

North Fork American River Sediment Dynamics Study
Presented by Sierra College on behalf of the
American River Watershed Group
Final Proposal approved as to form by the ARWG on 4.18/2003

Purpose

Sources of sediment, the nature of erosion and sediment routing, and the effects of these processes on resources in the American River watershed are not clearly understood. The objective of this study is to better understand these processes and determine any potential or actual effects upon key watershed resources. Key resources for this study are defined as aquatic habitat, aquatic organisms, water and power infrastructure, and water quality as outlined in the previous Category III study.

This is primarily a research project. We will develop a consistent database at a watershed scale, find out what data is missing, and attempt to fill holes in existing data. The resulting information will be used to develop a risk analysis that will prioritize areas of the watershed for future efforts. No landowner mandates or regulations are intended to result. This is a product of the American River Watershed Group (ARWG), as such, it is subject to the approval of the members throughout the project and prior to the final publication and/or product delivery.

Description of North Fork American River

The area included in this study is defined as all drainages of the North and Middle Forks American River from its source to the high water mark at Folsom Reservoir. This watershed is triangular in shape and is bordered by the crest of the Sierra Nevada and the Lake Tahoe Basin on the east, Yuba and Bear River watershed on the North, and South Fork American River watershed on the South. It includes 616,541 acres; about 963 square miles of land. Elevations range from approximately 9000 feet along the crest of the Sierra Nevada to approximately 406 feet at Folsom Reservoir. Within the eastern two thirds, the mix of public and private ownership is checkerboard with USDA Forest Service, Tahoe and El Dorado National Forests, and large landholders. The western third is a mix of private ownership and Bureau of Land Management and Bureau of Reclamation ownership.

Acreage

North Fork 222,360 acres

Middle Fork 394,181 acres

<u>Public Ownership</u>	<u>River Fork</u>	<u>Acres</u>
<i>Tahoe National Forest</i>	North Fork	93,527
	Middle Fork	98,005
<i>El Dorado National Forest</i>	Middle Fork	16,982
<i>Bureau of Land Management</i>		20,693

<i>Bureau of Reclamation</i>	25,000
<i>State Parks</i>	3,000

Totals	
<i>Public</i>	257,207
<i>Private</i>	359,334
Total	616,541

Project Description

A Geographic Information System (GIS) will be used to analyze existing data and determine which sub-basins have the highest potential to yield sediment. Using hydrologic and sediment modeling, we will describe the mechanisms that deliver sediment from hill slope to the resources of interest. The particular resources within the watershed will be identified by a Technical Advisory Committee (TAC) and will include streams, landscapes, and active channels. Sediment delivery as predicted by the model will be correlated to the identified key resource areas and the results used to determine whether erosion and sedimentation should be a cause for concern in each sub-basin.

We will classify and prioritize sub-basins that do now or have potential to deliver sediment to key resource areas. Using risk analysis methodology we will identify specific geographic areas of the watershed for future conservation, maintenance, and/or enhancement efforts. The project will facilitate watershed restoration activities by providing the necessary background information, criteria for consideration in selecting project priorities, and environmental data for their implementation.

To understand the sediment processes in the watershed, four core questions must be addressed:

1. What are the sources of sediment in the watershed?
2. How does sediment move through the watershed?
3. What are the potential effects of erosion and sedimentation upon key resources and are these actually occurring within the watershed?
4. What opportunities exist to address the effects of erosion and sedimentation upon key resources in areas determined to be high priority?

Modeling Procedures and Level of Investigation

Existing data will be inventoried and assessed for utility in answering the core questions. This data will be the primary source of information, but where none is available, collection of appropriate data will be required. New data may need to be digitized, purchased, and/or gathered in the field. We will attempt to use methodology that will correlate with the existing sources of information and coordinate with stakeholders. If similar methodology is not available, we will provide a cross walk for other sources of information so that consistency is maintained.

A Technical Advisory Committee (TAC) will be formed to provide guidance throughout the study. The committee will consist of representatives of the ARWG who can provide technical expertise as well as invited guests. This committee will select protocols for the data collection and analysis used to answer the core questions. It will ensure the quality and consistency of this data. It will coordinate with project administration, contractors and ARWG stakeholders.

Proposed work plan

1. Administration

The Project Management team will consist of a Project Manager, Water Resources Manager, and a Fiscal Manager. The Project Manager, in conjunction with the TAC, will monitor, oversee, and review all work performed, and define the contractual standard for the quality of work required. The Water Resources Manager will provide regular communication and updates to the ARWG membership on project status and progress. The Fiscal Manager will track expenses and submit invoices at the direction of the Project Manager and the TAC. This team will coordinate budgeting, scheduling, invoicing, agreements, permitting and subcontract development according to the following:

Project Manager Responsibilities

- a) Participate in TAC
- b) Prepare updates and reports as required
- c) Prepare RFP for subcontracted work
- d) Prepare final report

Water Resources Manager Responsibilities

- a) Participate in TAC
- b) Provide regular updates to ARWG, private landowners, and local entities on the status and progress of the study.

Fiscal Manager Responsibilities

- a) Track expenses over time relative to product deliverables.
- b) Prepare and submit invoices as required.

Technical Advisory Committee (TAC)

A TAC will be formed consisting of local and statewide stakeholders with technical expertise. This team will guide the process, ensure scientific integrity of all protocols and products and to coordinate between contractors and the ARWG. The TAC will review and approve work products before payment is made to any contractor. This committee's responsibilities include:

- a) Assist in the preparation of RFP for contracted work, review proposals, and make recommendation to grant administrator for award.

- b) Facilitate review of existing ARWG projects and information and determine what existing data may be applicable to this study
- c) Evaluate existing GIS data inventoried in Step 2 and determine that it is acceptable.
- d) Evaluate existing stream ecosystem data acceptable for use in Step 5.
- e) Work with contractor to select protocols.
- f) Work with contractor to develop a strategy for the completion of potential projects identified in Step 5.
- g) Work with contractor to develop a strategy for continued monitoring.
- h) Work with Project Manager to monitor work completed by contractor to ensure accurate and timely completion of deliverables.
- i) Report to ARWG the status of work accomplished by contractors and TAC.
- j) Ensure the integrity of all data used, including existing and newly collected data.
- k) Comment and review validity of the statistics proposed and/or arrange for statistical review where appropriate.
- l) Review final report for accuracy in data utilization and analysis.

Products:

- i) RFP for subcontracted work
- ii) Quarterly status reports
- iii) Monthly updates to the ARWG
- iv) Subcontract documentation
- v) Financial reports and invoices as required
- vi) Final reporting

2. Develop an understanding of erosion and sediment sources in the watershed at the 7th HUC level.

Analyze watersheds at the HUC-4 through the HUC-7 levels and apply a hierarchical approach to identifying sub basins with various levels of existing and/or potential erosion and sediment sources. This process will not identify particular parcels of land, but rather determine sub basins (7th HUC level) where existing and/or potential for accelerated erosion and/or sedimentation is high.

- a) Determine what information and data currently exists for use in this study, inventory and catalogue data.
- b) Assess existing data for utility in this study. (TAC)
- c) Develop/gather GIS information. All layers will be developed to a standard consistent with the Ecological Unit Inventory (EUI) in use on the Tahoe and El Dorado National Forests. Refer to USDA Forest Service EUI Manual.
- d) Analyze the layers to identify and locate existing and/or potential sources for erosion and sedimentation.
- e) Geographically classify 7th field HUC's by likely sediment sources and erosion potential. Define primary erosion processes for each sub basin.
- f) Define methods for field verification of DEM/GIS models.

- g) Field verify, using a random stratified sampling process, accuracy of GIS and modeling process.

Products:

- i) Characterization of “bare land potential” and erosion risk for each sub basin.
- ii) List of existing and/or potential erosion and sediment sources, stratified by various watershed levels (HUC-5 through HUC-7).
- iii) Data layer showing sub basins (7th field HUCs) broken down by percent surface area with potential to produce sediment.
- iv) Assessment of accuracy of DEM/GIS models and methods after field verification.
- v) List of data gaps and recommendations as to how to develop complete data.

3. Develop an understanding of sediment routing across landscapes, in and through channels in the watershed.

- a) Characterize hillslope development factors by sub basin.
- b) Identify factors affecting erosion and sediment transport (i.e., roads, urbanization...).
- c) Identify how sediment is reaching streams in each sub basin.
- d) Identify areas of the watershed where sediment transport has the potential to occur stratified by various watershed levels (HUC-5 through HUC-7).
Selection of models to be determined by TAC
- e) Identify and map stream reaches transporting sediment.
- f) Identify and map stream reaches with sediment deposition.
- g) Characterize sediment routing in each sub basin.

Products:

- i) Characterization of sediment routing, stratified by various watershed levels (HUC-5 through HUC-7).
- ii) List of data gaps and recommendations as to how to develop complete data.

4. Perform a risk analysis and assessment based on the information gathered in Steps 1 and 2. Categorize and prioritize sub basins according to erosion potential and ability to transport sediment.

- a) The TAC will apply a hierarchical, geographical approach to classify and prioritize areas within the watershed that are at various levels of risk for erosion and/or sediment and have potential to deliver to key resource areas, stratified by watershed levels (HUC-5 through HUC-7).
- b) Compare results with existing data on streams and/or field verify accuracy of risk assessment for each risk class.

Products:

- i) Assessment of the accuracy of risk analysis and methods after comparison with existing stream data and/or field verification.
- ii) List of data gaps and recommendations as to how to develop complete data.
- iii) Prioritized list of sub basins (HUC-5 through HUC-7). (TAC)

5. Identify and discuss potential effects of existing and/or potential erosion and sedimentation on key resources within the stream ecosystem in the watershed. Determine whether these effects are occurring.

This step will work with resource specialists and the Technical Advisory Committee to determine whether key resources are affected by erosion and sedimentation, identify, and initiate quantification of any effects. Effort will be focused on the highest prioritized sub basins.

- a) Identify and inventory existing sources of information about key resources within the stream ecosystem.
- b) Recommend a sampling protocol and strategy to collect additional information for key resources within the stream ecosystem to determine whether any resources are affected and to what extent by existing and/or potential erosion and sedimentation.
- c) Collect necessary information and data according to sampling protocol.
- d) Identify those resources throughout the watershed that are affected by existing and/or potential erosion and sedimentation so that they may be investigated and any effects may be quantified in future studies.

Products:

- i) List of potential effects of existing and/or potential erosion and sedimentation on key resources within the stream ecosystem.
- ii) Analysis of existing data to determine stream reaches in the watershed showing some of the potential effects of existing and/or potential erosion and sedimentation identified by the previous task, if any. Prioritize and rank identified sub basins for further investigation.
- iii) List of data gaps from the data analysis step above, selection, and implementation of a sampling strategy to collect required data.
- iv) Collection of new data for key resources and incorporation into the analysis of stream reaches showing the effects of existing and/or potential erosion and sedimentation if any are identified in the highest prioritized sub basins.

6. Identify opportunities to maintain, conserve, and/or enhance areas identified as affected by existing and/or potential erosion and sediment sources, sediment transport areas, and key resources.

- a. Identify and prioritize potential project areas based on the risk analysis
- b. Recommend a strategy for completion of potential projects, including identification of partners, potential funding sources, and monitoring plans.
- c. Develop a strategy for continued monitoring of the effects of maintenance, conservation, and/or enhancement on key resources within the stream ecosystem. This strategy should coordinate with any monitoring plans recommended to accompany potential projects as identified above.

Products:

- i) List of potential project areas. We do not anticipate this will be an exhaustive list.
- ii) Project Implementation Strategy, based on the list of potential project areas, including prospective partners and funding sources.
- iii) Monitoring strategy to coordinate with the Project Implementation Strategy and provide continued data in the watershed.

7. Establish a strategy for long-term monitoring

- a) Define the need for monitoring.
- b) Recommend landowner/citizen-based and professional monitoring programs.
- c) Develop a training program for interested individuals, citizen monitors, and land/resource managers.

8. Reporting and Presentations

- a) Communicate the results of this study to agency personnel, land/resource managers, and the general public.
- b) Produce hard copies of reports and data.
- c) Provide access to data.
- d) Public presentation of results.

Final Products - All reports to be made available in both printed form and on compact disk.

- i) Databases and GIS.
- ii) Data layer showing sub basins (7th field HUCs) broken down by percent surface area with potential to produce sediment.
- iii) Results of risk assessment, and map showing sub basins by potential for erosion and sediment and potential to deliver sediment to sensitive resource areas.
- iv) List of potential project areas.
- v) Project Implementation Strategy, based on the list of potential project areas, including prospective partners, project techniques, monitoring strategy, funding sources, and educational opportunities.

- vi) Monitoring strategy to coordinate with the Project Implementation Strategy and provide continued data in the watershed.
- vii) Prioritized list of data gaps.
- viii) Public presentation of results of the study.
 - a. Final report.

Glossary

Bare Land Potential is defined as the maximum erosion potential for an area of land that has no vegetation or soil cover.

Key resources for this study are defined as aquatic habitat, aquatic organisms, water and power infrastructure, and water quality as defined by the Category III Stewardship Strategy.

The study will utilize the **Hydrologic Unit Code (HUC)** method of dividing up watersheds into manageable drainage units. This method was developed by the Water Resources Council as a hierarchical classification of hydrologic drainage basins in the United States. This study proposes to describe areas using the 4th field, American River Basin, through 7th field, sub basins such as Bunch Creek to focus future efforts.

We plan to use USGS **Digital Elevation Model (DEM)** data files as a base for our Geographic Information System (GIS) analysis. These digital cartographic/geographic data files are digital representations of cartographic information in a raster form. DEMs consist of a sampled array of elevations for a number of ground positions at regularly spaced intervals. Our understanding is that 10-meter and 30-meter DEM's are currently available for most of the watershed.