



Guidance for Preparing Project Assessment and Evaluation Plans (PAEPs)

April 2006

As part of the grant agreement, all State Water Resources Control Board (State Water Board) grant recipients will prepare a Project Assessment and Evaluation Plan (PAEP) at the initiation of their project to summarize how project performance will be assessed, evaluated, and reported.

The goals of a PAEP are as follows:

- To provide a framework for assessment and evaluation of project performance.
- To identify measures that can be used to monitor progress towards achieving project goals.
- Provide a tool for grant recipients and grant managers to monitor and measure project progress and guide final project performance reporting that will fulfill grant agreement requirements.
- To provide information to help improve current and future projects.
- To maximize the value of public expenditures to achieve environmental results.

The attached outline and guidance (Attachments 1 through 7) provides assistance to grant recipients preparing and implementing a PAEP. It is a practical guide for evaluation of project performance. The information in this guidance should prepare you to design and carry out a PAEP, provide you with tools to track project progress, and link progress with desired outcomes. It could also help you identify any necessary adjustments within the constraints of your allocated budget during the course of the project and facilitate final report preparation.

We realize that the State Water Board grant recipients come in all shapes and sizes. Some recipient organizations have full-time staff and annual budgets exceeding \$1,000,000; others have far smaller budgets and rely almost entirely on volunteers. Recipient organizations also range widely in their goals—from providing technical assistance and enhancing public awareness, to delivering water for drinking and irrigation, to researching new management practices or monitoring water quality.

Likewise, the activities being supported by the State Water Board funds are very diverse, so PAEPs will need to identify performance measures or indicators that best fit the needs

of a particular project and the associated activities. In most cases, the identification of several measures will be necessary to evaluate project performance. For example, the success of education and outreach activities can be evaluated through measuring increased community awareness or the level of participation in volunteer monitoring and knowledge of watershed functions. Implementation of Best Management Practices (BMPs) can be evaluated based on water quality measurements, response of [bioindicators](#), changes in physical characteristics of in-stream habitat conditions, calculated pollutant load reductions, and the number of acres treated. Habitat restoration activities can be evaluated based on acres of wetlands restored, number of off-site causes of bank and bed erosion treated, or feet of stream channel stabilized, as documented with before and after photographs, and/or digitized data layers showing change in the extent or quality of habitat. Projects designed to achieve multiple objectives and create synergies by integrating flood management, water quality protection, water supply reliability and enhancement, and habitat protection/restoration activities will require performance measures that relate to all objectives the project is designed to address.

PAEP Outline and Guidance

The PAEP outline ([Attachment 1](#)) and example tables ([Attachment 2](#)) provide guidance that you can put to use now to implement your project and ensure that your desired outcomes can be achieved. The narrative portion of the plan outline, I. Project Summary and II. Project Goals and Desired Outcomes, can be completed using information presented in your proposal and executed agreement. The example tables are road maps you can use to chart the course of your project activities and measure how far you have gone in achieving your project goals and desired outcomes.

The PAEP groups project activities into five major categories. These categories are 1) Planning, Research, Monitoring, and Assessment, 2) Education, Outreach, and Capacity-building, 3) Habitat Restoration, 4) Load Reduction and 5) Beneficial Use Improvement and Protection. These categories allow you to assemble and organize activities with similar attributes, and evaluate them using a set of performance measures or indicators common to each category. Additional information on appropriate categories for different project activities can be found in [Attachment 3](#). Many grant projects implement multiple activities in more than one category, and Integrated Regional Water Management projects, in particular, are required by design to achieve multiple objectives on a watershed or river basin scale. This system of categories should help simplify the organization of your plan and choice of appropriate indicators for evaluation. The tables present examples of hypothetical projects in each of the five main activity categories. The tables are organized to provide for a simple and concise description of:

- Project goals;
- Desired project outcomes;
- Appropriate project [performance measures](#) which include: 1) [Output Indicators](#) *representing* measures to efficiently track outputs (activities, products (including capital investments, or deliverables) and 2) [Outcome Indicators](#), measures to evaluate change that is a direct result of your work and can be linked through a

- weight-of-evidence approach to your project activities or outputs (e.g. improvements in achieving or restoring multiple beneficial uses, environmental conditions, awareness, participation, or community, landowner, or local government capacity);
- Methods of measurement or tools you will use to document your project performance (e.g. California Rapid Assessment Method, California Department of Fish and Game Monitoring Protocols for fisheries restoration projects); and
 - Measurable [targets](#) that you think are feasible to meet during the project period, such as a 10% increase in community awareness, 90% reduction in invasive species acreage, 50% reduction in pesticide use within your watershed, or a 10% increase in water use efficiency that decreases groundwater use and overdraft.

The example tables ([Attachment 2](#)) include performance measures that are for illustration purposes only. They are intended to show the linkages between project goals, desired outcomes, the types of “output” indicators (activities and interim products), and the types of “outcome” indicators (environmental results and increases in watershed stewardship capacity), that could be used in the overall performance evaluation process. Specific indicators will vary based on project activities and goals and should be derived from those sections in your original proposal that describe the metrics or habitat attributes you intend to collect or document during your project. The list of Core Outcome Indicators ([Attachment 4](#)) should be used as a starting point for identifying appropriate project indicators based on your activity categories.

[Attachment 5](#) includes some example PAEP’s and supporting documents used to develop the PAEP’s. These may be helpful for efficiently developing your project PAEP. [Attachment 6](#) and [Attachment 7](#) include and provide access to additional project performance measurement information that can be used to guide your plan development and implementation.

Attachment 1

Project Assessment and Evaluation Plan (PAEP) Outline

I. Project Summary

- A. Funding Program: *Identify the program that will be used to fund your grant project contract or agreement. For Example, Proposition 40 Integrated Watershed Management Program, Proposition 50 Agricultural Water Quality Grant Program or Proposition 50 Integrated Regional Water Management Program. This funding source will be identified in your contract or agreement.*
- B. Project Description: *Provide a summary of the project. This can be a condensed version of the narrative presented in your proposal and/or agreement.*
- C. Problem Statement: *Briefly discuss the environmental issues or problems facing the watershed in which this project will take place. Identify which problems or issues you will address with the project. This information can be taken from your proposal and/or agreement. You can also combine this section with 'B. Project Description', above, if you find it provides a more concise discussion. Depending on the grant funding program, you may also be required to address the following points:*
- i. Identify or characterize baseline data*
 - ii. Identify pollution source categories*
 - iii. Identify and describe current restoration activities; BMPs; load reduction activities; prevention activities*
 - iv. Describe the manner in which the proposed best management practices or management measures will be implemented*
 - v. Summarize how the effectiveness of the proposed practices or measures in preventing or reducing pollution will be determined*
 - vi. Determine "changes in flow pattern" in affected water bodies.*
 - vii. Determine economic benefits of implementing the project.*
- D. Project Activities or Tasks: *Provide a list of the project activities or tasks that you will undertake to address the issues or problems. (These should be taken from your proposal, agreement or, contract depending on which grant program is providing funds to your project and at what stage you are in the program.)*

E. Category of Project Activities or Tasks: *Indicate which of the following categories your activities correspond to.*

- 1) *Planning, Research, Monitoring and Assessment*
- 2) *Education, Outreach, and Capacity -building*
- 3) *Habitat Restoration*
- 4) *Load Reduction*
- 5) *Beneficial Use Improvement and Protection*

Each activity should correspond to only one category. You may however, have more than one activity corresponding to a given category. This will be useful for preparing your Project Performance Measures Table(s) in item III below. In these tables, assessment and evaluation of project performance is differentiated based on categories of activities that will be implemented. These categories conveniently provide common sets of measures and methods or tools for measurement that you may pick from for your project. More detail and resources for identification of these project performance measures is provided below and attached for reference.

II. Project Goals & Desired Outcomes

Describe the goals of your project and state the desired outcomes in qualitative terms (e.g.: Goal: Implement TMDL plan for reducing toxicity by increasing landowner participation in BMP implementation. Desired Outcomes: Reduce pesticide application rates in watershed; reduce the number of toxic samples; increase benthic macroinvertebrate species diversity). This information should be used to guide completion of your Project Performance Measures Table(s) in item III below.

III. Project Performance Measures Tables

A Project Performance Measures Table should be completed for each category of activities identified for your project in item I. E above. Each of your project activities in a specific category must be listed in a corresponding table for that category. The attached tables contain examples of the kinds of performance measures or indicators, measurement tools, and targets that might apply to the five general activity categories. These tables are for illustrative purposes only and should be used to guide the identification of appropriate performance measures for your project. Use the following guidance when completing tables for your project:

<i>Project Goals:</i>	<i>Identify the project goals as they relate to activities or items outlined in the grant proposal or agreement</i>
<i>Desired Outcomes:</i>	<i>Identify measurable results you expect to achieve by implementing project activities consistent with the specified goals</i>

Output Indicators: Identify the indicators for specific activities that will be used to track progress towards achieving the project goal and desired outcome

Outcome Indicators: Identify the indicators that will be used to measure effectiveness in achieving the desired outcomes or results

Measurement Tools and Methods: Identify the proposed tools and methods used in documenting performance (examples of tools and methods are listed in Attachment 4 and 5)

Targets: Identify targets or benchmarks against which you can measure success (most targets will be quantitative, such as % reduction in pesticide use or % increase in community awareness; however, some targets will be qualitative, such as “broad acceptance of peer-reviewed monitoring plan,” or “adopted conceptual model hypothesizing cause-and-effect relationships.

Attachment 2

Table 1
Project Performance Measures for Planning, Research, Monitoring, or Assessment Activities
Identification of Effective Restoration and Land Management Measures in the Mill Creek Watershed
(Example only – please replace with your own content)

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Assess where and what kind of land and water use practices have contributed most to impairment of aquatic life uses	Identification and mapping of anthropogenic sediment “hot spots” and linkage to current land and water management practices, such as increases in the drainage density, impervious surfaces, as well as ill-timed water diversions and reduction of flood plain functions	1. Completeness and coverage of digitized maps of historical and present channel network and hydrology 2. Completeness and coverage of maps of historical and current habitat types	1. Site-, reach-, or area-specific options for alternative land/water management practices and restoration measures. 2. Number of conceptual restoration opportunities 3. Refinements to conceptual model of watershed processes and functions	<i>Documenting Local Landscape Change: the Bay Area Historical Ecology Project.</i> In: Egan, D. and E. Howell, editors, <i>The Historical Ecology Handbook: a Restorationist's Guide to Reference Ecosystems</i> (Island Press, Washington D.C.)	1. Broad acceptance of identified hot spots based on peer review. 2. Broad acceptance of conceptual model and sediment reduction management options with identified hot spots based on peer review
2. Identify range of restoration measures and management practices that could mimic historic watershed processes and contribute to the prioritization of site-specific TMDL implementation options	1. Development of site-specific and watershed-wide restoration and land management options capable of mimicking historic watershed functions and processes and capable of meeting TMDL implementation targets 2. Identification of appropriate index sites for tracking TMDL implementation progress	1. Digitized map and classification of BMPs and restoration measures. 2. Digitized maps of known and potential salmonid spawning sites	1. Site-, reach-, or area-specific options for alternative land/water management practices and restoration measures. 2. Conceptual restoration plans 3. Refinements to conceptual model of watershed processes and functions. 4. TMDL monitoring plan elements related to tracking progress toward long-term TMDL targets	1. http://www.ctic.purdue.edu/Core4/CT/Choices/Choices.html 2. http://www.dfg.ca.gov/nafwb/manual.html 3. http://www.waterboards.ca.gov/sanfranciscobay/Agenda/04-16-03/Stream%20Protection%20Circular.pdf	1. Adopted list of restoration and land /water mgt. options 2. Adopted list of index sites for TMDL monitoring

Attachment 2 (continued)

Table 2
Project Performance Measures for Education, Outreach, and Capacity-building Activities
Evaluating Alternative Futures in the Mill Creek Watershed
(Example only – please replace with your own content)

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Educate landowners and residents about baseline environmental conditions and watershed processes	1. Increase number of watershed residents who can adequately describe what a “watershed” is 2. Oakwood College expands environmental science curriculum 3. Watershed stewardship curriculum is adopted by professional organizations	1. No. of residents attending workshops 2. No. of meetings held with College Board of Trustees for expanding course offerings 3. No. of special events with relevant outreach material 4. No. of meetings held with prof. associations	1. % increase in general watershed knowledge and environmental conditions 2. No. of relevant new college courses offered 3. No. of Farm Bureau, Builders’ Council, and other prof. associations’ relevant training classes	Opinion/Behavior Surveys (e.g., http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714-75944--,00.html)	1. 15% increase in watershed residents who can adequately describe what a “watershed” is 2. Two new watershed curriculum components or courses at college 3. A minimum of two professional orgs. have adopted and implemented watershed stewardship curriculum for in-house training
2. Provide understanding about land use decisions and NPS pollution	1. Watershed science and planning curriculum is developed and adopted by the Public Works, Building, and Planning Departments throughout the County for in-house staff training purposes	1. No. of residents attending workshops 2. No. of meetings held with College Board of Trustees for expanding course offerings 3. No. of special events with relevant outreach material 4. Course material developed for County Public Works and Planning staff	1. Increase in knowledge about NPS pollution and land use decisions 2. Inclusion of NPS issues in land use planning and environmental science college curriculum 3. New training classes implemented for County Public Works and Planning staff 4. Increase in County GIS analysis and IT capacity	Opinion/Behavior Surveys	1. County staff training curriculum adopted and implemented 2. 50% of County staff have command of relevant NPS/land use issues after first year of training 3. Incorporation of NPS issues in new college watershed curriculum or courses
3. Involve residents in “Alternative Futures” project and General Plan update	1. Broad community attendance at the Alternative Futures kick-off meeting 2. Broad press coverage of the Alternative Futures Planning effort and outcomes.	1. No. of residents participating in “Alternative Futures” workshops 2. No. of newspaper articles and other media coverage about Alternative Futures	1. Broad understanding about NPS pollution and land use decisions, as demonstrated by evaluation forms 2. Increase in candidates for political office with good NPS and watershed understanding	Negotiated with Grant Manager	1. 200 residents at “Alternative Futures” kick-off meeting. 2. Series of three newspaper articles on AF project 3. Minimum of one candidate in city or county elections with good watershed understanding

Attachment 2 (continued)

Table 3
Project Performance Measures for Habitat Restoration Activities
Mill Creek Arundo donax Eradication Project
(Example only – please replace with your own content)

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Eliminate <i>Arundo donax</i> from the Mill Creek Watershed	1. Reduction of giant reed coverage of 420 acres to less than 1	1. No. of landowners granting access permission. 2. No. of volunteers participating in training and implementation	1. Percent of each watershed segment with eradicated stands of A.d. 2. Re-establishment of native riparian vegetation	Russian River <i>Arundo</i> Eradication Manual	100% eradication in upper and middle reaches of watershed; 90% eradication from lower watershed
2. Prepare a re-infestation prevention plan	1. Adoption of prevention plan and incorporation of re-infestation prevention plan into Public Works Department Standard Operating Procedures Manuals	1. Finalization of prevention plan 2. Integration with existing floodway maintenance SOPs	1. Adoption of prevention plan 2. Broad knowledge of Public Works supervisors about SOP updates 3. Floodway maintenance schedule based on watershed reaches sequenced from upstream to downstream	Negotiated with Grant Manager	100% county staff awareness of newly adopted SOP

Attachment 2 (continued)

Table 4
Project Performance Measures for Load Reduction Activities
Reducing Pesticide-Induced Sediment Toxicity from Stonefruit Orchards in the Mill Creek Watershed
(Example only – please replace with your own content)

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Demonstrate the environmental response to pesticide use reductions of 20%.	1. Increase in contiguous acreage in the “Going Organic” Program. 2. Large-scale enrollment of Dry Creek farms in BMP testing program. 3. Pesticide use reduction 4. Reduction of sediment toxicity 5. Increase in benthic macroinvertebrate diversity	1. No. of landowners granting access permission; 2. No. of contiguous acres enrolled in “Going Organic” 3. Number of Dry Creek landowners participating in monitoring plan workshop 4. Number of Dry Creek landowners following implementation schedule	1. Percent reduction of sediment toxicity hits 2. Percent increase in aquatic macroinvertebrate diversity 3. Percent reduction in pesticide use 4. Percent reduction in pyrethroid concentrations in orchard drain water	1. Sed. tox. Bioassay standard procedures; 2. Hayworth, J.D. and G. Siemering. July 2003. Aquatic Pesticide Monitoring Program Phase 2 Monitoring Plan. San Francisco Estuary Institute, Oakland, CA. 3. DFG, Rancho Cordova, GC-ECD or GCMS methods.	1. Enrollment of an additional 1,000 contiguous acres in the “Going Organic” Program. 2. Enrollment of 90% of Dry Creek farms in BMP testing program. 3. Statistically significant increase in benthic macroinvertebrate diversity. 4. Pesticide use reduction of 20%.
2. Contribute to achievement of TMDL target of zero sediment toxicity	1. Reduction of sediment toxicity	1. No. of landowners granting access permission; 2. No. of contiguous acres enrolled in “Going Organic” 3. Number of Dry Creek landowners participating in monitoring plan workshop. 4. Number of Dry Creek landowners following implementation schedule.	1. Percent reduction of sediment toxicity hits. 2. Percent increase in aquatic macroinvertebrate diversity. 3. Percent reduction in pyrethroid concentrations in orchard drain water.	Same as above	Reduction of toxic “hits” between pre-project conditions and project implementation by 75%.

Attachment 2 (continued)

Table 5
Beneficial Use Improvement and Protection Activities
Mill Creek Flood Protection and Conjunctive Water Management Project
(Example only – please replace with your own content)

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Provide safe drinking water to all residents	1. All localities certifying their water treatment systems	1. No. of water treatment managers inquiring about the Department of Health Services (DHS) certification requirements 2. Certification program requirement guidance material produced and posted on web	1. Increase number of water treatment facilities getting certified 2. Local residents inquiring about the water treatment facilities certification	DHS, Drinking Water Program http://www.dhs.ca.gov/ps/ddwem/technical/certification/devices.html	100% of the operating water treatment facilities getting DHS certification
2. Improve drinking water use efficiency	1. Educate local residents about benefits of conserving water	1. % increase in demand for water-saving devices 2. % increase in requests for water audits	1. Volume of water available for environmental enhancement 2. Volume of water conserved for other beneficial uses 3. Level of improved water use efficiency	Opinion/Behavior Surveys (e.g., http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714-75944--,00.html)	1. 1,000 ac. ft. of water available for environmental enhancement 2. 1,000 ac. ft. of water conserved for other beneficial uses 3. 10% improvement in water use efficiency
3. Provide 200 year flood protection for the Mill Creek watershed	1. Reduction in health and safety risk due to flooding 2. Integrate flood management and land use activities to maximize the value of public infrastructure expenditures 3. Restoration of natural flood processes in the Mill Creek watershed 4. Increase in water available for groundwater recharge	1. Local zoning regulations prohibiting incompatible development in flood plain 2. Integration with exotic species removal SOP's 3. Re-development plans include provisions for new flood terraces and removal of flow constrictions along mainstem and tributaries 4. New development and re-development proposals are required to mitigate for impervious surfaces and include restoration of historical hydrograph wherever feasible 5. Miles of new setback and reinforced levees constructed 6. Acres of natural flood plain restored 7. Areas suitable for groundwater recharge are mapped and included in special land use zones	1. Hydrographs resemble historical conditions in peak discharge amounts and timing 2. Public perception that local health and safety risk from flooding has been reduced to acceptable levels 3. Increase in capacity and volume of groundwater recharge from designated land use areas and integrated flood management activities 4. Measurable economic benefits from improved and sustained infrastructure 5. Reduce costs for local agency capital improvements and sustaining water quality and water supply benefits	1. Napa County Flood and Water Conservation District http://www.napaflooddistrict.org/Flood.asp?LID=535 2. DWR - http://www.publicaffairs.water.ca.gov/newsreleases/2005/01-10-05flood_warnings.pdf 3. DWR – Public Safety http://www.water.ca.gov/nav.cfm?topic=Public_Safety 4. Opinion/Behavior Surveys 5. Program specific economic analysis	100% of the Mill Creek watershed has 200 year flood protection

Table 5 (continued)
Beneficial Use Improvement and Protection Activities
Mill Creek Flood Protection and Conjunctive Water Management Project
(Example only – please replace with your own content)

4. Restore the Mill Creek flow to pre 1920s level for in-stream beneficial uses	1. Restore historic numbers of special-status migratory fish species	1. Increased stream flows 2. Monitor decrease in water temperature	1. Increase the no. of special-status migratory fish spawning in the stream 2. Increase in level of dissolved oxygen level 3. Increase in no. of deep holding pools for migratory fish	1. Fish counts and biological monitoring	5 % increase in special-status migratory fish
5. Treat wastewater and create supply for in-lieu ground water recharge	1. Increase the beneficial re-use of recycled water that meets regulatory requirements and reduce groundwater overdraft	1. Number of benefit assessment districts created to finance recycled water treatment and conveyance infrastructure 2. Number of new customers lined up for recycled water use	1. Reduction in groundwater use and surface water diversions for golf course and landscape irrigation 2. Reduction in groundwater overdraft and surface water diversions for agricultural irrigation needs 3. Public perception that recharge of treated waste water is safe and acceptable	1. DWR - California Water Plan – Updated 2005 http://www.waterplan.water.ca.gov/cwpu2005/ 2. Opinion/ Behavior Surveys	50% reduction in ground water overdraft in 20 years.
6. Improve municipal and industrial water quality for public health and safety protection	1. Provide drinking water that meets or exceeds the federal and state drinking water requirements	1. Measure water quality constituents for primary and secondary drinking water standards	1. Measure water quality parameters at the water treatment plant before it is delivered to customers	1. USEPA and Standard Lab Methods	Meet all primary and secondary drinking water standards over the next 10 years

Attachment 3

PROJECT ACTIVITY CATEGORIES

The Project Assessment and Evaluation Plan (PAEP) groups activities into five major categories. They are:

- **Planning, Research, Monitoring, and Assessment**
- **Education, Outreach, and Capacity-building**
- **Habitat Restoration**
- **Load Reduction**
- **Beneficial Use Improvement and Protection**

These categories allow you to assemble and organize activities with similar attributes and evaluate them using a set of performance measures or indicators common to each category. Many grant projects implement multiple activities in more than one category. In some cases, the boundaries between categories are indistinct. For example, certain habitat restoration activities, such as establishment and re-vegetation of riparian buffers with native plants, may also contribute to reducing sediment or nutrient loads. In such cases, the PAEP should reflect effectiveness measures that apply to the appropriate activity category. In the above example, outcome indicators for sediment load reduction might include model calculations according to the methodology described in <http://it.tetrattech-ffx.com/stepl/>, while outcome indicators for the same kind of activity applicable to habitat restoration might include linear miles of historical flood plain features restored to equilibrium conditions.

Planning, Research, Monitoring, and Assessment includes activities that precede implementation of pollution prevention and reduction practices, restoration of habitat or beneficial uses, and implementation of education and training activities. These kinds of activities can include development of analytical methods for detection of recently approved pesticides in surface water or sediment, new test procedures for detection of sub-lethal adverse effects on aquatic organisms, or testing of alternative hypotheses related to pollutant transport mechanisms or watershed functions. Activities in this category may also include beneficial use impairment assessment and analyses of limiting factors to beneficial use recovery.

Education, Outreach, and Capacity-building includes activities that are primarily designed to increase awareness about human activities that contribute to beneficial use impairment and to change behavior in such a way that human-induced stressors on aquatic organisms or watershed processes and functions are reduced below critical threshold levels.

Habitat Restoration includes activities that directly improve the physical or biological condition of a water body, stream reach, or watershed area or restore critical landscape features essential for the maintenance of aquatic habitat and organisms dependent on it.

Load Reduction includes activities that directly contribute to preventing or reducing quantifiable amounts of pollutants from entering waterbodies and aquatic food webs and are usually associated with Total Maximum Daily Load implementation plans.

Beneficial Use Improvement and Protection includes activities that improve and protect beneficial uses as defined in Porter-Cologne Water Quality Control Act, Chapter 2, §13050(f), http://www.swrcb.ca.gov/water_laws/docs/portercologne.pdf. Other activities may provide flood protection, or a new water supply that maintains the chemical, physical, and biological integrity of current beneficial uses.

Attachment 4

Core Outcome Indicators

The following is a list of core outcome indicators that should guide the development of your Project Assessment and Evaluation Plan (PAEP) for the State Water Board loan and grant funded projects. These core or general indicators are categorized consistent with the system used in the PAEP Outline and Performance Table.

The purpose of this core list is to provide a menu of outcome indicators that can be used to guide selection of indicators for your specific project. General review of these core indicators should help you recognize what performance measures are appropriate for quantifying the outcomes of your project activities. This is not a comprehensive list. You may find that you can use one or more of these indicators to measure performance of your activities. In some cases you will need to develop more specific indicators for your activities. For example, in one project, anthropogenic stressors and limiting factors to beneficial use recovery may be primarily due to specific pollutants, while in other projects, the stressors may be hydromodification or flow diversions. In any case, outcome indicators for the specific stressor(s) will have to be identified that enable you to compare environmental conditions before and after you implemented your project (e.g., indicators associated with pesticide toxicity or with altered flood peaks and timing, respectively).

A. Planning, Research, Monitoring, and Assessment

1. Number of characterized watershed land cover/land use categories
2. Number and magnitude of anthropogenic stressors identified (including extent of hydromodification; known and suspected pollution source categories)
3. Peer-reviewed and adopted watershed assessment report or watershed management plan
4. Peer-reviewed and adopted Monitoring Plan for TMDL implementation
5. Peer-reviewed and adopted Restoration Plan for beneficial use recovery
6. Adopted list of watershed-specific BMPs and restoration practices
7. Adopted conceptual models outlining hypothesized cause-effect relationships
8. Peer-reviewed and adopted limiting factors analysis
9. Peer reviewed and adopted source analysis
10. Adopted analytical methods, bioassays, or tests

B. Education, Outreach, and Capacity-building

1. % increase in community awareness
2. % increase in community participation in watershed stewardship activities
3. % increase in local government expertise, resources, and management tools (e.g. GIS capacity; SOPs; public-private partnership agreements; sustained funding)

sources for watershed health maintenance; building codes aligned with watershed goals, etc.)

4. % increase in landowners trained and certified in BMP implementation

C. Habitat Restoration

1. % increase in native habitat extent
2. % decrease in invasive species cover
3. Improvement in habitat condition or other biometric scores (e.g. CRAM, IBI)
4. % increase in sustained habitat maintenance and management agreements
5. % increase in watershed functions and processes resembling reference conditions

D. Load Reduction

1. % decrease in pollutant use and/or discharge
2. % increase in certified practices designed to result in reduction of pollutant inputs into listed water bodies
3. % increase in benthic macroinvertebrate diversity
4. % decrease in adverse effects biomarkers and targeted toxic samples (event-based water toxicity; sediment toxicity)

E. Beneficial Use Improvement and Protection

1. Value added to expenditures for public infrastructure where flood management and land use activities have been integrated.
2. % increase in volume of safe new drinking water supply
3. % increase in water supply reliability
4. % increase in recycled water use
5. Improvements in efficiency of water recycling capacity
6. % increase in volume of water available for environmental enhancement
7. % increase in restored watershed hydrologic processes compared to historic reference conditions
8. % decrease in acre-feet lost via accelerated runoff due to increases in drainage density and impervious area in the watershed
9. % reduction of subsidence due to overdraft mitigation
10. % increase in water use efficiency

EXAMPLES OF PAEPs
(for illustrative purposes only)

PLANNING, RESEARCH, MONITORING, AND ASSESSMENT

EDUCATION, OUTREACH, AND CAPACITY-BUILDING

HABITAT RESTORATION

POLLUTANT LOAD REDUCTION

BENEFICIAL USE IMPROVEMENT AND PROTECTION

Prototype Project Assessment and Evaluation Plan **Planning, Research, Monitoring and Assessment**

Identification of Effective Restoration and Land Management Measures in the Mill Creek Watershed

III. Project Summary

A. Funding Program

The Project is supported by Proposition 40 as part of the Agricultural Water Quality Grant Program and local and federal matching funds.

B. Project Description

Sediment is one of the pollutants that is impairing aquatic life uses in Mill Creek and all of its tributaries and has been on the 303(d) list since the mid-1980s. Sources of excessive sediment have been attributed to agricultural, urban, and ex-urban land development and management practices. This project will identify and prioritize various categories of alterations to the land and watershed hydrology that contribute most to excessive erosion and sedimentation. It will also identify additional factors contributing to beneficial use impairment, so that the appropriate mix of restoration measures and land use/development practices can be put in place where they achieve the greatest anticipated environmental benefits.

C. Problem Statement:

i. Identify or characterize baseline data

Several studies have recently been completed and published that document impairment to aquatic life uses in the Mill Creek Watershed. Excessive sediment is listed as one of the main causes of anadromous fisheries declines and extirpation of Coho salmon throughout the watershed. Sediment is also suspected as a factor that contributed to placing the California freshwater shrimp on the Endangered Species list. Oakwood County is currently preparing a Programmatic Environmental Impact Report and has completed a baseline data report, inventorying biological and cultural resources, geology, hydrology, and current land use. A digitized map of vegetation cover at a 1-m resolution exists for the whole county, including the Mill Creek Watershed. Extensive historical information has been assembled documenting pre-European land cover, land use changes in the past 150 years, and modification to the stream hydrology throughout the watershed.

ii. Identify pollution source categories

Agricultural land management practices, and to a lesser extent urban and ex-urban land uses are suspected to be the main sources of excessive sediment.

- iii. Identify and describe current restoration activities; Best Management Practices (BMPs); load reduction activities; prevention activities

Oakwood County has had a hillslope protection ordinance in place for several decades that applies to slopes greater than 5%. The ordinance requires review, approval, and implementation of erosion control plans prior to conversions of natural land cover to agricultural uses. Until recently, erosion control measures included large-scale expansion of the drainage network through construction of hillslope drains removing water from fields in accelerated fashion, reducing soil infiltration and causing major alterations in the hydrologic regime of tributaries and the mainstem of Mill Creek..

- iv. Describe the manner in which BMPs or Management Measures are proposed to be implemented

N/A

- v. Summarize how the effectiveness of proposed practices or measures in preventing or reducing pollution will be determined

N/A

- vi. Determine “changes in flow pattern” in affected water bodies

N/A. While this project will not be able to measure changes in flow pattern until Management Measures are implemented, it is designed to recommend opportunities for restoring flow where current water and land management practices have reduced dry-season base flow below critical threshold levels.

- vii. Determine economic benefits of implementing project

N/A. Not a requirement of AWQGP.

D. Project Activities or Tasks

Task 1: Project Management and Administration

Task 2: Develop detailed monitoring and assessment plan, including refinement of existing conceptual models reflecting our current understanding of watershed processes, and stating hypotheses that can be tested via spatial analysis.

Task 3: Develop Quality Assurance Project Plan linking project objectives with data quality objectives.

Task 4: Compile relevant historical and current datalayers and digitize maps (e.g., Mill Creek drainage network, land cover, documented wetland types and other habitats, floodplain structure); analyze and document change in georeferenced format; identify restoration constraints and opportunities.

Task 5: Obtain access permission to candidate field verification sites to spot-check interpretation of aerial photography and LIDAR images.

Task 6: Compile existing range of land management practices and document sites or areas of sediment sources, transport, and storage to land and water management practices.

Task 7: Compile a menu of alternative management practices and restoration measures tailored to sediment mobilization and storage problems identified in

Task 4 and identify suitable monitoring sites where progress toward TMDL targets could best be tracked.

Task 8: Prepare final report and submit data to SWAMP database.

E. Category of Project Activities or Tasks:

All project activities and tasks fall into the Planning, Research, Monitoring and Assessment Category.

IV. Project Goals & Desired Outcomes

The goals of this project are:

- 1) Assess where and what kind of land and water use practices have contributed most to impairment of aquatic live uses.*
- 2) Provide the information necessary to implement a range of restoration measures and land/water management practices that could mimic historic watershed processes (e.g., restoration of storm hydrographs through detention and infiltration basins and rehabilitation of wetlands; establishment of riparian buffer zones and setback levees to allow formation of meanders and important floodplain structural elements) and contribute to the prioritization of site-specific TMDL implementation options.*

The desired outcomes of this project are:

- 1) Identification and mapping of anthropogenic sediment “hot spots” and linkage to current land and water management practices, such as increases in the drainage density, impervious surfaces, and other hydromodifications, as well as ill-timed water diversions, and reduction of flood plain functions.*
- 2) Development of site-specific and watershed-wide restoration and land management options capable of mimicking historic watershed functions and processes and capable of meeting TMDL implementation targets.*
- 3) Identification of appropriate index sites for tracking TMDL implementation progress.*

III. Project Performance Measures Tables

Table 1
Example Performance Indicators for Planning, Research, Monitoring, and Assessment
Identification of Effective Restoration and Land Management Measures in the Mill Creek Watershed

Project Goals	Baseline Measurements and Information	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Assess where and what kind of land and water use practices have contributed most to impairment of aquatic live uses.	1. Historical documentation of landcover and drainage network 2. LIDAR imagery; vegetation maps; 3. Current land cover and uses 4. Historical and current flow data	1. Digitized maps of historical and present channel network and hydrology 2. Digitized maps of historical and current habitat types	1. Site-, reach-, or area-specific options for alternative land/water management practices and restoration measures. 2. Conceptual restoration plans 3. Refinements to conceptual model of watershed processes and functions	Documenting Local Landscape Change: the Bay Area Historical Ecology Project. In: Egan, D. and E. Howell, editors, The Historical Ecology Handbook: a Restorationist's Guide to Reference Ecosystems (Island Press, Washington D.C.)	1. Broad acceptance of identified hot spots based on peer review. 2. Broad acceptance of conceptual model sediment reduction management options with identified hot spots based on peer review
2. Identify range of restoration measures and management practices that could mimic historic watershed processes and contribute to the prioritization of site-specific TMDL implementation options	1. Erosion control plans and list of BMPs currently in place or considered for implementation 2. TMDL implementation targets	1. Digitized map and classification of BMPs and restoration measures. 2. Digitized maps of known and potential salmonid spawning sites	1. Site-, reach-, or area-specific options for alternative land/water management practices and restoration measures. 2. Conceptual restoration plans 3. Refinements to conceptual model of watershed processes and functions. 3. TMDL monitoring plan elements related to tracking progress toward targets.	1. http://www.ctic.purdue.edu/Core4/CT/Choices/Choices.html 2. http://www.dfg.ca.gov/nafwb/manual.html 3. http://www.waterboards.ca.gov/sanfranciscobay/Agenda/04-16-03/Stream%20Protection%20Circular.pdf	1. Adopted list of restoration and land /water mgt. options 2. Adopted list of index sites for TMDL monitoring by WICC TAC

Prototype Project Assessment and Evaluation Plan **Education, Outreach, and Capacity-building**

Evaluating Alternative Futures in the Mill Creek Watershed

V. Project Summary

A. Funding Program

The Project is supported by Proposition 40 as part of the Nonpoint Source Pollution Control Program and local and federal matching funds.

B. Project Description

Oakwood County and the Resource Conservation District are collaborating with USEPA, Office of Research and Development, on developing tools to evaluate “Alternative Futures” (see http://www.epa.gov/ord/scienceforum/PDFs/science/white_d.pdf). The “Alternative Futures” project involves building community capacity in the Mill Creek Watershed, particularly to raise community awareness about environmental issues, with emphasis on nonpoint source pollution in a watershed context, and to involve the watershed community in the planned update of the County’s General Plan with the goal of including appropriate planning elements that enhance in-fill development and reduction of impervious surfaces and drainage density throughout the watershed.

C. Problem Statement:

i. Identify or characterize baseline data

The Mill Creek Watershed is experiencing rapid conversion from agricultural and forestry lands to urban and ex-urban development. The opening of a bullet train station in the southern part of the watershed five years ago enabled people that formerly lived closer to employment centers with high housing costs to move into more affordable housing on the urban fringe. The influx of new watershed residents translates into a Mill Creek Watershed population growth rate of 11% a year over the last five years. The project provides an opportunity to educate long-term residents as well as newcomers about non-point source pollution issues, the connection between land development decisions and beneficial use protection, and to involve them in a planned visioning process as part of Oakwood County’s General Plan update. Baseline data exist in the County’s Geographical Information System (GIS) and include digitized data layers of land use change from 1950-2005, urban growth projections, hydrology, wetlands and other sensitive and unique aquatic habitat types, vegetation at a resolution of 1m, and stormdrain infrastructure. The County also recently compiled a biological resource inventory.

ii. Identify one or more sources of pollution

Mill Creek is on the Impaired Waters list for sediment, nutrients, and pathogens. Agricultural management practices are implicated as the cause of erosion and sedimentation ; malfunctioning septic tanks are suspected as a source of pathogen contamination; and a combination of agriculture and urban land uses are suspected as the sources of nutrients.

- iii. Identify and describe current restoration activities; Best Management Practices (BMPs); load reduction activities; prevention activities

The County has an existing hillslope protection ordinance in place designed to minimize erosion from slopes greater than 5%.

Agricultural landowners have implemented practices that drain runoff into extensive hillslope drainage networks discharging into tributaries of Mill Creek. Portions of the creek have experienced downcutting and bank erosion, and efforts are underway to restore floodplain functions in a four-mile reach in the central part of the watershed. TMDL implementation plans have not yet been developed or implemented for any of the three pollutant categories of concern.

- iv. Describe the manner in which BMPs or Management Measure are proposed to be implemented

N/A

- v. Summarize how the effectiveness of the proposed practices or measures in preventing or reducing pollution will be determined

N/A

- vi. Determine, to the extent feasible, changes in flow pattern in affected water bodies

N/A

- vii. Determine economic benefits of implementing project

N/A. Not a requirement of Proposition 40.

D. Project Activities or Tasks

Task 1: Project Management and Administration

Task 2: Develop detailed survey and assessment plan, including a training manual. The plan will be comprised of proposed questions and methods for analysis of pre- and post-implementation survey results.

Task 3: Develop Quality Assurance Project Plan linking project objectives with data quality objectives.

Task 4: Administer pre-project survey representative of Mill Creek Watershed population with a target maximum error rate of +/-5%. The opinion poll will be designed to gauge the knowledge of residents about what "a watershed" is, pollution issues (source categories, activities contributing to pollution, understanding of impairment of beneficial uses, and understanding of the connection between land use and impairment).

Task 5: Work with Oakwood Community College Board of Trustees to incorporate new classes into Environmental Science Department and assist in development of an endowment for instructor position.

Task 6: Develop curriculum for Public Works, Planning, and Building Departments for County and Cities within the Mill Creek watershed related to nonpoint source pollution issues and the role of land use decisions in reducing aquatic life and recreation beneficial use impairment.

Task 7: Hold a series of five workshops and participate in key community events (Earth Day; Adopt a Watershed Day; Friday Fairs during the summer; Sustainable Farming fundraising event) to staff watershed awareness and education table, distribute fact sheets, and raise community awareness

Task 8: Work with Farm Bureau, Builders Association, and Chamber of Commerce to incorporate appropriately tailored staff and member training events, based on curriculum developed for agency staff and modified for professional association audiences.

Task 9: Conduct targeted outreach to environmental reporters of Oakwood Gazette and Hillview Register on Alternative Futures project and relevance to General Plan update. Work with County staff and community groups (e.g. Friends of Mill Creek, Property Rights and No Responsibilities Advocates of Oakwood, Get Government off My Back, SUE FFIRST!, etc.) to generate community awareness of Alternative Futures Project.

Task 10: Conduct post-implementation survey of pre-project respondents to gauge increase in watershed awareness.

E. Category of Project Activities or Tasks:

All project activities and tasks fall into the Education, Outreach, and Capacity-building Category.

VI. Project Goals & Desired Outcomes

The goals of this project are:

- 1) Increase understanding of Mill Creek Watershed residents about basic watershed characteristics and processes and the role of nonpoint source pollution in beneficial use impairment*
- 2) Actively engage residents in the “Alternative Futures” visioning process which will inform the update of the County’s General Plan.*

The desired outcomes of this project are:

- 1) Increase the number of watershed residents who can adequately describe what a “watershed” is by a minimum of 15% by the end of the project period.*
- 2) Oakwood College adds new, relevant curriculum components.*
- 3) Insure that a watershed stewardship curriculum is adopted by two professional organizations.*

- 4) *Watershed science and planning curriculum is developed and adopted by the Public Works, Building, and Planning Departments throughout the County for in-house staff training purposes.*
- 5) *Broad community attendance at the Alternative Futures kick-off meeting.*
- 6) *Broad press coverage of the Alternative Futures Planning effort and outcomes.*

III. Project Performance Measures Tables

Table 2
Example Performance Indicators for Education and Outreach
Evaluating Alternative Futures in the Mill Creek Watershed

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Educate landowners and residents about baseline environmental conditions and watershed processes	1. Increase number of watershed residents who can adequately describe what a “watershed” is. 2. Oakwood College adds two new, relevant curriculum components. 3. Watershed stewardship curriculum is adopted by professional organizations.	1. No. of residents attending workshops; 2. No. of meetings held with College Board of Trustees for expanding course offerings; 3. No. of special events with relevant outreach material; 4. No. of meetings held with prof. associations	1. Increase in general watershed knowledge and environmental conditions; 2. No. of relevant new college courses offered. 3. No. of Farm Bureau, Builders’ Council, and other prof. associations’ relevant training classes	Opinion/Behavior Surveys (e.g., http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714-75944--,00.html)	1. 15% increase in watershed residents who can adequately describe what a “watershed” is. 2. Two new watershed curriculum components or courses at college. 3. A minimum of two professional orgs. have adopted and implemented watershed stewardship curriculum for in-house training
2. Provide understanding about land use decisions and NPS pollution	1. Watershed science and planning curriculum is developed and adopted by the Public Works, Building, and Planning Departments throughout the County for in-house staff training purposes.	1. No. of residents attending workshops; 2. No. of meetings held with College Board of Trustees for expanding course offerings; 3. No. of special events with relevant outreach material; 4. Course material developed for County Public Works and Planning staff	1. Increase in knowledge about NPS pollution and land use decisions; 2. Inclusion of NPS issues in land use planning and environmental science college curriculum 3. New training classes implemented for County Public Works and Planning staff	Opinion/Behavior Surveys	1. County staff training curriculum adopted and implemented. 2. 50% of County staff have command of relevant NPS/land use issues after first year of training. 2. Incorporation of NPS issues in new college watershed curriculum or courses
3. Involve residents in “Alternative Futures” project and General Plan update	1. Broad community attendance at the Alternative Futures kick-off meeting. 2. Broad press coverage of the Alternative Futures Planning effort and outcomes.	1. No. of residents participating in “Alternative Futures” workshops 2. No. of newspaper articles and other media coverage about Alternative Futures	1. Increase in County GIS analysis and IT capacity 2. Increase in candidates for political office with good NPS and watershed understanding	Specified by Grantee	1. 200 or more residents at “Alternative Futures” kick-off meeting. 2. Series of three newspaper articles on AF project. 3. Minimum of one candidate in city or county elections with good watershed understanding.

Prototype Project Assessment and Evaluation Plan **Habitat Restoration**

Eradicating Arundo donax from the Mill Creek Watershed and Establishing a Re-introduction Prevention Program

VII. Project Summary

A. Funding Program

The Project is supported by the Proposition 40 Integrated Watershed Management Program, and local and federal matching funds.

B. Project Description

Oakwood County and the Resource Conservation District are collaborating to build on recently completed mapping efforts in the Mill Creek Watershed and implement a full-scale Arundo donax (giant reed) eradication program based on the demonstration project methodology developed under a recently completed CALFED Ecosystem Restoration Program grant.

C. Problem Statement:

i. Identify or characterize baseline data

Infestation of the invasive giant reed (Arundo donax) has recently been mapped for the entire Mill Creek Watershed. Arundo is native to riparian areas in Asia and was promoted as an erosion control mechanisms in Soil Conservation Service handbooks until late into the last century. The giant reed alters riparian ecosystem functions and habitat values for native species in numerous ways, in addition to presenting a flood and fire management challenge. Although no systematic studies have been undertaken to document its impacts on evapotranspiration, it is also suspected to severely alter the water budget by accelerating transpiration of surface and subsurface water, thereby contributing to the dewatering of streams during periods critical to native fish species and aquatic invertebrates. Once established, giant reed outcompetes existing native riparian vegetation and generates monoculture stands. Mapping results indicate that about 420 acres are infested within the 200 square-mile watershed of Mill Creek. Arundo is known to only reproduce vegetatively, thereby enabling complete eradication in any given area, as long as removal is systematic from the top to the bottom of the watershed so that floods cannot disperse viable rhizomes or canes. The RCD conducted an extensive education and outreach campaign from 2003-05 targeted at affected landowners to facilitate access to infestation sites. An EIR was developed in early 2005, and all required permits are being processed at this time.

ii. Identify one or more sources of pollution

N/A

iii. Identify and describe current restoration activities; Best Management Practices (BMPs); load reduction activities; prevention activities

The County Department of Public Works has a removal policy in place, albeit only as part of its ongoing flood management and floodway maintenance program. The Resource Conservation District staff has obtained training in eradication

methodology in a neighboring watershed but has heretofore lacked the funds to implement an eradication and re-infestation prevention program.

- iv. Describe the manner in which BMPs or Management Measures are proposed to be implemented

We propose to utilize pond liner material after mechanically removing aboveground biomass to cover cut stands of Arundo and prevent the clones from photosynthesizing. This eradication methodology has proven to be the most cost-effective and least environmentally damaging alternative in the neighboring Russian River watershed. Usually, stands of Arundo are dead within two weeks. Aboveground biomass will be chipped as close to the eradication site as possible and composted on-site. Eradication will begin at the end of the wet season at the end of May in the uppermost reaches of Mill Creek and gradually work downstream toward the tidal marsh complex at the bottom of the watershed. Both the Public Works Department and the RCD will mobilize their existing volunteer crew and the California Conservation Corps to systematically remove canes and place pond liner over the remaining above- and below-ground biomass. We expect to be able to remove all 420 acres within the three-year project period.

- v. Summarize how the effectiveness of project implementation will be measured

We propose to measure effectiveness of the project primarily through comparison of digital maps before eradication with site visits and ground photography at the end of the eradication period throughout the project as identified stands are eliminated. Updates to the digital datalayer housed at the RCD will be made after confirmation of non-viability of treated stands. Table 1 shows the proposed indicators to be used in evaluating effectiveness of the project.

- vi. Determine, to the extent feasible, changes in flow pattern in affected water bodies

N/A

- vii. Determine economic benefits of implementing project

N/A. Not a requirement of IRWMP.

D. Project Activities or Tasks

Task 1: *Project Management and Administration*

Task 2: *Develop detailed implementation and monitoring plans, outlining treatment locations, anticipated eradication sequence, and post-implementation documentation.*

Adjust safety procedures and field reconnaissance manual as necessary.

Task 3: *Contact landowners and obtain permission to implement eradication*

Task 4: *Transport available pond liners from Healdsburg storage location in the Russian River watershed and distribute to Mill Creek staging areas according to implementation plan. Mobilize volunteer and staff.*

Task 5: *Train and mobilize field crews in safety procedures, for cane-cutting, micro-chipping, on-site composting of biomass, and placement of pond liners.*

Task 6: *Conduct post-eradication site visits to document success.*

Task 7: *Prepare re-infestation prevention plan and incorporate plan into Public Works floodway maintenance SOPs.*

Task 8: *Prepare project completion report, including updated maps and updates to methods manual. Submit maps to GeoWBS.*

E. Category of Project Activities or Tasks:

All project activities and tasks fall into the Habitat Restoration Category.

VIII. Project Goals & Desired Outcomes

The goals of this project are:

- 1) Eliminate Arundo donax from the Mill Creek Watershed*
- 2) Adopt a re-infestation prevention plan*

The desired outcomes of this project are:

- 1) Reduction of giant reed coverage of 420 acres to less than one acre.*
- 2) Adoption of prevention plan and incorporation of re-infestation prevention plan into Public Works Department Standard Operating Procedures Manuals.*

III. Project Performance Measures Table

Table 3
Example Performance Indicators for Habitat Restoration
Eradicating Arundo donax from the Mill Creek Watershed and Establishing a Re-introduction Prevention Program

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Eliminate <i>Arundo donax</i> from the Mill Creek Watershed	Reduction of giant reed coverage of 420 acres to less than 1	1. No. of landowners granting access permission; 2. No. of volunteers participating in training and implementation	1. Percent of each watershed segment with eradicated stands of A.d. 2. Re-establishment of native riparian vegetation	Russian River <i>Arundo</i> Eradication Manual	100% eradication in upper and middle reaches of watershed; 90% eradication from lower watershed
2. Prepare a re-infestation prevention plan	Adoption of prevention plan and incorporation of re-infestation prevention plan into Public Works Department Standard Operating Procedures Manuals	1. Finalization of prevention plan 2. Integration with existing floodway maintenance SOPs	1. Adoption of prevention plan. 2. Broad knowledge of Public Works supervisors about SOP updates. 3. Floodway maintenance schedule based on watershed reaches sequenced from upstream to downstream	Specified by Grantee	100% county staff awareness of newly adopted SOP.

Prototype Project Assessment and Evaluation Plan

Load Reduction

Reducing Pesticide-induced Sediment Toxicity from Stonefruit Orchards in the Mill Creek Watershed

IX. Project Summary

A. Funding Program

The Project is supported by Proposition 50 as part of the Agricultural Water Quality Grant Program and local and federal matching funds.

B. Project Description

The middle and lower reaches of Mill Creek and two of its tributaries have been placed on the “impaired waters list” for pesticide toxicity attributable to agricultural land use practices. This project is designed to demonstrate the efficacy of reducing pesticide use by 20% throughout the watershed and restore aquatic life beneficial uses in Mill Creek. It builds on several preceding efforts that assessed beneficial use impairment, developed a detailed conceptual model describing water and sediment transport processes throughout the watershed, as well as pesticide transport and fate. Targets for TMDL implementation have been adopted by USEPA, and implementation plans are currently under development. The project will contribute to fine-tuning several proposed implementation steps and provide “proof-of-concept” documentation for large-scale application of selected Best Management Practices.

C. Problem Statement:

i. Identify or characterize baseline data

*More than 40% of the watershed below river mile 42 is comprised of land cover consisting of stonefruit orchards and associated farm infrastructure (roads, both paved and unpaved, storage buildings, irrigation canals, etc.). The most recent pesticide use statistics show annual application rates of roughly 20,000 lbs of various synthetic pyrethroid compounds, comprising 95% of all pesticides applied. During synoptic sampling of Mill Creek and its two major tributaries draining agricultural land uses, nine out of ten samples exhibited sediment toxicity to bioassay organisms (*Hyalella* spp.).*

ii. Identify one or more sources of pollution

Stonefruit orchards are suspected to be the main source of pollution.

iii. Identify and describe current (if applicable) and proposed restoration activities; Best Management Practices (BMPs); load reduction activities; prevention activities

Several landowners with a combined acreage of 1,100 acres are transitioning to organic farming practices and are in their third year of conversion. The UC Cooperative Extension Program has begun to promote its Integrated Pesticide Management training curriculum, and the recent waiver conditions for Waste Discharge Requirements caused 99% of landowners to enroll in continuing education classes pertaining to IPM, and management practices for pesticide impact reduction to receiving waters.

- iv. Describe the manner in which BMPs or Management Measures are proposed to be implemented

This project will be testing the efficacy of three types of Management Measures in reducing sediment toxicity: 1) Enrolling 1,000 additional contiguous stonefruit acres in the “Going Organic” program. 2) Establishing detention ponds collecting orchard runoff at each discharge point into Mill Creek and tributaries that prevent contaminated sediment from being transported into receiving waters. 3)

Implementing a combination of Integrated Pest Management practices by 90% of the stonefruit farmers in the Dry Creek watershed (one of the tributaries to Mill Creek), cover crop and buffer strip BMPs according to recent UC Cooperative Extension handbooks. Detention pond engineering designs have already been approved by all necessary local, state, and federal agencies, and 90% of Dry Creek watershed farmers have already signed up for the demonstration program.

- v. Summarize how the effectiveness of project implementation will be measured

We will measure effectiveness of the project by taking an initial sediment sample set (n=30) distributed randomly in the middle and lower reaches of Mill Creek and its two tributaries to assess pre-implementation sediment toxicity. These random samples will be augmented by targeted water samples at the confluence of the ditches draining the largest contiguous parcels enrolled in the “Going Organic” program and the confluence of Dry Creek and ten farm drain outlets. The water samples will receive a pesticide scan and will be analyzed for pyrethroid pesticides. In addition, samples will be taken concurrently with sediment samples according to the recently developed bioassessment methodology for low-gradient streams and analyzed for aquatic macroinvertebrates. The same sampling regime will be followed in Year 3 after implementation of pesticide reduction measures.

- vi. Determine, to the extent feasible, changes in flow pattern in affected water bodies

N/A

- vii. Determine, to the extent feasible, changes in flow pattern in affected water bodies

N/A

- viii. Determine economic benefits of implementing project

N/A. Not a requirement of AWQGP.

D. Project Activities or Tasks

Task 1: Project Management and Administration

Task 2: Develop detailed monitoring plan, stating hypotheses to be tested, desired statistical power to be achieved, number of sampling sites required, and appropriate sample timing.

Task 3: Develop Quality Assurance Project Plan linking project objectives with data quality objectives.

Task 4: Work with UC Cooperative Extension staff to agendize feedback on monitoring plan by landowners and enhance participation in Dry Creek BMP pilot if necessary.

Task 5: Obtain access permission to candidate sampling sites (including replacement sites where permission is denied).

Task 6: Conduct landowner outreach and use existing education material to enroll additional farmers in “Going Organic” program.

Task 7: Implement pre-implementation sampling.

Task 8: Work with landowners and UC Cooperative Extension staff to track implementation progress.

Task 9: Conduct post-implementation sampling at the end of Year 2 and beginning of Year 3.

Task 10: Assess data and write evaluation report.

Task 11: Submit data to SWAMP database.

E. Category of Project Activities or Tasks:

All project activities and tasks fall into the Load Reduction Category.

X. Project Goals & Desired Outcomes

The goals of this project are:

- 1) Demonstrate the environmental response to pesticide use reductions of 20%.13)*
- 2) Contribute to achievement of TMDL target of zero sediment toxicity.*

The desired outcomes of this project are:

- 1) Enrollment of an additional 1,000 contiguous acres in the “Going Organic” Program*
- 2) Enrollment of 90% of Dry Creek farms in BMP testing program.*
- 3) Reduction in pesticide use by 20%*
- 4) Reduction of toxic “hits” between pre-project conditions and project implementation by 75%*
- 5) Increase in benthic macroinvertebrate diversity*

III. Project Performance Measures Table

Table 4
Example Performance Indicators for Load Reduction
Reducing Pesticide-induced Sediment Toxicity from Stonefruit Orchards in the Mill Creek Watershed

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
1. Demonstrate the environmental response to pesticide use reductions of 20%.	1. Increase in contiguous acreage in the "Going Organic" Program. 2. Large-scale enrollment of Dry Creek farms in BMP testing program. 3. Pesticide use reduction 4. Reduction of sediment toxicity 5. Increase in benthic macroinvertebrate diversity	1. No. of landowners granting access permission; 2. No. of contiguous acres enrolled in "Going Organic" 3. Number of Dry Creek landowners participating in monitoring plan workshop 4. Number of Dry Creek landowners following implementation schedule	1. Percent reduction of sediment toxicity hits 2. Percent increase in aquatic macroinvertebrate diversity 3. Percent reduction in pesticide use 4. Percent reduction in pyrethroid concentrations in orchard drain water	1. Sed. tox. Bioassay standard procedures; 2. Hayworth, J.D. and G. Siemering. July 2003. Aquatic Pesticide Monitoring Program Phase 2 Monitoring Plan. San Francisco Estuary Institute, Oakland, CA. 3. DFG, Rancho Cordova, GC-ECD or GCMS methods.	1. Enrollment of an additional 1,000 contiguous acres in the "Going Organic" Program. 2. Enrollment of 90% of Dry Creek farms in BMP testing program. 3. Statistically significant increase in benthic macroinvertebrate diversity. 4. Pesticide use reduction of 20%.
2. Contribute to achievement of TMDL target of zero sediment toxicity	Reduction of sediment toxicity	1. No. of landowners granting access permission; 2. No. of contiguous acres enrolled in "Going Organic" 3. Number of Dry Creek landowners participating in monitoring plan workshop. 4. Number of Dry Creek landowners following implementation schedule	1. Percent reduction of sediment toxicity hits 2. Percent increase in aquatic macroinvertebrate diversity 3. Percent reduction in pyrethroid concentrations in orchard drain water	Same as above	Reduction of toxic "hits" between pre-project conditions and project implementation by 75%.

Prototype Project Assessment and Evaluation Plan
Beneficial Use Improvement and Protection
Mill Creek Integrated Regional Water Management Implementation Project

XI. Project Summary

A. Funding Program

The Project is supported by the Proposition 50 Integrated Regional Water Management Grant Program, and local and federal matching funds.

B. Project Description

Through a cooperative planning effort, the City of Mill Creek, Oakwood County Water Agency, and Oakwood Resource Conservation District have identified a suite of water management projects and programs within the Mill Creek Watershed that, together, will improve water supply reliability and water quality for the community, reduce dependence on imported water, provide habitat diversity, and eliminate or reduce pollution in sensitive habitat areas and areas of special biological significance. The projects accomplish the regional objectives established through the regional planning process, and incorporate multiple water management elements to provide multiple benefits.

C. Problem Statement:

i. Identify or characterize baseline data

N/A

ii. Identify one or more sources of pollution

The main source of drinking water pollutants are increased sediment load, salt, nitrogen, phosphorus, and pesticide residue that comes from agricultural activities in the Russian River watershed. The City of Mill Creek drinking water supply intakes are located near agricultural discharges.

iii. Identify and describe current (if applicable) and proposed restoration activities; Best Management Practices (BMPs); load reduction activities; prevention activities

N/A

iv. Describe the manner in which BMPs or Management Measures are proposed to be implemented

N/A

v. Summarize how the effectiveness of project implementation will be measured

The effectiveness of the project will be measured by evaluating the success of the restoration activities and whether federal and state regulatory requirements for drinking water and local water quality goals have been met. Changes in flow pattern in affected water bodies will also be determined to the extent feasible. Pre-project data will be collected and compared to post implementation data to determine whether the stated goals and desired outcomes of the projects have been met.

Determine, to the extent feasible, changes in flow pattern in affected water bodies

N/A

Determine economic benefits of implementing project

Improving water quality decreases the costs to consumers (by increasing the life of appliances and plumbing, decreasing costs to industrial users by increasing the life of industrial facilities through corrosion), lowers the capital and operating costs of equipment to treat the water, decreases water use of industrial customers (fewer cycles), is less costly to treat in order to meet drinking water regulations, increases opportunities for water recycling and enhances the environmental beneficial use.

D. Project Activities or Tasks

Task 1: Relocate the City of Mill Creek water intakes along the Russian River further north away from the agricultural activities where there is better source water quality.

Task 2: Install an additional drinking water well in the Oak Park area to supplement water supply from the Russian River and convey the water to the City of Mill Creek Drinking Water Treatment Plant pumps via new, dedicated pipelines, where it can be blended with surface water prior to delivery to customers.

Task 3: Expand the City of Mill Creek Drinking Water Treatment Plant from 10 to 20 mgd to accommodate growing demand.

*Task 4: Remove 50 acres of *Arundo donax* (giant reed) from the Mill Creek and restore native riparian habitat along the Mill Creek and at the confluence of the Russian River.*

Task 5: Management and implementation:

- i. Project Management and Administration*
- ii. Develop detailed implementation and monitoring plans, outlining:*
 - water quality sampling and monitoring (number of samples, analysis, location, timing, statistical analysis, etc.)*
 - drinking water treatment process*
 - giant reed eradication sequence and treatment process*
- iii. Develop Quality Control Assurance Plan*
- iv. Obtain the required permits*
- v. Obtain landowner agreements for implementation of giant reed eradication along the Mill Creek*
- vi. Train and mobilize field crews including volunteers in giant reed removal, treatment (cane-cutting, painting & cutting, herbicide spray, tarping, micro-chipping, on-site composting of biomass) and safety procedures*
- vii. Conduct post giant reed eradication site visits to document success*
- viii. Prepare re-infestation prevention plan and incorporate plan into Public Works floodway maintenance SOPs*
- ix. Prepare a final report detailing project success and failures*

E. Category of Project Activities or Tasks:
Project activities and tasks fall into the Beneficial Use Improvement and Protection Categories.

XII. Project Goals & Desired Outcomes

The goals of this project are:

- 1) Improve water supply reliability*
- 2) Improve delivered water quality*
- 4) Improve water quality for public health and safety protection*
- 5) Environmental restoration and enhancement*

The desired outcomes of this project are:

- 1) Reduce source water impairment (particularly sedimentation and salt)*
- 2) Expand and increase the efficiency of water treatment plants in operation*
- 3) Increase drinking water supply*
- 4) Meet or exceed current and future state and federal drinking water quality requirements*
- 5) Provide drinking water that meets and exceeds federal and state drinking water requirements*
- 6) Completely eradicate giant reed infestation along the Mill Creek and revegetate the affected area with native plants*

III. Project Performance Measures Table

Table 5
Example Performance Indicators for Beneficial Use Improvement and Protection
Mill Creek Integrated Regional Water Management Implementation Project

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
Improve water supply reliability	1. Reduce source water impairment 2. Expand and increase the efficiency of water treatment plants in operation 3. Increase drinking water supply	1. Number of intakes relocated and capacity for conveyance to treatment facilities 2. Improvement in water quality due to intake relocation 3. Capacity of new groundwater well	1. Water quality improvement creating incremental efficiency in water treatment facilities 2. Increase in new local water supply that does not impact other beneficial uses	1. DWR – Cal. Water Plan– 2005 http://www.waterplan.water.ca.gov/cwpu2005/ 2. DWR – Bulletin 16098 http://rubicon.water.ca.gov/pdfs/b160cont.html#v2	Increase the water supply reliability by 100% over the next 10 years
Improve delivered water quality	Meet or exceed current and future state and federal drinking water quality requirements	1. Measure of source water quality improvement	30% increase in improvement of drinking water quality delivered to residents	1. DHS, Drinking Water Program http://www.dhs.ca.gov/ps/ddwem/technical/certification/devices.html 2. USEPA Treatment Technology http://www.epa.gov/ogwdw/standard/pp/treatpp.html	1. Meet current state and federal drinking water quality requirements by 2008 2. Achieve goals of the Long Term 2 Enhanced Surface Water Treatment Rule and the Partnership for Safe Water by achieving a combined filter water turbidity less than 0.1 NTU, 95 percent of the time.
Improve water quality for public health and safety protection	Provide drinking water that meets and exceeds federal and state drinking water requirements	No. of compliance inspections conducted by the local inspectors	Increasing percentage of water treatment facilities meeting and exceeding the drinking water standard requirements	1. DHS, Drinking Water Program http://www.dhs.ca.gov/ps/ddwem/technical/certification/devices.html 2. USEPA standards http://www.epa.gov/safewater/	1. 100% of the operating water treatment facilities getting DHS certification 2. Meet all primary and secondary drinking water standards over the next 10 years
Environmental restoration, and enhancement	Completely eradicate giant reed infestation along the Mill Creek and revegetate the effected area with native plants	1. No. of landowners granting access permission; 2. No. of volunteers participating in giant reed removal. 3. Acres of giant reed removed	Increase in water supply for environmental enhancement and the City of Mill Creek	Russian River <i>Arundo</i> Eradication Manual	100% eradication of giant reed from the Mill Creek watershed area

Attachment 6

WEBSITES FOR PERFORMANCE MEASUREMENT INFORMATION

(Many of the web resources are applicable to multiple activity categories)

PROJECT PLANNING, RESEARCH, MONITORING, AND ASSESSMENT (many of these resources also apply to BMP implementation or habitat restoration effectiveness monitoring)

<http://cwam.ucdavis.edu/>

<http://www.waterboards.ca.gov/nps/volunteer.html>

<http://www.waterboards.ca.gov/swamp/qapp.html>

<http://www.epa.gov/watertrain>

http://www.dfg.ca.gov/cabw/csbp_2003.pdf

<http://www.wrmp.org/cram.html>

<http://www.calfish.org/DesktopDefault.aspx?tabId=112>

http://www.cnr.berkeley.edu/forestry/comp_proj/DFG/Monitoring%20the%20Implementation%20and%20Effectiveness%20of%20Fisheries.pdf

<http://mpsl.mlml.calstate.edu/swcompare.htm>

EDUCATION AND OUTREACH

http://www.michigan.gov/deq/0,1607,%207-135-3313_3682_3714-75944--,00.html

http://cecommerce.uwex.edu/pdfs/G3658_10.PDF

HABITAT RESTORATION

<http://www.dfg.ca.gov/nafwb/manual.html>

<http://www.dfg.ca.gov/nafwb/pubs.html>

http://www.dfg.ca.gov/hcpb/species/stds_gdl/survmonitr.shtml

<http://www.epa.gov/watertrain/restor.html>

<http://www.waterboards.ca.gov/sanfranciscobay/Agenda/04-16-03/Stream%20Protection%20Circular.pdf>

<http://water.usgs.gov/nawqa/protocols/OFR-93-408/habit1.html>

<http://www.epa.gov/watertrain/river/>

LOAD REDUCTION

<http://it.tetrattech-ffx.com/step1/>

<http://www.sfei.org/watersheds/reports/GuadalupeYear1final.pdf>

<http://www.sccwrp.org/pubs/annrpt/96/ar-04.htm>

BENEFICIAL USE IMPROVEMENT AND PROTECTION

<http://www.dhs.ca.gov/ps/ddwem/technical/certification/devices.html>

<http://www.dhs.ca.gov/ps/ddwem/publications/waterrecycling/index.htm>

http://www.swrcb.ca.gov/html/recycling_index.html

http://www.publicaffairs.water.ca.gov/newsreleases/2005/01-10-05flood_warnings.pdf

http://www.water.ca.gov/nav.cfm?topic=Public_Safety

<http://www.waterplan.water.ca.gov/cwpu2005/>

<http://www.epa.gov/ogwdw/standard/pp/treatpp.html>

<http://www.epa.gov/safewater/>

Attachment 7

MISCELLANEOUS REFERENCES

http://www.ksg.harvard.edu/visions/performance_management/selected_readings.htm

<http://www.sfei.org/watersheds/reports/GuadalupeYear1final.pdf>

<http://www.sccwrp.org/pubs/annrpt/96/ar-04.htm>

http://www.cwp.org/stream_restoration.pdf

<http://www.cbrc.org/2003speakerpapers/Munoz%20and%20Aguiar%5B1%5D.v1%20for%20web%20site.pdf>

<http://www.on.ec.gc.ca/solec/indicators2000-e.html>

<http://www.valleywater.org/WMI/index.shtm>

http://science.calwater.ca.gov/sci_tools/project_perf_eval.shtml

<http://mpsl.mlml.calstate.edu/swdwnlds.htm>

http://www.swrcb.ca.gov/swamp/docs/wqindicators_considerations.doc

<http://www.napaflooddistrict.org/Flood.asp?LID=535>

<http://rubicon.water.ca.gov/b160index.html>