F1-171

1

CALFED BAY-DELTA PROGRAM WAREHOUSE
1997 CATEGORY III PROPOSAL
97 JUL 28 PM 3:01

TITLE PAGE

A.	**Title of Project:**	Cottonwood Creek Geomorphic Analysis, Design of Channel and Riparian Restoration Project for the Bengard Ranch, and Project Implementation
B.	**Applicant:**	Graham Matthews & Associates Principal Investigator: Graham Matthews P.O. Box 1516 Weaverville, CA 96093-1516 Phone: (916) 623-5327 Fax: (916) 623-5328 E-mail: wvgm@snowcrest.net
C.	**Type of Organization:** **Tax Status:**	Consulting Firm: Hydrology -- Geomorphology Sole Proprietorship
D.	**Tax Identification No:**	77-0252731
E.	**Technical/Financial Contact Person**	Same as above
F.	**Participants/ Collaborators**	Jeffrey Anderson, M.S., P.E. Keith Barnard, M.S.
G.	**RFP Project Group Type**	Phase 1: Geomorphic Analysis Group 3 Phase 2: Project Design Group 3 Phase 3: Project Construction Group 1 (Phase 3 is information only at this time)

F1-171

I. EXECUTIVE SUMMARY

a. Project Title and Applicant Name

"Cottonwood Creek Geomorphic Analysis, Design of Channel and Riparian Restoration Project for the Bengard Ranch, and Project Implementation"

Applicant: Graham Matthews & Associates on behalf of the Tom Bengard Ranch, Inc.

b. Project Description and Primary Biological/Ecological Objectives

This proposal has been prepared by Graham Matthews & Associates for the Bengard Ranch in order to conduct hydrologic and geomorphic analyses, evaluate channel and riparian restoration design alternatives, and prepare final design drawings and specifications for project construction. Recent streambank erosion along lower Cottonwood Creek has damaged and threatens to continue damaging Bengard Ranch orchards and facilities. The Bengard Ranch provides an unusual opportunity to implement a large scale channel and riparian restoration project. Without the participation of CALFED and/or similar funding sources, the Bengard Ranch would likely be forced to utilize standard erosion control techniques such as riprap, that would not include appreciable riparian restoration or other instream habitat features, due to cost constraints.

c. Approach/Tasks/Schedule

We have proposed a three phase approach to the project: (1) Phase 1 would involve geomorphic and hydrologic analyses and re-surveys of historic data to document trends, (2) Phase 2 would involve detailed site surveys and restoration project design development, and (3) Phase 3 would involve project construction in Fall 1998. Funding is not sought for Phase 3 at this time due to significant uncertainties in scope of the proposed project and thus implementation costs. Phase 1 will provide the geomorphic basis for the design, while Phase 2 produces construction ready plans and specifications. Phase 1 would be completed by May 1, 1998, with Phase 2 complete in time to submit permits and receive regulatory approvals for a Fall 1998 construction period.

d. *Justification for Project and Funding by CALFED*

Cottonwood Creek provides non-natal rearing habitat for salmonids, and has been judged to have potential for spring run chinook spawning. Loss of riparian vegetation in lower reaches due to increased lateral migration apparently caused by effects of gravel mining on channel integrity. The geomorphic analysis will document long-term changes in the lower alluvial reaches due to gravel mining or other watershed impacts on both channel geometry and substrate, by re-occupying USGS survey and sample locations from the early 1980s, and compiling other historical information. This is of particular interest after the high flows of 1993, 1995, and 1997. The design of a large scale (between 1 and 2 miles) restoration project for the creek channel would improve instream habitat and shaded riverine aquatic habitat. There is also an opportunity to remove a portion of a levee installed in this reach by the Corps of Engineers and replace with a setback levee, providing for a wider riparian corridor and improved floodplain function.

e. Budget Costs and Third Party Impacts

Phase 1: Geomorphic Analysis

Task 1:	Compile Background Information	$ 3,000
Task 2:	Channel Surveys/Particle Size Analysis	$ 10,000
Task 3:	Hydrologic Analysis	$ 3,000
Task 4:	Geomorphic Analysis	$ 12,000
Task 5:	Report Preparation	$ 4,000
	Total Phase 1:	$ 32,000

Phase 2: Channel/Riparian Restoration Design

Task 1:	Detailed Site Surveys	$ 15,000
Task 2:	Design Development/Specifications	$ 20,000
Task 3:	Implementation Coordination (permits, etc.)	$ 4,000
	Total Phase 2:	$ 39,000

Total Project Cost:	$ 71,000
Property Owner Share:	$ 10,000
Requested Funding:	$ 61,000

No third party impacts are anticipated from the study and design phases of this project.

f. Applicant Qualifications

This proposal represents a collaborative effort between three individuals with extensive professional experience in the areas of stream channel and riparian restoration, hydrology, geomorphology, hydraulics, and fisheries biology. We have extensive experience in conducting hydrologic and geomorphic analyses such as historical analyses, field data collection of channel geometry and substrate conditions, on a variety of large and small rivers.

Mr. Matthews, the principal investigator and project manager, has 16 years experience in hydrology and geomorphology, and 14 years of experience in the design and construction of stream and riparian restoration projects. The focus of his restoration philosophy and designs lies in the emulation of natural systems and in the implementation of biotechnical channel structures which emphasize the rapid establishment of riparian vegetation.

g. Monitoring and Data Evaluation

Since the funding currently requested is intended for geomorphic analysis and restoration design, no monitoring components are indicated. The surveys established during Phase 1 and 2 will, however, provide the basis for future monitoring after project implementation. Draft reports will be circulated to a number of experts in the field for review and comment.

III. PROJECT DESCRIPTION

A. PROJECT DESCRIPTION AND APPROACH

This proposal has been prepared by Graham Matthews & Associates for the Bengard Ranch in order to conduct hydrologic and geomorphic analyses, evaluate channel and riparian restoration design alternatives, and prepare final design drawings and specifications for project construction. Recent streambank erosion along lower Cottonwood Creek has damaged and threatens to continue damaging Bengard Ranch orchards and facilities. The Bengard Ranch provides an unusual opportunity to implement a large scale channel and riparian restoration project. Without the participation of CALFED and/or similar funding sources, the Bengard Ranch would likely be forced to utilize standard erosion control techniques such as riprap, that would not include appreciable riparian restoration or other instream habitat features, due to cost constraints.

The purpose of this project is to twofold: (1) document geomorphic change along lower Cottonwood Creek, and (2) develop a channel and riparian restoration design for the Bengard Ranch and perhaps adjacent properties and then implement such a project. In order to develop a complete restoration design, we have identified the following scope of work to produce necessary intermediate design elements and information. We have proposed a three phase approach to the project: (1) Phase 1 would involve geomorphic and hydrologic analyses and re-surveys of historic data to document trends, (2) Phase 2 would involve detailed site surveys and restoration project design development, and (3) Phase 3 would involve project construction in Fall 1998. Funding is not sought for Phase 3 at this time due to significant uncertainties in scope of the proposed project and thus implementation costs. Phase 1 will provide the geomorphic basis for the design, while Phase 2 produces construction ready plans and specifications.

B. LOCATION AND/OR GEOGRAPHIC BOUNDARIES OF PROJECT

The Bengard Ranch lies about 2 miles downstream from Interstate 5 along Cottonwood Creek, due east from the town of Cottonwood (Figure 1), and about 2 miles upstream of the confluence of the creek with the Sacramento River. The proposed restoration project would occur on the Bengard Ranch and perhaps adjacent parcels, while the geomorphic analysis would extend further upstream, encompassing the lower 20 miles of the creek (Figure 2).

C. EXPECTED BENEFITS

There are two types of expected benefits from this project: (1) improved understanding of geomorphic processes and long-term trends within the lower alluvial reaches of Cottonwood Creek, a large westside tributary of the Sacramento River, and (2) a significant expansion in the extent of riparian vegetation along lower Cottonwood Creek, providing additional Shaded Riverine Habitat (SRA) implemented through a channel restoration project instead of another riprap project to protect eroding orchards. A channel restoration project will also provide improved instream aquatic habitat along a one-mile reach of the creek.

I-003906

D. BACKGROUND AND BIOLOGICAL/TECHNICAL JUSTIFICATION

Cottonwood Creek drains about 930 square miles and is one of the few remaining undammed significant westside tributaries to the Sacramento River. Habitat problems in the basin include low flows due to diversions, high water temperatures due to lack of riparian vegetation, excessive fine sediment due to watershed impacts such as grazing, and loss of channel integrity due to instream gravel mining.

Cottonwood Creek provides non-natal rearing habitat for salmonids, and has been judged to have potential for spring run chinook spawning. Loss of riparian vegetation in lower reaches due to increased lateral migration apparently caused by effects of gravel mining on channel integrity. The geomorphic analysis will document long-term changes in the lower alluvial reaches due to gravel mining or other watershed impacts on both channel geometry and substrate, by re-occupying USGS survey and sample locations from the early 1980s, and compiling other historical information. This is of particular interest after the high flows of 1993, 1995, and 1997. The design of a large scale (between 1 and 2 miles) restoration project for the creek channel would improve instream habitat and shaded riverine aquatic habitat. There is also an opportunity to remove a portion of a levee installed in this reach by the Corps of Engineers and replace with a setback levee, providing for a wider riparian corridor and improved floodplain function.

E. PROPOSED SCOPE OF WORK

PHASE 1

Task 1: Compile Existing Information

Existing information and analyses will be assembled and reviewed by the Project Team. This includes historic aerial photographs, streamflow data and sediment records from USGS records, historic survey data, as available, and other relevant information sources. One of the primary goals of this study will be to replicate the surveys made by the USGS along lower Cottonwood Creek in 1982-83 to assess long-term changes. Existing hydrologic analyses, principally related to proposed dams, were made by the Corps of Engineers in 1977, 1980, and 1983. Other information related to proposed gravel mining operations in the vicinity of Interstate 5 and upstream will be evaluated for relevance. Information contained in various EIRs for these projects completed in the late 1980s and early 1990s are of questionable validity since they were mostly based on computer modeling.

Task 2: Channel Surveys/Particle Size Analysis

This geomorphic analysis will, in large part, be field based. We are attempting to define long-term trends and will utilize historic information combined with new field surveys to document changes. Of particular interest is evaluation of the effects of instream gravel mining on geomorphic processes and channel geometry along lower Cottonwood Creek.

To address these issues, we propose an extensive field data collection program in the lower reaches of Cottonwood Creek. This field effort will provide information on channel geometry, through cross sections and profiles, and bed material composition. We will resurvey the cross sections and re-sample the streambed at the 22 locations studied by the

USGS in the early 1980s. The passage of 4 high flows (in 1986, 1993, 1995, and 1997) since the USGS surveys makes this re-survey of greater significance.

Channel Geometry:

In addition to the USGS survey data, we will survey an extensive network of cross sections in the reaches downstream of Interstate 5. The cross sections will typically be surveyed at roughly consistent intervals and will be located at a consistent geomorphic features. The cross sections will be monumented with fenceposts and rebar, in order to allow future reoccupation. The cross sections will be surveyed by wading using total station surveying equipment. We propose to survey cross sections on an average of one every 1000 feet. All cross sections will use NGVD 1929 as a datum. Benchmark data from CalTrans will be obtained to facilitate the level loops required to provide a consistent datum. Surveys will focus on low-flow channel geometry, up to about the 10-year storm level, although section monumentation will be located to avoid washout in larger storms.

Substrate:

Substrate will be characterized in detail along Cottonwood Creek following the same techniques used by the USGS, namely pebble counts and bulk samples. The standard pebble count (Wolman 1954) will be used to assess framework size. This is a reproducible method of grid sampling, typically using a sample size of about 100 "pebbles". The are numerous advantages to this method, including ease of data collection, lack of large samples requiring drying or laboratory analysis, it provides a more representative sampling of a given population, and it is more applicable to very coarse materials. As such, it represents the most cost-effective means of determining framework size.

To characterize the intrusion of fine sediment into the streambed, we will use bulk sampling. Pebble counts do not adequately represent sediment sizes smaller than 8mm and so are not suitable for evaluation of fine sediment intrusion. Bulk samples will be collected using a modified McNeil sampler (McNeil and Ahnell 1960), consisting of a 55 gallon drum with the bottom cut out. The drum is worked into the streambed and the substrate removed to a depth of 1 foot. If fine sediment is present, the water column within the drum will be agitated and a sample collected of the thoroughly mixed water column. The water sample will be returned to the lab for analysis. We propose to measure the size distribution of the bulk samples by wet sieving on-site. This method eliminates the requirement to transport large samples and the time required to dry a given sample to allow dry sieving. Only that material smaller than 8mm will be retained and transported for drying and sieving. The combination of these techniques will allow extensive substrate sampling at a much lower cost than is typically encountered.

Task 3: Hydrologic Analysis

We will analyze hydrologic records from the USGS gages in the basin to establish storm hydrology, seasonal distribution of streamflow, flood frequency and flow duration characteristics. This information will then be analyzed with the cross sectional information to estimate and refine channel geometry parameters. Both existing and pre-disturbance geometry will be evaluated. A number of USGS gages have been maintained in the basin on the mainstem and on the North, Middle, and South Forks. Only the Cottonwood Creek near

Cottonwood (Gage #: 11376000) is still in operation (period of record 1941-present), and all other gages were discontinued by 1986.

Task 4: Geomorphic Analysis

An important design element in the development of a channel restoration plan will be the evaluation and specification of channel characteristics (both cross sectional such as width, depth, width/depth ratio and planform such as meander wavelength and amplitude) for the new channel. The determination of channel characteristics for the design of the restored channel may be accomplished in several ways: (1) regional relationships (2) analysis of gaging station records (3) historical analysis (4) analysis of existing, undisturbed channels in upstream areas or similar adjacent watersheds. All of these methods have their limitations, and a combination of techniques is generally most useful to develop the appropriate channel characteristics.

It is, however, important to evaluate the current conditions and proposed restoration scheme within the context of historic watershed land use changes. For example, erosion and treatment, or lack of treatment, on upstream properties must be considered as well as the likelihood of other projects in the vicinity affecting this reach.

Historical Channel Analysis:

The purpose of historical channel analysis is to determine the changes to a range of morphologic parameters as a result of human modifications to the river system. This allows quantification of historic and existing channel conditions in order to assess future trends.

Changes in channel morphology occur in response to both natural phenomena (floods, droughts, rapid geologic change) and human activity (mining, dam construction, water diversion, timber harvest, etc.). Furthermore, there is considerable interaction between natural events and the modified watershed conditions. Historical analysis provides documentation of the sequence of channel changes, allowing assessment of the role of individual events or activities in this process of change, and to evaluate the present channel in the context of its temporal dynamics.

This analysis also allows the data collection for one season to be viewed in terms of the historical perspective. The random nature of climatic events is such that hydrologic data will always be plagued with uncertainty. Characterization of the historical record reduces that uncertainty. Since we are concerned with understanding the results of natural changes and human activities on the channel in the project area, it is essential that this snapshot be placed into the longer-term perspective.

We will perform an analysis of historic channel changes along Cottonwood Creek from upstream of Interstate 5 to the confluence with the Sacramento River using the following techniques:

(1) Compilation of historic land survey maps from the two counties within the study area. These maps will be digitized within the detailed study area and compared to USGS topographic maps (both old and new) and mapping from sequential air photos to evaluate changes in planform characteristics and channel geometry. Aerial

photographs typically date from the 1940s, and at least one flight per decade at a usable scale (1:24,000 or larger) is available from the 1940s to present. Complete photo coverage of the project area is generally available in 1942, 1955, 1964, 1974, 1980, 1987, 1990, and 1995, with many additional flights in smaller areas.

(2) Compilation and analysis of historic channel geometry data, both cross sections and longitudinal profiles from a variety of sources including: USGS gaging station records, and in particular slope-area measurements in the vicinity of the gage, CalTrans, Railroad, and County bridge surveys, flood protection surveys by DWR or USACE, topography in the vicinity of Interstate 5, and other sources that are uncovered in the historical investigation.

3) Compilation and re-occupation of relevant historic ground photos. Such sources of information include: CalTrans files, County Flood Control District records, local newspapers, long-term residents, State (Department of Water Resources, Department of Fish and Game) and Federal agencies (U.S. Geological Survey, USDA Forest Service, USDA Soil Conservation Service, and U.S. Army Corps of Engineers), utility companies (Pacific Power & Light), historical societies, and library collections. Since these photographs have the potential to provide the oldest and most useful information on historic channel conditions, considerable effort will be used to locate, reproduce, and finally reoccupy these records.

PHASE 2

The first step in development of a comprehensive restoration design for this reach of lower Cottonwood Creek involves coordinating with adjacent landowners who have also suffered erosion damages. It may be possible to extend the scope of this project to incorporate adjacent areas, and thus provide more continuous riparian restoration areas. Even without the cooperation of the adjacent landowners, the Bengard Ranch owns about 2 miles of Cottonwood Creek, which will allow for implementation of a large restoration project. Once the scope has been determined, detailed surveying and design elements may begin.

Task 1: Detailed Site Mapping

One of the most basic elements needed for site analysis and design is a detailed map of the vicinity of the project site. We propose to complete such mapping using a combination of aerial photogrammetry and total station surveying equipment. We will use high resolution kinematic GPS equipment to set control for the aerial flight. We will produce a detailed topographic map of the project site including all features (levees, channels, vegetation, etc.). We will locate and tie into existing monuments to produce a unified data set, on a common datum. We will use Softdesk, Inc. software to develop digital terrain models (DTM) from the survey information. This software works within the AutoCad environment and is used for all aspects of engineering design including site maps, grading plans, profiles, and cross sections.

Task 2: Design Development

This task involves integration of information generated from analyses in the previous tasks with site characteristics and limitations and other design elements and parameters to reach

I-003910

the final design drawings. While some design parameters have already been specified as goals and objectives, these will require additional refinement and we expect that other design parameters will become apparent during the study.

We will use the DTM generated from our field surveys to evaluate design options and refine design concepts. At the same time, we will evaluate designs for constructability both in terms of cost and potential impact to adjacent areas.

The design drawings will include planform contour maps at a scale of 1" = 100' for both existing and design conditions, profile and cross section sheets, and construction details. The specifications will be provided in both text form and as a sheet of the design package. We propose to use D-size sheets (24" x 36") for all design documents. The DTM surfaces for existing and design conditions will be used to calculate grading volumes for development of cost estimates and engineer's estimates for contract bid documents. Complete construction ready drawings and specifications will be developed.

Task 3: Project Implementation Coordination

This task involves submittal of permits to allow implementation of the project in the Fall of 1998.

F. *MONITORING AND DATA EVALUATION*

Since the funding currently requested is intended for geomorphic analysis and restoration design, no monitoring components are indicated. The surveys established during Phase 1 and 2 will, however, provide the basis for future monitoring after project implementation.

To address the issue of data analysis and evaluation, we propose to circulate our draft report and draft restoration design for peer review. Although there are many individuals with expertise in geomorphology, we propose to request peer review from the following individuals: Dr. Matt Kondolf of UC Berkeley, Mitch Swanson, Koll Buer of DWR, Red Bluff, Scott McBain/Bill Trush, and Dr. Robert McArthur. Other peer review may occur as requested.

G. Implementability

There are few issues affecting the implementability of Phase 1 and Phase 2, and those are primarily related to access issues for surveying/sampling activities. Implementation of the proposed restoration design in Phase 3 will involve the following permits: County grading permits, California Department of Fish and Game 1603 streambed alteration permit, Corps of Engineers Section 404 permit of the Clean Water Act, and certification by the Regional Water Quality Control Board. Presuming the implementation of such a large scale channel/riparian restoration project is supported by the various permitting agencies, we believe that the required permits may be readily obtained. Environmental compliance for project implementation would occur under the jurisdiction of the lead agency, probably Tehama County. The Bengard Ranch is willing to provide a conservation easement on such lands used for riparian restoration, thus there are no concerns regarding willing property owners.

IV. COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

A. Budget Costs

Phase 1: Geomorphic Analysis

Task 1:	Compile Background Information	$ 3,000
Task 2:	Channel Surveys/Particle Size Analysis	$ 10,000
Task 3:	Hydrologic Analysis	$ 3,000
Task 4:	Geomorphic Analysis	$ 12,000
Task 5:	Report Preparation	$ 4,000
	Total Phase 1:	$ 32,000

Phase 2: Channel/Riparian Restoration Design

Task 1:	Detailed Site Surveys	$ 15,000
Task 2:	Design Development/Specifications	$ 20,000
Task 3:	Implementation Coordination (permits, etc.)	$ 4,000
	Total Phase 2:	$ 39,000

(Please see Table 1 for specific cost breakdowns of the individual tasks)

Phase 3: Channel/Riparian Restoration Project Implementation

No specific costs are provided for this phase until scope and design issues are resolved. However, conceptual volume estimates (~ 300,000 cubic yards earthmoving), biotechnical bank stabilization elements, and riparian restoration of about 80 acres would point to a project cost of around $ 800,000, based on $1.00/cy for earthmoving and $4,000/acre for riparian restoration based on the experience of the Nature Conservancy. Monitoring costs will be included in the funding request for Phase 3.

While the property owner (Tom Bengard Ranch, Inc.) is committed to funding a portion of the design and construction costs for an erosion control project to protect their property from additional erosion losses, the scope of the proposed restoration project far exceeds their resources and would not be their choice of project without funding partnership. In addition, the property owner anticipates significant costs this fall to construct temporary erosion control measures to insure no further damage prior to the implementation of a comprehensive project. Without CALFED funding to support the comprehensive restoration project, the property owner would likely follow the much lower cost route of constructing a riprap slope. Contractor estimates for this work are about $250,000. As the proposal has been developed, CALFED assistance is requested for incremental funding of distinct project phases. The property owner is willing to contribute $10,000 towards the design phase, leaving a funding deficit of $ 61,000 for which CALFED funding is requested.

I-003912

B. Schedule Milestones

Assuming contracts are completed by October 1, 1997, the following schedule has been developed:

Phase 1:

Task 1:	Compile Background Information	October 1-December 1
Task 2:	Channel Surveys/Particle Size Analysis	October 15-November 15
Product:	Progress Report for data collection	December 1
Progress Billing:	25% of Phase 1 contract	December 1
Task 3:	Hydrologic Analysis	November 15-December 15
Task 4:	Geomorphic Analysis	December 1-March 1
Product:	Progress Report of work to date	February 1
Progress Billing:	25% of Phase 1 contract	February 1
Product:	Draft Report	April 1
Progress Billing:	25% of Phase 1 contract	April 1
Task 5:	Report Preparation	March 1-May 1
Product:	Final Report	May 1
Progress Billing:	Final 25% of contract	May 1

Phase 2:

Task 1:	Detailed Site Surveying	May 15-June 1
Task 2:	Design Development	May 15-July 15
Product:	Detailed Site Maps, Draft Design	July 1
Progress Billing:	50% of Phase 2 contract	July 1
Task 3:	Implementation Coordination (Submit Permits)	July 1
Product:	Final Design/Specifications	August 1
Progress Billing:	Final 50% of Phase 2 contract	August 1

C. Third Party Impacts

We do not anticipate any potential third party impacts as a result of Phase 1 and Phase 2 of the proposed project, which are strictly planning and design phases. Phase 3, when the design is completed, and precise project scope is known, could have off-site impacts, although the Bengard Ranch owns almost 2 miles of the Cottonwood Creek corridor. These potential impacts would be assessed in Phase 3.

V. APPLICANT QUALIFICATIONS

This proposal represents a collaborative effort between three individuals with extensive professional experience in the areas of stream channel and riparian restoration, hydrology, geomorphology, hydraulics, and fisheries biology. We have extensive experience in conducting hydrologic and geomorphic analyses such as historical analyses, field data collection of channel geometry and substrate conditions, on a variety of large and small rivers. Our resumes list studies conducted on numerous rivers throughout California, including the Trinity, Eel, Mad, van Duzen, Russian, Sacramento, Stony Creek, Tuolumne, Upper Truckee, Garcia, and Carmel Rivers. In addition, projects have been completed on the following smaller streams and creeks: Hat Creek, Jamison Creek, Blackwood Creek, General Creek, various tributaries to the Carmel River, and Murrietta Creek. The members of the project team, rather than delegating to field technicians will complete all fieldwork. This provides the project designers with critical site specific knowledge and information.

The project team consists of the following members:

W.V. Graham Matthews, M.S. Mr. Matthews has 16 years experience in hydrology and geomorphology, and 14 years of experience in the design and construction of stream and riparian restoration projects. He has personally designed 4 miles and constructed over 2 miles of channel restoration projects on the Carmel River, CA, including surveying, design, specification development, permits, and construction management. The focus of his restoration philosophy and designs lies in the emulation of natural systems and in the implementation of biotechnical channel structures which emphasize the rapid establishment of riparian vegetation. He has recently completed conceptual restoration designs on 5 miles of streams for the Bureau of Land Management, Coeur d'Alene, ID, and will likely be involved in project implementation in the next year. He has completed studies evaluating the hydrology, geomorphology, and historic channel changes of the Upper Truckee River marsh at South Lake Tahoe, CA, including conceptual restoration recommendations. He has recently completed preliminary designs for two projects totaling 1.7 miles on the Carmel River, and is expected to begin final design shortly. He has completed final design drawings for Phase 1 of the Wood River Channel and Wetland Restoration Project totaling 0.75 miles of channel restoration for the Wood River a tributary to Upper Klamath Lake in Oregon.

Jeffrey K. Anderson, M.S., P.E. Mr. Anderson is a Registered Professional Engineer in California with 6 years experience in constructed wetlands, hydrology, open-channel hydraulics, stream restoration projects and computer modeling of these systems. He has recently completed Phase1 design for the Wood River Channel and Wetland Restoration Project.

Keith Barnard, M.S. Mr. Barnard is a consulting fisheries biologist with over 13 years of experience in salmonid fisheries habitat evaluation and restoration. He has managed the implementation of a variety of stream and riparian vegetation restoration projects. He has extensive experience in the evaluation of the physical parameters of aquatic habitat, particularly substrate condition, and in designing projects that create high quality habitat for all life stages. He has extensive experience in total station surveying and design work using Softdesk and Autocad software.

Graham Matthews will act as Project Manager for the team, coordinating all field work, and insuring the integration of riparian, geomorphic, and hydrologic tasks with design elements. He will be the primary contact person for the project. Detailed resumes are available separately.

There are no existing or potential conflicts of interest.

REFERENCES:

Geomorphic Analysis:

Carmel River	Andy Bell Larry Hampson	Monterey Peninsula Water Mgmt. District (408) 649-4866
San Simeon Creek	David Andres	Cambria Community Services District (805) 927-6223
Upper Truckee River	Steve Goldman Robert Erlich	California Tahoe Conservancy (916) 542-5580
Trinity River	Scott McBain	McBain & Trush (707) 826-7794
South Fork Kern River	Reed Tollefson	The Nature Conservancy Kern River Pres. (619) 378-2531
Wood River, OR	Rich McIntyre	Oregon Trout (541) 381-2322
Williamson River, OR	Mark Stern	The Nature Conservancy of Oregon (503) 230-1221
Pine Creek, ID	Mike Stevenson	Bureau of Land Management (208) 769-5024
Coyote Creek	Ronilee Clark	Anza-Borrego Desert State Park California Dept. Parks and Recreation (619) 220-5325
North Fork Stanislaus River	Wayne Harrison	Calaveras Big Trees State Park (209) 795-2334

Channel/Riparian Restoration Designs:

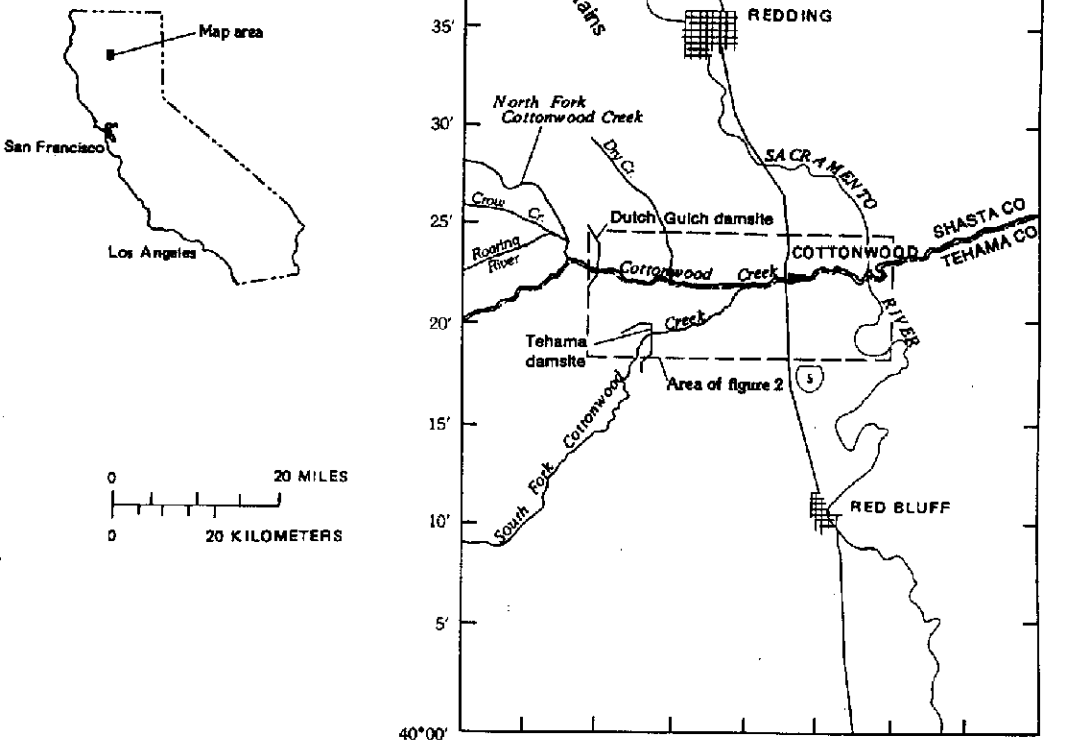
Carmel River	see above

San Simeon Creek	"
Upper Truckee River	"
Pine Creek, ID	"
Wood River,OR	"
Williamson River. OR	"

I-003916

FIGURE 2

LOCATION OF GEOMORPHIC STUDY AREA ON LOWER COTTONWOOD CREEK



I-003917

FIGURE 3

1995 AERIAL PHOTOGRAPH OF PROPOSED PROJECT SITE ON THE BENGARD RANCH, COTTONWOOD CREEK

Extensive additional erosion occurred in 1997, removing much of the mature riparian vegetation on the right bank and eroding into the orchard

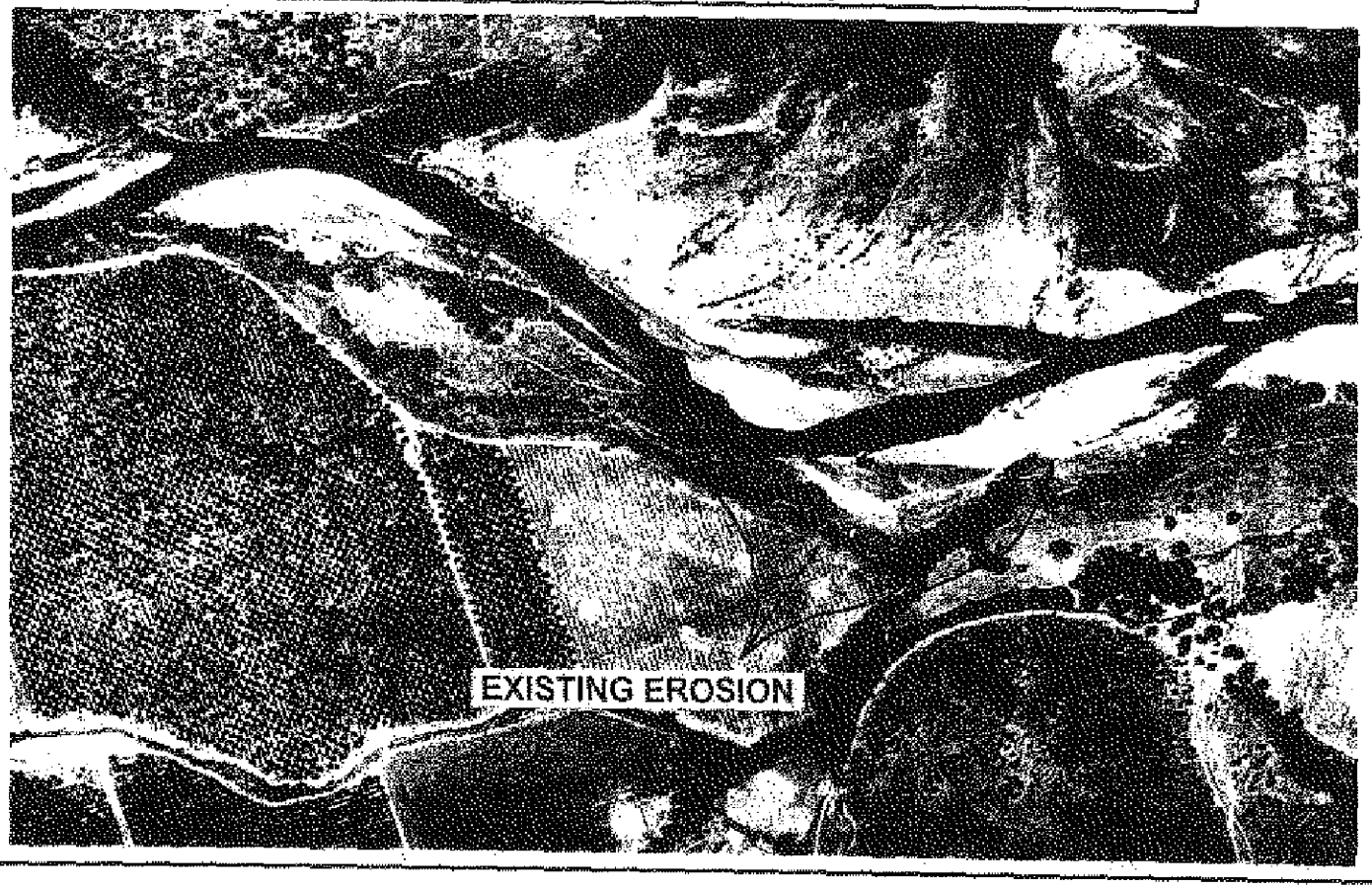
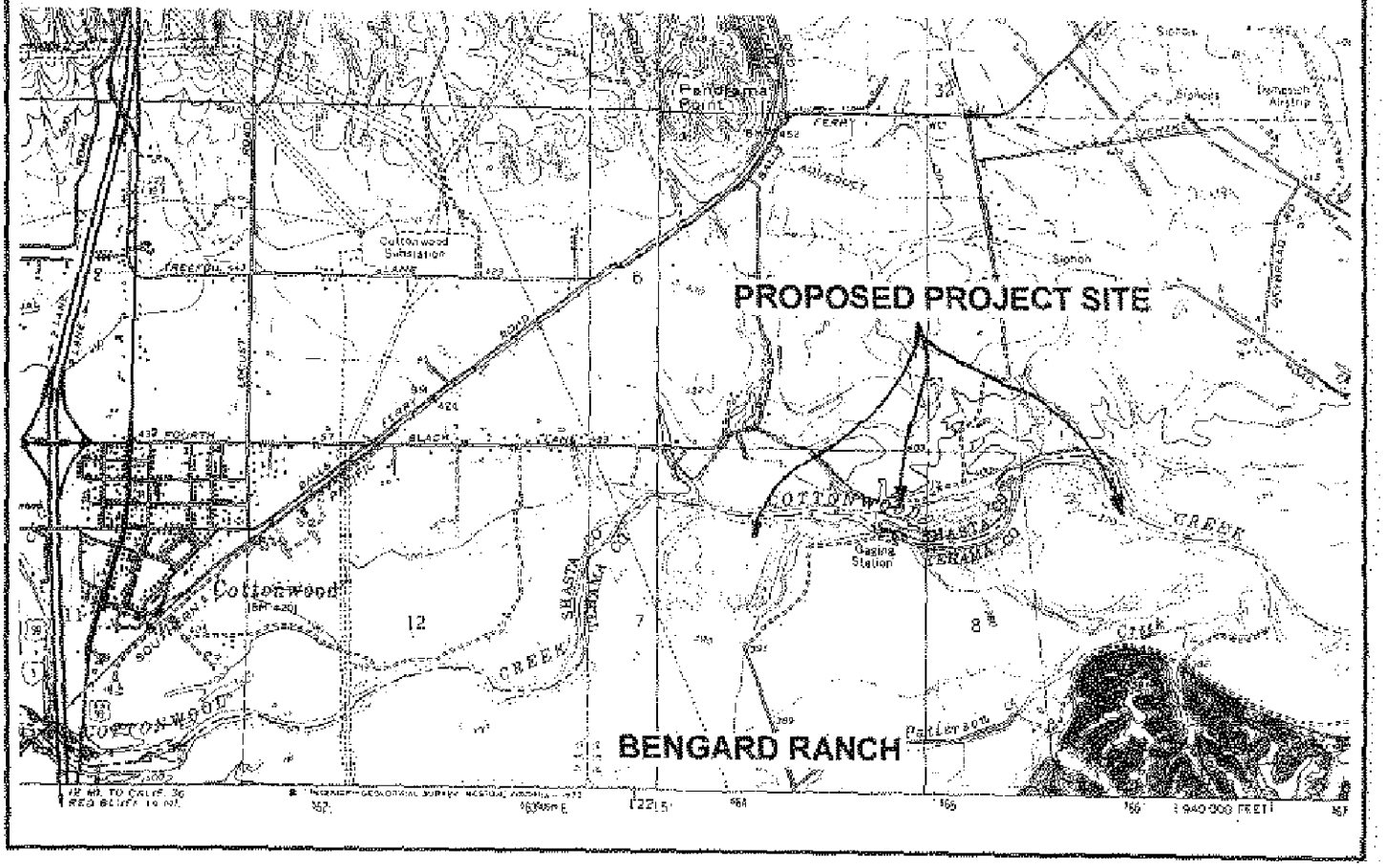


FIGURE 1

LOCATION MAP FOR PROPOSED CHANNEL AND RIPARIAN RESTORATION PROJECT ON THE BENGARD RANCH, *COTTONWOOD CREEK*



I-003919

Item B

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME
GRAHAM MATTHEWS & ASSOCIATES

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

DATE EXECUTED	EXECUTED IN THE COUNTY OF
JULY 28, 1997	TRINITY

PROSPECTIVE CONTRACTOR'S SIGNATURE
W.V.

PROSPECTIVE CONTRACTOR'S TITLE
OWNER

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME
GRAHAM MATTHEWS & ASSOCIATES