		40	10	10	25	15	
12	7	20	60		5	10	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____
Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	2	--	--	Y	none	--	N	Y	N	10	
2	none	--	--	--	Y	none	--	--	Y (few)	N	5	
3	none	--	--	--	Y	none	--	--	Y	N	20	
4	few	1	N	N	Y	few	--	--	Y	N	10	
5	few	--	--	--	Y	few	--	--	Y	N	25	
6	few	3	Y	N	many	few	--	--	Y	N	30	
7	few	--	--	--	many	many	--	--	Y	N	25	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	P	2	1	--	--	active	gravel - some sand	4x10
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	P	1	--	1	--	active	gravel	boulder shadow formed
5	A	--	--	--	--	--	--	
6	P	3	1	--	--	active	gravel	large bars, gravel abundant
7	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	Few ferns at bankfull elavation
2	A	--	--	--	--	--	few frens in large boulder gaps
3	P	1/2	5	1	N	--	few grasses on small sand deposits and on sand banks
4	A	--	--	--	--	--	few grasses at bankfull
5	P	1	5	1	N	--	grasses and herbs at bankfull
6	P	1/2/3	5	1	N	--	grasses / forbs in channel - sporadic
7	A	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	1/3	3	2	vulnerable/Unstable	some boulder armor and sand bank undercut
2	N	1	0	2	stable	few sand banks (<5% of unit)
3	Y	1/3	3	2	vulnerable/Unstable	trees good root cover through
4	Y	1/3	3	2	vulnerable/Unstable	1/2 unit boulder - few spots with undercut
5	Y	1/3	0	2	stable	vulnerable due to sand banks - mostly boulder
6	Y	3/1	3/2	2	Unstable	some good root cover
7	N	1	0	--	stable	all boulder / bedrock

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	--	1/2	1/2 unit	6	sporadic bank scour/undercut
2	--	1/2	<5% unit	6	very few scour locations otherwise bedrock/boulder
3	4	1/2	75% unit	6	
4	--	1/2	50% unit	6	many boulder banks too
5	--	1/2	25% unit	6	mostly boulder bank
6	4	1/2/3	75% unit	6	
7	--	--	--	--	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	P		X	X	5	L/M	Not a big factor
2	A					L/M	not present in unit
3	A					L/M	not really around
4	A						some
5	P	X	X		6	L	not a big factor or frequent
6	P		X		6	M	not much
7	P		X		6	L	infrequenly observed

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 8/6/2002 Sheet of
Stream: Chinquapin
General Location: Between Edison lake Road and Diversion

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	0		37 18.752	119 01.473	confluence of Chinquapin and Camp 62	
1	2	0.04		37 18.722	119 01.455	Right bank upstream of roadway (B3/B4?)	
2	4	0.07		37 18.689	119 01.451	Upstream right bank from G2/G4 to Aa+(2)	
	5	0.12		37 18.662	119 01.412	Upstream right bank from A(2)a+ to	
3	6	0.11		37 18.670	119 01.433	Aa+ rec location	
4	7	0.14		37 18.633	119 01.388	Upstream right bank from B2/B3 to Aa+	
5	8	0.18		37 18.591	119 01.397	Data rec. Loc. In A(2)a+	
	9	0.25		37 18.547	119 01.375	Florence Lake road at station 0.2 - possible right bank from Aa+ to ?	
6	10	0.28		37 18.525	119 01.334	Right bank from - impacted channel - looks like it forced flow through this area to protect road - u/s of this right bank channel looks " natural"	
7	11	0.35		37 18.488	119 01.278	Data Rec. loc. In B3 channel	
	12	0.4		37 18.457	119 01.232	Right bank from B3 to Aa+ (2)	
	13	0.48		37 18.435	119 01.192	Above Gauge station - some rock debris along channel	
8	14	0.5		37 18.402	119 01.194	A(2)a+ rec. location	
9	15	0.7		37 18.272	119 01.236	A(2)a+ rec. location	
10	16	0.8		37 18.185	119 01.208	Diversion	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.0-.04	1	--	--	--	--	--	--	--	--			x	very poor	very poor	--	4	B3/B4	No good indicators/ channel appears by road crossing/ channel braids	
.04-.07	2	18	1.5	2	14.4	--	0.8	12	--		x		H	H	--	4	G2/G4	significant undercut banks	
.07-.12	3	5.7	1.5	2	12.5	--	2.2	3.8	--		x		M	L	--	2	A2a+		
.12-.14	4	7.9	0.8	1.7	14.5	--	1.8	9.88	--			x	H	M	--	4	B2/B3		
.14-.18	5	9.5	1	1.8	14.5	--	1.5	9.5	--		x		M	L	--	3	A2a+		
.25-.28	6	12.3	0.6	1.3	12.1	--	0.97	20.5	--			x	H	M	--	4	G3	significant undercut banks	
.28-.35	7	8.5	0.6	0.9	15	--	1.76	14.17	--			x	L	L	--	4	B3		
.4-.5	8	12.7	1.3	1.5	8.7	--	0.7	9.77	--		x		L	L	--	2/3	A2a+	some step pool areas and some cascade - primarily step pool - measurements in section with undercut banks (~20' long in cascade)	
.65-.7	9	12.4	1.7	2.5	14.6	--	1.2	7.2	--	x			L	L	--	3	A2a+		
.75-.8	10	No good indicators			--	--	--	--	--	x			na	na	--	3	A2a+	no good indicators	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		--	--	15	30	40	15	
2		5	20	10	15	35	15	
3		10	60	20	1	2	7	
4		--	20	20	30	20	10	
5		--	35	35	10	10	10	
6		--	5	--	60	15	20	
7		--	--	5	60	15	20	
8		25	50	15	10	5	10	
9		10	50	20	10	10	5	
10		10	50	20	10	10	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	4	--	--	x	none	1	--	x	--	90	sand associated with small woody debris jams - -sediment retention
2	none	1	--	--	x	few	--	--	x	--	50	
3	none	--	--	--	x	none	--	--	x	--	50	
4	few	--	--	x	x	few	--	x	x	--	50	LWD jam at downstream end
5	few	--	--	--	x	few	--	--	x	--	60	
6	few	--	--	--	x	few	--	--	x	--	100	
7	none	--	--	--	x	none	--	x	x	in areas	80	
8	none	--	--	--	x	none	--	--	x	--	30	
9	none	--	--	--	x	none	--	--	x	--	35	
10	none	--	--	--	x	none	--	--	x	--	30	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	P	7	3	3	1	Active	cobble/gravel	
2	P	1	1	--	--	Active	gravel	
3	A	--	--	--	--	--	--	
4	P	2	2	--	--	Active	cobble	Avg 60X12 and 20X8
5	A	--	--	--	--	--	--	
6	A	--	--	--	--	--	--	
7	P	2	1	1	--	Active	cobble	
8	A	--	--	--	--	--	--	
9	A	--	--	--	--	--	--	
10	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet of

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/3	2/5	1	1	--	Perennial herb and alder along channel margin between BF & FPA
2	A	--	--	--	1	--	Perennial herb and alder along channel margin between BF & FPA
3	A	--	--	--	1	--	Perennial herb and alder along channel margin between BF & FPA
4	A	--	--	--	1	--	Perennial Herb. And alder along channel margin between bank full and flood prone area, location 2/2/1
5	A	--	--	--	1	--	Perennial herb and alder along channel margin between BF & FPA
6	A	--	--	--	1	--	Perennial herb and alder along channel margin between BF & FPA
7	A	--	--	--	1	--	Dense alder and perennial Herb along channel margin (between bank full and flood prone area) over hangs channel
8	A	--	--	--	1	--	Areas with dense alder which overhangs channel intermittently
9	P - sporadic not pervasive	1	5	1	1	--	alder and herb along channel between bankfull and flood prone - intermittently
10	P	1	5	1	1	--	alder and herb along channel between bankfull and flood prone - intermittently

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ______ of ______

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	3	3	2	Vulnerable	
2	Y	2/3/4	3	2	Unstable	Significant Undercutting - 4' into bank - 2' high
3	N	1/2	some 3 where exposed sand	2	Stable	some areas of exposed sand which has been scouring and undercutting
4	Y	3	3	2	Vulnerable	roots and areas of boulders stabilize banks
5	N	1	0	2	Stable	some intermittent areas of exposed sand with scour and undercut
6	Y	3/4	3	2/3E	Vulnerable	3E- appears as if natural channel location has been altered
7	Y	2/3	3	2	Vulnerable	Evidence of scour / but vegetation produces stability
8	N	1	0	--	Stable	
9	N	1	3	2	Stable	intermittent areas of sand matrix which has been scoured and undercut
10	N	1	0	2	Stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ________________ Date/Time: ________________ Sheet ____ of ____

Stream: ________________ General Location: ________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	1	--	6	Upslope - sand and organic material
2	4	2	unit	6	Upslope - sand and organic material
3	4	2	intermittent	6	Upslope - sand and organic material
4	4	2	intermittent	6	Upslope - sand and organic material
5	4	2	intermittent	6	Upslope - sand and organic material
6	4	2	intermittent	6	Upslope - sand and organic material
7	4	2	unit	6	Upslope - sand and organic material
8	4	na	100X30	63/4/5	large pile of 3/4/5 immediately upstream of former Gage station see gps for gauge station looks like anthropogenic inputs heavy equipment
9	4	1/2	intermittent	4/5/6	
10	4	--	none	--	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
chinquapin/camp 62	none	--	--		channel significantly impacted at confluence due to fill material. Associated w/ Mono siphon and roadway

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	M	trees but shallow slopes
2	P 1 piece	--	x	x	6	H	some dead trees and significant undercutting
3	P	--	x	x	6	H	trees/ relatively step slopes and some undercut banks
4	P	x	x	x	3/5/6	H	trees and undercut banks
5	P 2-3 pieces	x	x	x	6	M	
6	P	x	x	x	6	M	
7	P	x	x	x	3/6	H	
8	A	--	--	--	--	H	conifers along bank some area of steep slopes
9	A	--	--	--	--	H	steep slopes / many trees
10	A	--	--	--	--	H	steep slopes / many trees

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB | Date/Time: 8/6/2002 Sheet of

Stream: Chinquapin | General Location: 0.0 - below Kaiser Pass Rd

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
1	1	0.03		37 18.775	119 01.452	Data Rec. Location	
	2	0.05		37 18.813	119 01.463	Potential Reach Break from A2? (Disregard)	
	3	0.05		37 18.817	119 01.461	Large debris jam - flow splits with newly formed side channel to the east	
	4	0.06		37 18.801	119 01.490	RB between A2 (upstream) and side channel with some flow	
2 (SC)	5	0.07		37 18.813	119 01.476	Sample site within side channel	
3 (SC)	6	0.1		37 18.837	119 01.489	Confulence of side channel with Camp 62	
4	7	0.05		37 18.811	119 01.472	Sample site within existing channel	
	8			37 18.845	119 01.504	Confuence of existing channel with Camp 62	
5	9	0.83		37 18.881	119 01.515	Data Location in Camp 62- ~20' upstream of WP site B10 top of Site C	
	10	0.79		37 18.947	119 01.537	Potential right bank from A2 to G2 - may need to check slope	
	11	0.72		37 18.968	119 01.528	Potential RB from A2 to ?	
6	12	0.74		37 18.996	119 01.527	B2/B3 rec. location	
7	13	0.6		37 19.063	119 01.558	Data Rec. locaton B3/B4	
	14	0.56		37 19.085	119 01.556	A1a+ incuded in B3 / B4 seciton	
8	15	0.5		37 19.131	119 01.566	Data rec. right bank/in A(2)a+	
NC - New channel							
OC - Old Channel							

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	‿	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
0-.05	1	7.9	**0.8**	1.5	8.9	--	1.13	9.88	--		x		H	M	--	2	A2	channel appears downcutting in response to road crossing	
.06-.07	2 (SC)	4.8	0.4	0.6	18	--	3.75	12	--			x	H	M	--	4	C4/E4?	downcutting upstream appears to have created this new channel	
.07-.1	3(SC)	7	1.2	1.7	9	--	1.3	5.93	--			x	L	L	--	4	G4	side channel makes estimating of flood prone width difficult, New Channel difficult	
.07-.1	3(SC)	7.3	0.5	0.7	8.3	--	1.1	14.6	--			x	M	M	--	4	G4		
0.05	4	11.2	1.3	1.7	13	--	1.16	8.6	--		x		H	H	--	4	G2	check slope (A2?)	
.87-.82	5	14	1.2	2.4	20.5	--	1.5	8.2	--		x		H	H	--	2	A2	check slope to determine A2/G2	
.77-.72	6	9.6	1	1.5	17.7	--	1.8	9.6	--			x	H	H	--	4	B2/B3		
.65-.60	7	11.3	0.8	1.1	20	--	1.8	14.13	--			x	H	H	--	4	B3/B4		
.45-.50	8	na	--	--	--	--	--	--	--	x			--	--	--	2	A(2)a+	not able to record bankfull - large boulder /bedrock cascade	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		--	15	50	20	10	5	much of material is angular
2 (SC)		--	--	--	20	50	30	
3(SC)		--	--	--	10	60	30	significant duff material in channel
4		20	10	40	15	10	5	
5		10	30	30	10	10	10	
6		--	5	40	30	15	10	
7		--	--	10	40	40	10	
8		20	75	--	--	--	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools (% on bed)**	**Comments**
1	few	--	--	--	x	few	--	--	x	--	60	
2nc	none	2	--	--	x	none	--	--	x	--	50	
3nc	none	2	--	--	x	few	--	--	x	--	30	
4oc	none	--	--	--	x	none	--	--	x	--	50	
5	none	--	--	--	x	few	--	--	x	--	30	
6	none	--	--	--	x	none	2	--	x	--	25	
7	none	2	--	--	x	none	1	--	x	--	35	
8	none	--	--	--	x	none	--	--	x	--	<10	

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	A							
2 (SC)	P	2	2			Active	Gravel	
3 (SC)	P	2	2			Active	Gravel/sand	
4	A							
5	A							
6	P	2	2			Active	Sand	
7	P	3	3			Active	1sand / 2gravel	
8	A							

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1	--	alder on bank above flood plain and overhaning channel
2 (SC)	P	1/2	1/5	1/2/3	2	--	1 conifer ~12" dbh in channel bed; 1 small conifer with in bankfull on margin - herb intermittent on margin and in channel
3 (SC)	P	1	1	2/3	2	--	conifers with in bankfull channel
4	A	--	--	--	1	--	alder along channel margin outside of flood prone area
5	A	--	--	--	1	--	intermittent alders along channel with in and outside flood prone area
6	A	--	--	--	1	--	alder and perennial Herb along channel outside of flood prone width
7	A	--	--	--	1	--	alder and perennial Herb along channel outside of flood prone width, over haging channel
8	A	--	--	--	1	--	some alder on channel margin outside bankfull - no good bankfull indicators.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	y	1/2/3	3	2/3a	Vulnerable	3a-channel downcutting in response to road crossing
2 (SC)	y	3/4	3 (some scour)	2 (3a)	stable	areas of boulder stable/areas of sand significantly undercut - vegetation produces stability
3 (SC)	y	3/4	3	2 (3a)	Unstable	channel appears to be downcutting
4	y - areas of sand material	2/3	3	2	Vulnerable	appear relatively stable but significantly Undercutting in areas of sand mantel
5	n	1	0	2	stable	some areas of scour/undercutting where sand occur
6	y	2/3	3	2	Vulnerable (low energy)	small boulder and cobble/vegetation produces stability/but undercutting
7	y	2/3/4	3	2	Vulnerable (low energy)	veg providing stability
8	n	--	--	--	stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	2	unit	6	upslope - sand and organic material
2 (SC)		1	unit	6	upslope - sand and organic material
3 (SC)	4	1	unit	6	upslope - sand and organic material
4	4	2	unit	6	upslope - sand and organic material
5	4	1 - intermittent	intermittent scour along reach	6	upslope - sand and organic material
6	--	2	unit	6	upslope - sand and organic material
7	--	2	unit	6	upslope - sand and organic material
8	4	--	--	6	upslope - sand and organic material

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
4	Dep	Act	10' x 8'	cobble	confluence of Chinquapin (old channel) with Camp 62

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	BF	FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	H	trees/undercut/ moderate Slopes - abundant SWD
2 (SC)	A	--	--	--	--	M	very low slope but trees abundant
3 (SC)	A	--	--	--	--	M	very low slope but trees abundant
4	P	x	x	x	6	M	some trees and relatively steep slope
5	P-2pieces	x	x	x	6	H	relatively steep slopes abundant Trees
6	P -1piece	x	x	x	6	M	Abundant trees but low slope
7	P few pieces	x	x	x	6	M	Abundant trees but low slope
8	P	x	x	x	3/6	M	steep slopes but not many trees near channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/MC/TB

Date/Time: 8/22/2002 Sheet of

Stream: Chinquapin

General Location: Above Div. .8-1.3

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.8		37 18.191	119 01.204	chinquapin diversion	
1	2	0.84		37 18.142	119 01.205	site 1 ~200' upstream in A2a+ (very steep ~30% slope) photo 70	
	4	0.98		37 18.060	119 01.191	upper extent of boulder jam (debris flow) at 985' upstream	
2	5	0.99		37 18.055	119 01.176	at 1005' site 2 in upper extent of debris flow scoured section	
	6	1.03		37 18.008	119 01.173	at 1005' bedrock inflouence - steeping (>30%) (possible A1a+ break)	
	7	1.06		37 18.016	119 01.140	at 1394 debris jam falls - multi-thread - ready to go	
3	8	1.12		37 17.959	119 01.141	1689' with in steep (40% A2a+) site 3 - A2a+ to at least 1.2	
						End of survey - clearly 2a+ to 1.2 (visual)	
						- topo indicates same gradient	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.80-.84	1	22	**2**	**3**	**31**	--	1.41	11	--	x (LB)		x (RB)	M/H	M/H	--	2/3	A2a+	in step pool - wide energy dissipation zone - most of unit entrenched	2
.95-.99	2	15.8	0.9	1.3	19.5	--	1.23	17.6	--			x	L/M	L/M	--	--	A2/B2/A2a+	slope borderline 10% some flat some steep	5
1.06-1.12	3	--	--	--	--	--	--	--	--			x	--	--	--	2	A2a+	channel under 40' wide boulder swath - no channel, no indicators	8

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

DOMINANT STREAMBED PARTICLE SIZE

gps	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
2	1		60	20	10	5	5	very little sand boulders massive (~40"x)
5	2		50	25	10	5	10	sand deposits in debris flow effected channel
8	3		70	20	5	3	2	all boulder swath

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	few	--	N	N	Y	none (few)	--	N	Y (some)	N	0-5	very little sand
2	few	--	N	N	Y	few	--	N	Y (all)	N	20	
3	none	--	N	N	Y	none	--	N	Y (some)	N	10	few pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	most vegetation in flood prone
2	A	--	--	--	--	--	few grasses between boulders below bank flow above observed flow
3	A	--	--	--	--	--	few grasses at BF in distinguishable pools -no defined channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0 (3 if any)	1(2)	stable	some upslope loose sand on left bank few pockets of sand scour
2	Y	3/1	1/2/3	2	unstable	severe bank scour, probably due to debris flow - undercut and wasting
3	N	1	0	2	stable	boulder field to top banks no channel defied or banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4 (minor)	1 (minor)	10% unit	sand	Left bank steep with some upslope sand delivery; few pockets of sand bank scoured- no sand deposited In unit
2	4 (very minor)	1/2/3	100% unit	sand	banks wasted, undercut and actively depositing sands throughout
3	4 (minor)	1 (if any)	<5% unit	sand	boulder field - maybe debris flow (inactive)

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

LARGE WOODY DEBRIS

		Channel Zone					
Smpl Site ID#	**Presence / Absence**	**Low Flow**	**BF**	**FP**	**Geomorphic Function**	**Recruitment Potential (High / Moderate / Low)**	**Comments**
1	P		x	x	6	M/H	Leftbank (facing upstream) steep with many mature conifers - easy delivery
2	P	x	x	x	3/5	H	LWD recruited easily by debris flow - high supply
3	P	x	x	x	3/5	M/H	LWD holding cobble and boulder - perched ready to fall - confiners in boulder field

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF   Date/Time: 8/20/2002 Sheet of

Stream: Crater Creek   General Location: .0-.6 form SFSJR confluence

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0	18-17	37 18.715	118 58.605	confluence with South Fork San Joanquin River RM 0.0	
1	2	0.05	19	37 18.674	118 58.589	site 1 247' upstream of confluence	
	3	0.1	20	37 18.624	118 58.539	538' upstream LWD jam	
2	4	0.16	21	37 18.604	118 58.490	Left braid upstream of jam -dry- site 2	
	5	?		37 18.584	118 58.494	Right Braid in meadow	
3	6	0.23		37 18.560	118 58.524	site 3 in meadow ~ 1230' upstream	
	7	0.33		37 18.482	118 58.551	Break at 1722' to C channel - Broader channel filled with sand	
4	8	0.34	23	37 18.492	118 58.563	site 4 - 50' upstream of break	
5	9	0.45	24	37 18.439	118 58.633	site 5 at 2368' in broad dry sand bed channel	
	10	0.46		37 18.431	118 58.631	2443' reach break to boulder/bedrock confined high gradient A2a+	
	11	0.505		37 18.390	118 58.647	End survey - within A2a+ near WP sites	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth** ($AveD_{bf}$)	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.02-.05	1	13.5	1	1.2	19.5	--	1.14	13.5	--			x	M/H	M/H	--	5	G4/B4/G5/B5	boulder indicators - top bank scour, vegetation position; sand deposition	2
0.16	2	17	0.9	1.6	25	--	1.5	18.9	--			x	L	L	--	5/4	B3	left braid - no flow, water ponded is pools	4
.14-.23	3	4.5	1.1	1.3	12	--	4.1	27	--			x	M	M	--	5/6	E5	rt braid-classic meadow E5	6
.33-.35	4	12	0.8	1.1	26	--	2.16	15	--			x	L/M	L/M	--	5	C5/B5	C like with large sand bars and infilling	8
.4-.45	5a	21	0.7	1	25	--	1.2	21	--			x	M	M	--	5	B5?	using best current indicators top bar, bank underut	9
.4-.45	5b	24	1.6	2	60	--	2.5	15	--			x	M	M	--	5	C5	using slightly higher indicators - root scour, top bank	9

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

gps	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	5	5	10	5	40	35	
4	2	--	--	10	50	20	10	
6	3	--	--	--	--	--	100	all sand
8	4	--	--	--	--	--	100	all sand
9	5	--	--	--	--	10	90	gravel is small size

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	few	3	Y	N	Y	few	2	N	Y	N	60	
2	none	1	N	Y	Y	none	--	Y	Y	N	25	
3	--	--	--	--	--	--	--	N	Y	Y	100	
4	--	--	--	--	--	--	2	Y	Y	Y	100	
5	none	--	Y	N	Y	none	3	Y	Y	Y	95	

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	P	5	1		4	Active	Gravel/sand	Sand (1 point, 1 lateral), gravel (3 point)
2	P	1			1	Active?	Gravel	
3	A							several slumps in bed
4	P	2	2?		?	Active?	Sand	large bars 25' long by 10' width
5	P	3	3			Active?	Sand	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/2/3	5	1	3/2	?	grasses on point bars, fairly dense (horsetail?) grass on slumped deposits too
2	P	1/3	5	1	3/2	?	grasses and herbs on bars and banks at bank full
3	A	--	--	--	--	--	slumps with grass on bed
4	P	1/2/3	5	1	3/2	?	grass on bars, banks and dry low flow - willow on banks
5	P	1/2/3	5	1	3/2	?	grass on bars and below bank full, and on bed occasionally

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	3/4	2/3	2	Unstable	lacks good root cover and large particles, active slumping
2	Y	3/4	2/3	2	Unstable	some conifer root cover, no large particles
3	Y	3/4	2/3	2	Unstable	meadow E5 - some willow root cover
4	Y	3	2/3	2	Unstable	Lacks root and large particle cover; scoured
5	Y	3	2/3	2	Unstable	Lacks root and large particle cover; scoured

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1		1/2/3	Unit	6	sand banks undercut and slumping opposite point bars
2		1/2/3	Unit	6	sand banks undercut and slumping opposite point bars
3		1/2/3	Unit	6	slumping throughout
4		1/2/3	Unit	6	slumping and scour/undercut throughout
5		1/2/3	Unit	6	slumping and scour/undercut throughout

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X		3/4/5	L	few LWD pieces
2	P	X	X	X	1/5	H	many trees, dense flat forest
3	A	--	--	--	--	L	meadow
4	P	X	X	X	3/5	L/M	meadow
5	P	X	X	X	3/5	M	many cottonwood/aspen in meadow adjacent to channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF Date/Time: 9/11/2002 Sheet of

Stream: Crater Ck General Location: Below Div 1.5-2.4

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected) Photo	NORTHING	WESTING	Feature	Comments
	1	1.5		37 17.634	118 58.897	Florence/Kaiser road crossing	
1	2	1.56		37 17.592	118 58.946	304' upstream break form split A1a+/A2a+	
1	3	1.6		37 17.566	118 58.948	break A2a+ to lower gradient B?	
2	4	1.62		37 17.551	118 58.959	Site 2 at 637" upstream in B /A2/A2a+ above	
	5	1.7		37 17.493	118 58.992	1075' u/s Photo 8 downstream in A2/A2a+ trench	
	6	1.73		37 17.466	118 58.996	1234' upstream break to ? Lower gradient and entrenchment - right side channel	
	7	~1.73		37 17.472	118 58.977	Left side split channel Break to lower gradient sand bed channel	
	8	1.8		37 17.443	118 59.010	1569' is top of split - debris flow formed Photo 10	
3	9	1.81		37 17.435	118 59.023	site 3 photo 11	
	10	1.83		37 17.403	118 59.046	break to B2(G2) still C - incised - more entrenched - boulder dominated	
	11	1.87		37 17.379	118 59.066	break to B2/G2	
4	12	1.93		37 17.346	118 59.110	site 4 in B2/G2 B3/G3 photo 13	
	13	1.98		37 17.340	118 59.111	break to A1a+/A2a+ bedrock sheet - split channel	
	14	1.99		37 17.334	118 59.132	End split channel - break A2a+ photo 14	
5	15	2.03		37 17.309	118 59.160	site 5 in A2a+ photo 15	
	16	2.11		37 17.262	118 59.212	Photo 16 in A2a+ facing downstream	
	17	2.23		37 17.187	118 59.291	break to lower gradient ? A2/G2 wet!	
6	18	2.25		37 17.186	118 59.309	site 6 photo 17 A2/G2	
	19	2.3		37 17.145	118 59.336	Break to A2a+? - gradient steeping - bedrock confinement on both sides	
	20	2.35		37 17.113	118 59.364	still A2/A2a+? - probably >10%	
	21	2.42		37 17.061	118 59.402	End survey in A2a+ - bedrock trench with massive boulder	
	22	1.45		37 17.692	118 58.841	confluence of split channels below culverts	
	23	1.42		37 17.730	118 58.842	below confluence - end recon of crater below road	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.50-1.56	1		--	--	--	--	--	--					--	--	--	1/2	A1a+/ A2a+	split in bedrock trenches to road - 2 culverts	2
1.60-1.62	2	8.5	0.8	1.1	**18**		2.1	10.6				x	M/H	M	--	4	B2	lower gradient boulder Bed with sands	4
1.63-1.74	--	--	--	--	--	--	--	--					--	--	--	--	A1/A2	A1a+ / A2a+	--
1.76-1.82	3	14	1.1	2	52		3.7	12.7				x	M	M	--	4/5	C5	god indicators - scour line, slope break sand deposits, rooted vegetation	9
1.87-1.93	4	7	0.6	1	11.5		1.64	11.7				x	M	M	--	4	B3/G3	B2/G2	12
1.99-2.03	5	15	0.9	1.4	32		2.13	16				x	L	L	--	4	B2 (**A2a+**)	poor indicators	15
2.23-2.26	6	8.5	0.8	1.3	10.1		1.2	10.6				x	M	M	--	3/4	G2/(**A2**)	some B2 pieces ~5% - confined by bedrock	18

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet of

Stream: ______________ General Location: ______________

DOMINANT STREAMBED PARTICLE SIZE

gps	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	70	20	5	--	--	5	sand in pools in trench
4	2	--	35	40	10	5	10	
9	3	--	--	5	5	20	70	
12	4	10	5	35	35	10	5	
15	5	--	70	15	10	--	5	
18	6	10	25	40	10	5	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ______ of ______

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	--	N	N	N	few	--	N	N	N	50	sand in few pools
2	none	--	N	N	Y	few	--	N	Y	N	25	sand mostly interstitial
3	none	--	Y	N	Y	few	--	N	Y	Y	75	
4	none	--	Y	Y (some)	Y	none	--	Y	Y	N	25	
5	none	--	N	N	Y	few	--	N	Y	N	10	sand in pockets
6	none	--	N	N	Y	few	--	N	Y	N	30	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	
5	A	--	--	--	--	--	--	
6	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	--	--	No riparian matrix due to bedrock
2	A	--	--	--	--	2/3	few willow seedlings at bankfull cottonwoods/ willow below relict bankfull
3	P	1	5/3	1	2(3)	1/2	grass and willow seedling on adjacent flood prone - not bar - maybe debris deposit
4	P	1/2	4/5/1	1/2	3(2)	2	wild rose, ferns, ribes on bank at or below bank full, seedling willows in bed
5	A	--	--	--	--	1/2	one young/mature alder in channel between boulders
6	P	1	5/3	1	2	2	horsetails/grass at bank full, willows in relict bank full

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	2	stable	bedrock trenches
2	Y	3/2	3	2	vulnerable/unstable	some scour and undercut, but much of the banks have rock and root cover
3	Y	3	3	2	unstable	all undercut and scoured
4	Y	3/2	3	2	vulnerable/unstable	roots/LWD and small boulder cover on most banks - many scoured through
5	N	1	0 (3)	2	stable	Slight scour where sand banks present
6	N	1	3	2	stable	Vulnerable where sand banks present

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	n/a	n/a	n/a	sand	sand deliver form upstream only
2	n/a	1/2	50% unit	sand	
3	n/a	1/2	90% unit	sand	mostly sand banks and bankfull/flood prone transition
4	n/a	1/2	40% unit	sand	exposed sand matrix banks scoured
5	n/a	1 if any	<5% unit	sand	mostly boulder banks
6	n/a	1/2	5% unit	sand	mostly boulder banks

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet of

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	L	no trees on bedrock slab
2	A	--	--	--	--	L/M	not many trees - low slope
3	P	X	X		5/3/1	L/M	sparse and low slope
4	P	X	X	X	1/3/5	M/H	many conifers/cottonwood adjacent
5	A	--	--	--	--	L	low slope - less trees
6	A	--	--	--	--	L	few streamside large trees

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/JC/TB

Date/Time: Sheet of

Stream: Crater Ck

General Location: 2.4-3.4

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
Above Diversion							
	1	2.91		37 16.599	118 59.678	Diversion	
1	2	2.96		37 16.552	118 59.691	254' upstream site 1 in A2a+	
	3	3.1		37 16.496	118 59.761	1010' upstream Break to lower Gradient B?	
2	4	3.13		37 16.428	118 59.780	1213' upstream site 2 in B2/B3	
		3.2				HipChain broke 1500'	
	5	3.25		37 16.336	118 59.755	1800' 0.34 upstream begin sand deposits	
	6	3.28		37 16.337	118 59.776	End sand deposits mid-channel Bar - B2 above	
	7	3.32		37 16.330	118 59.801	break to C	
3	8	3.33		37 16.307	118 59.801	Site 3 C4	
	9	3.36		37 16.279	118 59.808	Break to A2a+ (boulder strewn)	
	10	3.4		37 16.241	118 59.827	Break to B2 photos (similar to d/s)	
Below Diversion						End survey upper crater	
L1	1	2.8		37 16.665	118 59.628	site L1 lower Crater	
	2	2.75		37 16.716	118 59.602	Break form A2a+ to B2	
L2	3	2.75		37 16.752	118 59.586	site L2 Photo 63 - 64	
	4	2.7		37 16.777	118 59.598	possible bedrock confined A2 (entrenched) boulder deposition	
L3	5	2.62		37 16.811	118 59.590	site L3	
	6	2.6		37 16.867	118 59.567	break to A2a+	
	7	2.5		37 16.930	118 59.519	LWD Jam (4) photo ___/no access	
L4	8	2.45		37 16.943	118 59.500	site L4 in A2a+	
	9	2.35		37 17.052	118 59.471	D/S end ? A2a+ at least another 500'	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
2.91-2.96	1	21	**3**	**5**	**35**	--	1.67	7	--		x		M	M	--	2	A/B A2a+	Large boulder A2a+ cascade	2
3.10-3.15	2	11	0.9	1.2	17	--	1.54	13.75	--		x		M/H	M/H	--	4	B2		4
3.33-3.35	3	16	0.5	0.8	28	--	1.75	32	--			x	M./H	M./H	--	5	B4/5/C4/5	meandering with gravel and sand bars	8
2.85-2.75	L1	16	2	3.8	40	--	2.5	8	--						--		E2	relict bank full	1
2.85-2.75	L1b	7.4	0.8	1	15	--	2	9.25	--			x	L	L	--	**2**	B2/**A2a+**	looks B too	--
2.75-2.70	L2	12	0.6	1.4	20.3	--	2	20	--		x	x	L/M	M	--	4	B2	8-12% slope	3
2.65-2.62	L3	12	0.7	1.4	16	--	1.3	17	--			x	M	M	--	4	B2	5-10% slope	5
2.55-2.45	L4	9.6	0.6	1	14.5	--	1.6	15	--	x	x		M	M	--	2	B2/**A2a+**	~A2a+	8

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

DOMINANT STREAMBED PARTICLE SIZE

gps	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1		75	5	5	5	10	100% Large boulder underlain by others
4	2		50	20	10	10	10	
8	3		5	5	5	60	25	
1	L1		60	15	15	5	5	
3	L2		30	40	15	5	10	
5	L3		25	40	20	10	5	
8	L4		70	10	10	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____
Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	none	--	N	N	Y	many	--	N	Y	N	N/A	no pools
2	none	1	N	N	Y	few	--	N	Y	N	50	
3	many	2	Y	N	Y	few	1	Y	Y	N	40	
L1	none	--	N	N	Y	few	--	N	Y	N	30	few pools
L2	few	--	N	N	Y	few	--	N	Y	N	25	few pools
L3	none	--	N	N	Y	few	1	N	Y	N	25	few pools
L4	none	--	N	N	Y	few	--	Y	Y	N	20	LWD jam bar, few pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	--	--	--	--	--	--	
2	P	1	--	1	--	Active	gravel/cobble	small no vegetation in riffle at site
3	P	3	--	--	3	Active	gravel/sand	
L1	A	--	--	--	--			
L2	A	--	--	--	--	--	--	
L3	P	1	--	1	--	Active/Inactive	sand	sapling willow and sod grass 10% vegetation
L4	A	--	--	--	--	--	--	Large LWD jam bar

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A					n/a	alder at bank full
2	A					n/a	few grasses and seedling willow at bank full
3	P	1/2/3	5	1	2/3	n/a	grass on large bars and in bed
L1	P	1/2	5	1	2/3	2	alder in relict bank full, grass on banks and sand in bed
L2	P	1	5	1	2/3	2	alder in relict bank full, grass on banks and sand in bed
L3	P	1/3	5/3	2	3 (2)	2	alder in relict bank full, grass on banks and sand in bed
L4	P	1	5	1	2(1)	? (2)	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ______ of ______

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	2	STABLE	all large/massive boulder
2	N	1	0	2	STABLE	boulder dominated Bank
3	Y	4	2/3	2	UNSTABLE	all sand bank
L1	N	4(1)	3	2	STABLE/VULNERABLE	some sand banks - good cover though
L2	N	4(1)	3	2	STABLE	some sand banks - good cover though
L3	Y	4/1	3	2	VULNERABLE	good boulder/root cover
L4	N	1	0	2	STABLE	all boulder/bedrock banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	--	--	--	6	sand on bed between boulder
2	4 (inactive)	1	50% unit	6	minor upslope inactive, bank is minor and few
3	--	1/2/3	100% unit	6	lots of sand by LWD
L1	4 (inactive)	1	10% unit	6	some exposed bank -stable though
L2	4 (a bit)	1	15% unit	6	some exposed bank -stable though
L3	4	1	25% unit	6	some exposed bank -stable though
L4	4 (a bit)	1	5% unit	6	very few sand banks - all bedrock/boulder

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	M	none in channel
2	P	X	X	X	5	M/H	
3	P	X	X	X	3	M	
L1	A	--	--	--	--	M	none in channel
L2	P	--	--	X	6	M	none in channel
L3	A	--	--	--	--	M	none
L4	P	X	X	X	3/5	L/M	LWD jam at ~2.5

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/11/2002 Sheet of

Stream: Crater Diversion

General Location: Pack Station Rd. -> Fl. Lake

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	47	0.65		37 16.565	118 58.510	Outlet to Florence Lake	
18	48	0.7		37 16.612	118 58.481	SS#18	
	49	?		37 16.615	118 58.474	Road Crossing	(low confidence in stationing use GPS to correct)
	50	?		37 16.643	118 58.472	Diversion -> wood/bedrock with ~2" pipe and valve	(low confidence in stationing use GPS to correct)
19	51	?		37 16.659	118 58.463	SS#19 -> rightbank of B - channel (GPS #46)	(low confidence in stationing use GPS to correct)
	52	?		37 16.667	118 58.471	Gaging station	(low confidence in stationing use GPS to correct)

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
GPS #47 - #48	18	14	0.8	1	18.5		1.3	17.5				X	H	H		4	G2/G5 B2/B5	-> Sand embedding boulder	
GPS #49 -> #51	19	11	1.3	1.8	12.5		1.1	8.46				X	H	M		4	G2		

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

gps	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
18		10	15	20	15	15	25	
19		1	25	25	15	10	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
18	none	-	-	X	X	none	2	X	X	in areas	None	sand embedding boulder
19	few	-	-	-	X	few	-	X	X	-	None	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
18	P	2	-	2	-	inactive	Sand	Size 30x10' and 20x6' -> dense vegetation
19	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
18	A	-	-	-	1	-	willow/ alder/ cottonwood / herb in flood prone area
19	A	-	-	-	1	-	Alder /Willow / Aspen /conifer in flood prone area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
18	Y50% - N50%	3 - 1/2	3 - 0	2	Stable - Vulnerable	vegetation provides stability
19	N	1/2	3	2	Stable	bank scour evident but large elements and vegetation provide stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
18	4	1	4 -> unit 1 -> 50% unit	6	~ 50% bank scour
19	4	1	unit	6	-> bank scour evident, but large elements provide stability

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	Channel Zone BF	Channel Zone FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
18	P	X	X	X	3/6	Moderate - High	Moderate - High density of trees along channel
19	P	X	X	X	3/6	High	-> dense trees along channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 9/11/2002 Sheet of
Stream: Crater Diversion Channel
General Location: .64-1.5

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	23	1.47		37 16.818	118 59.106	200' section downstream - left bank becomes better defined in A2a+ section then transitions back into sheet flow over bedrock A1a+	
10	24	1.39		37 16.859	118 58.985	SS# 10 in A1a+	
	25	1.37		37 16.905	118 58.979	flow become more channnelized (vs. sheet flow upstream) in Bedrock	
	26	1.3		37 16.887	118 58.954	channel is dry - right bank from A1a+ to A/G - channel gradient decreases significantly as channel drops into valley floor	
	27	1.27		37 16.875	118 58.935	side channel / high flow channel joins main channel	
11	28	1.25		37 16.878	118 58.913	SS # 11 - Pod. RB form A4 /A5 to Aa+ downstream	
	29	1.22		37 16.853	118 58.887	short G1/G2 section (150') within A2a+ reach as gradient decreases	
	30	1.19		37 16.862	118 58.864	Reach Break to A1a+/A2a+	
12	31	1.14		37 16.853	118 58.809	SS #12 in A1a+ section	
	32	1.09		37 16.818	118 58.770	Potential reach break from A1a+ to G1 (?) - gradient decreases	
13	33	1.02		37 16.804	118 58.747	SS #3 in G1	
	34	0.98		37 16.789	118 58.744	Potential reach break from G1/G4/G5 to Aa+?	
	36	1		37 16.795	118 58.741	station 1.00 -1.09 - G1 station .98-1.02 - G4/G5	
	37	0.95		37 16.745	118 58.732	Reach Break from A1a+/A2a+ to A2/A5 - check dam/diversion in channel - concrete "dam" with 4" steel pipe along left bank.	
	38	0.92		37 16.755	118 58.700	Potential reach break from short A2/A5 - Aa+	
14	39	0.88		37 16.767	118 58.655	SS#14 in Aa+ - near WP site E	
	40	0.86		37 16.765	118 58.642	RB form Aa+ to G2	
15	41	0.8		37 16.748	118 58.569	SS# 15 in G2	
	42	0.76		37 16.734	118 58.545	Potential reach break from G2 - A1a+/A2a+	
16	43	0.72		37 16.719	118 58.520	SS# 16 in A1a+/A2a+ ~200' upstream of road crossing	
	44	0.7		37 16.710	118 58.510	Florence lake road crossing - right bank from A2a+ - B2	
17	45	0.66		37 16.694	118 58.498	SS #17 in B2	
	46	0.64		37 16.686	118 58.473	pack station road crossing	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	**V**	**U**	**‿**	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.39 -1.47	10	--	--	--	--	--	--	--	--			x	--	--	--	1	A1a+	sheet flow over bedrock - no apparent bankfull indicators- Intermittent areas where more channelized	24
1.25-1.30	11	16.3	0.6	1	12.6	--	0.8	27.2	--			x	H	H	--	4	A4/A5 or (f4/f5)	some lower gradinet areas maybe G predominantly A	28
1.14-1.19	12	13	0.4	1.1	21	--	1.6	32.5	--			x	M	M	--	1/2	A1a+	Gradient 10 - 12% check slope in office	31
1.0-1.09	13a	8.5	0.6	0.8	9.5	--	1.1	14.2	--			x	H	M	--	1/4	G1	gradeint 2-4% - bedrock banks	33
.98-1.02	13b	16.6	0.5	1	18	--	1.1	33.2	--			x	H	M	--	1/4	F1b?	collect additional measure upstream	34
.88-.92	14	8	0.8	1.4	13.5	--	1.7	10	--			x	H	M	--	2	A1a+/A2a+		39
.80-.86	15	9.7	1.2	1.6	11	--	1.1	8.1	--			x	H	H	--	4	G2		41
.68-.76	16	9	0.8	1.2	13	--	1.4	11.25	16.7	x			H	H	H	2	A2a+		43
.65-.70	17	9.5	0.7	1.2	16.5	--	1.74	13.6	--			x	H	L	--	4	B2		45

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

gps	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
	10	95	2.5	2.5	--	--	--	minor sand /gravel in bedrock seams
	11	--	10	15	5	35	35	
	12	90	5	5	--	--	--	minor sand / gravel
	13a	70	5	5	2	9	9	
	13b	10	10	10	5	30	35	
	14	45	20	20	5	5	5	
	15	15	15	30	10	15	15	
	16	10	50	20	5	10	10	
	17	--	20	40	10	15	15	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
10	none	--	--	--	--	none	--	--	--	--	no pools	No measureable quantities of sand/gravel
11	few	--	--	--	x	few	--	x	--	x	no pools	sand and gravel cover bed
12	none	--	--	--	--	none	--	--	--	--	no pools	minor sand / gravel
13a	few	--	--	--	x	none	--	--	x	in areas	no pools	
14	none	--	--	--	x	none	--	--	x	--	no pools	
15	none	--	--	x	x	none	--	x	x	--	no pools	
16	few	--	--	--	x	many	--	--	x	--	no pools	
17	none	--	--	x	x	none	--	x	x	--	no pools	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
10	A							
11	A							
12	A							
13a	A							
14	A							
15	A							
16	A							
17	P	1		1		Inactive	small boulder	size ~ 30'x80' - vegetation alder and mature conifer

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
10	A	--	--	--	1	--	Sporadic vegetation along Channel margin in bedrock joints
11	A	--	--	--	1	--	Alder, Herb, and conifer in flood prone area
12	A	--	--	--	1	--	Alder / Herb along right bank - left bank gently sloping bedrock with no vegetation
13a	A	--	--	--	1	--	Alder along Channel margin in flood prone area where bedrock absent
14	A	--	--	--	1	--	alder/herb/conifer in flood prone area along joints in bedrock and sand in Boulder matrix
15	A	--	--	--	1	--	low density and sporadic herb and alder on bank in flood prone area
16	A	--	--	--	1	--	low density and sporadic herb and alder on bank in flood prone area
17	A	--	--	--	1	--	alder / herb in flood prone area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
10	N	1-85% 3-<15%	0-85% 3-<15%	0-85% 2-<15%	stable	no well defined banks - sheet flow over bedrock - where banks present, boulder and sand
11	Y	3	2/3	2	unstable	significant undercut and scour and slumping in areas
12	N	1/2	0	0	stable	large boulder/bedrock
13a	N-75% Y-25%	1/2-75% 3-25%	1/2-0 3-3	0-0 2-3	stable	75% bedrock/Boulder - 25% sand with vegetation and some scour
14	N	1/2	0	0	stable	
15	Y	1/2/3	3	2	vuln	undercut areas - conifer root matrix and boulder/bedrock providee stability
16	N	1	0	0	stable	Bedrock and boulder with some sporadic areas of sand which show scour
17	Y	2/3	3	2	vuln	vegetation and boulder provide stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: Date/Time: Sheet of

Stream: General Location:

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
10	4	1(<15%)	upslope - unit bank - < 15%	6	
11	4	1/2/3	unit	6	bank undercut and slumping
12					bedrock bed and banks
13a	4		unit	6	
14	4		unit	6	
15	4	2	unit	6	Bank -> primarily sand with small boulder, cobble, and gravel
16	2/4		50% unit	2 -> 2/3 4 -> 6	Rockfall along right bank - large and small boulder
17		1	70% unit	6	surface scour

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
10	A					M	moderate density trees along channel
11	P	X	X	X	3/5/6	H	dense conifers along channel / low slopes
12	P (1 piece)	X	X	X	3	L	low density of conifer along channel
13	P	X	X	X	3/6	M	moderate density of conifer along channel / low slopes
14	P	X	X	X	6	L-M	low-moderate density of conifer along channel, mod slopes
15	P	X	X	X	1/3/6	H	dense conifers along channel / low slopes
16	A					M	moderate density of conifers due to presence of bedrock / steep slope
17	P	X	X	X	1/3/5/6	M-H	moderately High density of conifers / low slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 9/11/2002 sheet 2 of 10
Stream: Crater Diversion
General Location: Stations 1.5-2.18

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	2.18		37 16.600	118 59.677	Crater diversion	
	2	2.14		37 16.602	118 59.633	small drainage enters stream along leftbank	
1	3	2.11		37 16.606	118 59.619	SS#1- potential right bank from A2-B2 as gradient decreases upstream >4%, downstream 3-5%	
	4	2.05		37 16.588	118 59.557	Gaging station with check dam. Gradient decreases upstream with sand deposits	
2	5	2.07		37 16.584	118 59.556	SS#2 in G2	
3	6	2.04		37 16.583	118 59.539	SS#3- 50' downstream of gage station - constructed wall absent, channel widens G3/G5	
	7	2		38 16.583	118 59.524	RB- Aa+?	
4	8	1.94		37 16.593	118 59.457	SS#4 in Aa2a+	
	9	1.92		37 16.587	118 59.434	gradient decreases- right bank from A2a+ to C4/C5	
	10	1.9		No GPS coverage	No GPS coverage	depositional area, channel braids through cobble, gravel, sand	
	11	1.84		37 16.617	118 59.374	site channel with trickle of water. Dense alder channel width 6-8 ft., significant - LWD	
5	12	1.84		37 16.622	118 59.409	SS#5 in Main Channel- C4/C5	
	13	1.8		37 16.627	118 59.377	gradient increases to B1/B2- start A1a+ (50') then gradient = 8%	
	14	1.7		37 16.716	118 59.303	Right bank from B1/B2 to A1/A5	
6	15	1.75		37 16.640	118 59.341	SS#6 in B1/B2?	
7	16	1.65		37 16.733	118 59.263	SS#7 in A1/A5	
	17	1.62		37 16.735	118 59.238	Potential Right bank A1/A5- Aa+	
	18	1.6		37 16.752	118 59.185	bend in channel to north and confluence with small drainage	
8	19	1.58		37 16.754	118 59.185	SS#8 in A1a+/A2a+	
	20	1.57		37 16.777	118 59.173	No defined leftbank, bedrock channel, A1a+	
	21	1.53		37 16.789	118 59.154	Gradient increases, drops down hillslope	
9	22	1.5		37 16.810	118 59.120	SS#9 in A1a+	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: #######

Stream: Crater Diversion

General Location: stations 1.5-2.18

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
2.11-2.18	1	5.5	1	1.2	6.5		1.2	5.5				X	M	M		3/4	A2	Rightbank concrete/rock wall, leftbank placed and natural boulders, high gradient riffle	3
2.05-2.11	2	8.8	0.6	1	11.5		1.3	14.7				X	M	M		3/4	**G2** (A2?)	gradient approximately. 3-5%	5
2.0-2.05	3	13.5	0.7	0.9	17.5		1.3	19.3				X	M	M		4	B3/B5or **G3/G5**	Downstream of gauging station, channel widens	6
1.94-2.0	4	16	1.3	1.7	23		1.4	9.4				X	M	M		2	A2a+		8
1.84-1.90	5	10.6	0.4	0.7	25		2.4	26.5				X	H	L		4/6	C4/C5	channel gradient decreases to <1%, braided with multiple side channels/ abandoned channels	12
1.70-1.80	6	15.5	1.2	1.7	21		1.4	12.9				X	H	M		4	**B1/B2** (A1/A2?)	Integrated slope =8-10%	15
1.60-1.70	7	6.5	0.8	1	6		0.92	8.1				X	H	H		4	A1/A5	alternate areas of A1 and A5, gradient alternates between 8-12%	16
1.55-1.60	8	7.8	0.4	0.6	9	150	1.2	19.5	19.23	X			H	H		2	A1a+/ A2a+	channel confined by bedrock	19
1.5-1.55	9	-	-	-	-	-	-	-	-			X	-	-		1	A1a+	no apparent bankfull indicters, no well defined leftbank, sheet flow over bedrock	22

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/11/2002

Stream: Crater Div.

General Location: stations 1.5-2.18

DOMINANT STREAMBED PARTICLE SIZE

gps	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
1		-	30	40	15	5	10	
2		5	20	40	15	5	15	
3		-	5	20	35	10	30	
4		5	40	35	7.5	7.5	5	boulder from eroding banks
5		-	5	5	10	40	40	deposition zone
6		50	15	15	10	10	5	
7		50	-	-	-	-	50	
8		40	25	15	-	10	10	
9		95	2.5	2.5	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 9/11/2002

Stream: Crater Div.   General Location: stations 1.5-2.18

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	Few	-	-	-	X	Many	-	-	X	-	10	
2	Few	-	-	-	X	Many	-	-	X	-	20-30	
3	None	-	-	-	X	None	-	X	X	-	no pools	
4	Few	-	-	X	X	Few	-	X	X	-	no pools	
5	None	X	-	X	X	None	X	X	X	-	80-90	
6	Few	-	-	-	X	Few	-	X	X	-	no pools	
7	None	-	-	-	-	None	-	-	-	X	100	no gravel
8	None	-	-	X	X	None	-	X	X	-	no pools	
9	None	-	-	-	-	None	-	-	-	-	no pools	No sand or gravel

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	-
2	P	1	1	-	-	Active	cobble	size= 6'X15' =20' downstream of gaging station
3	P	2	2	-	-	Active	cobble/gravel/sand	size= 6'X25'
4	P	1	-	1	-	Inactive	boulder/sand	flow braids around remnant hillslope due to LWD and big boulder. Young alder and several dying mature conifer.
5	P	6+	2	4+	-	lateral is active, mid-channel bar is inactive	lateral is sand/gravel and mid-channel bar is sand/ gravel/ cobble/ boulder	Mid-channel bar- remnant hillslope with conifer and alder
6	A	-	-	-	-	-	-	-
7	A	-	-	-	-	-	-	-
8	A	-	-	-	-	-	-	-
9	A	-	-	-	-	-	-	-

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC   Date/Time: 9/11/2002   Sheet 6 of 10

Stream: Crater Div.   General Location: stations 1.5-2.18

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	willow, alder, herb. rooted in sand within boulder matrix
2	A	-	-	-	1	-	willow, alder, herb. rooted in sand within boulder matrix
3	A	-	-	-	1	-	willow, alder, herb. in flood prone area
4	A	-	-	-	1	-	willow, alder, herb. in flood prone area
5	P	1/2/3	1	3	3	-	conifers within active channel, dense alder along channel and overhanging channel
6	A	-	-	-	1	-	alder, willow, herb. in flood prone area
7	A	-	-	-	1	-	alder, mature conifer at bank full, moderate density, alder overhanging channel
8	A	-	-	-	1	-	alder, mature conifer at bank full, moderate density, alder overhanging channel
9	A	-	-	-	1	-	willow and herb. growing sporadically in bedrock. No well defined channel.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 9/11/2002

Stream: Crater Div.

General Location: stations 1.5-2.18

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1/2	0	-	Stable	right bank- concrete/ rock wall. Leftbank - bedrock, large and small boulders
2	N	1/2	0	-	Stable	right bank- concrete/ rock wall. Leftbank - bedrock, large and small boulders
3	Y	2/3	3	2	vuln (75%) stable(25%)	vegetation provides stability. Slumping present
4	N(75%) Y (25%)	2/3(75%) 3(25%)	2/3	2	stable(75%) vul(25%)	flow eroded banks but boulders from hills now armor 75% of banks. Areas with out boulders are slumping
5	Y	3/4	3	2	vulnerable	Vegetaion provides stability (dense alder/herb.)
6	Y	1/2/3	3	2	vulnerable	vegetation provides stability. Scour/undercut banks where bedrock absent
7	Y	1/3	3	2	vulnerable	significant undercut areas but vegetaion provides stability
8	N	1	0	-	stable	primarily bedrock/boulder banks, sporadic areas with sand which show scour
9	N (Y?)	1 (3?)	0 (3?)	2	stable/vulnerable	bedrock channel with no defined leftbank. Rightbank sand with some surface scour

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 9/11/2002

Stream: Crater Div.

General Location: stations 1.5-2.18

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	unit	6	sand/organic material from upslope
2	4	-	75% unit	6	sand/organic material from upslope, no upslope sediment where bedrock present
3	4	2/3	(2- unit), (3 -25% unit)	6	upslope sand/organic, banks-sand
4	4	2/3	(4-unit), (2/3-25% unit)	(4- 6), (2/3-2/3/6)	upslope- sand organic material, banks- where not armored slumping with sand and boulders
5	-	1/2	unit	6	very shallow slopes
6	4	1/2	unit	6	
7	4	2	unit	6	
8	4	1/2	(4-unit), (1/2- 10-20%unit)	6	
9	4	1	unit	6	areas of bank scour along rightbank

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/11/2002

Stream: Crater Div.

General Location: stations 1.5-2.18

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	-	-	-	-	Mod	moderate density of conifers, low slopes, 1 piece LWD across top of flume
2	A	-	-	-	-	Mod	Moderate density of conifer, low slopes, few pieces of LWD across top of flume
3	P	X	X	X	2/3/6	High	dense conifers, low slope
4	P	X	X	X	2/3/4/6	V High	dense conifers, moderate slopes, abundant LWD in channel
5	P	X	X	X	2/3/6	High	flow through and around dense conifers
6	P	X	X	X	3/5/6	High	dense conifers along channel, low slopes
7	A	-	-	-	-	High	dense conifers, low slopes, alder/conifer growing out from bank with root mass, retaining sediment
8	P	X	X	X	3/6	High	dense conifers and steep slopes
9	A	-	-	-	-	Low	low-moderate density of trees, bedrock channel with sheet flow.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 8/19/2002 9:00 Sheet of

Stream: Ely Cr

General Location: .54-1.56

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Photos	NORTHING	WESTING	Feature	Comments
	1	0.54		37 11.350	119 17.080	Lower road bridge at ~ 0.5 mile upstream of Big Creek confluence, Ely Dry	
1	2	0.57		37 11.329	119 17.099	152' upstream of bridge site 1 (WP site in high gradient riffle)	
	3	0.6		37 11.307	119 17.123	tributary at 316' upstream	
2	4	0.67	1	37 11.274	119 17.106	in A2a+ at ~ 690' upstream site 2	
	--	0.63		no gps	no gps	Reach break to A2a+ below bedrock sheet	
	--	0.76		no gps	no gps	1172' first big bedrock sheet/falls A1a+	
3	5	0.82	2 and 3	37 11.147	119 17.108	~1502' site 3 in bedrock Aa+	
	6	0.93	4 and 5	37 11.070	119 17.138	~2036' upstream top of bedrock sheet falls A2a+, huge one	
4	7	0.96		37 11.033	119 17.084	site 4 ~ 2213' upstream site in low gradient riffle/high gradient riffle of cascade	
	8	1.01		37 10.965	119 17.089	Pipe and tunnel upstream of Talus Pile 2475 A1	
	9	1.09	7 and 8	37 10.956	119 17.162	Gauge station and diversion at road crossing ~ 2883' A1a+/A2a+	
5	10	1.13		37 10.902	119 17.185	site 5 3147' steep A2a+	
	11	1.16	9	37 10.886	119 17.202	base of HUGE BEDROCK FALLS - 3275'	
	12	1.32		37 10.797	119 17.270	top of Huge A1a+ falls ~ 4100 upstream of road	
	13	1.38		37 10.728	119 17.264	4421' upstream - A1a+/A1 above top falls- BREAK	
6	14	1.4		37 10.725	119 17.272	~4526 site 6 in B1/B5 or A1a+ ?, site is break to sand bank low gradient	
7	15	1.45	10	37 10.660	119 17.322	~4800' site 7 - in low gradient Sand bed/bank	
	16	1.53		37 10.579	119 17.280	5262' Pumping site in boggy low gradient sand channel	
8	17	1.56	11	37 10.616	119 17.264	5417 site 8 in low gradient meandering sand bed	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	**V**	**U**	**⌣**	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.54-.51	1	7.5	0.6	1	14	--	1.87	12.5	--		x		M	M	--	4	B2/B3	high gradient but not quite 10%	2
.64-.68	2	8.5	0.5	1.1	13.5	--	1.58	17	--	x			M	M	--	3/2	B2/A2a+	>10% slope boulder/bedrock cascade	4
.78-.82	3	2.2	0.4	0.8	6	--	2.7	5.5	--	x	x		L	L	--	1/2	E1/**A1a+**	High gradient bedrock sheet falls	5
.93-.96	4	8.5	0.6	0.9	14	--	1.65	14.2	--	x			L/M	L/M	--	2/3	B2/A2a+	25% slope -cas/step pool	7
1.10-1.14	5	3.5	0.5	0.8	8.5	--	2.4	7	--		x		M	L	--	3/2	E2/A2a+	poor indicators 25% slope	10
1.38-1.40	6	5.2	0.2	0.4	7.5	--	1.44	26	--	x		x	M	L/M	--	1?	B1/B5	Bedrock sheet with large kettles with sand	14
1.44-1.45	7a	11	0.5	0.8	13	--	1.18	22	--		x		M	M	--	5	F5/B5/G5	low gradient/high width depth ratio - alternating point bars	15
1.44-1.45	7b	9	0.6	0.7	11	--	1.2	15	--		x		M	M	--	5	F5/B5/G5	low gradient/High width depth ratio - alternating point bars	15
1.53-1.56	8	9	0.8	1.1	11	--	1.2	11.25	--			x	M	M	--	5	G5/G3	alternating lateral/point bars	17

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	--	20	30	33	2	5	
4	2	15	20	35	15	10	5	
5	3	75	10	5	5	--	5	Bedrock sheet
7	4	20	40	20	10	5	5	
10	5	5	80	10	--	--	5	
14	6	70	5	5	--	--	20	Bedrock with sand pools
15	7	--	10	5	5	--	80	
17	8	--	--	5	30	5	60	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____
Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	N	--	N	N	Y	few	-	-	Y	-	10	
2	N	--	N	N	Y	few	-	Y	Y (few)	N	10	
3	N	--	N	N	N	few	-	N	Y	N	0	no pools
4	N	--	N	N	N	few	-	N	Y	N	15	
5	N	--	N	N	Y	few	-	Y	Y (few)	N	75	
6	N	--	N	N	N	N	2	N	N	N	90	sand in kettle pools
7	N	--	N	N	N	many	10	Y	Y	Y	95	sandy
8	N	--	Y	N	Y	N	10	Y	Y	Y	90	sandy /cobble in riffles

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	
5	A	--	--	--	--	--	--	
6	P	2		2		Active	Sand	sand infilling of kettles, etc
7	P	10	X		maybe	Active	Sand	alternating lateral/point bars with grasses
8	P	10	X		X	Active	Sand	alternating lateral/point bars with grasses

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/2	5	1	possible 2	--	few ferns on bed and herbs at bank full on banks
2	P	1/2	5 (2)	1	possible 2/1	--	few ferns on bed and herbs on banks, some alder on bedrock portion bed
3	A	--	--	--	--	--	some herbs and seeding alders in bedrock cracks
4	A	--	--	--	--	--	some alder and ribes on banks
5	A	--	--	--	--	--	willows/alder in flood prone area few grasses in bank full channel
6	P	1	5	1	1	--	grasses in bank full bank
7	P	1/3	5	1	2/3 possible	--	grasses on all banks below bank full throughout unit
8	P	1/3	5	1	2/3 possible	--	grasses on all banks below bank full throughout unit

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	2/1	3 (few)	2	stable/vulnerable	most banks boulder-cobble with few undercuts
2	N	1/2	0	2	stable	some rock fall in flood prone areas
3	N	1	0	2	stable	Bedrock
4	N	1/2	0	2	stable	Boulder
5	N	1	0	2	stable	No erosion
6	N	1(3)	0 (3)	1/2	vulnerble	one sand bank pool with scour and bar, rest is bedrock stable
7	Y	3	2/3	2/1 (3 from road???)	unstable	no rock cover; weak root cover
8	Y	3	2/3	2/1	unstable	no rock cover; weak root cover

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	1/2	25% unit	6	some upslope input (not much): few undercuts
2	2(4)	1	30% unit	4	intermittent rock fall (cobble): few surficial sand inputs
3	2	1	20% unit	4	episodic rockfall, no sand
4	2	0	30% unit	4	episodic rockfall, no sand
5	0 (2/4)	0	unit	0	0
6	4	1/2	20% unit deposition 5% unit erosion	6	upslope (road?) delievering sand, one sand bank scoured
7	4	1/2/3	unit	6	sand bank and bed, upslope and upstream source
8	4	1/2/3	unit	6	sand bank and bed, upslope and upstream source

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
RM .6	N	some	none	3/4	some cobble/gravel, no delta or bar

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P		X	X	5	M/H	Perpendicular to channel
2	P	X	X	X	3/2/5	M/H	maintaining some step pools and retaining sand through cobble
3	P		X	X	6	L/M	
4	P	X	X	X	6/5 IF AT ALL	M	boulder and bedrock doing the work
5	P	X	X	X	3/5	L/M	
6	P	X	X	X	6 5/3 too	M	on near bank
7	P	X	X	X	5/2	M/H	many trees
8	P	X	X	X	5/3	M	many trees, slight slope

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 08/07/2002 10:00 AM

Sheet 2 of 10

Stream: Hooper Creek

General Location: Downstream Diversion Stations 0.0-0.3

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.00	0.00	37 18.306	118 57.674	Confluence of Hooper Creek & South Fork San Joaquin River	0.0-0.08 (Road) A2a+
1	2	0.05	0.05	37 18.289	118 57.604	SS #1 - A2a+	Within A2a+ reach
	3	0.08	0.08	37 18.321	118 57.638	Hooper Diversion Road	Reach break from A2a+ (D/S) to B3 (U/S)
2	4	0.13	0.13	No GPS Coverage	No GPS Coverage	SS#2 - B3	Within B3 reach
	5	0.2	0.2	37 18.349	118 57.521	Channel bifurcates	Approx. 60% of flow in southern (surveyed) channel (south) and 40% of flow in northern channel.
3	6	0.25	0.25	37 18.33	118 57.480	SS#3	Reach break from B3 (D/S) to A2a+ (U/S)
4	7	0.3	0.3	37 18.322	118 57.407	SS#4	Within A2a+ reach

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB | Date/Time: 08/07/2002 10:00 AM | Sheet 3 of 10

Stream: Hooper Creek | General Location: D/S of Diversion

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	ER W_{fp}/W_{bf}	W/D $AveD_{bf}/W_{bf}$	Conf. W_v/W_{bf}	Valley Shape V	U	⌣	Degree of Confidence BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.0- 0.05	1	-	-	-	-	-	-	-	-		X		NA	NA	-	2	A2a+	No apparent bank full indicators (boulder cascade). Flow controlled by large boulder elements.	1
0.08- 0.13	2	7.3	0.6	0.9	12.9	-	1.76	12.17	-			X	H	H		2/4 (high gradient riffle)	B3	Intermittent areas of greater entrenchment	4
0.2- 0.25	3a	7.8	1	1.4	21.8	-	2.79	7.8	-			X	L-M	L-M		2/4 (high gradient riffle)	E2/ E3? B2/B3?	Low confidence in measurement- collect additional measurement at SS#3b	
	3b	8.7	0.8	1.3	18	-	2.07	10.88	-			X	M	H		2/4 (high gradient riffle)	B2/B3		6
0.25- 0.30	4	6.5	1.2	1.8	13	-	2	5.41	-			X	M	M		2 \ 3	A2a+		7

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB

Date/Time: 08/07/2002 10:00 AM

Stream: Hooper Creek

General Location: Downstream of Diversion

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		0	40	40	5	5	10	
2		0	5	20	50	5	20	
3		0	10	30	40	10	10	
4		0	50	30	10	0	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB
Date/Time: 08/07/2002 10:00 AM
Sheet 5 of 10
Stream: Hooper Creek
General Location: D\S Div.

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools (% on bed)**	**Comments**
1	None	-	-	X	X	None	-	-	X	-	80	
2	Few	-	-	-	X	Many	-	-	X	-	80	1 pool observed
3	None	-	-	-	X	Many	-	-	X	-	0	no pools observed
4	None	-	-	-	X	Few	-	-	X	-	40	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive		Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point				
1	A	-	-	-	-	-		-	
2	A	-	-	-	-	-		-	
3	A	-	-	-	-	-		-	
4	A	-	-	-	-	-		-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC\ CB

Date/Time: 08/07/2002 10:00 AM Sheet 6 of 10

Stream: Hooper Cr.

General Location: :eam diversion

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1 / 2	1 /2 / 5	1 /2 / 3	2	-	Difficult to discern bank full channel due to lack of indicators, Conifers (3) within active channel, Sporadic alder/ herb. vegetation within channel rooted in boulder matrix.
2	A	-	-	-	1	-	Alders/ herb. vegetation along channel margins in flood prone area
3	A	-	-	-	1	-	Alders/ herb. vegetation along channel margins in flood prone area
4	A	-	-	-	1	-	Alders/ herb. vegetation along channel margins in flood prone area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 08/07/2002 10:00 AM Sheet 7 of 10

Stream: Hooper Cr.

General Location: D/S div.

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	-	Stable	Some areas of scour where sand is present.
2	Y	2 / 3	3	2	Vulnerable	Vegetation and coarse material provides stability
3	Y	2 / 3	3	2	Vulnerable	Vegetation and coarse material provides stability
4	N	1	0	-	Stable	Some areas of scour where sand is present.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 08/07/2002 10:00 AM

Stream: Hooper Creek

General Location: D/S div

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	0.05- 0.08	6	Road fill upslope of this section consists of loose sand with very little vegetation - likely source of sand in channel.
2	4	1 / 2	approx. length of survey segment	6	
3	4	1	approx. 50% of survey segment	6	
4	4	1	< 20% of survey segment	6	Sporadic areas of scour where sand /fines present

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
Station 0.0	Deposition	Active	approx. 40 X 10 feet	small boulder	Confluence of Hooper and SFSJR. Small boulder with minor gravel and cobble. Interspersed willow/ alder/ herb. rooted in boulder matrix within channel. No apparent encroachment.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB
Date/Time: 08/07/2002 10:00 AM
Sheet 9 of 10

Stream: Hooper Cr.
General Location: Downstream of diversion

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	3 /4 / 5/ 6	High	Abundant conifers and steep slopes along channel.
2	P	-	-	X	3 /6	High	Abundant conifers along chanel with relativly low slopes along channel.
3	A	-	-	-	-	Moderate	Moderately dense of conifers with relatively low slopes along channel.
4	P	X	X	X	3 / 5 / 6	Moderate	Moderately dense of conifers with relatively low slopes along channel.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF | Date/Time: 08/07/2002 10:00:00 AM | Sheet 1 of 10

Stream: Hooper | General Location: Downstream from Diversion

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.72	0.72	37 18.342	118 57.018	Hooper Diversion Dam RM 0.72	Photo#16 - impound, #17 - Dam/ spillway, #18 - D/S Hooper Channel.
	2	0.66	0.66	37 18.330	118 57.071	Hooper Gage 320 ft. downstream of Diversion	Photo #20
1	3	0.62	0.62	37 18.335	118 57.096	SS#1 - 510 ft. downstream	
	4	0.54	0.54	37 18.322	118 57.181 (960 ft)	Possible break - valley opens up with less confinement, still fairly steep with flow cascading	
2	5	0.53	0.53	20 feet D/S of GPS#4	(980 ft)	SS#2	
3	6	0.45	0.45	37 18.322	118 57.273 (1432 ft)	SS#3 (same as wetted perimeter site A)	Step pool / Cascade
	7	0.39	0.39	37 18.339	118 57.317 (1775 ft)	Small burn area to channel with conifers cut	Maybe bank impact by crews
4	8	0.3	0.3	37 18.319	118 57.399 (2221 ft)	SS#4	Photo 23

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF

Date/Time: 08/07/2002 10:00:00 AM

Sheet 2 of 10

Stream: Hooper

General Location: DS Div.

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.65- 0.62	1	8.5	0.6	1.2	**12**	**-**	1.4	14	-	X			H	M	-	2 (3)	A2a+/A1a+	approx. 20% slope	3
0.54- 0.52	2	15	0.5	0.9	21	-	1.4	30	-			X	M	M	-	4	B2	Appears less entrenched than measured due to flood attenuation by diversion.	5
0.50- 0.45	3	8.5	0.8	1.5	16.5	-	1.9	10.63	-			X	M	M	-	3	B2, A2a+	Site behind LWD jam at gravel bar in depositional area	6
0.35- 0.30	4	6.5	1.2	1.8	13	-	2	5.4	-			X	M	M	-	2/3	A2a+	High gradient	8

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF

Date/Time: 08/07/2002 10:00:00 AM

Stream: Hooper

General Location: Downstream diversion

DOMINANT STREAMBED PARTICLE SIZE

GPS ID	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
3	1	25	40	15	10	5	5	
5	2	-	15	30	35	10	10	
6	3	-	40	30	20	5	5	
	4	-	50	30	10	-	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC /RF

Date/Time: 08/07/2002 10:00:00 AM

Sheet 4 of 10

Stream: Hooper

General Location: Downstream diverson

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools (% on bed)**	**Comments**
1	None	1	N	Y	Y	Few	0	Y	Y	N	15	LWD is few
2	None	-	-	_	Y	None	1	Y	Y (few)	N	40	LWD makes pool with sand dep.
3	None	2	N	Y	Y	Few	-	N	Y (few)	N	20	
4	None	-	-	-	Y	Few	-	Y	Y	N	40	LWD with sand dep.

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	P	1	X			active	gravel	5 X 10 ft.
2	P	1	X			active	sand	15 X 10 ft. Dep. behind LWD jam
3	P	2	X			active	gravel	15 X 5 ft. formed by LWD jam
4	A	-	-	-	-	-	-	-

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF

Date/Time: 08/07/2002 10:00:00 AM sheet 5 of 10

Stream: Hooper

General Location: Downstream Diversion

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	-	-	-
2	A	-	-	-	-	-	-
3	P	1	5	1	No	-	Grass on bank at bankfull
4	A	-	-	-	-	-	Grass on bank at bankfull

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF

Date/Time: 08/07/2002 10:00:00 AM

Stream: Hooper

General Location: D/S div.

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1 (3)	0 (3)	2	Stable	Some sand on bank with undercutting - channel may be downcutting
2	Y (N)	1 / 3	3 (0)	2	Stable	Large boulder armor and good root cover
3	N	1	0	2 (if any)	Stable	Large boulder armor and good root cover with some areas of scour
4	N	1	0 (3)	2 (if any)	Stable	Large boulder armor and good root cover with some areas of scour

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC /RF

Date/Time: 08/07/2002 10:00:00 AM

Stream: Hooper

General Location: D/S div.

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4 (road)	1/2 (minor)	approx. 25% of survey segment	6	Some sand deposits at or above bankfull
2	4	1/2 (minor)	approx. 25% of survey segment	6	Large deposits behind LWD jam in floodprone area
3	4	1/2 (minor)	approx. 10% of survey segment	6	Infrequent scour where sand present
4	4	1/2	Length of survey segment	6	Infrequent scour where sand present

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF

Date/Time: 08/07/2002 10:00:00 AM sheet 8 0f 10

Stream: Hooper

General Location: Downstream Diversion

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X		3 (if any)	L	Not much large wood adjacent to channel
2	P	X	X		3	L	Not much large wood adjacent to channel
3	P	X	X		3	M	LWD forms gravel bars
4	P	X	X	X	1/3/5	M	LWD forms sand bars and some bank scour

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF　　Date/Time: 08/20/2002 16:35　　Sheet 2 of 9

Stream: Upper Hooper　　General Location: RM 0.7 to 1.2 (dam to U/S)

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.7	0.7	37 18.360	118 56.989	Immediately upstream of diversion dam	
	-	0.73	0.73	no GPS	no GPS	140' upstream of dam - extent of impound.	
	2	0.75	0.75	37 18.347	118 56.982	268 ft. upstream begin A1a+ (A2a+). B2 cascade downstream of A1a+.	
1	3	0.76	0.76	37 18.354	118 56.965	SS#1 - 309 ft. upstream of dam in A2a+ (A1a+) immediately above wetted perimeter site.	
	-	0.77	0.77	no GPS	no GPS	A1a+ begins (for at least another 400 ft.)	
	-	0.84	0.84	37 18.357	118 56.898	760 ft. upstream of dam - tributary cascades down A1a+ immediately above confluence	
	4	0.93	0.93	37 18.371	118 56.814	1195 ft. upstream of dam - wetted perimeter site above A1a+ in 50 ft. long B-type plunge pool with tailout below A1a+	
	5	0.97	0.97	37 18.372	118 56.757	1385 ft. upstream of dam - end survey in A1a+cascade (bedrock sheet).	
	Station 0.97 to 1.1+ is A1a+ (A2a+) based on visual estimate					To 1700 ft. upstream of dam - A2a+ / A1a+	
						1700 ft to 2000 ft. - Aa1+ cascade bedrock sheet appears to steepen above A1a+ at 2000 ft. Photo 29 at A1a+ cascade ~ 2000ft. upstream (Station 1.1)	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.73- 0.76	1	14.5	0.7	1.2	23.5	-	1.62	20.7	-	X	-		M	M	-	2	A2a+ (with B2 characteristics)	>10% gradient	3

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		20	20	30	15	10	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF
Date/Time: 08/20/2002 16:35
sheet 5 of 9
Stream: Upper Hooper
General Location: RM 0.7 to 1.2 (dam to U/S)

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	few	-	N	N	Y	N	-	N	Y	N	5	no pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	-	-	-	-	-	-	No bars

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35 Sheet 6 of 10

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	Alders rooted at bankfull

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1/2 (3)	0	3 (1)	stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	1	<5 % of survey segment	Sand	No real erosion or sediment

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/ RF

Date/Time: 08/20/2002 16:35 sheet 9 of 10

Stream: Upper Hooper

General Location: RM 0.7 to 1.2 (dam to U/S)

LARGE WOODY DEBRIS

		Channel Zone					
Smpl Site ID#	**Presence / Absence**	**Low Flow**	**BF**	**FP**	**Geomorphic Function**	**Recruitment Potential (High / Moderate / Low)**	**Comments**
1	P	X	X	X	4(6)	Moderate	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF　　Date/Time: 9/9/2002　　sheet 2 of 10

Stream: Mono Creek　　General Location: U/S and D/S of div.

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Photos**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	5.79	1,2,3	37 21.593	118 59.903	Mono Diversion	
	2	5.29	4,5	37 21.469	119 00.262	Downstream 0.5 mile (hip chain 2640' from diversion)	
1	3	5.33	6,7	37 21.550	119 00.193	205' Upstream site 1 in B2/A2, most B2 but bedrock confinement present	
	4	5.55	8	37 21.507	119 00.079	1385' upstream 80' X 30' Mid-channel/lateral bar- photo 8	
	5	5.67	9	-	-	photo 9- Mid-channel bars with 1 class alder/willow at bankfull, boulders 1999'	
	6	5.74	10	37 21.555	118 59.959	break to A2/A2a+ 2409' upstream valley is V with local steepining	
2	7	5.78	11	37 21.581	118 59.948	2591' site 2 in A2 photo 11 upstream from site 2	
	8	5.82		See GPS 1	See GPS 1	2808' diversion	
		5.79		See GPS 1	See GPS 1	diversion	
	9	5.98		37 21.565	118 59.725	1000' upstream of diversion, flow entering impound- riffle 150' upstream B2	
3	10	6.21	14,15	37 21.693	118 59.618	site 3 in B2 2216' upstream of diversion	
	11	6.29		37 21.710	118 59.567	2700' Upstream of diversion- end survey in B2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002

Stream: Mono Cr.

General Location: u/s and d/s of diversion

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
5.29-5.33	1	40'	2.3	3	55-60	-	1.45	17.4	-	X	X	-	L/M	L/M	-	4(3)	B2	some areas more entrenched. Poor indicators- willow root position	3
5.74-5.79	2	27'	3.2	4.3	37	38	1.37	8.43	-	X			M	M	-	4/3	A2	8-12% localized A2a+	7
5.98-6.24	3	60'	4.5	3	95	-	1.6	20	-		X		M/H	M	-	4	B2	gross visual estimate - flowing 1' below bankfull	10

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002

Stream: Mono Cr.

General Location: Upstream and downstream of diversion

DOMINANT STREAMBED PARTICLE SIZE

gps	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
3	1	5	65	20	5	2.5	2.5	
7	2		60	30	10		10	silt/sand interstitial and shallow
10	3	-	60	20	10	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF Date/Time: 9/9/2002 sheet 5 of 10

Stream: Mono Cr. General Location: and d/s of div.

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	few	0	N	N	Y	few/none	0	N	N(Y)	N	<5	not much fines
2	none	0	N	N	Y	many	0	N	Y	N	40	sand between boulders
3	few	1	N	Y	Y	few/none	0	N	Y(N)	N	<5?	difficult to see any sand

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	no bars/upstream 2 bars
2	A	-	-	-	-	-	-	
3	P	3	2	1		active	gravel/ cobble	1 gravel bar (Mid-channel) LWD/ boulder shadow/ 2 cobble lateral point bars.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002 sheet 6 of 10

Stream: Mono Cr,.

General Location: Upstream and downstream of Diversion

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1	2/3/5	1	Possible	1/2	willow alders rooted between boulders and bankfull elevation in channel
2	P	1	5	1	No	1	willow/alder in former bankfull
3	A	-	-	-	No	-	no vegetation in bankfull other than on bars- alder

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002 sheet 7 of 10

Stream: Mono Cr.

General Location: u/s and d/s of div.

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	2(1)	stable	some upsolope erosion sands
2	N	1	0(1)	1(2)	stable	some shallow landslides and upslope sand delivery from loose/steep slopes
3	N (Y?)	1(3)	0(3)	2(1)	stable (vulnerable)	some exposed sand bank, no undercut, some sand upslope

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002

Stream: Mono Cr.

General Location: ınd d/s of div.

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4 if any	1 if any	<5% unit	sand	no deposits or erosion per se
2	4 (1,2)	1 if any	30% unit	sand/ angular cobble	sand and angular cobble from upslope
3	4	1 if any	10% unit	sand	some sand and boulder bank- upslope sand delivery- no deposits

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002 sheet 9 of 10

Stream: Mono Cr.

General Location: Upstream and downstream of diversion

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	6	L/M	trees in boulder strewn section at or above bankfull
2	A	-	-	-	-	-	-
3	P	X	X	X	1/2/4	M/H	steep slope conifer recruitment many parallel and perpindicular to flow.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF　　Date/Time: 9/12/2002　Sheet　　of

Stream: N Fk Stevenson ck　　General Location: 3.55-3.05 D/S of Tunnel 7

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	3.55		37 09.293	119 13.969	Tunnel 7 outlet - discharging through fish flow pipe only	
	2	3.48		37 09.283	119 14.033	367' downstream end bedrock A1a+ section below tunnel-transition to A2a+	
	3	3.45		-	-	510' downstream photo #24	
	4	3.41		37 09.272	119 14.092	725' Downstream, break downstream all bedrock A1a+ no boulders, photo 25	
	5	3.39		37 09.269	119 14.136	840' Downstream tributary on right bank downstream photo 27/28	
	6	3.34		37 09.231	119 14.180	1131' break - boulder strewn - flattened below A1a+	
	7	3.25		37 09.193	119 14.215	1565' Downstream site 1 photo 30 form downstream to Site	
	8	3.18		37 09.151	119 14.269	1953' slight transition form B2 to B1, true Aa+/B break between here and site 1	
	9	3.15		37 09.127	119 14.283	2100 site 2 photo 33	
	10	3.07		37 09.082	119 14.348	2527 break to A1a+	
	11	3.05		37 09.069	119 14.358	End survey in A1a+, becomes a bedrock sheet fall	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
3.34-3.25	1	33	**1**	**1.8**	**~47**	**x**	1.42	33		x	x		L	L		3/4	B2/A2a+	~10% slope, Boulder on BR	7
3.18-3.12	2	30	2	1	~44	x	1.47	30		x	x		L	L		1/4	B1/B2	Bedrock bed, many boulders on bedrock	9

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
7	1	15	55	15	10	2.5	2.5	
9	2	35	25	25	10	4	1	Bedrock controlled and bed - B2

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	few	--	N	N	Y	none	--	N	N	N	2	very little sand
2	none/few	--	N	N	Y	none	--	N	N	N	5	very little sand

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A		--	--	--	--	--	
2	P	1	1	--	--	?	cobble with small boulder	large boulder shadow formed

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1	4/5	1	2	N/A	Channel incising - relict bankfull gone
2	P	1/2	3/4/5	1(2)	2(1)	UNK	Bankfull unknown, position generally along margin

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	1	1/2	Vulnerable-unstable	steep upslope - incision causes mass wasting (Stable due to bedrock/boulder cover)
2	N	1	1	1/2	stable-vulnerable	same upslope but more stable

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	1/4	2 if any	80% of unit	sand	upslope banks actively delivering to incised channel
2	1/4	3 if any	30% of unit	sand	upslope banks actively delivering to incised channel but less frequent due to bedrock

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	6	M/H	Many large conifers on steep upslope, slope failure delivery
2	A	--	--	--	--	L	Less upslope wood availible high transport capacity here

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/12/2002 Sheet of

Stream: North Fork Stevnson

General Location: 3.55-4.05 upstream Tunnel 7

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	3.55		37 09.294	119 13.970	Start of Survey, Tunnel 7	
	2	3.57		37 09.289	119 13.949	abandoned gauging station	
1	3	3.63		37 09.310	119 13.900	End of Survey Segment #1, start survey in A1a+, upstream goes into A1a+ bedrock cascade	
2	4	3.71		37 09.291	119 13.814	end of Survey SS#2	
	5	3.81		37 09.266	119 13.725	Reach break A1a+, Gradient decreases significantly to ~ 4-5%, start survey segment	
3	6	3.84		37 09.272	119 13.697	SS #3	
	7	3.86		37 09.290	119 13.691	End of Survey Segment in B2	
	8	3.9		37 09.336	119 13.676	Potential reach bank to C? from B2	
4	10	3.97		37 09.355	119 13.614	Reach break from C5 to B2	
	11	4.02		37 09.370	119 13.589	Downstream end of 100' of E5	
5a	12	4.05		37 09.359	119 13.561	End of survey ss#5	
5b	13	4		37 09.370	119 13.592	SS #5b confluence of drainage with channel probable form road, SS# 5b immediately upstream	
	14	3.57		See GPS #2		Measurements form SS#1 10' upstream of abandoned gauging station	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
3.55-3.63	1	7.5	**0.5**	**0.9**	**7**		0.43	12.5	--	x						2/3	A2a+/A2	gradient 8-12%, steep banks along channel opens up, upslope	
3.63-3.71	2	15	0.5	0.7	18		1.2	30	--	x			M	M	--	1/2	A1a+	gradient steepens, bedrock channel, sheet flow over bedrock gradient 20-30%	
3.81-3.86	3	9	0.7	0.9	20		2.2	12.9				x	H	H	--	4	B2	gradient decreases Significantly Above to 4-5% A1a+	
3.90-3.97	4a	4.4	0.35	0.6	30		6.8	12.6				x	H	H	--	4/5	C5	gradient decreases, moderately sinuosity, "point bars" - like flood prone area	
	4b	9.5	0.35	0.6	24		2.5	27.1				x	H	H	--	4/5	C5		
3.97-4.05	5a	4.7	0.5	0.7	9.5		2.02	9.4					H	H	--	4	B5	moderate Sinuosity	
	5b	5.8	0.5	0.6	12		2.07	9.6					M	M	--	4	B5	moderate Sinuosity	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		--	40	30	2	8	20	
2		95	--	--	--	2	3	
3		10	20	40	2	8	20	
4		--	5	5	25	15	50	
5		5	10	5	25	15	40	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____
Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow (none, few, many)**	**Bars (# in unit)**	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools (% on bed)**	**Comments**
1	few	--	--	x	x	few	--	x	x	--	50-80	Varied by pool
2	none	--	--	--	x	none	--	x	--	--	<10	pools, small depressions in bedrock which retain sediments
3	none	--	--	--	x	few	--	x	x	--	70-80	
4	none	--	x	--	x	none	--	--	x	x	80-100	
5	none	--	--	--	x	none	--	x	x	x	80-100	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	P	1	1	--	--	Active	6-sand	Downstream of LWD 10x8'
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	
4	A	--	--	--	--	--	--	Flood prone has point bar characteristics, 4 total, but well vegetated
5	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1	--	Alder, ferns, willow, herb, along chanel margin above bankfull
2	A	--	--	--	1	--	Vegetation along banks above bankfull
3	A	--	--	--	1	--	Vegetation along banks above bankfull
4	A	--	--	--	1	--	Dense herb/willow/alder in flood prone area
5	A	--	--	--	1	--	Dense herb/willow/alder in flood prone area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ________________ Date/Time: ________________ Sheet ____ of ____

Stream: ________________ General Location: ________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1/2	--	--	Stable	primarily large boulder sand /duff
2	N	1	--	--	Stable	lacks bedrock in area which show evidence of scour
3	Y	1/2/3	3	2	Vuln/Stable	40-50% channel armored by boulder/bedrock, 50-60% sand stabilized by vegetation
4	Y	3	3	2	Vuln	vegetation provides stability
5	Y	3	2/3	2(3)	Vuln - 70%/unstable - 30%	vegetation provides stabilizing, slumping in vicinity of road drainage and 1 area upstream

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	--	unit	Sand/organic -6, some large/small boulder	Upslope significant sand and organic material upslope with abundant duff
2	4	--	unit	6	Upslope significant sand and organic material upslope with abundant duff
3	4	1	unit	6	Upslope with sand/organic streambank with some scour areas
4	--	1/3	3 -20% of unit(50-100')/ 1-unit	6	100' section with slumping /unstable bank
5	4	1/2/3	2/3 30% of unit and 1/2 -20% unit	6	30% of unit slumping especially downstream of road drainage

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	Channel Zone BF	Channel Zone FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	1/2/3/6	H	steep slopes, dense conifers
2	P	X	X	X	3/6	H	steep slopes, moderately dense conifers along channel
3	P	X	X	X	3/6	H	moderate steep slopes/abundant conifers and abundant downed trees
4	A	-	--	--	--	M	moderately dense trees, low slope
5	P- 1 piece	X	X	X	3	M	low-moderate density of trees/low slope

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF   Date/Time: 8/7/2002 Sheet of

Stream: North Slide   General Location: SFSJR to N Slide Diversion

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	0		37 17.711	118 57.251	SFSJR Confluence	
1	2	0.03		37 17.701	118 57.242	Site 1 to 142' upstream of Confluence	
2	3	0.045		37 17.688	118 57.234	Site 2 at 240' upstream ~50' downstream of Hooper Rd culvert	
	4	0.06		37 17.675	118 57.249	Culvert (downstream end) at 305' downstream Photo 27	
3	5	0.1		37 17.678	118 57.186	Site 3 at 542' upstream of SFSJR	
4	6	0.17		37 17.645	118 57.131	Site 4 at 896' / Below Boulder strewn	
	-	0.18				20' upstream of Site 4/ GPS 6 - flows under large boulders	
						916' Photo 29	- no indicators
						Stream buried in colluvium/landslide?	
						at 1010' resurfaces Photo 30 downstream over colluvium on stream	
	7	0.2		37 17.665	118 57.128	Valley with break to V Aa+ at 1070'	
5	8	0.21		37 17.622	118 57.103	Site 5 at 1120'	
6	9	0.26		37 17.617	118 57.049	Site 6 at 1390'	
	10	0.31		37 17.616	118 57.005	Diversion at ~1650'	Photo 31
						Diversion filled with sediment - Rock grout structure - Heavy leakage below weir	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
0.1 - 0.03	1	2.7	0.5	0.6	6.5	-	2.4	5.4	-			X	M	M	-	4	E5/**A5a+**	Steep near confluence ~5% to 140' upstream	2
0.03 - 0.04	2	3	0.6	0.8	5	-	1.67	5	-			X	M	M	-	3	B2/**A2a+**	Steep >10%	3
0.07 - 0.10	3	4	0.3	0.8	6.5	-	1.62	13.3	-			X	M	M	-	3	B2/**A2a+**	Steep >10%	5
0.15 - 0.17	4	3.5	0.4	0.6	10		2.5	8.7	-			X	M	M	-	4	E5/**A5a+**	spring like - shallow flow wide draw	6
0.20 - 0.22	5	3.5	0.4	0.6	4.5	30	1.29	8.7	8.6	X			M	M	M	2(3)	A3a+	mixed substrate High gradient 30%+	8
0.22 - 0.26	6	2.3	0.5	0.7	4	20	1.74	4.6	8.7	X			M	M	M		A2a+	High Gradient 30%+	9

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID# GPS	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
2	1	-	5	5	10	15	65	Organic Material and Silt/Sand
3	2	-	50	20	5	5	20	
5	3	-	15	40	30	5	10	
6	4	-	10	10	10	10	60	
8	5	-	20	10	35	5	30	Mixed
9	6	5	60	10	10	5	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	none	-	-	-	Y	many	-	Y	Y	Y	95	LWD is actually SWD
2	none	-	-	-	Y	none	-	N	Y	N	50	
3	none	-	-	-	-	-	-	N	Y	N	30	
4	none	-	-	-	Y	few	-	Y	Y	Y	60	
5	none	-	-	-	Y	none	-	N	Y	N	45	
6	none	-	-	-	Y	none	-	N	Y	N	25	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	-	-	-	-	-	-	
2	A	-	-	-	-	-	-	
3	A	-	-	-	-	-	-	
4	A	-	-	-	-	-	-	
5	A	-	-	-	-	-	-	
6	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1	5	1	Possibly	-	
2	A	-	-	-	-	-	some herbaceous at bankfull (spotty)
3	A	-	-	-	-	-	Alder rooting at bankfull indicator line
4	P	1/2	5	1	Possibly	-	
5	A	-	-	-	-	-	grasses/herbs at bankfull, aspen in relict channel
6	A	-	-	-	-	-	grass at bankfull

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	4	2/3	2	UNSTABLE	No riparian root cover
2	Y	1/4	3	2	VULNERABLE	- most with good boulder bank a lot of sand bank too
3	N	1/3/4	3	2	VULNERABLE	- fairly stable - some sand banks
4	Y	3/1	3	2	UNSTABLE	- fairly exposed
5	Y	3/1	1/2/3	2 (1)	UNSTABLE	good rooted cover, and few boulder
6	Y	3/1	3	2	VULNERABLE	good root cover many boulder, some incision

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	-	1/2/3	unit	6	sand and organic material banks and bed
2	-	1/2/3	1/2 unit	6	
3	-	1	<25% unit	6	Sand & organic material
4	-	1/2	75% unit	6	
5	4	1/2/3	50% unit	6	Sand
6	4	1/2	25% unit	6	Sand

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	-	-	-	-	M	SWD is geomorphic factor
2	A	-	-	-	-	L	
3	A	-	-	-	-	L	
4	P	X	X	-	3	L	
5	A	-	-	-	-	L	none present adjacent
6	A	-	-	-	-	L	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC / RF Date/Time: 9/9/2002 Sheet of

Stream: N Slide / S Slide General Location: Above N&S Slide Div's

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.32		37 17.508	118 57.053	Former South slide Diversion	
1SS	2	0.34		37 17.501	118 57.042	117' U/S Site 1 (SS) in A1a+/A2a+	
	3	0.42		37 17.496	118 56.976	540' U/S on South Slide - end survey	
	4	0.285		37 17.618	118 56.004	North Slide Diversion	
1NS	5	0.325		37 17.604	118 56.967	212' U/S Site1 (NS) in A1a+/A2a+	
	6	0.42		37 17.580	118 56.882	End North Slide at ~ 705' upstream	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
0.32 - 0.34 South Slide	1-SS	2.9	0.6	0.9	4.2	-	1.45	4.8	-			X	M/H	M	-	2	A1a+/A2a+	South Slide 50% slope, bedrock bed/Boulder-Sand bank	2
0.285 - 0.325 North Slide	1-NS	2.5	0.45	0.6	4.6	-	1.84	5.55	-	X			M	M	-	2(1)	A1a+ (A2a+)	Bedrock bed with Boulder's.	5

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1 South Slide	30	35	20	5	5	5	South Slide
5	1 North Slide	85	5	5			5	North Slide

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____
Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1 South Slide	none	0	N	N	Y	none	0	N	Y	N	15	few pools
1 North Slide	0	0	N	N	N	none	0	N	N	N	5	no pools

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1 South Slide	A	-	-	-	-	-	-	-
1 North Slide	A	-	-	-	-	-	-	-

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1 South Slide	A	-	-	-	-	-	Alder at and above bankfull 100+% canopy
1 North Slide	A	-	-	-	-	-	Alder at and above bankfull 100% canopy

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1 South slide	N	1	0(3)	2 (if any)	stable	few sand banks - good boulder/alder root cover.
1 North Slide	N	1(3)	0(3)	2/1	stable (vulnerable)	few undercuts, but mostly bedrock

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1 South Slide	0	1 (2?)	<5% unit	sand	few exposed sand banks in good boulder/alder cover
1 North Slide	4	1/2	10% unit	sand	few exposed bank areas - most bedrock/boulder with alder cover

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1 South Slide	P		X		5 (if any)	L	Low bank slopes, no conifers
1 North Slide	P		X		6 (5/3) if any	L	very few LWD present - not major feature

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/23/2002 11:30 Sheet of

Stream: Pitman Ck

General Location: 1.10-1.52

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.52		37 11.914	119 12.873	Pitman Diversion	
1	2	1.43		37 11.968	119 12.938	gaging station and SS# 1 , reach break from B1/A1a+ to A1a+	
	3	1.38		37 12.050	119 12.990	seepage along left bank upslope supports ferns and herb.	
2	4	1.3		37 12.035	119 13.081	End Survey - Visual assessment of channel- A1a+ to station 1.1	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ______ of ______

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
1.43-1.52	1	75'	--	--	--	**150**	--	--	--		x		--	--	--	1/3	B1/A1a+	Bedrock channel no apparent bankfull indicators, Sheet flow/pools	2
1.30-1.35	2	80'	--	--	--	500	--	--	--	x			--	--	--	1/2	A1a+	Bedrock cascade with kettle pools and scour pools at base of cascades	4

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ______ of ______

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

<table>
<tr><th>Smpl Site ID#</th><th>Smpl Site ID#</th><th>Bedrock</th><th>Lg. Boulder
(512-4096 mm)</th><th>Sm. Boulder
(256-512 mm)</th><th>Cobble
(64-256 mm)</th><th>Gravel
(2-64 mm)</th><th>Sand/ Fines
(<2mm)</th><th>Comments</th></tr>
<tr><td>1</td><td></td><td>90</td><td>8</td><td></td><td></td><td colspan="2">-----------------2%-----------------</td><td></td></tr>
<tr><td>2</td><td></td><td>95</td><td>3</td><td></td><td colspan="3">--------------------2%-----------------</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	none	--	--	--	x	none	--	--	--	--	<5%	Very little to no sand / gravel - present in pools and kettle holes
2	none	--	--	--	x	none	--	--	--	--	<5%	Very little to no sand / gravel - present in pools and kettle holes

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A/P?	3?	3/5?	1?	1/2	--	-No apparent BF indicators within top width of channel
2	A	--	--	--	1	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	--	Stable	
2	N	1	0	--	Stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	2/4	--	unit	2/6	Upslope- sand/organic material and rockfalls along channel
2	2/4	--	unit	2/6	Upslope- sand/organic material and rockfalls along channel

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	H	Dense conifers along channel and steep slopes
2	A	--	--	--	--	H	Dense conifers along channel and steep slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB/JH

Date/Time: 8/19/2002 17:30 Sheet of

Stream: Pitman Cr

General Location: Upstream of Pitman diversion RM 1.52-1.85

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	1.52		37 11.906	119 12.864	Diversion	
	2	1.55		37 11.906	119 12.844	gaging station	
	3	1.57		37 11.909	119 12.817	start survey	
1	4	1.64		37 11.845	119 12.805	SS 1 within boulder/cobble riffle - near pitman AD site 2	
	5	1.66		37 11.838	119 12.788	Potential reach break - bedrock and large boulder- gradient increase - pitman AD site3	
2	6	1.75		37 11.767	119 12.742	SS 2	
3	7	1.85		37 11.734	119 12.639	SS 3	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	W_{bf}	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	**BF**	**FP**	W_v	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.6-1.65	1	34.8	0.3	0.7	50	--	1.43	116				x	M	M		4/5	B1/B3 OR F1/F3?		
1.65-1.75	2	30	0.8	1.8	44	500	1.47	37.5			x		L	L		4/5	B1/F1?	Bankfull indicates difficult to identify due to bedrock	
1.75-1.85	3	--	--	--	--	--	--	--	--		x		--	--	--	4/5	B1/B2	Channel braid around mid-channel bars with no good bankfull indicators	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		30	10	10	25	20	5	
2		70	10	--	5	5	10	
3		30	40	--	20	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	few	2	--	--	x	few	--	--	x	--	50	
2	many	x	--	--	x	many	2	--	x	--	80	
3	few	--	--	x	x	few	--	x	x	--	40	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	P	2	1	--	1	A	cobble	
2	P	4	3	1	--	A	laterals- 2 sand - 1 cobble	1 mid-channel bar of boulder - lateral bars occur in boulder shadows
3	P	3	1	2	--	A	lateral cobble mid-channel bar- boulder	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1	--	willow and herb. along channel margin in flood prone area
2	A	--	--	--	1	--	willow and herb. along channel margin in flood prone area
3	A	--	--	--	1	--	willow and herb. along channel margin in flood prone area

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	--	--	Stable	Predominately large boulder with vegetation cover-~20% consists of sand /cobble with some scour
2	N	1	--	--	Stable	
3	N	1	--	--	Stable	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	--	1	~20% unit	6	20% of banks consist of sand / cobble which show some scour
2	2/4	--	unit	2/3/6	Rock falls and sand/organic material from upslope
3	2/4	--	unit	2/3/6	Rock falls and sand/organic material from upslope

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	M	sporadic areas of dense conifers but low slopes
2	P	--	x	x	6	L/M	low density of conifers/steep slopes
3	P (2 places)	x	x	x	3/6	L/M	low density of conifers/moderate slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 8/19/2002 17:30 Sheet of

Stream: Pitman

General Location: upper from RM 2.1-D/S

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Photos**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	2.12		37 11.606	119 12.437	Pitman confluence with intermittent Tributary	
1	2	2.1	12	37 11.669	119 12.421	126' downstream of tributary Site 1 slightly braided with large cobble bar	
2	3	1.98	13 and 14	37 11.698	119 12.531	Site 2 763' downstream steepening a bit B3/B4	
	4	1.95		37 11.691	119 12.555	880' downstream break to B1/B2 type	
3	5	1.93	15 and 16	37 11.713	119 12.581	1030' downstream in bedrock dominated/low gradient	
	6	1.89		37 11.730	119 12.611	1194 upstream of mid-channel bar - cobble/boulder with vegetation	
	7	1.87		37 11.734	119 12.639	1350' downstream end of mid-channel bar cobble/gravel	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
2.12-2.10	1	25	**0.6**	**1.2**	**75**	--	3	41.6	--			x	M/H	M	--	5 (4,6)	C3	Slightly Briaded due to laterial mid-channel bar	2
2.00-1.98	2	23	0.8	1	36	--	1.6	28.8	--		x	x	M/H	M/H	--	4 (5)	B3/B4	graded cobble/gravel; single thread 2-4%	3
1.95-1.93	3	25	0.7	1.8	39.5	--	1.6 (1.58)	35.7	--		x		M	M	--	1	B1/F1	Bedrock 2-4%	5

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	--	5	10	55	15	15	
3	2	10	10	5	35	35	5	
5	3	90	2.5	2.5	--	2.5	2.5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	few/many	1	y	n	y	few/many	--	n	y	n	75	
2	many	4	n	n	n	n	n	n	n	n	2	no sand
3	few	--	--	--	n	few	--	n	n	n	10	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	P	2	2			Unknown	cobble/gravel	young willows on large bar/none on gravel (active) bar
2	P	4	3		1	Active	cobble/gravel	large point bar has seedling willows and dead conifer
3	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/3	3/5	1	2/3	N/A	willows on bar above bankfull and at bankfull, willow and grass below bankfull on bank
2	P	1/3	5	1	2/3	N/A	willows on bar above bankfull and at bankfull on banks grasses below bankfull on Bank
3	A	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ________________ Date/Time: ________________ Sheet ____ of ____

Stream: ________________ General Location: ________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	3/1	3	2	vulnerable to unstable	good root cover in most places
2	Y	1/3	3	2	vulnerable	lots of bedrock/boulder cover, other sand banks with root cover
3	N	1	0	0 (2)	Stable	all bedrock

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	--	1/2	unit	6	sand banks undercut, but fairly stable
2	--	1/2	60% unit	6	periodic sand banks undercut
3	--	--	no sediment/erosion all unit	5/6 if any	no inputs

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	A				--	L/M	low slope, many trees
2	P	X			6 (3)	L/M	low slope, fewer trees
3	A				--	L	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB
Date/Time: 9/10/2002 8:45 Sheet of
Stream: Rock Creek
General Location: Station 0.4 - 0.7

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0.48		37 16.482	119 20.383	Rock Creek --> diversion	
1	2	0.38		37 16.469	119 20.304	Downstream of Survey	2' diameter pipe, daylights along right bank and goes into bedrock Tunnel
	3	0.5		37 16.507	119 20.408	Upstream end of impound --> start survey segment	
	4	0.6		37 16.516	119 20.464	End of survey segment (.5-.6)	
3	5	0.67		37 16.519	119 20.533	break to A1a+ approximately 150' upstream of measure point --> at 100' bedrock Fall	
2	6	0.52		37 16.487	119 20.389	SS #2	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB — Date/Time: 9/10/2002 8:45 — Sheet ___ of ___

Stream: Rock Creek — General Location: Station 0.4 - 0.7

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	⌣	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.38-.48	1	--	--	--	--	--	--	--			x		--	--	--	1/2	A1a+	Bedrock channel --> sheet flow --> no indicators	
.5-.6	2	18.5	1.7	2.2	24		1.3	10.9			x		L-M	L-M		2/3 (HGR)	A2	Flow braids around large boulder elements, sample site in run	
.6-.7	3	19	1.7	2.9	30		1.6	11.2			x		L-M	L-M		2/3 (HGR)	A1/A2	Less braiding than downstream channel --> predominantly single tread	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		100	--	--	--	--	--	
2		25	40	25	5	5	<1%	
3		35	35	20	5	5	<1%	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	None	--	--	--	--	None	--	--	--	--	<5%	No gravel, very little to no sand
2	Few	--	--	--	x	None	--	--	--	--	10-20	
3	Few	--	--	--	x	Few	--	--	--	--	10-20	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P(?)	1/2	2/3/5	1/2	1	--	no good indincators of bankfull -->sheet flow on bedrock. Isolated areas of herb and alder/ willow with in wetted channel
2	P(?)	1/2	2/3/5	1/2/3	1/2	--	no good indincators of bankfull due to briaded flow, area with herb./alder with in wetted channel in boulder matrix
3	P	1	2/5	1/2	1/2	--	No good bankfull indincators due to lage bed elements. Area with herb./alder along channel and within wetted channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	--	--	Stable	Bedrock banks
2	N	1	--	--	Stable	Large boulder/Bedrock
3	N	1	--	--	Stable	Large boulder/Bedrock

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	--	Unit	6	Sand/organic material from upslope areas
2	2/4	--	25% of Unit	2/3/6	Unstable sandy slope along channel with evidence of erosion; intermittent rock fall areas
3	2	--	25% of Unit	2/3	rock fall areas where bedrock present along channel

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	Mod	Low-Mod abundance of conifers, but steep slope
2	P	--	--	x	6	High	Moderate - high density of conifers/alders along channel. Steep slopes
3	P	--	--	x	6	Mod	Moderate density of trees - steep slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF Date/Time: 9/10/2002 8:45 Sheet of

Stream: Ross Ck General Location: 0.7-1.2 Diversion Vicinity

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Photos**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	0.75	30,31	37 13.982	119 20.581	Downstream start survey - A1a+/A1 all bedrock bed 0'	
	2	0.83	32,33	37 14.050	119 20.636	Begin SCE blasted channel 445'	
	3	0.87	34,35	37 14.066	119 20.667	Diversion Photo 34/35 651'	
	4	0.9		37 14.079	119 20.698	137' Upstream no break A1a+ to A2?, no break 252' back to A1a+	
	5	0.99	36,37	37 14.1.34	119 20.768	634' Upstream in A1a+ Photos 36 (downstream) 37 (upstream)	
	6	1.02	38,39	37 14.129	119 20.798	784' Upstream in A1a+ base of large falls Photo 38 upstream 39 downstream	
	7	1.06	40	37 14.128	119 20.839	1013' Upstream end survey in A1a+	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	V	U	‿	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
.75-.82	1	~30	**~.3**	**~1**	**~35**	**--**	~1.17	~100	--			x			--	1(2)	A1a+	No Measurements no indicators, all visual estimates; >10% slope	2
.99-1.02	2	--	--	--	--	--	--	--	--	X			--	--	--	1(2)	A1a+	No indicators	n/a

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
2	1	100						few pool sand deposits
--	2	100						confined bedrock STP/CAS

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	N	0	N	N	N	N	N	N	N	N	5	Few pools
2	--	--	--	--	--	--	--	--	--	--	10	when present

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	A	--	--	--	--	--	--	
2	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	2	3/5	1	1	--	Few grass clumps and small willows in bed
2	A	--	--	--	--	--	willows on banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	0	1/2	stable	some up slope delivery, all berock- nonerodible
2	N	1	0	1/2	stable	some up slope delivery, all berock- nonerodible

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4 if any	--	<5%	sand	some upslope sand delivery
2	5 if any	--	<5%	sand	some upslope sand delivery

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	--	--	--	--	L	no conifers or large riparian trees
2	A	--	--	--	--	L	no wood available

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB | Date/Time: 8/7/2002 Sheet 2 of 10

Stream: South Slide | General Location: Conf. with SF SJR (0.0) to diversion

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	0		37 17.665	118 57.292	confluence with South Fork San Joaquin River	
	2	0.015		37 17.659	118 57.277	start of braiding- upstream single channel	
1	~~3~~	0.03		37 17.637	118 57.272	sample site below Hooper Div Rd - water quality site SS-3	
	4	0.04		37 17.639	118 57.268	Hooper Div Rd - reach break B2/B3 A2a+- sand fill material on steep slopes	
	5	0.05		37 17.631	118 57.257	Upstream end of diversion culvert situated approximetly 50' upstream of road	
2	6	0.1		37 17.577	118 57.230	site in A2a+ channel	
4	8	0.23		37 17.559	118 57.166	site in A2a+ channel	
5	9	0.28		37 17.543	118 57.127	site in A2a+ channel	
	10	0.32		37 17.533	118 57.097	change from a2a+ channel to A1a+	
6	11	0.34		37 17.521	118 57.081	Rec. location in A1a+	
7	12	0.4		37 17.503	118 57.037	Rec. location in A1a+	
8	13	0.36		37 17.507	118 57.054	South Slide diversion	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 8/7/2002   Sheet 3 of 10

Stream: South Slide   General Location: ıth SF SJR (0.0) to ‹

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0-0.03	1	6.9	0.3	0.6	11.6		1.7	23				X	L	M		4 (HGR)	B2/B3	indicators difficult to identify due to flow disturbances created by bed elevation. Check slope- may be Aa+	
0.05-0.1	2	3.6	0.3	0.5	4.5		1.25	12				X	M	M		3	A2a+		
0.18-0.2	3	4	0.5	0.7	7		1.75	8				X	M	M		2/4 HGR	A3a+	B3 depends on gradient = 100' stretch of channel	
0.2-0.23	4	3.5	0.4	0.8	6.5		1.85	8.75				X	M	M		2/4 HGR	A2a+	maybe B2 (depending on slope)	
0.25-0.28	5	4	0.3	0.7	6.5		1.4	13.33				X	M	L		2/4 HGR	A2a+	maybe B2 (depending on slope)	
0.32-0.34	6	NA	NA	NA	NA		NA	NA				X	NA	NA		1	A1a+	sheet flow is over bedrock face	
0.38-0.46	7	4.8	0.4	0.8	5.4		1.12	12				X	M	M		2	A1a+	"channel" approximately 30' wide	
0.34-0.36	8	NA	NA	NA	NA		NA	NA				X	NA	NA		2	A1a+	no good indicators channel- dense vegetation	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 8/7/2002

Stream: South Slide

General Location: Conf. with SF SJR (0.0) to diversion

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
	1	-	10	40	40	5	5	
	2	-	30	40	15	5	10	
	3	-	10	20	30	15	25	
	4	-	30	40	10	10	10	
	5	-	40	20	10	15	5	
	6	100	-	-	-	-	-	
	7	75	5	5	5	5	5	
	8	75	5	5	5	5	5	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC
Date/Time: 8/7/2002
Sheet 5 of 10

Stream: South Slide
General Location: ıf. with SF SJR (0.0) to diver:

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	None	-	-	-	X	Few	-	-	X	-	No pools	
2	None	-	-	-	X	Few	-	-	X	-	80	
3	None	-	-	-	X	None	-	-	X	X (in areas)	No pools	
4	None	-	-	-	X	Few	-	-	X	-	No pools	
5	few	-	-	-	X	Few	-	-	X	-	15	
6	None	-	-	-	-	None	-	-	-	-	No pools	No gravel/sand
7	None	-	-	-	X	Few	-	-	X	-	No pools	
8	None	-	-	-	X	None	-	-	X	-	No pools	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	
2	A	-	-	-	-	-	-	
3	A							
4	A							
5	A							
6	A							
7	A							
8	A							

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 8/7/2002 sheet 6 of 10

Stream: South Slide

General Location: onf. with SF SJR (0.0) to diversi

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	Alder/ Willow/ perennial herb. in flood prone channel
2	A	-	-	-	1	-	Alder/ Willow/ perennial herb. in flood prone channel
3	A	-	-	-	1	-	Alder/ Willow/ perennial herb. in flood prone channel
4	A	-	-	-	1	-	alder/willow/aspen/ perennial herb. 1/2/3 within flood prone
5	A	-	-	-	1	-	alder/willow/aspen/ perennial herb. 1/2/3 within flood prone
6	A	-	-	-	1	-	vegetation along bedrock and in soil areas within bedrock face. vegetation- alder and perennial herb. along channel/bedrock margin. Areas of soil which could be referred to as bars which are well vegetated with alder and perennial herb.
7	A	-	-	-	1	-	very thick dense vegetation along channel. inactive dense channel (1/2 age). Margin outside of flood plain area- alder dense overhanging channel.
8	A	-	-	-	1	-	In general no, but very dense along margin and overhanging vegetation (dense)
Immediately upstream of diversion	P	2	2	2	Yes		1 large alder in middle of channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 8/7/2002 sheet 7 of 10

Stream: South Slide

General Location: Conf. with SF SJR (0.0) to diversion

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	No	2	some surface scour in areas	2	Stable	small boulders/cobble and vegetation stability. banks with bankfull channel/ flood prone consists of duff and sand, [illegible]
2	No	1/2	some areas of surface scour and undercut; sand/fine bank	2	Stable	intermittent areas of sand/ gravel banks that are scoured and under cut but primarily boulder/small boulders
3	Yes	2/3	-	2	vulnerable	vegetation stabilizing bank and some larger substrate-cobble banks appear relatively stable.
4	No	1	-	2	Stable	primarily boulder banks but some areas of scour where gravel and finer sediment present.
5	No	1	-	2	Stable	primarily boulder banks but some areas of scour where gravel and finer sediment present.
6	No	1	-	-	Stable	sheet flow across bedrock face
7	No	1	-	-	Stable	bedrock face
8	No	1	-	-	Stable	dense vegetation on banks

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 8/7/2002

Sheet 8 of 10

Stream: South Slide

General Location: nf. with SF SJR (0.0) to divers

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	-	6	upslope- organic material and sand
2	-	-	intermittent areas, through unit of sand banks	6	-
3	-	1	unit	6	-
4	-	1	intermittent areas of bank scour where fine sediment is present on bank	6	-
5	-	1	intermittent areas of bank scour where fine sediment is present on bank	6	-
6	-	-	-	-	-
7	-	-	-	-	-
8	-	-	-	-	-

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments
SFSJR Conf	Deposition	Inactive	60 X 40	small/large boulders	alder and willow/ per. herb. growing in boulder matrix. Appears to receive very limited flow.

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/BC

Date/Time: 8/7/2002 sheet 9 of 10

Stream: South Slide

General Location: Conf. with SF SJR (0.0) to diversion

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone Low Flow	Channel Zone BF	Channel Zone FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	A	-	-	-	-	Low	shallow slopes/ low density of trees
2	A	-	-	-	-	Low	shallow slopes/ low density of trees
3	A	-	-	-	-	Low	shallow slopes/ low density of trees
4	P 2 pieces	-	X	X	6	Low	shallow slopes/ low density of trees
5	P 1 piece	X	X	X	4	Low	shallow slopes/ low density of trees
6	A	-	-	-	-	Low	lack of trees
7	A	-	-	-	-	Low	lack of tees and thick alder vegetation
8	A	-	-	-	-	Low	lack of tees and thick alder vegetation

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB — Date/Time: 9/12/2002 13:30 Sheet of

Stream: Stevenson Creek — General Location: 3.8 - 4.3 (D/S of Shaver Lake)

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
	1	3.83		37 08.571	119 18.571	Downstream end of Survey , reach break to A1a+, Downstream, bedrock cascade and Deeply incised channel	
	2	3.85		37 08.659	119 18.47	Gauging station ~100' Upstream of bedrock cascade, Gradient Downstream ~8-10%, include A1a+, check dam with small impound upstrear little sand mostly bedrock, reach break from A1a+ - ?	
1	3	3.87		37 08.672	119 18.514	SS#1	
	4	3.95		37 08.698	119 18.457	~50' downstream of road, 2 10x5 hex culverts under road, cement and concert lined	
	5	3.98		37 08.692	119 18.442	Upstream side of roadway, reach break from B1/B	
2a	6	4.04		37 08.653	119 18.411	Upstream of roadway, SS#2, water to deep to measure, edge of relief flood prone ~20-30' left bank sandy over bank deposit, visual estimate due channel deposition, slackwater pool area	
2b	7	4.1		37 08.631	119 18.411	SS#3, Immediately downstream, channel deepens significantly	
3	8	4.02		37 08.659	119 18.389	Start of restoration area on right bank, boulder on filter fabric, collect bankfull measurements	
	9	4.08		37 08.621	119 18.423	Flood channel for release, grass area along bank (sand), 25' wide mid-channel bar is forested with conifer	
	10	4.1		37 08.606	119 18.424	Flood channel for release, upstream dense alder	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______ Date/Time: ______ Sheet ____ of ____

Stream: ______ General Location: ______

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
3.85 - 3.90	1	12.7	0.5	0.7	22		1.7	25.4			x		H	H		4	B1	Flow near bankfull, high width depth ratio due to bedrock	
3.90-3.95		5.5	1	1.3	14.5			5.5				x	H	H		4		Rosgen type aftected by culvert	
4.0-4.1	2a	20	3	4	30-50		1.5-1.8	6.7				x	H	H		4	B5(E5?)	visual esimate due to deep channel, pool slackwater upstream of road, no riffle, channel has widened E-like look	
4.1-?	2b	16	1.8	2.4	50		3.13	8.9				x	H	L		4	E5?	Slackwater area	
	2b	30	1.8	2.4	2.5														
4.08-GPS	3	21	2.5	3	34		1.6	8.4				x	H	L		4	B2/B5	Rip rap on right bank	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet of

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		90	--	--	--	5	5	
2a		--	--	--	--	--	100	
2b		--	--	--	5	5	90	
3		--	15	40	2.5	2.5	40	Boulder from rip rap bank

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	None	--	--	--	x	none	--	--	--	--	x	10-15% very little sand and gravel in depressions in bedrock
2a/b	None	--	--	--	--	none	--	--	--	100	100	no visible gravel, channel appears to be slackwater/pool
3	None	--	--	--	x	none	--	--	--	100	100	
6	None	--	--	--	x	none	--	--	--	x	80-90%	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	--	--	--	--	--	--	
2a	A	--	--	--	--	--	--	
2b	P	1	--	1	--	Inactive	6	100% veg
3								

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	--	--	--	1	--	dense riparian above bankfull, overhanging channel
2a	A	--	--	--	1	--	Sporadic area of reed growth <5% inchannel, vegetation primarily on banks
2b	P	1/2	1/2/3/5	1/2/3	3	--	Relict bankfull, vegetation

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	3	3	2	Vulnerable (stable)	Sand overlays bedrock, dense vegetation which stabilizes bank
2a/b	Y	3	3	2	Vulnerable (stable)	Dense vegetation provides stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	--	unit	6	Small amounts of sand/organic material from upslope
2a/b	100% upstream of road, road fill, sand	2	unit	6	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	x	x	x	1/6	low - mod	Low - moderate density of conifers, moderate slopes RB/Low slope RB
2a/b	P	x	x	x	6	mod	Moderate density of trees a long channel / low slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF
Date/Time: 9/12/2002 13:30 Sheet of
Stream: Stevenson Ck
General Location: 4.3-3.8 (below shaver lake)

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	4.3		37 08.655	119 18.222	100' downstream of dam, survey start (downstream)	
1	2	4.27		37 08.650	119 18.231	146' downstream of start site 1 in riffle	
	--	4.26				Upstream end of large mid-channel bar- boulder/cobble-dense willow/grass	
	--	4.24				Downstream end of large mid-channel bar- begin talus/riprap bar against scoured bank	
	3	4.24		37 08.637	119 18.261	Site 2-in B3 adjacent to small cobble rip rap bar	
	4	4.2		37 08.632	119 18.293	Upstream extent of inundation, slackwater pool formed by road crossing	
	5	4.2		37 08.632	119 18.293	site 3-just upstream of slackwater pool	
	6	4.15		37 08.624	119 18.347	Upstream extent of rip rap - photo 41	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
4.30-4.25	1a	25	0.6	1	27	x	1.1	42	x		x		L/M	L/M	x	4	G/B/F2/3	Existing bankfull?	
4.30-4.25	1b	30	3	3.5	42	x	1.4	10	x		x		M	M	x	4	G3/G2	Relict bankfull	
4.25-4.24	2a	14.5	0.6	0.8	24	x	1.65	24	x		x		M	M	x	4	B3	Existing bankfull, adjacent to rip rap cobble bar	
4.25-4.24	2b	37	3.5	4.4	67	x	1.81	10.6	x		x		M	L	x	4	B3 (G3?)	Relict bankfull	
4.20-??	3a	7.5	0.6	1	13	x	1.73	12.5	x		x		L/M	L/M	x	4	B3 (B5)	Existing bankfull	
4.20-??	3b	18.5	3.6	4	~60	x	3.2	5.1	x		x		M	L/M	x	4	E3 (E5)	incision entrenched, narrows, and deepens B3 type	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________ General Location: ______________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
2	1	10	15	30	35	5	5	Mostly angular cobble and small boulder
5	3	5	10	10	35	15	25	sand at bankfull/flood prone

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	none	--	N	N	Y	none	--	N	N	N	5	Not much sand or gravel
3	none	--	N	N	Y	few	--	N	Y	N	70	sandy pools

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	A	--	--	--	--	--	--	
3	A	--	--	--	--	--	--	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	P	1/2	5/3	1	1(2)	1(2)	few willows in relict bankfull, most just grass
3	P	1/2	5	1	1(2)	1/2	grass/horsetails on margin and in channel - willow/alder in relict bankfull

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1/2	0	2	Stable	boulder banks
3	Y	3	3/2	2	Unstable	undercuts, slumping evident

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	N/A (4 if any)	1 if any	5% unit	sand	Bedrock/ Boulder bank cover, No sand in channel
3	N/A (4 if any)	1/2/3	70% unit	sand	almost all sandy banks

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	A	--	--	--	--	L	No LWD recruitment available
3	A	--	--	--	--	L	No LWD recruitment available

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: MC/RF

Date/Time: 9/9/2002 Sheet of

Stream: Lower Tombstone

General Location: Jackass Meadow

GPS LOG							
Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Photos	NORTHING	WESTING	Feature	Comments
	1	-0.06	23 to 25	37 16.753	118 57.791	SFSJR / Jackass / Tombstone	Slough - Confluence?
		0	26,27	37 16.737	118 57.733	300' Down Jackass Slough	- Tombstone Confluence
		---		37 16.744	118 57.701	Jackass Slough / Braid confluence with SFSJR	
				37 16.702	118 57.741	Tombstone in Jackass	WP+
				37 16.708	118 57.737	Tombstone in Jackass	WP+
				37 16.706	118 57.751	Tombstone in Jackass	WP+(Fish site B - Run)
				37 16.690	118 57.762		WP+(Fish site A - Run)

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 9/9/2002 Sheet of

Stream: Tombstone Creek   General Location: Station 0.0 - 0.6 D/S of Diversion

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	0.6		37 16.560	118 57.567	Start Survey	
1	2	0.53		37 16.559	118 57.592	SS#1 in E5	
	3	0.51		37 16.552	118 57.607	LWD jam fills channel - between 0.50-50.51-> reach break from E5 -> G5?	
2	4	0.47		37 16.540	118 57.647	SS#2 (= 20' downstream of footbridge)	
	5	0.43		37 16.536	118 57.646	Reach break from G5 -> E5	
3	6	0.38		37 16.529	118 57.684	SS#3 in E5	
	7	0.31		37 16.503	118 57.735	Barbed wire fence crossing	
4	8	0.29		37 16.502	118 57.754	SS#4 in E5	
5	9	0.2		No GPS Coverage		SS#5	
	10	0.13		37 16.627	118 57.759	Channel filled with sand - no defined bed/bank	
						> Channel widens, no bankfull indicators	
6	11	0.09		37 16.667	118 57.752	SS#6	
7	12	0.04		37 16.707	118 57.707	SS#7	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB   Date/Time: 9/9/2002   Sheet 3 of 10

Stream: Tombstone Creek   General Location: Station 0.0 - 0.6

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	⌣	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
0.53 - 0.60	1	6	0.7	0.9	21		3.5	8.6				X	H	H		4	E5	LWD -> abundant in channel which influences flow	2
0.43 - 0.51	2	7.3	0.6	0.8	10.5		1.4	12.2				X	M - H	M - H		4	G5		4
0.38 - 0.43	3	3.6	0.7	0.9	14		3.9	5.14				X	H	M		4	E5	-> channel degraded by grazing impacts	6
0.29 - 0.34	4	5.3	0.4	0.8	15		2.8	13.25				X	H	M		4	E5	-> channel degraded by grazing impacts	8
0.20 - 0.25	5	4.7	0.2	1	15+		3.2	6.7				X	H	L		4	E5	-> channel degraded by grazing impacts	9
0.08 - 0.13	6	7	0.8	1.2	20+		2.9	8.75				X	H	L		4	E5	-> channel degraded by grazing impacts	11
0.04 - 0.07	7	6.7	0.3	0.6	15		2.2	22.3				X	H	L		4	E6	-> channel degraded by grazing impacts	12

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 9/9/2002

Sheet 4 of 10

Stream: Tombstone Creek

General Location: Station 0.0 - 0.60

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	Smpl Site ID#	Bedrock	Lg. Boulder (512-4096 mm)	Sm. Boulder (256-512 mm)	Cobble (64-256 mm)	Gravel (2-64 mm)	Sand/ Fines (<2mm)	Comments
1		-	-	-	-	10	90	Fine gravel
2		-	-	-	-	10	90	Fine gravel
3		-	-	-	-	>5	95	Sand more abundant relative to upstream
4		-	-	-	-	-	100	Channel filled with sand
5		-	-	-	-	-	100	Channel filled with sand
6		-	-	-	-	-	100	Channel filled with sand
7		-	-	-	-	-	100	primarily silt

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB
Date/Time: 9/9/2002
Sheet 5 of 10
Stream: Tombstone Creek
General Location: Stations 0.0 - 0.6

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	Boulder Shadow (none, few, many)	Bars (# in unit)	Pool Tail-Out/ Riffle	Associated with LWD	Scattered, Poorly Sorted	Boulder Shadow (none, few, many)	Bars (# in unit)	Associated with LWD	Interstitial spaces filled	Concentrated, Covering Bed	Pools (% on bed)	Comments
1	none	-	-	-	X	none	6	X	-	X	No pools	
2	none	-	-	-	X	none	-	X	-	X	No pools	
3	none	-	-	-	-	none	-	-	-	X	No pools	
4	none	-	-	-	-	none	-	-	-	X	No pools	
5	none	-	-	-	-	none	-	-	-	X	No pools	
6	none	-	-	-	-	none	-	-	-	X	No pools	
7	none	-	-	-	-	none	-	-	-	Silt	No pools	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type			Active / Inactive	Bar Particle Size Comp	Comments
			Lateral	Mid-channel	Point			
1	P	6	4	-	2	Active	Sand	No vegetation on banks
2	A	-	-	-	-	-	-	
3	A	-	-	-	-	-	-	
4	A	-	-	-	-	-	-	
5	A	-	-	-	-	-	-	
6	A	-	-	-	-	-	-	
7	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB

Date/Time: 9/9/2002

Sheet 6 of 10

Stream: Tombstone Creek

General Location: Station 0.0 - 0.6

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	-> Dense alder/herb. In flood prone area
2	P	1	5	1	2	-	-> Intermittent herb. along channel margin
3	A		-	-	1	-	-> Dense herb. and low - moderate alder/willow in flood prone area
4	P	1/2	1	3	2	-	-> Dense herb. and low density/sporadic alder
5	P	1/2	1	3	2	-	-> Dense herb. and low density/sporadic alder
6	P	1/2	3	2	2	-	-> Dense willow in flood prone area -> Sporadic areas with willow in bankfull channel
7	P	1/2	5	1	3	-	Dense herb. in channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/ CB

Date/Time: 9/9/2002 Sheet 7 of 10

Stream: Tombstone Creek

General Location: Stations 0.0 - 0.6

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	Y	3/4	3	2	Vulnerable	-> Alder and Herb/ vegetation provide stability
2	Y	3/4	2/3	2/3d/3e(grazing)	Unstable	-> Scour exposing root mass of vegetation -> Undercut and Slumping in areas
3	Y	3/4	2/3	2/3d/3e(grazing)	Vuln. /Unstable	-> 75% vegetation provides stability -> 25% slumping due to anthropologic impacts
4	Y	3/4	2/3	2/3d/3e(grazing)	Vuln. /Unstable	-> 75% vegetation provides stability -> 25% slumping due to anthropological impacts
5	Y	3/4	3	2/3d/3e(grazing)	Vuln. /Unstable	
6	Y	3/4	3	2	Vulnerable	Vegetation provides stability
7	Y	3/4	2/3	2/3d/3e(grazing)	Vulnerable	Vegetation provides stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB

Date/Time: 9/9/2002

Sheet 8 of 10

Stream: Tombstone Creek

General Location: Stations 0.0 - 0.6

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	-	1/2	unit	6	
2	-	1/2	scour / undercut -> unit; slumping ~25% of unit	6	
3	-	1/2/3	scour / undercut -> unit; slumping ~25% of unit	6	
4	-	1/2/3	scour / undercut -> unit; slumping ~25% of unit	6	
5	-	1/2/3	unit	6	
6	-	1/2	unit	6	
7	-	1/2	unit	6	
		1/2	unit	6	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
missing data sheet							

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/JH/CB
Date/Time: 8/20/2002 Sheet 2 of 10
Stream: Tombstone Creek
General Location: Station 0.6 - 1.1

GPS LOG

Smpl Site ID#	GPS LOG ID#	Station (estimated in field)	Station (corrected)	NORTHING	WESTING	Feature	Comments
1	1	1.06		37 16.450	118 57.147	SS#1 in A1a+/A2a+	
	2	1.02		37 16.459	118 57.180	WP Study Site - Site C - Within lower gradient, B-type channel, energy dissipation zone	
2	3	1		37 16.455	118 57.184	SS#2 in A2a+ -> Start Survey Segment	
	4	0.95		37 16.466	118 57.230	End of survey segment in A1a+/A2a+	
	5	0.85		37 16.524	118 57.319	Potential reach break from A1a+/A2a+ to ? -> gradient decreases to ~10%	
	6	0.81		37 16.525	118 57.361	Surface flow in channel decreases significantly somewhere between 0.81 - 0.85. Alluvial bed with gravel/sand	
3	7	0.82		37 16.529	118 57.348	Gradient increases from ~10% -> ? ~50' upstream of WP Site upper reach site E	
	8	0.75		37 16.551	118 57.412	Gradient increases significantly to ~30% (A1a+)	
	9	0.7		37 16.560	118 57.445	Downstream end of A1a+ reach -> potential reach break - Start Survey Segment. Pool at base of A1a+ ~ 100% sand	
	10	0.66		37 16.534	118 57.500	Potential reach break from A/B type segment - lower gradient.	
4	11	0.67		37 16.565	118 57.462	SS#4	
	12	0.65		37 16.564	118 57.487	Downstream end of A2a+ -> Start survey segment at BM-1 - BD Site C	
	13	0.647		37 16.550	118 57.501	Channel splits -> flow ~50% in northern channel and 50% in southern channel	
5	14	0.645		37 16.568	118 57.500	North channel ~50' downstream of split (Headcut Location)	
	15	0.6 ?		37 16.543	118 57.625	Footbridge crossing on Tombstone	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	Smpl Site ID#	W_{bf}	Ave BF depth ($AveD_{bf}$)	Max BF depth	W_{fp}	W_v	W_{fp}/W_{bf}	$AveD_{bf}/W_{bf}$	W_v/W_{bf}	V	U	‿	BF	FP	W_v	Bed-Form Montg.-Buffingt.	Stream Type Rosgen	Comments	GPS LOG ID#
1.05 - 1.01	1	-	-	-	-	200	-	-		X			-	-	-	2/3	A1a+/A2a+	-> No apparent bankfull indicators -> Bedrock/ Block cascade	1
0.95 - 1.0	2	4	0.6	1	6.4	-	1.6	6.7				X	L	L	-	2/3	A1a+/A2a+	-> poor bankfull indicators	3
0.81 - 0.85	3	7	1.2	1.5	6	-	0.85	5.8				X	M	M	-	2/4	A2a+	-> gradient ~10% -> high gradient riffle	7
0.66 - 0.70	4	7	0.3	0.5	9.5	300	1.4	14	42.9		X		M	M	-	3/4	B2/B5	-> High gradient riffle -> WP sites in this reach	11
0.64 - 0.65	5	2.5	0.2	0.4	3.7	-	1.48	12.5				X	M	M	-	4	B5	-> north channel	14

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		30	40	10	-	5	5	
2		30	50	10	5	2.5	2.5	
3		5	20	40	5	20	10	
4		-	20	30	5	10	40	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

GRAVEL and SAND DEPOSITIONAL FEATURES

	Gravel Deposits					Sand Deposits						
Smpl Site ID#	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Pool Tail-Out/ Riffle**	**Associated with LWD**	**Scattered, Poorly Sorted**	**Boulder Shadow** (none, few, many)	**Bars** (# in unit)	**Associated with LWD**	**Interstitial spaces filled**	**Concentrated, Covering Bed**	**Pools** (% on bed)	**Comments**
1	few	-	-	-	X	few	1	-	X	-	80	
2	few	-	-	-	X	few	-	-	X	-	20	
3	none	-	-	-	X	few	-	-	X	-	20	
4	none	-	-	-	X	none	-	X	X	-	80/90%	

INSTREAM BARS

Smpl Site ID#	**Presence/ Absence**	**Count**	**Bar Type**			**Active / Inactive**	**Bar Particle Size Comp**	**Comments**
			Lateral	**Mid-channel**	**Point**			
1	P	1	-	1	-	Inactive	Boulder with sand with 1-4" dbh alder on bar	
2	A	-	-	-	-	-	-	
3	A	-	-	-	-	-	-	
4	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
1	A	-	-	-	1	-	-> Size 1/2 alder along channel margin in flood prone. Within Boulder Matrix
2	A	-	-	-	1	-	-> Size 1/2 alder within flood prone area along clear margin and some herb
3	A	-	-	-	1	-	-> Size 1/2 alder and dense thimbleberry in flood prone area along channel
4	A	-	-	-	1	-	-> Sixe 1/2 alder in flood prone area along channel

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	-	-	Stable	
2	N	1	-	-	Stable	-> Some isolated areas of bank scour where boulders absent
3	Y	1/2/3	3	2	Vulnerable	-> Areas of surface scour and undercut (<50% of channel) where fines present
						-> overall rootmass and large material provide stability
4	Y	1/2/3	3	2	Vulnerable	-> overall rootmass and large material provide stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ______________________ Date/Time: ______________________ Sheet ____ of ____

Stream: ______________________ General Location: ______________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	50% unit	6	- upslope - sand/ organic material primarily on right bank - leftbank bedrock (steep slopes)
2	4	-	unit	6	- upslope - sand/ organic material primarily on right bank - leftbank bedrock (steep slopes)
3	4	1/2	- Bank < 50% unit - upslope - unit	6	upslope - organic material/sand
4	-	1/2	< 50% unit	6	

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone			Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
		Low Flow	BF	FP			
1	P	-	X	X	6	High	- Dense trees along channel - steep slopes
2	P	X	X	X	6	High	- Dense trees along channel - steep slopes
3	P	X	X	X	6	High	- Dense trees along channel - steep slopes
4	P	X	X	X	3/6	High	- Dense trees along channel - shallow slopes

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC / CB — Date/Time: 08/20/02 — Sheet 2 of 10

Stream: Tombstone Creek — General Location: Station 0.98 - 1.60

GPS LOG							
Smpl Site ID#	**GPS LOG ID#**	**Station (estimated in field)**	**Station (corrected)**	**NORTHING**	**WESTING**	**Feature**	**Comments**
	1	1.10	0.98	37 16.448	118 57.107	Tombstone Diversion	
1	2	1.15		37 16.396	118 57.086	SS#1	
	3	1.20		37 16.381	118 57.020	Potential Reach break from A1a+ to A/B	
2	4	1.21		37 16.380	118 57.018	SS#2	
	5	1.23		37 16.377	118 57.017	WP sample site BMI Site AD -> gradient increases to ~100' upstream to A2a+	
	6	1.27		37 16.350	118 56.983	Possible reach break -> bedrock bed -> upstream gradient increases	
3	7	1.28		37 16.342	118 56.991	SS#3 within A/B section -> flow transect AD	
	8	1.30		37 16.333	118 56.976	Potential reach break to A2a+ -> boulder jam/cascade - Immediately downstream of WP site AD high gradient riffle	
	9	1.32		No GPS Coverage	No GPS Coverage	Gradient decreases - Potential reach break A2a+ -> A4/A5 between 1.32 - 1.34	
	10	1.36		37 16.306	118 56.926	Reach break from A4/A5 to A1a+ ~ 100' downstream at station 1.34	
4	11	1.46		37 16.268	118 56.850	SS#4 in A1a+	
	12	1.50		No GPS Coverage	No GPS Coverage	Reach bank from A1a+ to A2a+	
5	13	1.60		No GPS Coverage	No GPS Coverage	End of survey	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB/JH

Date/Time: #######

Sheet 3 of 10

Stream: Tombstone Creek

General Location: U/S of Diversion

CHANNEL ENTRENCHMENT, VALLEY CONFINEMENT, BED-FORM, and CHANNEL CLASSIFICATION

							ER	W/D	Conf.	Valley Shape			Degree of Confidence						
Station to Station	**Smpl Site ID#**	**W_{bf}**	**Ave BF depth ($AveD_{bf}$)**	**Max BF depth**	**W_{fp}**	**W_v**	**W_{fp}/W_{bf}**	**$AveD_{bf}/W_{bf}$**	**W_v/W_{bf}**	**V**	**U**	**‿**	**BF**	**FP**	**W_v**	**Bed-Form Montg.-Buffingt.**	**Stream Type Rosgen**	**Comments**	**GPS LOG ID#**
1.1 - 1.15	1	-	-	-	-	**100+**	-	-	-	X	-	-	-	-	-	3	A1a+	- No apparent bankfull indicators - entrenched channel	1
1.20 - 1.25	2a	5	0.8	1	7.8	-	1.56	6.25	-	-	-	X	H	H	-	4	A2/A5 (B2/B5?)	WP site does not appear representative flow influenced by LWD	4
	2b	3.5	0.8	1	4.3	-	1.22	4.375	-	-	-	X	M	M	-	4	A2/A5	Plane bed area between boulder cascades, flow influenced by LWD	
	2c	2.5	0.7	0.8	4.5	-	1.8	3.125	-	-	-	X	H	H	-	4	A4/B4?	check gradient potential Aa+	
1.27 - 1.30	3	5.8	0.6	0.8	7.8	-	1.34	1.34	-	-	-	X	H	H	-	3	A4/A5	Plane bed with LWD jams creating grade stabilization	7
1.4 - 1.46	4	-	-	-	-	-	-	-	-	-	-	X	-	-	-	2	A1a+	No apparent bankfull indicators	11
1.50 - 1.60	5	-	-	-	-	-	-	-	-	-	-	X	-	-	-	3	A2a+	No apparent bankfull indicators	13

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB/JH

Date/Time: 8/20/2002

Sheet 4 of 10

Stream: Tombstone Creek

General Location: U/S of Diversion

DOMINANT STREAMBED PARTICLE SIZE

Smpl Site ID#	**Smpl Site ID#**	**Bedrock**	**Lg. Boulder (512-4096 mm)**	**Sm. Boulder (256-512 mm)**	**Cobble (64-256 mm)**	**Gravel (2-64 mm)**	**Sand/ Fines (<2mm)**	Comments
1		85	10	-	-	-	5	
2		-	25	15	10	10	40	
3		+	5	20	5	30	40	
4		90	2	2	2	2	2	
5		5	50	20	5	10	10	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: JC/CB/JH
Date/Time: 8/20/2002
Sheet 5 of 10
Stream: Tombstone Creek
General Location: U/S of Diversion

GRAVEL and SAND DEPOSITIONAL FEATURES

Smpl Site ID#	Gravel Deposits: Boulder Shadow (none, few, many)	Gravel Deposits: Bars (# in unit)	Gravel Deposits: Pool Tail-Out/ Riffle	Gravel Deposits: Associated with LWD	Gravel Deposits: Scattered, Poorly Sorted	Sand Deposits: Boulder Shadow (none, few, many)	Sand Deposits: Bars (# in unit)	Sand Deposits: Associated with LWD	Sand Deposits: Interstitial spaces filled	Sand Deposits: Concentrated, Covering Bed	Sand Deposits: Pools (% on bed)	Comments
1	none	-	-	-	very little	none	-	-	-	-	80	very little gravel, sand only in pool
2	none	-	-	-	X	none	-	X	X	-	80	
3	none	-	-	-	X	none	-	X	X	-	80	
4	none	-	-	-	X	few/none	-	-	-	-	-	very little gravel/sand some behind boulder jams, no pools
5	few/none	-	-	-	X	none	-	X	X	-	70	

INSTREAM BARS

Smpl Site ID#	Presence/ Absence	Count	Bar Type: Lateral	Bar Type: Mid-channel	Bar Type: Point	Active / Inactive	Bar Particle Size Comp	Comments
1	A	-	-	-	-	-	-	
2	A	-	-	-	-	-	-	
3	A	-	-	-	-	-	-	
4	A	-	-	-	-	-	-	
5	A	-	-	-	-	-	-	

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

VEGETATION ENCROACHMENT

Smpl Site ID#	VEG w/in BF channel (P/A)	Vegetation in Bankfull Channel			Vegetation Encroachment Rating	Veg Sz. Cl. in Relict BF Ch.	Comments
		POSTION	TYPE	SIZE CLASS			
missing data sheet							

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

BANK STABILITY

Smpl Site ID#	Erodibility (yes /no)	Bank Composition	Instability Feature	Causative Erosion Process	SCI Stability Rating	Comments
1	N	1	-	-	Stable	
2	N	1	-	-	Stable	-> some isolated areas of bank scour where boulders absent
3	Y	1/2/3	3	2	Vulnerable	-> areas of sand; scour and undercut (<50% of channel) where fines present
						-> overall root mass and large material provide stability
4	Y	1/2/3	3	2	Vulnerable	-> overall root mass and large material provide stability

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________________ Date/Time: ____________________ Sheet ____ of ____

Stream: ____________________ General Location: ____________________

STREAM-SIDE SEDIMENT SOURCES

Smpl Site ID#	Upslope	Streambank	Size of Erosion / Deposition Feature	Dominant Particle Size	Comments
1	4	-	unit	6	- upslope sand/organic material - sporadic rockfalls along channel
2	4	1/2	unit	6	- upslope -> sand/ organic material
3	4	1/2	unit	6	- upslope -> sand/ organic material
4	4	-	50% unit	6	- upslope -> sand/ organic material
5	4	-	unit	6	- upslope -> sand/ organic material

Tributary Deposition

Smpl Site ID#	Deposition / No Deposition	Active/ Inactive	Size of Deposition	Dominant Particle Size	Comments

FIELD RECONNAISSANCE DATA FOR GROUND SURVEYS

Survey Crew: ____________ Date/Time: ____________ Sheet ____ of ____

Stream: ____________ General Location: ____________

LARGE WOODY DEBRIS

Smpl Site ID#	Presence / Absence	Channel Zone: Low Flow	Channel Zone: BF	Channel Zone: FP	Geomorphic Function	Recruitment Potential (High / Moderate / Low)	Comments
1	P	X	X	X	3/6	High	-> Alders growing across channel -> LWD ~ 4-6". Abundant small woody debris in channel and banks. -> Steep slopes dense conifers along channel
2	P	X	X	X	1/3/6	High	-> Dense conifers along channel, low slope
3	P	X	X	X	1/3/6	High	-> Dense conifers along channel, low slope -> Abundant LWD in channel
4	A	-	-	-	-	Low - Moderate	-> Sparse conifers but high potential where present
5	P	X	X	X	3/6	High	-> Abundant trees along channel