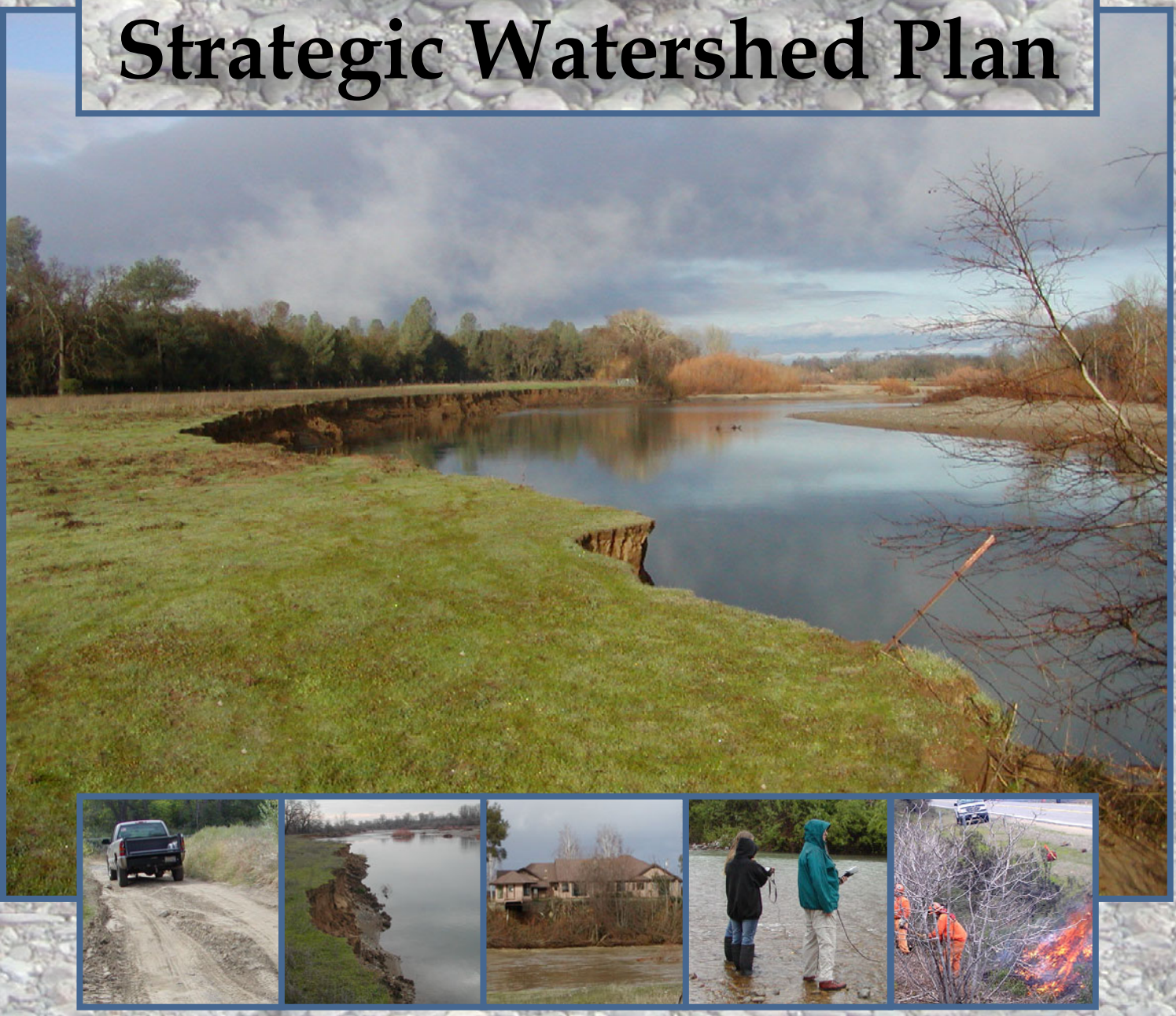
Cottonwood Creek Strategic Watershed Plan



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Cottonwood Creek Strategic Watershed Plan

Prepared for

Cottonwood Creek Watershed Group

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Acronyms and Abbreviations

AFRP	Anadromous Fishery Restoration Program
CCWG	Cottonwood Creek Watershed Group
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CRMP	Coordinated Resource Management Plan
GIS	Geographic Information System
Group	Cottonwood Creek Watershed Group
RPD	Redding Police Department
Strategic Plan	Cottonwood Creek Strategic Watershed Plan
TAC	Technical Advisory Committee
USFS	U.S. Forest Service
WMP	Watershed Management Plan

SECTION 1.0

Introduction

This Cottonwood Creek Strategic Watershed Plan (Strategic Plan) was completed under the direction of the Cottonwood Creek Watershed Group (CCWG or Group) through a process of stakeholder meetings designed to arrive at a consensus about the desired conditions in the Cottonwood Creek watershed. This Strategic Plan will form the foundation for a comprehensive Watershed Management Plan (WMP) that will ultimately provide a rational, science-based approach to cooperatively managing the watershed using input from a diverse set of stakeholders.

This document creates an operating framework that will give direction to subsequent management efforts, including the upcoming WMP. A series of meetings and workshops have allowed landowners, resource agency personnel, and other concerned citizens to have a voice in determining strategies that the CCWG will adopt. This document briefly describes the conclusions that were reached during this workshop process, the immediate actions that will be taken by the Group, and the long-term goals set for the watershed.

1.1 History and Location

The CCWG was formed in 1999, and is organized under the California Non-profit Public Benefit Corporation Laws of California exclusively for public, scientific, educational, and charitable purposes within the meaning of Section 501(c)(3) of the Internal Revenue Code. The purpose of the CCWG, as described in its mission statement, is to "preserve the environment, private property and water rights and economic resources of Cottonwood Creek watershed through responsible stewardship, liaison, cooperation and education." The CCWG is directed by a board of five to seven members, selected from landowners within the watershed. Table 1 provides a list of watershed characteristics.

TABLE 1
Cottonwood Creek Watershed Characteristics
Cottonwood Creek Strategic Watershed Plan

Characteristic	Value
Cottonwood Creek Annual Runoff	586,000 acre-feet
Watershed Area	938 square miles
Cottonwood Creek Stream Length	68 miles
Headwater Elevation	7,860 feet
Mean Discharge	860 cubic feet per second
10-year Flood	50,000 cubic feet per second
100-year Flood	93,000 cubic feet per second
Mean Precipitation	36 inches

The Cottonwood Creek drainage area lies within Shasta and Tehama Counties on the northwest side of the Sacramento Valley. The lower two-thirds of the drainage area lie in the Central Valley uplands, and the upstream portion includes the east slope of the North Coast Mountain Range and Klamath Mountains, and the southern slopes of the Trinity Mountains. Cottonwood Creek flows eastward, in general, through the valley to the Sacramento River. With an annual runoff of 586,000 acre-feet, Cottonwood Creek, covering 938 square miles, is the third largest watershed tributary west of the Sacramento River, and the largest undammed watershed in the Sacramento Valley. The community of Cottonwood is the most developed area in the watershed, but several large-scale housing developments (including Lake California, Del Webb, and Holiday Ranch) are planned for the near future. Projections suggest the lower watershed population could more than double.

The watershed has a large amount of open space and provides habitats for a wide array of species, including notable threatened and endangered species such as northern spotted owl (*Strix occidentalis)* and spring-run Chinook salmon (*Oncorhynchus tshawytscha*). Several important features distinguish the Cottonwood Creek watershed from others in the valley. Watershed runoff is flashy: high in the rainy seasons and low in the dry seasons. This pattern is particularly pronounced in Cottonwood Creek because, typically, a small amount of snow pack is in the upper reaches of the watershed with very little recharge to aquifers in the upper watershed, which reduces the potential for intra-annual storage.

In the early 1970s, the U.S. Army Corp of Engineers produced a draft general design memorandum for the construction of two dams and reservoirs on each of the mainstems of Cottonwood Creek and South Fork. This project was proposed under the federal Flood Control Act of 1970, to assist flood control, supply water to the State Water Project annually, enhance fishery use, and provide potential hydropower generation. The project mainly focused on the two potential candidates: Dutch Gulch and Tehama Reservoirs. As a result of this proposed project, water quality research was initiated. Historically, human impacts on Cottonwood Creek began in the 1850s, with gold mining operations. The gold mining in placer deposits on Cottonwood Creek commonly used dredge, hydraulic, and ground-sluicing techniques that undoubtedly resulted in the discharge of sediment to the stream. Over the past 150 years, these mining effects have healed, with the possible exception of residual mercury wastes locked up in the tailings of historical mining sites.

Today, Cottonwood Creek watershed is a working watershed with large tracts of harvestable timber in the upper reaches, grazing land in the middle reaches, and gravel mining operations in the lower reaches. This Strategic Plan discusses this combination of factors that create numerous challenges and opportunities for future watershed management.

1.2 Workshop Discussion Topics

A first round of workshops was held in June and July 2004. One workshop was held for each resource area identified in the CALFED grant application. The summary that follows documents the stakeholder input that was received as a result of these workshops.

1. Aquatic Habitat

   The Aquatic Habitat workshop included discussions of fish, frog, and water quality monitoring. Other topics included bank erosion, trespass, fish system modeling, and riparian mapping. Some landowners expressed frustration with trespassers and illegal off-roading. Erosion and bank stabilization were briefly discussed, but stakeholders decided to continue the dialogue at the Erosion and Flooding meeting. The following recommendations were made:

   a. Improve communications with regulatory agencies in Sacramento.

   b. Address illegal off-road motorized vehicle use and trespass issues in the watershed by adding signs, increasing public education and awareness, contacting elected officials, and limiting access at known entry points.

   c. Establish baseline water quality monitoring.

   d. Establish baseline fish monitoring.

   e. Establish baseline frog monitoring.

   f. Determine current regulations for in-stream gravel mining for Shasta and Tehama Counties.

   g. Determine restricting conditions for all fish species in the watershed.

   h. Create a general fishery systems model.

   i. Perform riparian mapping of the watershed.

2. Erosion and Flooding

   The Erosion and Flooding workshop included discussion of topics ranging from trespass to erosion. Some landowners expressed concerns about motorized vehicles driving on the dry creek bed. Others mentioned that trespass in the creek offers access for theft of private property. The appropriate courses of action to control erosion in the watershed, particularly in the lower watershed, was discussed in depth. Some participants preferred a proactive solution of adaptive management including stream alteration and bank stabilization in heavily eroded areas. This approach would use both aggregate materials and replanting techniques to reinforce eroding banks. Some participants felt that the adaptive management approach was not the best solution and might add to the problem. The Group recommended further investigation of the adaptive management process.

   Other erosion considerations included the added sediment load from landslides in the watershed. Landslide zones add significant amounts of mud and sediment to Cottonwood Creek during heavy rainfall runoff periods. Abandoned roads in the upper watershed that have not been rehabilitated or stabilized can also add significantly to erosion and sedimentation. A road inventory and analysis should be completed to identify problem areas and roads so that they can be replanted and stabilized.

3. Rangeland and Timber

   The Rangeland and Timber workshop included discussion of landowner concerns about grazing, private tree cutting rights, and prescribed burn plans. Many of the attendees were concerned about implementation of prescribed burns. The urban interface and increased use of public forests by recreational off-roaders was discusses at length. California Department of Forestry and Fire Protection (CDF) officials suggested that CCWG could play an important role in the outreach and education of landowners in the watershed concerning fire safety and creation of safe zones. The Group recommended investigating the use of goats or sheep as a means of fuel reduction.

4. Terrestrial and Riparian Habitat

   The Terrestrial and Riparian Habitat workshop topics included noxious weeds, endangered and threatened species, and riparian mapping considerations. Key Group recommendations included the following:

   a. Implement a watershed fire management plan

   b. Encourage healthy riparian habitat stewardship through outreach education

   c. Map riparian areas

   d. Create a list of native flora and fauna with their general habitat locations identified within the watershed

5. Water Quality and Groundwater

   The Water Quality and Groundwater workshop began with landowners expressing concerns about the lack of water quality monitoring in the watershed. Some surface-water and groundwater quality data were included in the Cottonwood Creek Watershed Assessment, but funding for most monitoring has been reduced. The topic of agricultural discharge permits was discussed, as well as CCWG's role in assisting landowners with discharge requirements. Some stakeholders expressed interest in assessing the impact of planned large-scale developments within the watershed on water quality and quantity, both surface water and groundwater. The Group recommended pursuing a water quality monitoring program that complements the Agricultural Waiver Monitoring Program.

The Strategic Plan's approach changed after review of the comments, conclusions, and recommendations from the initial workshops. Significant overlap exists among the concerns raised at each of the resource area workshops, and strategic themes emerged. Therefore, the resource issues identified in the CALFED grant were redefined as Strategic Areas for further discussion. A second round of workshops was used to better define and set goals for each of these Strategic Areas within the Cottonwood Creek watershed. Table 2 presents a summary of the overlap among the discussion subjects raised at the workshops held for each resource issue. The minutes from each of the workshops is included in Appendix A.

The CCWG has evaluated all of the recommendations developed during preparation of this Strategic Plan. Some of the recommendations have been fully endorsed by the CCWG Board of Directors and are being implemented through various efforts. However, some of the

workshop recommendations made by participants have not been fully endorsed, and are subject to further study with the intent of further developing the recommendations. After the study phase, recommendations worthy of further consideration would be presented to stakeholders for review and comment. As appropriate, recommendations would then be implemented through action taken or advocated by the CCWG.

TABLE 2
Matrix of Recommendation/Discussion Subjects and Resource Issue Workshops
Cottonwood Creek Strategic Watershed Plan

	Resource Issues				
Strategic Areas	**Aquatic Habitat**	**Erosion and Flooding**	**Rangeland and Timber**	**Terrestrial and Riparian Habitat**	**Water Quality and Groundwater**
Fuel Reduction and Vegetation Management	•		•	•	
Inventory and Mapping	•		•	•	•
Outreach and Education	•	•	•	•	•
Management Plan Development	•	•	•	•	
Monitoring and Modeling	•				•

SECTION 2.0

Strategic Area 1: Fuel Reduction and Vegetation Management

Fuel reduction and vegetation management were discussed in three of the five issue-area workshops. The recommendations adopted by the CCWG resulting from the first round of workshops are discussed in detail following the summary below.

The Rangeland and Timber workshop focused most heavily on fuel reduction and vegetation management. It was noted that any action-oriented objectives set by CCWG, such as fuel reduction and vegetation management plan implementation, must be supported by a base of information about resources in the watershed and their locations. Without inventories of watershed resources, it will be difficult for CCWG to recommend how best to manage resources.

The CCWG, together with CDF, U.S. Forest Service (USFS), Bureau of Land Management, and local timber companies, could play a large role in fire prevention and safety by creating safe zones and educating landowners in the watershed area about ways to help minimize fire hazard.

2.1 Workshop Summaries

Concerns about fire prevention and safety were discussed in the Rangeland and Timber workshop. New problems that increase fire hazard, such as small-size developments, the increasing number of recreational vehicles available for off-roading, and the urban interface pushing deeper into the forest, are increasingly important topics.

Participants feel strongly about bringing forest fuels into balance by vegetation management, using prescribed burning programs or grazing. This also would reduce the concern of decadent brush acreage.

Participants introduced the concept of increasing water retention in the watershed (referred to in the workshop as a "sponge factor"). The intent was to increase basin retention of rainfall within the watershed, thereby reducing peak flood flows for a given rainfall event. To increase basin retention, rangeland management measures including riparian vegetation restoration/enhancement, watershed drainage restoration/enhancement, range planting, and livestock fencing upgrades could be implemented. These measures would act to increase interception and reduce runoff, allowing greater infiltration and less erosion.

Adequate information is available on the current types of vegetation; however, the information necessary to characterize historical vegetation within the watershed is limited. Additional studies would assist land management decisions.

The relationship between native vegetation and exotic, invasive, and noxious plants was acknowledged in the rangeland and timber watershed areas; however, this issue was not addressed in the Terrestrial and Riparian Habitat workshop.

2.2 Workshop Recommendations Adopted by Cottonwood Creek Watershed Group

Table 3 outlines recommendations from the various workshops, and includes a status of the recommendations. A detailed discussion of each of the recommendations follows.

TABLE 3
Fuel Reduction and Vegetation Management Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Consider grazing as a tool for fuels reduction	Rangeland and Timber workshop	Sunflower Coordinated Resource Management Plan (CRMP) initiating grazing-based effort
Pursue vegetation management through prescribed burning program	Rangeland and Timber workshop	CCWG advocating prescribed burn projects in conjunction with CDF and USFS
Bring forest fuels into balance	Rangeland and Timber workshop	CCWG to act as clearinghouse for forest management efforts in watershed
Eliminate or reverse fire suppression trends by implementing a watershed fire management plan	Terrestrial and Vegetation Management workshop	Management plan completed, currently being implemented

2.2.1 Consider Grazing as a Tool for Fuels Reduction

According to workshop participants, previous attempts at grazing as a form of fuel reduction have been met with limited success. Animals used for fuels reduction were lost to predation. The CCWG is currently participating in a new project that would use grazing to reduce fuels. The Sunflower CRMP received a grant to purchase approximately 1,000 sheep and goats that will be used to reduce fuels. The CCWG is partnering with Sunflower CRMP to determine the effectiveness of this option on a portion of land that is directly adjacent to the Cottonwood Creek watershed.

2.2.2 Pursue Vegetation Management through Prescribed Burning Programs

The CCWG currently advocates numerous prescribed burning projects, in conjunction with various fire–suppression agencies, including CDF and USFS. These projects will continue as part of the overall fuel management goals of the CCWG. The CCWG is ready to help landowners in the watershed implement prescribed burns in accordance with the fuels management plan. The CCWG will not be the final arbiter of the prescribed burn locations, but might propose specific projects as needed.

2.2.3 Act as a Clearinghouse for Forest Management in the Watershed

Workshop participants recommended that CCWG help bring forest fuels into balance. The CCWG determined that the technical implications of this request are unclear, and might be impossible to define. For example, one person's definition of "balance" in a coniferous forest might contradict another's definition of balance, or even of what constitutes a coniferous forest. The CCWG prefers not to impose a version of "balance" on landowners or land management agencies, but would prefer rather to monitor and share forest management experience within the watershed. The CCWG can thus help bring forest fuels into balance by acting as a clearinghouse for information about forest fuels management. Information on studies, experiments, and practical experience could be kept by CCWG. The CCWG would conduct outreach to stakeholders and watershed users to disseminate information and to solicit information about ongoing projects.

2.2.4 Eliminate or Reverse Fire Suppression Trends by Implementing a Watershed Fire Management Plan

Workshop participants identified the need for vegetation management in the watershed. Star-thistle (*Centaurea solstitialis L.*), Medusa head (*Taeniatherum caputmedusae L.*), and Klamath weed (*Hypericum perforatum L.*) are all noxious weeds of particular concern in the watershed. Some landowners inadvertently create noxious weed problems by planting species that are invasive and negatively impact habitat for native species. A vegetation management plan would include prescribed burning programs and/or grazing management programs that would educate and improve and/or restore habitat. Other vegetation management strategies should include an Arundo (*Arundo donax L.*) abatement plan when funding becomes available.

A fire management plan for Cottonwood Creek titled *Cottonwood Creek Watershed Strategic Fuels Reduction and Management Plan* is being implemented by the CCWG. The fire management plan is available at CCWG's Web site. The CCWG has implemented the fire management plan on portions of Highway 36 near the USFS boundary and in the Cottonwood Creek Wilds area. The CCWG is currently pursuing funding to continue implementation of the fire management plan, specific projects for fuels reduction at R-Ranch, and biomass reduction at Bowman Road.

The CCWG has received funds for the Hammer Loop fuel break that lies in the South Fork drainage, just across the watershed boundary from the Sunflower Gulch. This will tie the two projects together and proceed into the Shasta-Trinity National Forest. The CCWG also funded the purchase of a water tank to provide 5,000 gallons of water for the purpose of fire suppression in the Quail Ridge Subdivision.

2.3 Potential Recommendations Still under Consideration

The following recommendations were identified during the preparation of this Strategic Plan, and CCWG is evaluating these recommendations further:

- Contact CDF concerning the two programs established to provide cost-sharing technical assistance and educational programs for timberland owners. These two programs include the California Forestry Improvement Program and the Chaparral Management

Program. It might also be possible to contact Natural Resources Conservation Service about EQIP and other funding for this type of land management. The California Forestry Improvement Program provides landowners with funds for reforestation, erosion control, and wildlife habitat and timber stand improvement. The Chaparral Management Program is a cost-sharing program between private landowners and the CDF for using prescribed burning for vegetation management. The USFS also sponsors resource plans that should be explored for the watershed area.

- With assistance from the University of California - Davis Cooperative Extension Rangeland Monitoring Program, evaluate the effects of various grazing strategies on propagation of native vegetation.
- Assess status and trends of native oak woodlands, particularly blue oak woodlands in the middle and lower watershed. The Tehama County Hardwood Committee has established guidelines for oak harvesting and management within the watershed. Their goal is to educate the public and landowners on the ordinances and guidelines set forth by the committee and Tehama County.
- Establish a comprehensive rangeland management plan.
- Create a database of information on forest fuels. Start outreach to landowners and Technical Advisory Committee (TAC) to share the information in the database and also to find more information to add to the database. The database's purpose will be to share forest management experience within the watershed.

2.4 Status of Workshop Recommendations

Table 4 outlines the status of all recommendations relating to fuel reduction and vegetation management that were collected during the workshops. Recommendations have been assessed according to whether they are undergoing further technical, administrative, or policy study; are the subject of outreach to affected parties; or are currently being implemented through action by the CCWG.

TABLE 4
Status of Fuel Reduction and Vegetation Management Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Consider grazing as a tool for fuels reduction and fire break maintenance	Provide anecdotal information of historical grazing in the watershed	Discuss at Water Management Strategy workshops; newsletter	Facilitating Sunflower CRMP grazing program
Pursue vegetation (brush primarily) management through prescribed burning programs	Fire management plan	Coordinate with local landowners	Ongoing
Eliminate or reverse fire suppression trends by implementing a watershed fire management plan	Fire management plan completed	Coordinate with local landowners	Ongoing
Bring forest fuels into balance (TAC)	Create an information clearinghouse	Direct outreach to landowners and TAC	Create/update database

TABLE 4
Status of Fuel Reduction and Vegetation Management Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Develop rangeland management plan for watershed that includes helpful landowner guide to grazing issues, noxious weed identification and eradication, and fencing criteria	In progress	In progress	Future action to be determined
With assistance of the University of California - Davis Cooperative Extension Rangeland Monitoring Program, evaluate the effects of various grazing strategies on propagation of native vegetation	In progress	In progress	Future action to be determined
Assess status and trends of native oak woodlands, particularly blue oak woodlands in the middle and lower watershed	In progress	In progress	Future action to be determined

SECTION 3.0

Strategic Area 2: Inventory and Mapping

Inventory and mapping were discussed in four of the five issue-area workshops. Recommendations involving inventory and mapping resulted from the Aquatic Habitat workshop and the Terrestrial and Riparian Habitat workshop. The recommendations resulting from the first round of workshops are discussed in detail following the summary below.

3.1 Workshop Summaries

The Terrestrial and Riparian Habitat workshop discussion focused most heavily focused on inventory and mapping. It was noted that any action-oriented objectives set by CCWG, such as management plan implementation or outreach activities, must be supported by a base of information about resources in the watershed and their locations. Without inventories of watershed resources, it will be difficult for CCWG to establish how to manage resources.

Inventory and mapping issues were also discussed in other workshops, although they did not result in specific recommendations. These discussions centered on lack of inventory information for the following topics:

- Gravel sources and replenishment rates
- Grazing practices in the watershed
- Critical versus suitable habitat
- Oak woodland habitat

It is anticipated that additional needs for inventories and mapping will be identified through the development of the WMP and other studies, plans, and projects.

3.2 Workshop Recommendations Adopted by Cottonwood Creek Watershed Group

Table 5 outlines recommendations from the various workshops, and includes a status of the recommendations. A detailed discussion of each of the recommendations follows.

TABLE 5
Inventory and Mapping Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Map riparian areas	Aquatic Habitat and Terrestrial and Riparian Habitat workshops	The CCWG will develop protocols for mapping riparian areas and will act as a clearinghouse for riparian mapping information in the watershed
Create a list of native species in the watershed	Terrestrial and Vegetation Management workshop	A draft list of native species has been completed and is currently undergoing review by the CCWG and TAC

3.2.1 Map Riparian Areas

Maintaining healthy riparian vegetation is beneficial to landowners for several reasons. Well-managed riparian areas buffer the destructive impacts of floods and droughts, especially when landowners combine their efforts on a watershed basis. Well-managed riparian areas represent good stewardship of shared resources such as water, fish, and wildlife. Healthy riparian areas also add value to ranches through enhanced water quality, habitat, and wildlife. However, the current status of riparian habitat in the watershed is largely unknown. Improved mapping would facilitate better management in the future.

Workshop participants identified at least two reasons why riparian mapping is important to watershed management. First, it is important to know where riparian areas occur and what condition they are in, because the condition of riparian areas influences many aspects of aquatic and terrestrial habitat. For example, information about riparian health might be important in interpreting resource data, such as fish monitoring, and putting it in context.

Secondly, it is important for CCWG to identify what its objectives are and what riparian conditions should be achieved. Stakeholder education was identified as a way to encourage better riparian habitat stewardship. Promoting practices such as grazing management that considers riparian areas, culvert maintenance, and wildlife-friendly fencing can improve/ restore riparian habitat.

The technical aspects of a riparian mapping program need to be determined. Areas requiring additional information include types of riparian habitat to be modeled, areas of concern within the watershed, scope of mapping effort, and overall monitoring plan for assessing riparian condition over time. The Group needs to reach consensus concerning what type and to what extent riparian mapping needs to be accomplished.

Riparian mapping in the Cottonwood Creek watershed would be an ambitious undertaking, given the size and complexity of the watershed. There is consensus that riparian mapping, in some form, needs to be performed before moving forward with certain aspects of vegetation management and outreach. Some participants have expressed concern that detailed riparian mapping for informational purposes might be overreaching and overly ambitious, perhaps even impossible given financial constraints. At a minimum, the mapping effort should include location and extent of invasive species and identification of areas with accelerated erosion.

The CCWG has decided to restrict the scope of recommended riparian mapping efforts to selected areas. The areas mapped would be targeted to those where landowners are agreeable, and other related projects – such as erosion control – are forthcoming. The CCWG would help map riparian areas where landowners have decided to prioritize riparian management or conservation. The CCWG would help facilitate riparian mapping by providing the technical information needed to map those areas and act as a clearinghouse, storing information on how to map riparian areas and keeping the results of past mapping. The CCWG would also conduct outreach to stakeholders to provide education about riparian areas and encourage riparian mapping.

3.2.2 Create a List of Native Species in the Watershed

The Terrestrial and Riparian Habitat workshop participants noted that native habitat needs to be defined before it can be restored. For this reason, a list and description of native watershed species needs to be developed. Defining and mapping native habitat has been a concern because critical habitat is sometimes confused with suitable habitat, particularly in the context of endangered species management. Another concern is the unofficial, unpublished notes and sightings of various species (mostly by resource agency employees) that would provide valuable information on habitat. Because the Cottonwood Creek Watershed Assessment only included published data, this information was not documented. The Cottonwood Creek Watershed Assessment included Wildlife Habitat Relationships habitat information, but did not include habitat information by the guild approach. This approach can also be used to identify habitat.

A habitat guild is a group of species that have similar habitat requirements, use resources in a similar way, and respond in a similar way to changes in their environment. Guild members have similar functions within ecosystems. For example, a species guild is a group of species defined by their role within the ecosystem. The guild approach is used to simplify the structure and dynamics of complex ecosystems, and could be used to list native species in a useful way according to their function in the ecosystem.

Identifying habitat that is associated with native species would also be beneficial in planning the location and timing of prescribed burns that benefit, not harm, certain species.

The CCWG has started developing a list of native species that are found within the Cottonwood Creek watershed. The list will include pictures and some descriptive information on each of the species. This list could become a useful tool for conducting outreach to local schools, community groups, and the public.

3.3 Potential Recommendations Still under Consideration

The following recommendations were identified during the preparation of this Strategic Plan, and CCWG is currently evaluating these recommendations further:

- Determine what kind of riparian mapping should be conducted and set the priorities for riparian habitat mapping. Mapping should include a percentage of streambank vegetation, specific existing terrestrial and riparian habitat, and problem areas (i.e., areas with erosion and lacking vegetation and habitat).
- Gather all available data sets, Geographic Information System (GIS) layers, Digital Elevation Models, and air photos.
- Identify priority areas in the watershed.
- Obtain/develop a list and descriptions of specific habitat types in the watershed.

3.4 Status of Workshop Recommendations

Table 6 outlines the status of all recommendations relating to inventory and mapping that were collected during the workshops. Recommendations are assessed according to whether

they are undergoing further technical, administrative, or policy study; are the subject of outreach to affected parties; or are currently being implemented through action by the CCWG.

TABLE 6
Status of Inventory and Mapping Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Map riparian areas	The CCWG maintains a GIS database. Vegetative, river, and soils layers exist for Cottonwood Creek and are available on the CCWG Web site. Digital Elevation Models for the watershed have been downloaded and stored. Air photos taken of the watershed have been scanned but not Georeferenced.	The photos, both hardcopy and those scanned onto discs, are available.	Resources have been used by the local California Department of Fish and Game (CDFG).
Create a list of native species in the watershed	A preliminary list is underway and under review.	In progress.	Future action to be determined.

SECTION 4.0

Strategic Area 3: Outreach and Education

Outreach and education were discussed in all five issue-area workshops. Landowners and resource agency members expressed the desire for continued and improved outreach and education to the following three main sectors: watershed landowners, regulatory agencies, and the general public. Several recommendations resulting from the first round of workshops are discussed in detail following the summary below.

4.1 Workshop Summaries

The role that CCWG plays in education and outreach programs concerning fire prevention and fire safety was discussed in the Rangeland and Timber workshop. New problems that increase the fire hazard, such as small-size developments, the increasing number of recreational vehicles sold for off-roading, and the urban interface pushing deeper into the forest, are increasingly important topics of outreach and education.

The Riparian and Terrestrial Habitat workshop discussed landowner education regarding species, habitats, and actions that could affect them. Workshop participants discussed ways to improve communication about habitat to landowners, including grazing practices, culvert maintenance, and wildlife-friendly fencing.

Although it is important to gather information about watershed resources, it is equally important to make that information available to landowners. Public education is essential to managing the watershed. Stakeholder education was also recommended as a way to encourage riparian habitat. However, mention was made about the importance of identifying what CCWG is trying to accomplish and what riparian conditions should be achieved. This is an important step before outreach can begin. The CCWG is generally in favor of riparian habitat building. Landowners are currently focusing on eroding streambanks. The CCWG will continue to work toward educating landowners on the benefits of riparian habitat building for prevention of streambank erosion.

Educating landowners about certain species and their effects on the watershed is also necessary. Some landowners inadvertently create noxious weed problems by planting species that are invasive, which negatively impacts habitat for native species. Workshop participants also discussed the role that CCWG could have in organizing volunteers and landowners for riparian area projects.

The newly constructed Web site will facilitate information dissemination from the CCWG office, and serve as a means for landowners to provide information about their part of the watershed to the CCWG office. For example, information about noxious weeds on the Web site could help landowners identify them. Landowners could then contribute to a comprehensive invasive weed mapping effort by reporting, via the Web site, where noxious weeds are located on and around their land.

The Water Quality and Groundwater workshop briefly discussed outreach from the perspective of landowners' acceptance of the Strategic Plan. There is concern that if the Strategic Plan were constructed without the participation of stakeholders, then acceptance would be limited.

4.2 Workshop Recommendations Adopted by Cottonwood Creek Watershed Group

Table 7 outlines recommendations from the various workshops, and includes a status of the recommendations. A detailed discussion of each of the recommendations follows.

TABLE 7
Outreach and Education Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Watershed resident and landowner outreach	Aquatic Habitat recommendation	Ongoing efforts. The CCWG might develop a specific outreach plan using the CDFG outreach plan for Cantara Loop Spill.
General public outreach	Terrestrial and Riparian Habitat recommendation	Ongoing efforts. The CCWG might develop a specific outreach plan using the CDFG outreach plan for Cantara Loop Spill.
Regulatory agencies outreach	Terrestrial and Vegetation Management workshop	Ongoing efforts. The CCWG might develop a specific outreach plan using the CDFG outreach plan for Cantara Loop Spill.
Increase public awareness of trespass	Aquatic Habitat recommendation	Ongoing efforts. The CCWG might promote trespass awareness through signage, barriers, education, and enforcement. Public education can be taught at local schools. The CCWG can function as a point of contact for reporting areas with trespass problems and can keep information about possible solutions to trespass.
Participate in land use planning efforts	Terrestrial and Riparian Habitat recommendation	The CCWG is to participate in watershed land use planning efforts.
Continue watershed education in local schools	Water Quality and Groundwater Recommendation	The CCWG will continue to work closely with local schools.

4.2.1 Watershed Resident and Landowner Outreach

Communication between watershed landowners and the CCWG Coordinator is imperative. However, the level of communication that occurs between watershed residents and the CCWG office is restricted by CCWG financial and administrative time constraints, the size of the watershed, and the limited time that landowners have to attend meetings. The newly constructed Web site will facilitate information dissemination from the CCWG office, and

serve as a means for landowners to provide information about their part of the watershed to the CCWG office. Where education about improving habitat or watershed resources is concerned, it is important that CCWG establishes the objectives before outreach can begin.

4.2.2 General Public Outreach

A large portion of the land in the Cottonwood Creek watershed is privately owned. For this reason, less information about watershed land and resources is available to the public than would be available if most of the land were federally owned public land. Trespass with motorized vehicles is detrimental to riparian areas, aquatic habitat, and streambeds. The need to create awareness about trespass on private land in riparian areas and in the streambed is important in sustaining the creek's resources.

4.2.3 Regulatory Agencies Outreach

Various stakeholders expressed concern that communication among CCWG, other stakeholders, and regulatory agencies needed to be improved. In some cases, activities that benefit the watershed economically are in conflict with regulatory agency goals, and cooperation between parties is needed to find a solution. In other cases, stakeholders feel that they receive conflicting advice or instructions from different agencies. Communication and cooperation with regulatory and resource agencies is also important in providing CCWG with guidance on resource management and the opportunity for CCWG to participate in management forums that directly or indirectly affect the watershed. Resource agencies might not agree that current levels of communication are problematic.

4.2.4 Increase Public Awareness of Trespass

At the first round of workshops, concerns and anecdotal information regarding trespass on private land that is adjacent to the creek were discussed. Often, trespassers are recreational users of off-road recreational vehicles and pickup trucks. Evergreen Road Bridge, Farquhar Road, the Benson-Pine Creek area, and Eighmy Road have been identified as access points used heavily by trespassers with off-road vehicles. Although workshop participants agreed that trespass needed to be addressed, concern was expressed that aggressive suppression such as tire spiking would lead to an "us versus them" mentality and possibly make the situation worse.

The CCWG was donated K-rail (concrete barriers often used in highway construction to close off or partition sections of road), and placed it at Evergreen Road Bridge in September 2004. A gate is also planned at this location. Gates are also needed at the Farquhar Road location; however, the funding for this effort has not been secured.

A suggestion was made to contact the Redding Police Department (RPD) for information on the methods it used to discourage recreational off-road use of the wetlands near Highway 44 and Airport Road in Redding. The following information is from personal communication with Officer Cochrane of RPD (August 30, 2004). Because the wetlands contained fairy shrimp (a listed species), RPD was able to work in conjunction with CDFG. Although CDFG provided some enforcement, RPD provided most of the enforcement.

Officer Cochrane's activities to discourage disturbance of the wetlands included the following:

- Signage
- Public service announcements on local radio stations
- Posters at local motorcycle shops informing customers that motorized vehicle use in the wetlands is illegal
- Interviews on local television stations
- Flights over the area to determine where fencing and gates should be located
- Enforcement, including warnings, and subsequently, tickets

Officer Cochrane suggested that outside of the city limits, fencing and gates are needed to keep trespassers off private land. Signage alone is ineffective; public education is crucial to successfully protecting private land and the resources therein.

Trespass, including motorized vehicle use in the creek, can be viewed as an infringement on landowner rights. The CCWG will work to protect landowner rights. The CCWG can promote information about the process of preventing trespass, including signage, use of barriers, public education, and enforcement. The CCWG can hold stakeholder meetings, keep copies of signage for distribution to interested stakeholders, and put together a public education presentation that can be shown at local schools. The CCWG can also function as a point of contact for reporting areas with trespass problems and can keep information about possible solutions to trespass. Part of the outreach process could include working with a landowner to identify suitable public access areas.

4.2.5 Participate in Land Use Planning Efforts

Several of the workshops discussed the impact of the proposed large-scale residential development on groundwater in the watershed. Participants were uncertain of these impacts and desire to stay informed, through CCWG, about the development of the new residences and their impact on the groundwater resource.

The CCWG views large-scale residential development as indicating a need for more out-reach and education about local and regional planning. The CCWG can serve watershed landowners and the general public by acting as a clearinghouse for information about county and city planning departments. The CCWG would monitor planning activities within the watershed and inform interested stakeholders about current conditions and events. Updates and changes to general plans would also be monitored. Information on how to get involved or participate in the planning process would also be kept by CCWG for the benefit of stakeholders. By acting as a clearinghouse for information, CCWG can facilitate stakeholder participation in the planning process. By participating in the planning process, stakeholders can ensure that issues such as impacts to the watershed by development are addressed before projects are initiated.

4.2.6 Continue Watershed Education in Local Schools

The CCWG has actively participated in developing watershed education programs for local schools. Outreach to schools will remain an important tool for educating the local population on important resources in the watershed and fostering long-term stewardship of the watershed.

4.3 Potential Recommendations under Consideration

The following recommendations were identified during the preparation of this Strategic Plan, and CCWG is currently evaluating these recommendations further:

- Develop means to improve/increase outreach for fire prevention and safety.
- Define information regarding species, habitats, and the landowner actions that affect them.
- Develop riparian habitat management goals.
- Develop public outreach goals regarding invasive, exotic species and their effects on native species' habitat. Determine species of emphasis.
- Develop a CCWG Safe Harbor Agreement Handout.

4.4 Status of Workshop Recommendations

Table 8 outlines the status of all recommendations relating to outreach and education that were collected during the workshops. Recommendations are assessed according to whether they are undergoing further technical, administrative, or policy study; are the subject of outreach to affected parties; or are currently being implemented through action by CCWG.

TABLE 8
Status of Outreach and Education Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Communicate with regulatory agencies	CCWG communicates with agencies	Periodic TAC meetings	Ongoing
Use public agencies to participate in management forums	TAC formed	Periodic TAC meetings	Ongoing
Increase public awareness of trespass	CCWG will work to protect landowner rights	Signage	Ongoing
Address use of motorized vehicles in creek	CCWG will work to protect landowner rights	Stakeholder meetings	K-rail installed at Evergreen Road Bridge
Investigate RPD trespass deterrent methods	CCWG will work to protect landowner rights	Contacted RPD	Future action to be determined
Encourage good riparian habitat stewardship through stakeholder participation	Ongoing	Stakeholder meetings	Future action to be determined

TABLE 8
Status of Outreach and Education Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Maximize outreach to land-owners via the new CCWG Web site and educational programs; continue with the "Kids for our Creek" program	Web site is up and running	Stakeholder meetings	Updates to the Web site will be ongoing; funding for a Web master will be requested
Engage large development projects as they move forward to address future groundwater and water quality issues	Need to initiate contacts	In progress	Future action to be determined
Develop a set of management tools; these tools should be concise and easily accessible to all stakeholders (put on Web site and/or brief handout)	None	None	None
Tool topics include erosion control, noxious weeds abatement, wildlife species, and fuel reduction			
Make watershed education in the Cottonwood Schools a priority for CCWG	None	None	None
Plan public outreach functions (e.g., trash cleanup or tree planting)	None	None	None

SECTION 5.0

Strategic Area 4: Management Plan Development

Workshop participants agree that management goals and plans are needed before resource management actions take place in the watershed. In particular, both aquatic and terrestrial habitat wildlife management requires plans that are based on knowledge of these resources in the watershed, their current condition, and focused management goals. Adaptive management was also discussed as an approach to streambank erosion. The concept of adaptive management was not explained in detail during the workshop meetings; therefore, in response to workshop requests, a definition and discussion of adaptive management is provided below. Appendix B provides an example from a similar project in the Northwest.

5.1 Workshop Summaries

Development of a management plan is necessary to implement on-the-ground projects that have been identified by CCWG. The management plan should present the key goals and plans for the watershed, including the methods for determining the success of proposed plans and actions. Water quality, habitat, and vegetation management would all be important components of a management plan, but the primary focus of local landowners in the lower reach of the watershed is erosion.

The landowners have significant concern regarding the loss of private property to erosion from the creek. The specific causes for this accelerated erosion are unclear, although many theories exist, and some have been implemented by individual land owners. However, the dynamic nature of the problem, the long timeframes involved, resource management concerns, and possible liability issues have kept this issue from being developed into a full implementation program. Correcting the loss of private property will be a central focus of any future management plan. The following description of an Adaptive Management Strategy outlines the components necessary to develop a practicable strategy for addressing erosion and loss of private property.

5.1.1 Strategy

During the Flooding and Erosion workshop, the fundamental question that arose from the group discussion was "Do we need more studies, or do we want to move forward with an aggressive hands-on approach?" In other words, should the approach to the erosion problems that landowners adjacent to the creek are experiencing be active, passive, or somewhere in-between?

Adaptive management was suggested as one approach, which combines action and study, to address the erosion problem. The following information on adaptive management is from the British Columbia Ministry of Forestry.

5.1.2 Definition of Adaptive Management

Adaptive management has been defined in various ways since its development in the early 1970s. Different people and organizations continue to have somewhat differing views of the best definition for their purposes. One definition that emphasizes a thoughtful and organized approach is as follows: "Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs."

5.1.3 How Adaptive Management Works

Its most effective form, "active" adaptive management, employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed. The adaptive management process is often portrayed as a six-step cycle and emphasizes that successful adaptive management requires managers to complete all six steps:

- Acknowledgement of uncertainty about what policy or practice is "best" for the particular management issue
- Thoughtful selection of the policies or practices to be applied (the assessment and design stages of the cycle)
- Careful implementation of a plan of action designed to reveal the critical knowledge that is currently lacking
- Monitoring of key response indicators
- Analysis of the management outcomes in consideration of the original objectives
- Incorporation of the results into future decisions

Specifically, a plan was proposed to move in-channel islands in the stream and relocate the sediment and vegetation to the streambank. Several critical issues are associated with this type of action, if it is undertaken without previous study. Notably, these concerns include the following:

1. **Potential sediment transport changes**. Removing and replacing sediment and vegetation from in-channel islands could significantly change the sediment transport dynamics in Cottonwood Creek and impact aquatic and riparian habitat by changing the creek water flows and causing pooling in the creek areas upstream and downstream.
2. **Potential flood hydraulics changes**. Removing and replacing sediment and vegetation from in-channel islands could change how and where the water flows during floods. This could potentially increase flood effects and move them downstream.
3. **Potential impacts to structures**. Flow characteristics of streams can lead to unintended consequences for structures, notably bridges. Careful consideration should be given to possible impacts downstream, possibly including an assessment of Interstate 5, railroad, or other local bridges.

4. **Short-term erosion**. In-channel vegetation removed from the channel and replaced along the channel banks will require a period of establishment before providing adequate erosion control on the banks. Large floods soon after the proposed project could cause massive bank erosion.

5. **Suitability of in-channel material (vegetation and substrate) for bank stabilization**. The sediment that makes up the in-channel islands is not necessarily the same sediment that collects along the bank, so it might not be suitable for placement along the bank for bank stabilization and revegetation. If unsuitable materials are used, massive bank erosion could occur.

6. **Single thread versus split-flow hydraulics**. Removing the in-channel islands will change the way the water flows in that part of the creek, and could lead to unwanted results. The islands provide "roughness," or friction that slows down the water. Removing the islands will remove this roughness and could lead to faster flow that erodes the bank and streambed even more.

7. **Aquatic and riparian habitat impacts**. The vegetated islands and streambanks likely provide unique habitat for a range of aquatic and terrestrial organisms. Removing the islands will remove this habitat that does not exist on streambanks.

8. **Infrastructure impacts**. Infrastructures such as pipelines, bridges, and adjacent roadways could be impacted by the changes in sediment movement and creek flow that result from the recommended approach.

9. **Long-term Maintenance**. High flows might force the channel back into the existing form. Therefore, the maintenance schedule for this kind of project should match the anticipated rate of recurrence for channel changes.

With these uncertainties listed, a plan could be devised that includes a monitoring provision to determine if such actions would work in problem areas throughout the watershed. Some participants mentioned during the workshop that landowners have historically performed similar streambed alterations with great success. The CCWG could participate in coordinating and monitoring such a project and later use this knowledge to help other landowners, including agencies responsible for bridge maintenance. This type of project would be conducted outside of the "meander zone." A meander zone is an area of the creek where it would be allowed to meander naturally. The meander zone would need to be identified during the next phase of meetings by stakeholders.

5.1.4 Adaptive Management Implementation Considerations

In addition to environmental permitting considerations, any adaptive management project undertaken by CCWG will need to consider special requirements imposed by funding sources. Examples from CALFED's Ecosystem Restoration Program are presented below to illustrate the types of requirements that might be imposed on an adaptive management project.

1. **Existing habitat degradation**. To attract funds for the proposed project from ecosystem restoration programs such as CALFED's Ecosystem Restoration Program, the current

channel shape must be shown as a limiting factor to aquatic or terrestrial species of concern in the project area.

2. **Potential local habitat improvements**. The proposed project should be shown to improve local aquatic and riparian habitat conditions.

3. **Potential downstream habitat improvements**. The proposed project might improve delivery of spawning gravel to the Sacramento River, which could be viewed as a positive result.

5.2 Workshop Recommendations Adopted by Cottonwood Creek Watershed Group

Table 9 outlines recommendations from the various workshops, and includes a status of the recommendations. A detailed discussion of each of the recommendations follows.

TABLE 9
Management Plan Development Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Develop clear and concise management goals for aquatic wildlife habitat	Aquatic Habitat recommendation	Work with stakeholders to facilitate sustainable wildlife and human cohabitation within watershed. CCWG would distribute information on aquatic wildlife habitat.
Develop clear and concise management goals for terrestrial wildlife habitat	Terrestrial and Riparian Habitat recommendation	Work with stakeholders to facilitate sustainable wildlife and human cohabitation within watershed. CCWG would distribute information on terrestrial and riparian habitat.
Research the adaptive management approach	Erosion and Flooding recommendation	Continue development of adaptive management approach to include information from geomorphical study grant. Study will ensure that restoration and management actions implemented in the watershed are complimentary, compatible with CALFED Watershed Program, meet restoration goals and objectives, and are supported within the community of stakeholders and resource agencies.
Eliminate or reverse fire suppression trends by implementing a watershed fire management plan	Terrestrial and Vegetation Management workshop	Management plan completed and currently being implemented.

5.2.1 Develop Clear and Concise Management Goals for Aquatic Wildlife Habitat

The general policy goal from the CCWG Board of Directors on this issue is to work with stakeholders to facilitate wildlife and human cohabitation that is robust and sustainable. The CCWG will act as a clearinghouse for information on aquatic wildlife habitat.

5.2.2 Develop Clear and Concise Management Goals for Terrestrial Wildlife Habitat

The general policy goal from the CCWG Board of Directors on this issue is to work with stakeholders to facilitate wildlife and human cohabitation that is robust and sustainable. The CCWG will act as a clearinghouse for information on terrestrial wildlife habitat.

5.2.3 Research the Adaptive Management Approach

Additional information on the adaptive management approach to erosion and flooding will continue to be developed. Some additional information was provided under an Anadromous Fishery Restoration Program (AFRP) grant application for funding of a geomorphological study that was recently submitted. The geomorphological study will provide information to help ensure that restoration and management actions implemented in the Cottonwood Creek watershed are mutually complementary, compatible with CALFED Watershed Program and environmental restoration goals and objectives, and supported by local community stakeholders and resource agencies within the watershed. The geomorphological study will improve the understanding of geomorphological processes and historical changes in the lower reaches of Cottonwood Creek to enhance watershed planning and restoration activities. Additional contacts with resource agencies should continue in an effort to find and develop areas of consensus concerning stream permitting and bridge maintenance.

5.3 Potential Recommendations Still under Consideration

The following recommendations were identified during the preparation of this Strategic Plan, and CCWG is currently evaluating these recommendations further:

- Establish a fence management plan for the watershed. (Plan will consist of a simple, one-page list of guidelines/Best Management Practices to help landowners create more wildlife-friendly fencing.)
- Complete road inventory and identify old roads, culverts, and stream crossings that need to be stabilized to minimize further erosion.
- Develop ranch management plan for watershed that includes helpful landowner guide to grazing issues, noxious weeds, and fencing criteria.
- Develop a set of management tools. These tools should be concise and easily accessible to all stakeholders. (Put on Web site and/or brief handout.) Tool topics include erosion control, noxious weeds abatement, wildlife species, fuels reduction/fire.
- Develop a monitoring plan to track in-stream changes in the unstable reach of Cottonwood Creek mainstem (geomorphologic monitoring program).

- Develop a floodplain management plan (similar to Clear Creek/Deer Creek).

5.4 Status of Workshop Recommendations

Table 10 outlines the status of all recommendations relating to management plan development that were collected during the workshops. Recommendations are assessed according to whether they are undergoing further technical, administrative, or policy study; are the subject of outreach to affected parties; or are currently being implemented through action by CCWG.

TABLE 10
Status of Management Plan Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Develop clear and concise management goals for aquatic wildlife habitat	CCWG will act as a clearinghouse for information on aquatic habitat.	None	Future action to be determined
Develop clear and concise management goals for terrestrial wildlife habitat	CCWG will act as a clearinghouse for information on terrestrial habitat.	None	Future action to be determined
Research the adaptive management approach	Applied for AFRP grant to fund geomorphological study.	None	Future action to be determined
Establish a fence management plan for the watershed (plan will consist of a simple, one-page list of guidelines/Best Management Practices to help landowners create more wildlife-friendly fencing)	None.	None	Future action to be determined
Complete road inventory and identify old roads, culverts, and stream crossings that need to be stabilized to minimize further erosion	Road inventory has been started and is nearly complete.	In progress	Future action to be determined
Develop ranch management plan for watershed that includes helpful landowner guide to grazing issues, noxious weeds, and fencing criteria	Much of this information exists already for other watersheds, but CCWG needs to provide clarification and organization to make it more accessible to landowners.	None	Future action to be determined
Develop a set of management tools; these tools should be concise and easily accessible to all stakeholders (put on Web site and/or brief handout)	None.	None	None
Tool topics include erosion control, noxious weeds abatement, wildlife species, fuels reduction/fire			
Develop a monitoring plan to track in-stream changes in the unstable reach of Cottonwood Creek mainstem (geomorphologic monitoring program)	None.	None	None
Develop a floodplain management plan (similar to Clear Creek/Deer Creek)	None.	None	None

SECTION 6.0

Strategic Area 5: Monitoring and Modeling

In many cases, information about resources in the watershed is insufficient to determine if their condition is deteriorating, remaining constant, or improving. Without information about baseline conditions (conditions before actions are taken to change or maintain resources in the watershed), it will be impossible to judge how those actions affect the watershed. In particular, water quality, fish, and frog monitoring should be established to provide some basic information about the conditions of these resources. Water quantity was also identified as an issue that should be monitored with increasing residential development in the watershed.

6.1 Workshop Summaries

The Cottonwood Creek water quality is generally considered good from a drinking water standard perspective. There is concern regarding the South Fork's regular contribution of suspended sediments and turbidity to the mainstem. Additional studies of specific water quality characteristics are needed to develop more detailed information regarding the source or sources of turbidity in the creeks.

Recommendations included establishing a water monitoring program that is consistent with the Agricultural Waiver Monitoring Program guidelines, obtaining additional groundwater level data from the City of Cottonwood and the Rio Alto Water District, and engaging the large development projects as they move forward to address future groundwater and water quality concerns.

6.2 Workshop Recommendations Adopted by Cottonwood Creek Watershed Group

Table 11 outlines recommendations from the various workshops, and includes a status of the recommendations. A detailed discussion each of the recommendations follows.

6.2.1 Establish Baseline Fish and Frog Monitoring

Information on the current status of fish and frog populations is extremely limited. If CCWG determines that a long-term management strategy requires population assessments, it would be necessary to determine baseline population levels through surveys. Such surveys could occur over a range of effort levels.

The CCWG can work to help stakeholders in fish and frog monitoring activities. The CDFG and U.S. Fish and Wildlife Service have a stake in fish and frog monitoring. Property owners within the watershed might have species on their property. When landowners decide they want to monitor species on their property, CCWG can facilitate cooperative monitoring between the regulatory agencies and landowners. The CCWG can further assist both landowners and regulatory agencies by storing and distributing information about fish and

frog monitoring programs, monitoring techniques, and the need for monitoring. Some participants have indicated that other types of monitoring might also be necessary to determine overall watershed and aquatic health.

TABLE 11
Monitoring and Modeling Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Establish baseline fish and frog monitoring	Aquatic Habitat recommendation	Ongoing
Determine limiting conditions for all fish species in the watershed and create a general fishery systems model	Aquatic Habitat recommendation	Under development for Beegum Creek
Establish a baseline water quality monitoring program that provides information that contributes to the Agricultural Waiver Monitoring Program guidelines	Erosion and Flooding recommendation	Ongoing
Obtain additional groundwater level data from the City of Cottonwood and the Rio Alto Water District	Groundwater and Water Quality recommendation	Ongoing as part of Redding groundwater assessment
Continue to engage the large-scale development projects to address future groundwater and water quality issues	Groundwater and Water Quality recommendation	CCWG to participate in land use planning processes

Biological and physical integrity of stream systems can be evaluated through the study of benthic macroinvertebrate communities. Benthic macroinvertebrates make up a diverse community of organisms that show sensitivities to various levels of chemical and organic pollution. Monitoring of benthic macroinvertebrates would provide a good general indicator of the watershed's overall aquatic health.

The CCWG can also work cooperatively with colleges and university to help match researchers with research sites within the Cottonwood Creek watershed. The CCWG would seek out and maintain relationships with Shasta College, Chico State, Humboldt State, University of California - Davis, and other educational facilities so that students or researchers interested in studying natural resources such as red-legged frogs or native plants can find local landowners who are interested in having those resources studied on their property. By maintaining relationships with landowners and educational facilities, CCWG can facilitate cooperative research within the watershed.

6.2.2 Determine Limiting Conditions for All Fish Species in the Watershed and Create a General Fishery Systems Model

A general fisheries model could be beneficial for assessing potential impacts to fish that might occur following changes in the watershed. Such a model could range in sophistication from a complex computer simulation to a simple conceptual model. Currently, a modeling project for the Beegum area in the watershed might be adaptable to the entire watershed.

Alternatively, other general fishery models have been developed with public funds that are available for download on the internet at no charge. One model that deserves investigation is the Humboldt State University *in Stream* model. This model is primarily a trout-feeding model, but could be useful for turbidity issues, and temperature and flow-change impacts on fish in the system. The WMP will include further details about the type of modeling and the goals for fish modeling in the watershed.

6.2.3 Establish a Baseline Water Quality Monitoring Program that Provides Information that Contributes to the Agricultural Waiver Monitoring Program Guidelines

Information on the current status of water quality is extremely limited. There is no consistent approach to water quality monitoring in the watershed. Collection of water quality information should be consistent with guidelines set out in the Agricultural Waiver Monitoring Program.

Surface-water quality monitoring has been ongoing in Cottonwood Creek since the early 1950s, according to the *Cottonwood Creek Water Assessment*. The majority of the monitoring stations has been maintained by the California Department of Water Resources and U.S. Geological Survey, and is generally located in the mid-eastern section of the watershed.

The CCWG intends to conduct surface-water quality monitoring in the future. The details of surface-water quality monitoring will by included in the upcoming WMP for Cottonwood Creek watershed. The CCWG can also serve its stakeholders by acting as a clearinghouse for surface-water quality data.

6.2.4 Obtain Additional Groundwater Level Data from the City of Cottonwood and the Rio Alto Water District

Groundwater monitoring has been ongoing in Cottonwood Creek since the early 1950s, according to the *Cottonwood Creek Water Assessment*. The majorities of the monitoring stations have been maintained by both California Department of Water Resources and U.S. Geological Survey, and are generally located in the mid-eastern section of the watershed. The CCWG will attempt to obtain all available groundwater data in the watershed. Because groundwater levels vary spatially and temporally, there might also be some need to pursue a groundwater system model such as the one designed by CH2M HILL for the Redding Basin. Major recharge areas should also be identified and mapped within the watershed to determine possible groundwater impacts from future development.

6.2.5 Continue to Engage the Large-scale Development Projects to Address Future Groundwater and Water Quality Issues

Currently, CCWG does not have direct contacts with the large development planned for the southeast portion of the watershed. Direction is needed regarding potential concerns and opportunities for cooperation with the planned development.

The CCWG views large-scale residential development as indicating a need for more out-reach and education about local and regional planning. These developments are reviewed by county and city planning departments. The CCWG can serve watershed landowners and the general public by acting as a clearinghouse for information on projects that are in the

planning stage and could impact water and habitat resources. The CCWG will monitor planning activities within the watershed and inform interested stakeholders about current conditions and events. Updates and changes to general plans would also be monitored. Information on surface-water and groundwater quality would be kept by CCWG for the benefit of stakeholders and planning agencies. By acting as a clearinghouse for information, CCWG can facilitate stakeholder participation in the planning process. By participating in the planning process, stakeholders can ensure that issues such as impacts to the watershed by development are addressed before projects are approved.

6.3 Potential Recommendations Still under Consideration

The following recommendations were identified during the preparation of this Strategic Plan, and CCWG is currently evaluating these recommendations further:

- Consider monitoring of benthic macroinvertebrates
- Examine trends in wildlife distribution and abundance
- Develop a monitoring plan to track in-stream changes in the unstable reach the Cottonwood Creek mainstem (geomorphologic monitoring program)

6.4 Status of Workshop Recommendations

Table 12 outlines the status of all recommendations relating to monitoring and modeling that were collected during the workshops. Recommendations are assessed according to whether they are undergoing further technical, administrative, or policy study; are the subject of outreach to affected parties; or are currently being implemented through action by CCWG.

TABLE 12
Status of Monitoring and Modeling Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Develop an ecosystem monitoring plan/ watershed monitoring plan	To be addressed in WMP	None	None
Establish baseline fish and frog monitoring	Beginning to address with U.S. Fish and Wildlife Service	None	None
Consider monitoring of benthic macroinvertebrates	To be addressed in WMP	None	None
Determine limiting conditions for all fish species in the watershed and create a general fishery systems model	None	None	None
Establish a baseline water quality monitoring program that provides information that contributes to the Agricultural Waiver Monitoring Program guidelines	None	None	None
Obtain additional groundwater level data from the City of Cottonwood and the Rio Alto Water District; map key aquifer recharge areas	Groundwater monitoring has been ongoing since the early 1950s	None	None

TABLE 12
Status of Monitoring and Modeling Recommendations
Cottonwood Creek Strategic Watershed Plan

Recommendation	Study	Outreach	Action
Continue to engage development projects as they move forward to address future groundwater and water quality issues	CCWG to participate directly in land use planning efforts	None	None
Examine trends in wildlife distribution and abundance	None	None	None
Develop a monitoring plan to track in-stream changes in the unstable reach of the Cottonwood Creek mainstem (geomorphologic monitoring program)	Developed proposal for AFRP funding	None	None

SECTION 7.0

Summary of Workshop Recommendations Adopted by CCWG

Table 13 summarizes the workshop recommendations adopted by CCWG for all of the Strategic Areas.

TABLE 13
Workshop Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Consider grazing as a tool for fuels reduction	Rangeland and Timber workshop	Sunflower CRMP initiating grazing-based effort
Pursue vegetation management through prescribed burning program	Rangeland and Timber workshop	CCWG advocating prescribed burn projects in conjunction with CDF and USFS
Bring forest fuels into balance	Rangeland and Timber workshop	CCWG to act as clearinghouse for forest management efforts in watershed
Eliminate or reverse fire suppression trends by implementing a watershed fire management plan	Terrestrial and Vegetation Management workshop	Management plan completed, currently being implemented
Map riparian areas	Aquatic Habitat and Terrestrial and Riparian Habitat workshops	CCWG will develop protocols for mapping riparian areas and will act as a clearinghouse for riparian mapping information in the watershed
Create a list of native species in the watershed	Terrestrial and Vegetation Management workshop	A draft list of native species has been completed and is currently undergoing review by CCWG and TAC
Watershed resident and landowner outreach	Aquatic Habitat recommendation	Ongoing efforts. CCWG might develop a specific outreach plan using CDFG outreach plan for Cantara Loop Spill
General public outreach	Terrestrial and Riparian Habitat recommendation	Ongoing efforts; CCWG might develop a specific outreach plan using CDFG outreach plan for Cantara Loop Spill
Regulatory agencies outreach	Terrestrial and Vegetation Management workshop	Ongoing efforts; CCWG might develop a specific outreach plan using CDFG outreach plan for Cantara Loop Spill
Increase public awareness of trespass	Aquatic Habitat recommendation	Efforts to improve outreach regarding trespass issues are ongoing

TABLE 13
Workshop Recommendations Adopted by Cottonwood Creek Watershed Group
Cottonwood Creek Strategic Watershed Plan

Recommendation	Source	Status
Participate in land use planning efforts	Terrestrial and Riparian Habitat recommendation	CCWG to participate in land use planning efforts in the watershed
Continue watershed education in local schools	Groundwater and Water Quality recommendation	CCWG will continue to work closely with local schools
Develop clear and concise management goals for aquatic wildlife habitat	Aquatic Habitat recommendation	To be addressed in WMP
Develop clear and concise management goals for terrestrial wildlife habitat	Terrestrial and Riparian Habitat recommendation	To be addressed in WMP
Research the adaptive management approach	Erosion and Flooding recommendation	Ongoing
Eliminate or reverse fire suppression trends by implementing a watershed fire management plan	Terrestrial and Vegetation Management workshop	Ongoing
Establish baseline fish and frog monitoring	Aquatic Habitat recommendation	Ongoing
Determine limiting conditions for all fish species in the watershed and create a general fishery systems model	Aquatic Habitat recommendation	Under development for Beegum Creek
Establish a baseline water quality monitoring program that provides information that contributes to the Agricultural Waiver Monitoring Program guidelines	Erosion and Flooding recommendation	Ongoing
Obtain additional groundwater level data from the City of Cottonwood and the Rio Alto Water District	Groundwater and Water Quality recommendation	Ongoing as part of Redding groundwater assessment
Continue to engage the large-scale development projects to address future groundwater and water quality issues	Groundwater and Water Quality recommendation	CCWG to participate in land use planning processes

Appendix A
Minutes from Stakeholder Workshops

Cottonwood Creek Watershed Strategic Plan
Aquatic Habitat Introductory Workshop
June 29, 2004

FROM: Stephanie Tillman/CH2M HILL
Mike Urkov/CH2M HILL

DATE: July 7, 2004

INVITEES:

Julia Arnond/CCWG Board
Jackie Baker/CCWG Board
Mike Berry/CDFG*
Guy Chetelat/RWQCB*
Cottonwood Creek Sand & Gravel
Richard Edsall/CCWG Board*
Kelley Garrett/CALTRANS*
Bill Gibson/CCWG Board
Ken Green/Landowner*
Sonja Green/Landowner*
Paul Gurrola/Landowner
Tom Harrington/CCWG Board
Dennis Heiman/RWQCB*
Aric Lester/DWR*
Tom McCubbins/Tehama Co. RCD
Brandy Norton/CCWG*
Tricia Parker/USFWS
Dennis Possehn/Landowner*
Karen Scheurer/Landowner*
John Schoonover/CH2M HILL*
Jeff Souza/Souza Environmental Solutions
Penny Sullivan/Landowner*
Kathleen Surbaugh/Landowner*
Dee Swearingen/ACID
Vieva Swearingen/CCWG
Stephanie Tillman/CH2M HILL*
Mike Tucker/NMFS*
Steve Turek/CDFG
Mike Urkov/CH2M HILL*
Jack Williamson/USFWS*
Chuck Wolf/Sand and Gravel
Sharon Younkers/CH2M HILL*

COPIES: Vieva Swearingen/CCWG

*Attendees

Introductions and Meeting Purpose

The meeting began at 3:00 p.m.

The purpose of this workshop was to bring together stakeholders to determine the direction of the Cottonwood Creek Watershed Strategic Plan. The goal is to arrive at a consensus among stakeholders about the desired aquatic habitat conditions of the watershed. Workshop discussions will be instrumental in the development of a comprehensive watershed management plan (WMP), and ultimately provide a rational, scientific approach to cooperatively managing the Cottonwood Creek Watershed, which includes a diverse group of stakeholders.

Mike Urkov/CH2M HILL facilitated introductions and reviewed the agenda.

Mike gave a brief PowerPoint presentation about the Cottonwood Creek Watershed that included Cottonwood Creek Watershed Assessment 2002 (Watershed Assessment) findings, new data, recommendations, and current Cottonwood Creek Watershed Group (CCWG) programs pertaining to aquatic habitat. A copy of the PowerPoint presentation was included as a handout.

Expectations and Discussion

Prior to the presentation, Mike asked each person in attendance to state their expectations for this workshop. A discussion followed the presentation.

Expectations:

- Learn more about the watershed
- Protect listed species, e.g., steelhead, spring-run salmon
- Guide a strategy for fish enhancement
- Answer lingering questions from the Watershed Assessment
- Determine how the process will lead to a Watershed Management Plan
- Keep property out of the river and promote property use that is compatible with restoration
- Introduce stakeholders
- Brainstorm a scientific approach to preservation/balance
- Address bank stabilization issues
- Determine a strategy embraced by residents
- Promote preservation/enhancement of fisheries resources and geomorphology
- Establish a hierarchy of resources
- Define the process behind the strategies
- Develop goals (i.e., good notes/reports)
- To find a new way to achieve goals on a local level

Discussion:

Dennis Heiman asked Mike Urkov what should have been done differently in preparing the Watershed Assessment.

Dennis Heiman requested that more specific draft recommendations be put forth during these workshops.

Mike Urkov indicated that the Watershed Assessment was a compilation of existing data and reports, and that there were several areas that had minimal or no existing data.

Watershed priorities and the project scope were discussed

Questions: Is the Anadromous Fish Restoration Program (AFRP) target number of 5,900 salmon a fall-run or spring-run target? What is this target based upon? Does fall-run data exist? How will progress be determined if there are no fall-run data?

Response: Mike Urkov informed the group that the AFRP target number was based on Central Valley Project Improvement Act (CVPIA) legislation, specifically that anadromous fish populations should be "doubled" in the future. The target represents a doubling of a baseline estimate of total salmon (2,950).

Follow up: John Schoonover contacted Doug Killam after the meeting. Doug stated that currently no data are available for fall-run Chinook salmon in Cottonwood Creek. Fall-run Chinook are very difficult to count in Cottonwood Creek because of the increased water flows during the rainy months. Since there is no weir and funding is unavailable to conduct scientific surveys, no real data are available for the fall-run. Doug also indicated that there was some difficulty in gaining access to the creek because most of the creek flows through private property. Surveys require bank access and some landowners have been reluctant to allow DFG personnel access to their land. Some estimates have been made in previous years based on redd counts that are done by airplane.

Comment: Current conditions of habitat need to address all species.

Question: Do we have temperature info about the creek?

Response: Mike Urkov stated that the temperature data was "spotty. "

Follow up: DWR has monitored and continues to monitor Cottonwood Creek for temperature. Some temperature data were presented in the water-quality section of the Watershed Assessment. Further discussion of temperature parameters will be presented at the Groundwater and Water-Quality Workshop on July 15. As some participants have indicated, further studies might be needed to determine the effects of temperature on the aquatic habitat.

Comment: Kath Surbaugh described the problem of erosion on her property and presented photos. She would like to find a way to solve the erosion problem that is beneficial to the environment and aquatic habitat.

Response: Mike Urkov stated that other landowners in the watershed probably had similar experiences. One goal of the workshops is to identify these specific problems in each discussion area and use them to develop the overall water management plan. This topic led to some brief discussion about erosion and the Graham Matthews Report. Since erosion and flooding is the topic of the next meeting, further discussion will be continued on July 13.

Noted: There is a problem with unintended impacts brought about by stream alterations in the watershed.

Noted: The evidence includes land erosion, loss/change in habitat

Noted: We could avoid problems and unintended impacts by performing appropriate studies prior to allowing stream alterations.

Question: What is the link between erosion and aquatic habitat?

Comment: We need to identify portions of the creek that can move and those that cannot move.

There was some discussion about the Graham Mathews & Associates (GMA) report and the idea that it was based primarily on the lower reaches of Cottonwood Creek.

Question: Should there be a geomorphic study conducted on the entire length of Cottonwood Creek to identify which areas are being eroded?

Participants agreed that the creek has been moving forever, but now many stakeholders want it to stay in the same place. Vieva questioned the idea of a watershed-wide geomorphic study because of the cost. Because the GMA report will be discussed at length in the next meeting, further discussion was postponed.

Noted: Copies of the GMA report are available on CD-ROM for review.

Comment: The idea was introduced that there is some possibility of California Bay-Delta Authority (CALFED) funding demonstration projects in sensitive areas with bank erosion.

Comment: In the south fork, near Evergreen bridge, one landowner has been grading without a permit in the creek. Erosion seems to be occurring radically; silt build-up is a big problem. Permitting process is seen by some landowners as a hindrance to potential efforts to protect banks from erosion. Several attempts have been made to contact agencies in Sacramento with no response. The only response came from the Redding office of DFG.

Comment: The Bowman Road area is quickly developing, especially around Cottonwood Creek.

Question: Has development impacted the aquatic habitat? If so, to what degree?

Question: Is protection of topsoil from bank erosion a priority for the group? Are we fighting a losing battle against natural forces?

Comment: Communications with regulatory agencies in Sacramento need to be improved.

Comment: Some landowners stated that erosion was also caused by illegal trespassing by 4x4s and all-terrain vehicles in the creek. Poachers have been reported at night driving in the creek. There was concern about shooting in the area and the dangers of confronting these trespassers. Specifically, the Benson—Pine Creek area, the Farquar area, and Evergreen and Eighmy Roads were all mentioned as problem trespass areas. There has been little response from the Sheriff's Office or other agencies regarding the problem.

Comment: Protection and stewardship of land are high priorities for landowners.

Response: Vieva stated that the CCWG has been working on the problem of driving in the creek. K-rail barricades are being placed at some entrance points. There were several ideas presented to help combat the problem including:

- Placing "No Trespassing" signs (Interstate-5 exit signs?)
- Promoting public education/ awareness
- Contacting elected officials
- Increasing fines
- Making access more difficult

- Increasing the number of wardens

Question: Do we have baseline water quality monitoring data?

Comment: Baseline water quality information is necessary "...so that our children will be able to see the changes when they're sitting here."

Comment: We need baseline fishery monitoring.

Questions: Is frog monitoring a priority? Are frogs an important indicator of a healthy stream? Do we know the status of the red-legged frog in the watershed? Do we have any data on frogs in the watershed?

Comment/Question: EPA standards are not being met. What is the standard for enforcement of existing regulations and standards?

Question: What is the status of in-stream gravel mining in watershed?

Response: Gravel mining is different for Shasta and Tehama counties. There is no in-stream gravel mining in Shasta County, but there is in Tehama County.

Question: What is the status of the Crowley Gulch problem and the Anderson-Cottonwood Irrigation District (ACID) siphon problem?

Response: Vieva stated that she was sure that both problems had been addressed and fixed, but we need to ask Mr. Swearingen for the details. (CH2M HILL will follow up.)

Comment: We need to determine limiting conditions for fish.

Comment: We need better baseline information for fish and water quality.

Comment: We need a general system fishery model.

Comment: We need to establish a hierarchy of resources and make specific recommendations.

Noted: Riparian mapping is needed.

Mike Urkov closed the discussion by going back to the original expectations to see if the discussion adequately addressed the expectations. A follow-up list was developed for our next meeting.

Follow-up Items:

- Develop a strategy for fish enhancement
- Protect listed species, e.g., steelhead, spring-run salmon
- Answer lingering questions
- Determine how the process can lead to watershed management plan
- Bank stabilization
- Preservation/enhancement of fisheries resources and geomorphology
- Watershed management
- Establish a hierarchy of resources

Recommendations of the Group:

1. Improve communications with regulatory agencies in Sacramento.
2. Address 4X4 and trespassing issues in the watershed by adding signs, increasing public education and awareness, contacting elected officials, and limiting access at known entry points.
3. Establish baseline water-quality monitoring.
4. Establish baseline fish monitoring.
5. Establish baseline frog monitoring.
6. Determine current regulations for in-stream gravel mining for Shasta and Tehama county.
7. Determine limiting conditions for all fish species in the watershed.
8. Create a general fishery systems model.
9. Perform riparian mapping of the watershed.

The meeting was adjourned at 5:30 p.m.

Cottonwood Creek Watershed Strategic Plan
Erosion and Flooding Introductory Workshop
July 13, 2004

FROM: Stephanie Tillman / CH2M HILL
Mike Urkov / CH2M HILL

DATE: August 5, 2004

INVITEES:

G. Ivar Amen / Landowner*****
Jackie Baker / CCWG Board*
Barten Bengard / Bengard Ranching
Koll Buer / CDWR
Guy Chetelat / RWQCB*
Jeff Davis / Landowner
James Diel / Union Pacific*****
Richard Edsall / CCWG Board
Kelley Garrett / Caltrans*****
Bill Gibson / CCWG Board
Ken & Sonja Green / Landowners
Paul Gurrola / Landowner
Carl Harral / DFG*
Dennis Heiman / RWQCB
Marc Horney / Chico State Department of Agriculture
Joe Irvin / Union Pacific*****
Ed Kernihan / Anderson-Cottonwood Concrete (J F Shea)
Chuck Lema / Landowner
Greg Long / Tom Bengard Ranch*****
Martha Lutz / Landowner
Tom McCubbins / Tehama Co. RCD*****
Dennis Mitchell / CCWG Board
Brandy Norton / CCWG*****
Kevin Pond / DWR*****
Bill & Robin Rich / Landowners
Roy H. Richards, Jr. / CCWG Board
Rod Rodriquez / Cottonwood Creek Ranch
Bruce E. Ross / DWR*****
Boyd Sartori / Landowner*****
Holly Savage / CCWG*****
John Schoonover / CH2M HILL*****
Jeff Souza / Souza Environmental Solutions
John Stoufer / Tehama Co. Planning Dept.*
Kath Surbaugh / Landowner*****
Dee Swearingen / ACID*
Vieva Swearingen / CCWG*****
Gene Tenney / Cottonwood Creek Sand & Gravel*
Stephanie Tillman / CH2M HILL*****
Lyle Tullis / Cottonwood Creek Sand & Gravel*
Mike Urkov / CH2M HILL*****
Bill Walker / Shasta Co. Planning Dept.
Sharon Younkers / CH2M HILL*****

COPIES: Vieva Swearingen / CCWG

* Attendees

Introductions and Meeting Purpose

The meeting began at 3:00 p.m.

The purpose of this workshop was to bring together stakeholders to determine the direction of the Cottonwood Creek Watershed Strategic Plan. The goal is to arrive at a consensus

among stakeholders about the desired erosion and flooding conditions of the watershed. Workshop discussions will be instrumental in the development of a comprehensive watershed management plan (WMP), and ultimately provide a rational, science-based approach to cooperatively managing the Cottonwood Creek Watershed with a diverse set of stakeholders.

Mike Urkov / CH2M HILL facilitated introductions and reviewed the agenda.

Prior to the presentation, Mike Urkov asked each person in attendance to state his or her expectation for this workshop.

Mike Urkov gave a brief PowerPoint presentation about the Cottonwood Creek watershed that included findings of the Cottonwood Creek Watershed Assessment (CH2M HILL, 2002); conclusions and recommendations of the Hydrology, Geomorphology and Historic Channel Changes of Lower Cottonwood Creek (Graham Matthews & Associates, 2003); and other erosion issues such as trespassing with 4X4 vehicles, that were introduced in the Aquatic Habitat Workshop on June 29, 2004.

Expectations and Discussion

Expectations:

- Answer technical questions
- Discuss the Graham Matthews & Associates report (Graham Matthews report)
- Learn about information from the field
- Discuss the "rock-throwing" report and discover the source of these allegations
- Gather information
- Provide the Tehama County perspective
- Hear landowner perspectives on erosion and discuss technical issues
- Observe process toward watershed restoration
- Discuss Anderson-Cottonwood Irrigation District (ACID) issues, address sediment control, channel stabilization, and save riparian habitat
- Start discussing strategy options
- Learn from this process and avoid pitfalls when creating the WMP for Western Tehama
- Assist in railroad issues and keep the railroad where it is rather than moving it down the river
- Discuss what can be done with the creek
- Observe and learn
- Find answers to questions regarding streambed alteration and gravel extraction
- Provide technical expertise

- Discuss prevention of future erosion at a minimum expense
- Learning and sharing in the stakeholder process
- Continue to obtain help with local trespassing problems
- Introduce stakeholders
- Work toward an adaptive management plan and consider modeling of the creek to explore possible solutions

Topics of discussion:

Following the presentation, the group discussed these issues:

Question: I am against the idea of aggressive suppression concerning the trespassing issue. Tire-spiking and fence construction will lead to an "us versus them" mentality. Does driving a 4X4 hurt a dry creek?

Response: It is trespassing and needs to be addressed.

Comment: I have had hay stolen by trespassers.

Mike Urkov reviewed the recommendations on page three of the erosion and flooding background information memorandum.

Question: What effect does the Sacramento River have on the flow of Cottonwood Creek?

Response: The Sacramento River can act as a backwater dam to Cottonwood Creek. The Department of Reclamation regulates the releases at Keswick Dam according to a distinct set of parameters. These operational guidelines are different during high flow and flooding events. In flood situations the dam is often closed to allow the creeks to flow freely.

Question: Mike Urkov asked Dee Swearingen to discuss the impact of erosion on the ACID canal.

Response: ACID spent $200,000 on hard-surfacing and re-covering siphons in Cottonwood Creek and Hooker Creek. ACID was in danger of losing siphons. Downstream water customers get nervous when their supply line is eroding and exposed. I believe that the siphons had a 5-foot cover around 1918.

Question: How far above Interstate-5 is the siphon?

Response: Five to six miles.

Question: Has anybody conducted studies about the reduction in logging and the effect of no more run-off? If erosion is not occurring, is the source of gravel no longer there? Is it possible that, because logging has been reduced, no more gravel is being put into the creek and this is having an impact on erosion?

Response: Gravel-starved streams tend to erode banks. We need to look at soil types upstream.

Comment: I think we need to look at ways to improve stabilization of the current situation that also provides protection for riparian habitat.

Comment: I think we should also investigate non-hard surface alternatives—alternatives to riprap.

Comment: I believe that we have the same situation with mining as we had with logging. Maybe we need to pay the gravel extractors or compensate them before restoration work. Is funding available to buy out owners if their property if used for restoration?

Response: Cottonwood Creek Watershed Group (CCWG) has no intention of turning the watershed into a park. We want to stop the erosion and restore cut banks with vegetation.

Response: There is no discussion in any form that involves CCWG buying out property owners. Habitat restoration projects come from landowners that seek help from the watershed group with stabilization and habitat restoration. No one is being forced to sell his or her land.

Response: CCWG is not interested in any other sale of land within the watershed. It is here to protect private landowners and their property rights.

Comment: CCWG was formed in response to California Bay-Delta Authority (CALFED) concerning grazing and loss of farmland. In August 1991, we (Cottonwood Creek Sand and Gravel) issued a report (EIR) that was approved by Tehama County. The Department of Fish and Game sued because they had problems with the report, but we won. The report we received (in the information packet for this workshop) states that there wasn't much data available before 1977, but that isn't true. There is a lot of data available prior to 1977 that isn't included in the Graham Matthews report. We have tons of data. Every year we do cross-sections in the mining area and take aerial photos. We know that in high-flow years, more rock ends up in the area. We are allowed to take 265,000 tons for gravel extraction per year according to the environmental impact report (EIR). In the last eight years, we have averaged less than 85,000 tons per year, about one-third of what we are allowed. I've been told by a reliable source that the problem with the creek is that there is too much rock in it. At one time there were four operations in the creek, and now there is only one. If you calculate the total amount of rock removed from the creek it is less than 2 inches of overall thickness. There is no logging in the upper watershed now; that means less gravel input to the system. I believe that gravel may be one problem in the creek, but to say stop all gravel extraction is crazy.

Comment: The environmental impact statement (EIS)/environmental impact report (EIR) approved by Tehama County is the most qualified document. It was completed by very competent people and was challenged twice in court and won.

Comment: Vandalism is a huge problem at our site. We've had equipment stolen and I've repaired fences several times.

Comment: One of the problems is that agencies are in conflict with one another. I had one agency tell me to push up gravel on one side, and then I was shutdown for having too much gravel storage on the site.

Comment: We need to recommend a re-channeling of the creek back to a stable alignment.

Comment: A good management plan could be put into place that would allow us manage the creek back to center. Years ago, farmers would just go in and re-align the creek to keep it

moving straight. Now, that's now allowed. I know one landowner who took a D-6 into the creek and did some work. We need to get agency involvement and move forward with a management plan.

Comment: I'm not convinced that gravel extraction is causing this problem. Too much gravel in the creek is pushing the creek outside the channel.

Comment: Over-extraction does present the symptoms that we are seeing in Cottonwood Creek. I have problems with the Xtra Power document. Any over-extraction will cause adverse impacts. How can we find a balance? How much gravel can we take safely? We need to gather and analyze data from upstream. We need comprehensive data.

Comment: This report uses words such as "likely, probably, could be" etc.

Comment: I think that there is too much rock in the creek. You can see it piled up around the lower bridge areas when you drive over Interstate-5. I'm no hydrologist, but I think that you can easily see that.

Comment: Cross-sections are not indicating that there is too much gravel. In fact, just the opposite. The stream is wider because it is eroding the bank, trying to accrue more gravel. A gravel-starved stream tends to meander more. It changes the fluvial geomorphology.

Question: Isn't that typical of all streams…with or without gravel operations?

Response: No, normally a stream finds a natural channel and settles in a relatively stable channel alignment. It is not normal to see degradation like this on streams that don't have gravel extraction.

Question: Can we agree that we are continuing to assess cross-sections as needed?

Comment: This gravel extraction operation was passed by voter initiative and removal would be difficult. All gravel operations have impacts, yes. But it is a necessity. There will be no further gravel operations in Tehama County. This groups sits on the Shasta/Tehama County line, and it is in a good position to make real change. We could study this to death. This group could go forward with a good management plan, and Tehama County would move forward with the group.

Comment: We should do some channel alignment tests, maybe with J F Shea or Lyle [Tullis] to see what could be done.

Mike Urkov asked Dee to explain his idea for the management plan.

Response: Most stream meandering starts with downed trees. One thing that was missed in the Graham Matthews report is the lack of gravel recruitment in the Sacramento River. We could identify six spots that open up the lower reaches of the creek and get the gravel flowing again. We could get Carl [Harral] to devise a plan to move some willows and get the gravel moving in the stream again.

Comment: The river is trying to re-establish a flood plain; these natural processes can occur. Lots can be done, but we need to do some studies. Symptoms need to be addressed, but we need an adaptive management plan and that involves studies.

Response: We could do some pilot projects and then monitor them to see the results. I want to move forward with a real plan. I'm tired of paying hydrologists. We could line the creek with studies. I want to see action. We could start by looking at Dry Creek. It is straight. We could start upstream by moving some trees.

Response: Downed trees are valuable to the ecosystem.

Response: We would just move them, not remove them.

Comment: Maybe we could get the gravel operators to go in and remove some bars to help channel alignment.

Question: Is something like that possible?

Mike Urkov recommended that we move forward and agree to at least research the adaptive management approach.

Comment: I think that there is a definite need to start now. Two hundred thousand people are projected to live in the watershed in the near future.

Comment: One final thought: the Redding Police Department (RPD) was very effective against the trespassing situation east of Redding near Lumberjack. There are some vernal pools there that were being destroyed by 4X4s. You might want to contact the RPD to see what they did to stop the trespassing.

Mike Urkov closed the discussion by going back to the original expectations to see if the discussion adequately met expectations. A follow-up list was developed for our next meeting.

Follow-up items:

· Habitat loss and sediment

- Keeping the railroad in place (erosion issues of railroad)
- Contact RPD to see what actions were taken to stop trespassing

Recommendations of the Group:

1. Research the adaptive management approach

The meeting was adjourned at 5:30 p.m.

Cottonwood Creek Watershed Groundwater and Water Quality Introductory Workshop—July 15, 2004

FROM: Stephanie Tillman / CH2M HILL
Mike Urkov / CH2M HILL

DATE: August 5, 2004

INVITEES:

Guy Chetelat / RWQCB*	Tom McCubbins / Tehama Co. RCD*
Jeff Davis / Landowner	Dennis Mitchell / CCWG Board
Richard Edsall / CCWG Board	Brandy Norton / CCWG*
Kelley Garret / Caltrans	Holly Savage / CCWG*
Bill Gibson / CCWG Board	John Schoonover / CH2M HILL*
Clark Goodrich / Landowner	Fraser R. Sime / CDWR*
Dennis Heiman / RWQCB	Penny Sullivan / Landowner*
Wendy Johnston / Vestra Resources	Dee Swearingen / ACID*
Ed Kernihan / Anderson-Cottonwood Concrete (J F Shea)	Vieva Swearingen / CCWG*
	Stephanie Tillman / CH2M HILL*
Bonnie Lampley / Lawrence & Associates*	Mike Urkov / CH2M HILL*
	Jack Williamson / USFWS*
Aric Lester / DWR*	Sharon Younkers / CH2M HILL*

COPIES: Vieva Swearingen / CCWG

* Attendees

Introductions and Meeting Purpose

The meeting began at 3:00 p.m.

The purpose of this workshop was to bring together stakeholders to determine the direction of the Cottonwood Creek Watershed Strategic Plan. The goal is to arrive at a consensus among stakeholders about the desired groundwater and water quality conditions of the watershed. Workshop discussions will be instrumental in the development of a comprehensive watershed management plan (WMP), and ultimately provide a rational, science-based approach to cooperatively managing the Cottonwood Creek watershed with a diverse set of stakeholders.

Mike Urkov / CH2M HILL facilitated introductions and reviewed the agenda.

Following the presentation, Mike Urkov asked each person in attendance to state his or her expectation for this workshop.

Mike Urkov gave a brief PowerPoint presentation about the Cottonwood Creek watershed that included:

- Cottonwood Creek Watershed Assessment (CH2M HILL, 2002), findings, conclusions, and recommendations
- Water Quality Control Plan for the Sacramento River Basin (Basin Plan)
- Irrigated lands, conditional waiver summary, and conditional waiver water monitoring requirements
- Current monitoring of Cottonwood Creek

Expectations and Discussion

Expectations:

- Discuss the influence of population growth on groundwater and water-quality
- Determine which parameters to monitor
- Learn from the process in preparation for the Western Tehama Project
- Examine the relationship between groundwater and surface water; discuss how groundwater influences streamflow and stream water quality
- Provide technical advice and assistance
- Discuss land use and infiltration in the watershed (i.e., how the watershed acts like a sponge)
- Help guide the process as it moves toward a WMP
- Determine the rate and affect of leach lines and pesticides on the groundwater system
- Improve understanding of groundwater and surface water for better management
- Learn more about the watershed
- Meet stakeholders
- Gain water quality and quantity information

Topics of discussion:

Following the presentation, the group discussed these issues:

Question: Are we discussing groundwater quantity as well as groundwater and surface-water quality?

Response: Primarily, we are discussing the quality of groundwater and surface water. The Watershed Assessment did not find a significant amount of data about groundwater quantity. However, we can discuss it if the group feels that it is an area of concern.

Question: Don't we have huge amounts of groundwater?

Response: DWR has been monitoring groundwater wells for many years. The Watershed Assessment did not contain information from the monitoring sites of the City of Cottonwood or the Rio Alto Water District (Lake California).

Comment: The presentation lists the source of turbidity in the south fork of Cottonwood Creek as possibly caused by land slides into the creek. That slide is definitely the source of turbidity from the south fork. I've been up there and there is no doubt.

Comment: There was a comment that the water quality was "good to excellent" which seems a little vague. I would question whether the east side groundwater is good to excellent. There has been a boron issue in the eastern section of the watershed, for example.

Response: The Watershed Assessment is referring to the overall picture that the groundwater and surface water has generally fallen into the good to excellent range as determined by United States Environmental Protection Agency (USEPA) guidelines. It is noted in the assessment that there have been some problem areas; some parameters have not been in the good to excellent range, but in general they are.

Comment: Concerning the agricultural waivers, there is also a third option. A landowner can also have an engineered plan to prove that they have no discharge in the summer or winter. It would not be cheap, but it can be done.

Question: Is the Phase II (SWAMP) monitoring site in the south fork, at Evergreen Road, or some other location?

Response: The site could be one of the older United States Geological Survey (USGS) sites or the DWR site. My understanding is that it is actually at the Evergreen bridge.

Question: How will enforcement of agricultural waivers be handled?

Response: The Regional Water Quality Control Board (RWQCB) is the enforcement agency. The RWQCB wants to help with management techniques rather than enforcement.

Response: If you violate [agricultural waivers] the RWQCB will enforce.

Comment: The agricultural waiver is not meant to be a finger pointing measure.

Comment: The idea of the agricultural waiver is to restrict the permitting process. It starts with monitoring. Education is a big part of the program.

Question: What percentage of the watershed is agriculture?

Response: There is a substantial amount of agriculture in the watershed, but because of the size of the watershed as a whole, the percentage is relatively low.

Comment: The Cottonwood Creek Water Group (CCWG) monitoring program will be in harmony with the agricultural waiver requirements. Monitoring is a good idea.

Question: Are we identifying the need for a monitoring plan as a recommendation?

Response: Yes, we need to identify best management practices though. We need a toolbox and some sort of diagnostic tool for use by landowners.

Comment: We don't want this to look like something that is coming from bureaucrats. Outreach has been a problem with this group; this group is closed and stakeholders are not being informed.

Response: CCWG publishes a newsletter with information for stakeholders. Landowners, are welcome to submit an article for the newsletter that they feel is important to communicate to other landowners.

Comment: We always encourage landowner participation, but we cannot force people to attend these meetings and become informed about the issues in the watershed.

Question: What about groundwater?

Question: How are groundwater aquifers recharged?

Response: There is a model already tying the Redding basin to the Cottonwood Creek basin. There is a lot of data available for public consumption.

Comment: Perhaps we need to invite Toccoy Dudly / DWR to talk about groundwater.

Comment: Fritz Carlson / CH2M HILL worked with him, and he would be able to provide more information.

Follow up: Fritz Carlson / CH2M HILL built the groundwater model for the Redding Groundwater Basin. Toccoy Dudly / DWR was not involved in building the model. The model demonstrated that the aquifer associated with Cottonwood Creek is full.

Question: Is land use impacting recharge?

Question: When a new home or well is completed, isn't there some monitoring requirement for water quality? Would this information be available through the county health department?

Response: Often times, the testing is done by private parties and the data is usually not available to the public.

Question: Are there any issues with methyl tertiary butyl ether (MTBE)?

Response: There may be a couple of files available to the public concerning MTBE.

Question: How does the stockyard impact water quality? What enforcement is there?

Response: The stockyard had a problem with flooding that involved an Anderson-Cottonwood Irrigation District (ACID) canal. Violations are enforced in these circumstances.

Comment: There was a discussion about the scope of the project and the possibility of adding or changing the structure of the meeting schedule. Specifically, some attendees expressed an interest in combining issue areas for the next series of meetings. The idea was raised that the technical advisory committee could meet on various issues and deliver their ideas to the CH2M HILL team for inclusion in the technical memos.

Comment: It is vital that we get the WMP correct because it will be the governing document for the watershed for future grants and projects

Mike Urkov closed the discussion by going back to the original expectations to see if the discussion adequately addressed the expectations. A follow-up list was developed for our next meeting.

Follow-up items:

- Influence of population growth on water quantity and quality
- Consider the groundwater relationship to surface water
- Further discussion of the influence of land use on the infiltration of water into the system (sponge theory)
- Leachline and pesticide influence on groundwater

Recommendations of the Group:

- Establish a water monitoring program that is concurrent with the agricultural waiver program guidelines.
- Obtain additional groundwater level data from the City of Cottonwood and the Rio Alto Water District.
- Continue to engage the Del Webb development project as it moves forward to address future groundwater and water-quality issues.

The meeting was adjourned at 5:30 p.m.

Cottonwood Creek Rangeland and Timber Introductory Workshop—July 16, 2004

FROM: Stephanie Tillman / CH2M HILL
Mike Urkov / CH2M HILL

DATE: August 5, 2004

INVITEES:

Julia Arnold / CCWG Board
Jackie Baker / CCWG Board*
Herb Baldwin / Sierra Pacific Industries*
Tricia Bratcher / DFG*
Guy Chetelat / RWQCB
Crane Mills
Chuck Forero / Livestock Advisor
Roy & Karen Graves / Graves Ranch
Tom Harrington / CCWG Board*
Marc Horney / Chico State Department of Agriculture
Arlene B. Kallis / Shasta-Trinity National Forest
Dave Loeffler / U S Forest Service*
McAuliffe Family Ranching / Landowners
Tom McCubbins / Tehama Co. RCD*
Gary Nakamura / Area Forestry Specialist
Brandy Norton / CCWG*
Dennis Possehn / Landowner
Rich Pound / CA Dept. Forestry & Fire Protection
Roy H. Richards, Jr. / CCWG Board
Holly Savage / CCWG*
John Schoonover / CH2M HILL*
Vieva Swearingen / CCWG*
Stephanie Tillman / CH2M HILL*
Julie Titus / USFS
Mike Urkov / CH2M HILL*
Doug Wenham / CA Department of Forestry and Fire Protection
Sharon Younkers / CH2M HILL

COPIES: Vieva Swearingen / CCWG

* Attendees

Introductions and Meeting Purpose

The meeting began at 3:00 p.m.

The purpose of this workshop was to bring together stakeholders to determine the direction of the Cottonwood Creek Watershed Strategic Plan. The goal is to arrive at a consensus among stakeholders about the desired rangeland and timber conditions of the watershed. Workshop discussions will be instrumental in the development of a comprehensive Watershed Management Plan (WMP), and ultimately provide a rational, science-based approach to cooperatively managing the Cottonwood Creek watershed with a diverse set of stakeholders.

Mike Urkov / CH2M HILL facilitated introductions and reviewed the agenda.

Mike Urkov gave a brief PowerPoint presentation about the Cottonwood Creek watershed that included Cottonwood Creek Watershed Assessment (CH2M HILL, 2002) findings, conclusions, and recommendations, and new data from the Strategic Fuels Reduction and Management Plan (Western Shasta Resource Conservation District, 2002).

Prior to the presentation, Mike Urkov asked each person in attendance to state their expectation for this workshop.

Expectations and Discussion

Expectations:

- Express concerns regarding fuel management
- Get landowner input on grazing and fencing
- Provide input regarding fuels
- Discuss issues regarding the fire plan
- Discuss development and urbanization issues concerning fire
- Discuss rangeland, grazing, and public perception
- Discuss meeting the needs of the Department of Fish and Game (DFG) and landowners in terms of land management
- Discuss forest management in the watershed including private and U.S. Forest Service timberland
- Learn more about the watershed
- Preserve landowners' right to cut timber

Topics of discussion:

Following the presentation, the group discussed these issues:

Question: Do they still log Digger (Gray) pines in the watershed?

Response: Yes, although I'm not sure what they use it for. It contains quite a bit of sap. Maybe they are used for split rail fences. But yes, some people are still logging Digger pine.

Comment: There seems to be a lack of information on grazing in the watershed.

Comment: There used to be more vegetation management. In the old days, ranchers would graze through the watershed and throw a match on the way out to burn off the vegetation.

Comment: I think that the causes of fires in more populated areas have changed.

Comment: One of the problems is the increasing number of new toys. Many new ATVs, quad-runners, motorcycles, etc., are moving into the forests and starting fires.

Comment: The grants available for communities at risk, like Platina and Beegum, should be based upon their proximity to federal lands.

Comment: Different types of urban interfaces exist. Urban sprawl on the one hand, and more people actually going farther into the national forest.

Comment: Development itself is not the problem; the type of development is really the problem. The size of a parcel influences how difficult it is to defend against fire. Two-acre parcels that are subdivided are the most difficult. They tend to be much more difficult than quarter to half-acre parcels in a subdivision or development.

Question: Are Shasta and Tehama counties considering fire in the planning process?

Response: Tehama, yes; Shasta, no.

Response: Actually, Shasta County does have a well-defined plan for water sources and roads.

Comment: The California Department of Forestry (CDF) is in charge of fire safety, not the county planning department.

Response: It's called 4290, Public Resource Code.

Comment: All new developments fall under 4290. The plans go through CDF and building projects for approval. Prior to about 1980, a 40-acre parcel would be split up 40 times. There wasn't that much development work regarding road access or water sources for fire. Some have narrow roads or single entrance/exit points that make fire fighting difficult. Others have little or no water sources available to fight fires.

Comment: Propane tanks are often a problem.

Comment: That's true. During the Jones Valley fire there were several reports of propane tank ruptures.

Question: Are there any air tankers right now?

Response: Yes, there are a few. Not all of them were grounded in the recent events, and those are back in service.

Comment: Cottonwood Creek Watershed Group (CCWG) could play a large role in the education and outreach program concerning fire prevention and fire safety, creating safe zones, and handing out information to landowners about ways to help minimize fire.

Comment: One of the hurdles that CCWG faces is the difficulty in getting large grants for fuels reduction when competing communities like Weaverville or Burney are surrounded by forests.

Question: What is the possible role that CCWG would play in the execution of controlled burns in the watershed?

Response: We are already playing a role in prescribed burns. We are part of the burn that is going on in the Knob Peak area.

Comment: Burns are being stopped by California Air Resources Board (CARB) because of air quality concerns.

Comment: There have been some very successful vegetation burn programs in the area. The problem is that with the current budget situation, CCWG will have to push CDF to conduct burns. CDF will be more responsive to multiple landowners than a single landowner. If CCWG could coordinate a group of landowners to do a burn, CDF will be more responsive to the request.

Comment: Grazing can be an essential tool for fuels reduction.

Response: Yes, grazing can be helpful. Some people have tried to use goats in remote areas to help with fuels reduction, but mountain lion populations have grown, and the goats were attacked by the lions.

Comment: I think it is important to realize that whatever maintenance plan is pursued, it must be on-going. There have been many projects completed that were not maintained and were not effective during a fire. It is less expensive to keep up the maintenance than to do the project over again in a few years.

Comment: Star-thistle, Medusa Head, and Klamath Weed are all of concern. There are Weed Management Areas that could be used as an information source for our project.

Comment: We should also consider oak regeneration. Oaks are still being harvested and lost in the watershed. We need to maintain oaks by any means; oaks are a valuable resource.

Mike Urkov closed the discussion by going back to the original expectations to see if the discussion adequately met expectations. A follow-up list was developed for our next meeting.

Follow-up items:

- Grazing and fencing issues
- Ranch plans
- Address the water quality issues of having farm animals confined to a small parcel of land. Some landowners have one or more animals on a relatively small plot of land, which may create water quality problems.

Recommendations of the Group:

- Consider grazing as a tool for fuels reduction
- Continued education and outreach
- Pursue vegetation management through prescribed burning programs

The meeting was adjourned at 5:30 p.m.

Cottonwood Creek Terrestrial and Riparian Habitat Introductory Workshop—July 19, 2004

FROM: Stephanie Tillman / CH2M HILL
Mike Urkov / CH2M HILL

DATE: August 5, 2004

INVITEES:

Julia Arnold / CCWG Board
Barten Bengard / Bengard Ranching
Tricia Bratcher / DFG*
Guy Chetelat / RWQCB*
Cottonwood Creek Sand & Gravel
Richard Edsall / CCWG Board*
Kelley Garrett / Caltrans*
Julie Graham / Landowner
Clarissa Hale / Landowner*
Aric Lester / DWR
Martha Lutz / Landowner
Tom McCubbins / Tehama Co. RCD
Dennis Mitchell / CCWG Board
Brandy Norton / CCWG*
Harry Rectenwald / DFG
Roy H. Richards / CCWG Board
Rod Rodriquez / Cottonwood Creek Ranch
Holly Savage / CCWG*
Karen Scheuermenn / Landowner*
John Schoonover / CH2M HILL*
Penny Sullivan / Landowner*
Vieva Swearingen / CCWG*
Stephanie Tillman / CH2M HILL*
Mike Urkov / CH2M HILL*
Jack Williamson / USFWS
Sharon Younkers / CH2M HILL*

COPIES: Vieva Swearingen / CCWG

* Attendees

Introductions and Meeting Purpose

The meeting began at 3:00 p.m.

The purpose of this workshop was to bring together stakeholders to determine the direction of the Cottonwood Creek Watershed Strategic Plan. The goal is to arrive at a consensus among stakeholders about the desired terrestrial and riparian habitat conditions of the watershed. Workshop discussions will be instrumental in the development of a comprehensive watershed management plan (WMP), and ultimately provide a rational, science-based approach to cooperatively managing the Cottonwood Creek Watershed with a diverse set of stakeholders.

Mike Urkov / CH2M HILL facilitated introductions and reviewed the agenda.

Mike gave a brief PowerPoint presentation about the Cottonwood Creek Watershed that included Cottonwood Creek Watershed Assessment (CH2M HILL, 2002) findings and recommendations, Western Shasta Resource Conservation District Mapping, and the Middle Fork Cottonwood Creek Watershed Analysis (Shasta-Trinity National Forest Southfork Management Unit, 2002).

Prior to the presentation, Mike Urkov asked each person in attendance to state his/her expectation for this workshop.

Expectations and Discussion

Expectations:

- Discuss the interface between grazing and riparian areas
- Discuss listed species, specifically the different species of frogs in the watershed.
- Determine need for surveys of frog species
- Discuss habitat concerns
- Discuss noxious weeds in riparian areas
- Discuss options to deal with landowners to enhance fish and wildlife
- Discuss using a guild approach to assess habitat
- Discuss a guild approach to assess bird species and regionally important species; discuss the need for more in-depth surveys.
- Learn more about the watershed
- Protect and enhance the riparian habitat while meeting the needs of the landowners
- Discuss the loss of songbirds and the overgrazing that occurs in the watershed
- Obtain input for the educational programs that the Cottonwood Creek Watershed Group (CCWG) will be implementing in the future regarding habitat
- Maintain status quo
- Discuss additional information on riparian restoration
- Learn about riparian habitat and share information about the red-legged frog grant

Topics of discussion:

Following the presentation, the group discussed these issues:

Comment: The Wildlife Habitat Relationships (WHR) information is different from the guild approach.

Comment: We need to develop a list and description of what exactly is native in the watershed. There is discussion about returning and restoring the native habitat, but that seems to be undefined at this point.

Comment: This has been an issue from the beginning. For instance, there are goshawks in the watershed. The map of critical habitat produced by Western Shasta Resource Conservation District is better described as a suitable habitat map.

Comment: The Watershed Assessment was not scoped to allow any original work by CH2M HILL. In fact, it specified that no original studies were to be done. Because of this,

the assessment only includes published works in most cases. Hand written notes and undocumented sitings were not included for that reason. We know that there is more information out there, it is just a matter of documenting it.

Question: In the last slide, there was something about fire suppression having the greatest impact to wildlife in the Middle Fork. What kind of impact, good or bad?

Comment: The Middle Fork Cottonwood Creek Watershed Analysis was written to justify the Knob Peak burn that is being undertaken. The upper watershed is so heavily brushed that it is hard for wildlife to pass through and the impact of fire suppression on wildlife is bad.

Comment: The western pond turtle is a Federally Listed "species of concern," which is why it is mentioned quite often. It exists in the watershed.

Comment: We seem to be approaching a recommendation to eliminate or reverse fire suppression trends and to implement the fire management plan.

Comment: We also need to look at the various parts of the watershed in a more in-depth way. For instance, the lower / western sections of the watershed have lots of chamise. This needs to be checked and included in a fire management plan.

Question: What are the normal species conditions? We seem to be trying to manage a system without knowing specific objectives. We need to be more specific about what species we are managing for and in which part of the watershed. In some cases, a burn in the spring would destroy the nesting songbirds in that area. The timing of the burn is very important. Furthermore, a burn that is good for one species is probably going to negatively impact another. It may be good for the grasses or certain species, but may be harmful to others. I think we need to define exactly what we are managing toward.

Comment: We also need to put all of the knowledge out there for the landowners to be able to utilize. Public education is one of the keys to managing the watershed.

Question: What mechanisms can we employ to help get information out to the public, specifically the landowners?

Response: We have the newsletter, and we're working on the new website www.cottonwoodcreekwatershed.org that will allow us to post new information and all of the reports that are being published about the watershed.

Question: Can the watershed group be included in the Forest Service burn planning?

Response: Much of the watershed is private land.

Comment: We can at least recommend that we utilize public agencies in management forums.

Comment: If we can first identify habitat, we can plan specific fuel reductions or burns that benefit certain species.

Comment: Grant funding for fire reductions on private lands must meet California Environmental Quality Act (CEQA) and National Environmental Quality Act (NEPA) guidelines.

Question: If you rip-rap a stream bank, what is the effect?

Response: Hard cover removes riparian habitat. In some cases you remove habitat for bank swallows or other riparian species.

Comment: There are many things that could be done to improve and increase riparian habitat. You can remove grazing cattle from the stream bank, fix old culverts, and install wildlife-friendly fencing. Sometimes planting can be helpful, other times plant removal is beneficial. It depends on what you are trying to accomplish.

Question: What is wildlife-friendly fencing?

Response: The upper wire of fencing is not barbed, allowing deer or other wildlife to jump over safely.

Response: Also, I believe the bottom wire is higher to allow young animals to go under.

Follow-up: According to the U.S. Fish and Wildlife Service website, the best fence for deer areas has a top wire maximum height of 38 inches with at least 12 inches between the top two wires. Furthermore, it recommends that the bottom wire be smooth because fawns often go under the fence and sometimes get tangled in the barbs. More information is available at http://pacific.fws.gov/jobs/orojitw/standard/fence-wldf.htm

Comment: We can recommend encouraging riparian habitat conservation through stakeholder education.

Comment: Here again we need to identify what we're trying to accomplish. What are the conditions that we're trying to achieve? Do we want to restore the riparian areas back to some specific condition, or just stop the further intrusion of invasive and noxious weeds?

Comment: Noxious weeds in the riparian areas are a real problem, invasive weeds from salt cedar to pampas grass. Arundo is also a growing problem.

Question: What is arundo?

Response: (Vieva Swearingen handed out brochures to describe arundo). Arundo is the bamboo-looking plant that is growing in the watershed.

Comment: There is an arundo removal program in Chico. Grants are available for removal.

Comment: We need to educate landowners about some of these species and the effect they have on the watershed. One landowner removed a bunch of native plants and planted the pampas grass all over.

Comment: There might be a role for CCWG to help organize volunteers and landowners for weekend clean-up or planting projects in riparian areas. West Valley High School has a requirement to do volunteer work for graduation.

Comment: We also need to address trespassing and 4X4s in riparian areas. I watched someone with a 2-wheel drive truck go half-way out into the creek, get stuck and winch the truck across more than once.

Comment: We need to figure out some very basic facts such as the percentage of the bank that is vegetated. The Anderson-Cottonwood Irrigation District (ACID) canal has also added some riparian habitat, and that needs to be mapped.

Question: Would it be beneficial to include modeling of the creek?

Response: What type of modeling? There are computer models and physical models. Perhaps we could just start with a conceptual model.

Comment: A model is not action-oriented.

Comment: We should also evaluate grazing practices and grazing strategies on native vegetation.

Comment: Habitat creation can sometimes create a nuisance. We need to consider how we will manage this issue from the beginning.

Comment: We didn't talk much about oak woodlands. We should at least inventory the oaks for evaluation. Also, the red fir zone has serious problems. We should engage the Forest Service to survey oak woodlands.

Comment: We now have a grant for the red-legged frog research. If you would like further information come see me (Vieva).

Comment: We also need to address beaver and wild pig impacts.

Mike Urkov closed the discussion by reviewing the original expectations to see if the discussion adequately met expectations. A follow-up list was developed for our next meeting.

Follow-up items:

- Guild assessment
- Red-legged frog monitoring details

Recommendations of the Group:

1. Eliminate or reverse fire suppression trends by implementing a watershed fire management plan.
2. Utilize public agencies to participate in management forums.
3. Encourage riparian habitat through stakeholder education.
4. Map riparian areas.
5. Develop an overall plan for the desired condition of vegetation and wildlife habitat in the watershed with clear and concise management goals.
6. Create a list of native flora and fauna in the watershed.
7. Maximize outreach to the landowners via the new website and educational programs.

The meeting was adjourned at 5:30 p.m.

CCWG Strategic Plan Review

Technical Advisory Committee—May 26, 2005

FROM: Ed McCarthy/CH2M HILL
Mike Urkov/CH2M HILL

DATE: June 1, 2005

INVITEES:

Arlene Kallis/USFS—Shasta-Trinity	Larry Forero/UCD
Bruce Ross/DWR	Mary Ann McCarary/CalTrans*
Chuck Schoendienst/CDF	Mike Berry/CDFG
Dee Swearingen/ACID*	Mike Tucker/NOAA
Dennis Heiman/RWQCB	Steve Turek/CDFG
Doug Wenham/CDF	Tricia Bratcher/CDFG*
Fraser Sime/DWR*	Tricia Parker/USFWS*
Gary Nakamura/UCD	Mike Urkov/CH2M HILL *
Guy Chetelat/RWQCB*	Ed McCarthy/CH2M HILL *
Harry Rectenwald/CDFG	Vieva Swearingen/CCWG*
Jim Diel/Union Pacific Railroad	Sharon Younkers/CH2M HILL
Josh Davy/UCD	Julie Arnold/Board member*
Julie Titus/USFS	Kim Desena/CDF/TCFD*
Lon Currey/Board member*	

*Attendees

Introduction/Review Agenda

The meeting began at 3:34 p.m.

Vieva Swearingen/CCWG facilitated introductions.

Mike Urkov/CH2M HILL reviewed the agenda.

Comments:

- This was meeting 6 of a possible 10.
- Public input should be maximized.
- There were approximately 18 people at the stakeholder meeting held on 5/24/2005.

Project Review/ Consideration of Strategic Plan Recommendations

Mike Urkov provided a PowerPoint presentation that included background information about the strategic plan. As the PowerPoint presentation continued, TAC members commented and discussed a variety of issues. These comments and discussion included the following:

The "big picture" on watershed management involved four steps and ended with "Physical Projects". Many of the endpoints of the management project are not necessarily physical projects. It was generally agreed that "Physical Projects" should be changed to "Actions".

The Purpose of the strategic plan was listed in the presentation as "Cooperative Watershed Strategic Plan outlining desired watershed conditions". Based on the work to date, the strategic plan will not outline the "desired watershed conditions". The TAC recommended that this be changed to more accurately reflect the material that will be in the strategic plan. Perhaps, "Cooperative Watershed Strategic Plan outlining the areas that will be focused on in the Management Plan". There was some discussion on how the strategic plan and the management plan are related to one another. The strategic plan is "step 1" or "the executive summary" of the management plan, outlining what topics will be included in the management plan.

The original workshops were divided into "Focus Areas". Once the workshops were completed, several similar issues were noted. The similar issues were discussed in technical memoranda that replaced the focus areas. The issues were discussed as "issue areas". There was some discussion about whether or not "issue" was the right name for what was being discussed. The TAC did not provide a definitive new name for the "issue areas," although "key interest areas" and "watershed tools" were suggested.

It was generally noted that keeping language consistent was important. Definitions of topics like "riparian habitat" should be kept the same in the assessment, the strategic plan, and in the management plan.

The slide depicting grazing as a tool for fire suppressing spurred discussion. The question of how to combine technical information with public perception was discussed. Some members of the TAC thought that some members of the public might have anecdotal evidence that grazing was ineffective because of predation. Some members of the TAC believed that there was technical information available that suggested predation was not an issue for grazing in the watershed, however, no specific technical information was provided. This discussion lead to one of the strategic plan recommendations, "**CCWG can help 'bring forest fuels into balance' by acting as a clearinghouse for information about forest fuels management. "** The TAC generally agreed that CCWG could manage the watershed by acting as a clearinghouse for information about grazing and other fuels management techniques. It was also noted that a grant for restoration of a fire lookout was in process. There was some discussion about the rental value of the fire lookout. It was also noted that the recommendation to create a vegetation management plan should be moved form the Fuels reduction memorandum to the management memorandum.

Use of the terms "Inventory" and "Monitoring" was discussed extensively. Some of the comments included:

- Inventory is presence vs. absence and is generally qualitative.
- Monitoring is quantitative and tends to be more statistically oriented and scientifically derived.

The strategic plan should do a better job at differentiating monitoring and inventory. It was generally agreed that the strategic plan lists monitoring activities and inventory activities correctly.

One of the recommendations in the strategic plan is to facilitate riparian mapping by providing landowners the tools needed to map riparian areas on their property. The TAC noted that this would result in a patchwork of mapping. The TAC preferred a watershed wide approach to riparian mapping because impacts to one riparian area or one portion of the creek can be related to other riparian areas further away. Some discussion of what landowners wanted to know ensued. Discussion focused on the "what ifs" of finding an endangered species or critical habitat on private property. Do landowners want to know what species or habitat is on their property? Conducting high resolution aerial photography could be done to map riparian corridors throughout the watershed. The strategic plan recommendation of providing information to landowners about identifying vegetation, endangered species, and native species was mentioned. It was generally agreed that CCWG should provide information to landowners about vegetation and species.

Discussion then progressed to Blue Oak woodland habitat. Blue Oak woodland management plans are being produced by each county. Tehama County has completed one and Shasta County is working on one. The Wildlife Conservation Board has grants to give but will only give grants for work in counties that have completed woodland management plans.

It was noted that in the tech memos the "study/outreach/action" categories are not well defined. Whether they are forward looking (Studies that will be done) or backward looking (studies that have been done) should be defined. Also, the table could be more robust and include more information.

The TAC generally agreed that the Del Webb name should be removed from the strategic plan. Referring to any specific company was not appropriate because the activity taking place was what was important, not the company doing the activity. This would also prevent conflict in the future and help avoid an adversarial relationship.

It was also generally agreed that the Strategic Plan recommendation for providing signage was a good one. The TAC discussed their experiences with posting signs. There was some discussion of posting large signs at the main entry points to the watershed and posting smaller signs at other locations, like along roads and at the boundary of the watershed.

The TAC thought that "Regulatory Agency" was not an accurate phrase and that it had a negative connotation. The preferred phrase was "Local, State, and Federal Resource Management Agencies". This phrase will be used in the future to more accurately reflect what agencies do and which agencies are being referred to. The phrase "cohabitate" struck members of the TAC as rather funny. Since people and the environment will not be sharing housing, TAC suggested the phrase be changed to "coexist".

The extensive discussion did not leave time to discuss all of the recommendations in the technical memos. Some TAC members said they would provide further comment to CH2M HILL on hard copy documents.

The meeting was adjourned at approximately 5:15 p.m.

Cottonwood Creek Strategic Plan

Stakeholder Workshop—July 28, 2005

FROM: Ed McCarthy/CH2M HILL
Mike Urkov/CH2M HILL

DATE: June 1, 2005

INVITEES:

Bruce Alexander	Darryl Deaton
Julie Arnold/Board member	Clark Goodrich
Lon Currey/Board member	Julie Graham
Roselyn Currey*	Roy & Karen Graves/Graves Ranch
Tom Harrington*	Ken & Sonja Green
Jan Lopez	Paul Gurrola
Roy H. Richards, Jr*	Clarissa Hale*
Vieva Swearingen/CCWG	Chuck Lema*
Mike Berry/CDFG	Chris Leininger
Tricia Bratcher/CDFG*	Martha Lutz
Virginia Bratcher*	Bill & Robin Rich
Koll Buer	Rod Rodriquez
Guy Chetelat/RWQCB*	Boyd Sartori
Larry Forero/UCD	Kathy Surbaugh*
Kelly Garrett	Penny Sullivan
Dennis Heiman/RWQCB	Anderson-Cottonwood Concrete
Marc R. Horney	Cottonwood Creek Sand & Gravel
Arlene Kallis/USFS—Shasta-Trinity*	Crane Mills
Gary Nakamura/UCD	McAulliffe Family Ranching
Tricia Parker/USFWS*	Roseburg Forest Products
Rick Pound/CDF	SPI
Harry Rectenwald/CDFG	Wendy Johnston/Vestra
Fraser Sime/DWR	Bonnie Lamprey
Dee Swearingen/ACID*	Dennis Possehn
Julie Titus/USFS	Carl Harral/CDFG
Mike Tucker/NMFS	Aric Lester/DWR
Steve Turek/CDFG*	Jackie Baker
Doug Wenham/CDF	Richard Edsall
Jack Williamson/USFWS	Dennis Mitchell
Barten Bengard/Bengard Ranching	Bill Gibson
Jeff Davis	Mike Urkov/CH2M HILL *
Brenda Olson/USFWS*	Ed McCarthy/CH2M HILL *
Kim Desena/CDF/TCFD*	Sharon Younkers/CH2M HILL

*Attendees

Introduction/Review Agenda

The meeting began at 2:35 p.m.

Vieva Swearingen/CCWG facilitated introductions.

Mike Urkov/CH2M HILL reviewed the agenda.

Comments:

- This was meeting 7 of a possible 10.
- Public input should be maximized.
- There were approximately 18 people at the stakeholder workshop held on 7/28/2005.

Project Review/ Consideration of Strategic Plan Recommendations

Mike Urkov provided a PowerPoint presentation that included background information about the strategic plan. As the PowerPoint presentation continued, TAC members commented and discussed a variety of issues. These comments and discussion included the following:

There was unanimity among participants that the five technical memos (TM) should be combined into one comprehensive document. That document would become the CCWG Strategic Plan.

The original workshops were divided into "Focus Areas". Once the workshops were completed, several similar issues were noted. The similar "issues" were discussed in technical memoranda that replaced the focus areas. The "issues" were discussed as "issue areas". There was some discussion about whether or not "issue" was the right name for what was being discussed. The stakeholders did not provide a definitive new name for the "issue areas," although "strategy areas" or "topic" were suggested. The TAC had previously suggested "key interest areas" or "watershed tools" be used.

Vieva discussed Sunflower CRMP's plans to use grazing as a tool for fire suppression.

Page four of Technical Memo (TM) 1 needs to be corrected. The TM states, "CCWG is ready to assist landowners in the watershed in implementing prescribed burns in accordance with the Fuels Management Plan, but no specific projects will be proposed by CCWG." CCWG is taking an active roll in the prescribed burn program. This section was intended to say that CCWG will not be the final arbiter of the locations of prescribed burns. CCWG may propose specific projects but will not be the final decision maker on where or when prescribed burns take place.

Several TMs have a heading called "Next Steps". These sections need to be discussed more and some differentiation between "Next Steps" and "Recommendations" needs to be explained.

Workshop participants generally agreed that a native species list would be useful and should be perused. There was some discussion about adding species population trends to the list.

One of the workshop participants recommended that CCWG should enhance communication with landowners in order to help get information from landowners about watershed conditions.

There was a suggestion that the outreach to the general public section include two more topics: dumping near the creek and ATV use in the creek. These two topics are similar to topics already in the TM: trespassing, because much of the dumping involves trash generated by trespassers while they are in the watershed, and four wheal drive vehicle use in the creek. An explicit exception should also be added to the trespassing and four wheal drive vehicle discussion for fire fighting crews and their vehicles.

CCWG should include some discussion about the Kids in the Creek program. Involvement in the program would be an excellent way to conduct outreach and education.

One of the participants asked if CCWG had or planned on establishing a specific fish systems model. A model that includeds distribushion, timing, habitat utilization, etc. is being developed on Beegum and/or Battle Creek by Cal Fed and US F&WS. There is a training coming up next month. Getting information and working collaboratively with others locally to make sure that any fish systems model developed is compatible with other models is a good idea. If there is a model that could be adapted, it would be a good idea to use that model for Cottonwood Creek.

It was suggested that CCWG should use desired conditions to guide future action.

At this point the Power Point presentation was complete. The group then moved on to a review of each individual TM. The review focused primarily on the "next steps" and an attempt was made to refine those suggestions and convert them into "recommendations"

Oak woodlands are well understood in Cottonwood Creek. CCWG should make an effort to get copies of the documents that are already out there on oak woodlands and talk with local experts about relevant issues.

Some new or revised recommendations include:

- Explore the conection between the road network and erosion.
- Examine trends in wildlife abundance and/or distribution.
- Move the fencing management plan suggestion to TM 4, Management plan development. The should be changed from a management plan, which would be to expensive and cumbersome, to a set of BMPs or single page handouts that cover the most important points about fencing.

CCWG needs to develop options for dealing with erosion. Develop tools that can be offered to stakeholders to implement erosion control and prevention.

The next steps for outreach are good and should be converted to recommendations.

Adaptive management should be linked to a clear definition. The commentor was referred to language in the tech memo regarding adaptive management.

Recommendation 5, page 5 should call Cottonwood a Town, not a City.

One of the stakeholders vented some frustration that the workshop didn't clearly state any new actions that would be accomplished in the near future. He also told the workshop about some of his experiences with erosion and some solutions. The main solution he described was removing cottonwoods from the middle of the creek and placing them on the banks. He complemented the work that Vieva has done to date. He also pointed out that any of the future action discussed by the workshop would have to be carried out by Vieva. His comments indicated that the critical roll played by Vieva, as the watershed coordinator, was not fully appreciated by workshop participants.

The extensive discussion did not leave time to discuss all of the "next steps" in the technical memos. Some participants said they would provide further comment to CH2M HILL on hard copy documents.

The meeting was adjourned at approximately 4:45 p.m.

Appendix B
Project Example of Adaptive Management

APPENDIX B

Project Example of Adaptive Management

As referenced in Section 5.0, Strategic Area 4: Management Plan Development, first paragraph.

Report 13: Adaptive Management: Concepts and Applications to Plum Creek's Native Fish Habitat Conservation Plan

(Proposal by Plum Creek Timber Company to implement a plan to conserve native fish habitat on 1.7 million acres of Plum Creek land in Montana, Idaho, and Washington.)

Overview

Adaptive management is a challenging blend of rigorous science and practical management designed to provide the basis for "learning by doing." Adaptive management is used in the Plum Creek Native Fish Habitat Conservation Plan (NFHCP) to address areas of uncertainty and risk. Adaptive management can be used to address "leaps of faith" in the NFHCP where there is dependence on theoretical models and untested conservation measures. The objectives of Technical Report #13 are twofold:

1. Examine the concept and application of adaptive management
2. Propose research and monitoring projects that may help the practice of adaptive management in the NFHCP

The array of candidate projects described in this report represents the opinions of the authors in consultation with outside experts. The final suite of projects selected for the NFHCP will depend on further discussions with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service.

Key Points

To be effective, adaptive management projects must include three components:

1. Clear objectives and testable theories that relate back to plan components
2. Credible design and study methods
3. Plan for changing management direction in response to new information

Technical Report #13 describes 15 proposed adaptive management projects for the NFHCP. The projects differ in the level of complexity and certainty, but must meet certain selection criteria to be included in the NFHCP.

Project Complexity and Certainty

Adaptive management projects proposed for the NFHCP fall under three categories:

- Continuous improvement monitoring
- Experimental management
- Basic research projects

Six of the 15 proposed projects are considered continuous improvement monitoring (CIM) because they are low risk but high return investments, and the data can be immediately used to adjust management activities. Many of these activities involve annual database updates and inspections. Examples of CIM projects include road condition inventories, NFHCP implementation monitoring, grazing lease monitoring, and biological monitoring of bull trout redds.

Another six projects are considered experimental management with more rigorous scientific design because of their importance or complexity. Examples of experimental management projects include evaluating the effectiveness of NFHCP mitigation measures in reducing in stream fine sediment from roads, and maintaining maximum water temperatures near background levels. Others include a project to examine the effectiveness of NFHCP riparian buffers in maintaining natural levels of in-channel large woody debris and the success of riparian restoration projects. Long-term projects are also proposed to speed watershed analysis using riparian "superguilds" and grazing trend plots.

Three of the projects are basic research. These topics are more speculative in nature or require more investigation before substantive mitigation measures can be initiated. Projects described under this category include development of a technique to suppress brook trout, and evaluation of conifer thinning to accelerate riparian forest development. A third project is designed to validate the Forest Vegetation Simulation model and riparian forest growth and yield relationships.

Project Criteria

Several criteria will help Plum Creek and FWS to determine which projects will be chosen for implementation. To be selected, the project must do the following:

- Improve the level of "certainty" in mitigation measures
- Address the Four C's of cold, clean, complex, and connected water
- Consider the magnitude or potential risk to the species
- Be cost-effective
- Relate to a major NFHCP item that has large costs or significant uncertainly
- Be credibly investigated with appropriate technology and design

The goal of these economic and technical criteria is to get the best results for fish from the research and monitoring investment.

Conclusion and Implications

By the nature of the HCP process, a dynamic tension exists between the need to change management based on valid new information and the "No Surprises" policy that limits landowner liability for committing more land and money beyond the HCP requirements. Adaptive management is funded by the HCP applicant, in this case Plum Creek, to develop effective management strategies that achieve the objectives of the HCP. The ultimate result of this process is a better understanding of ecosystem function and management based on Scientific fact.