2006 CACHE CREEK
STATUS REPORT AND TREND ANALYSIS

1996-2006

Prepared By:

YOLO COUNTY
Planning, Resources, and Public Works Department
Parks and Natural Resources Division
Julia McIver, Director of Parks and Natural Resources
Chris Alford, Resource Planner

Cache Creek Technical Advisory Committee
Dr. Jeff Hart, Riparian Biologist
Kevin O'Dea, Geomorphologist
Dr. Geoff Schladow, Hydraulic Engineer

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1.0 EXECUTIVE SUMMARY

1.1 PURPOSE

This status report and trend analysis provides documentation of the Cache Creek Resource Management Plan (CCRMP) from 1996-2006, describes trends and observations based on monitoring efforts, and recommends actions for future implementation of the CCRMP. As a management plan that recognizes Cache Creek and its resources as a dynamic system, the CCRMP is not a static vision of Cache Creek management. Yolo County designed the program to evolve and adapt in response to new creek conditions and understanding of creek processes.

1.2 ACCOMPLISHMENTS

Although the CCRMP has only been in effect since January 1997, Yolo County (County) has successfully implemented a comprehensive monitoring program and over twenty projects to stabilize the creek banks, enhance habitat, and improve flood capacity. These accomplishments exemplify Yolo County's leadership in management of riparian resources and the County's success in prompting participation by private landowners, aggregate companies, and various resources agencies in habitat restoration and channel stabilization efforts.

- **The County implements an ongoing monitoring program, including:**

  - **AERIAL PHOTOGRAPHY:** The County takes aerial photographs of the CCRMP area each year during low-flow periods. These aerial photographs are made available for public use and are utilized regularly by the County, landowners, aggregate companies, and other public and private organizations such as; the Cache Creek Conservancy, the Department of Water Resources, and the Yolo County Resource Conservation District to implement projects, evaluate bank erosion, facilitate monitoring studies, and document changes in the creek over time.

  - **DIGITAL TERRAIN MODELS (DTMS):** The County creates digital terrain models of the CCRMP area annually. The County, landowners, aggregate companies, and other public and private organizations utilize these three-dimensional computer models of the CCRMP area to implement projects, evaluate topographical changes from one year to the next, and assess multi-year aggradation and degradation trends.

  - **VEGETATION MONITORING:** The County conducts vegetation studies in the CCRMP area to monitor for the presence of both riparian vegetation and invasive species. Initial base data was collected for riparian vegetation cover in 1995 and for tamarisk (*Tamarix sp.*) cover in 1997. In 2006, the County will conduct a vegetation analysis of the CCRMP area to: 1) evaluate changes in riparian vegetation since implementation of the CCRMP, 2) map invasive species as a tool for monitoring and evaluating the invasive species removal program, and 3) monitor and evaluate human-assisted habitat improvement areas so that interested parties can utilize the information gathered to make future planting and management recommendations.

  - **WATER QUALITY MONITORING:** The County monitors water quality annually on Cache Creek in order to track changes in water quality parameters and identify parameters of concern.

- **SEDIMENT AND TURBIDITY:** Yolo County implemented this monitoring program in 2004 to provide baseline data of natural variations in suspended sediments at six locations along the creek within the CCRMP area. Suspended sediment concentrations are of interest because pollutants, such as herbicides, nutrients, and mercury concentrations are often associated with suspended sediment. This study also plays an essential role as it fulfills the turbidity monitoring requirements for individual projects within the CCRMP area in the Cache Creek mercury Total Maximum Daily Load, saving project proponents the time and money required to conduct monitoring independently.

- **STAGE AND TEMPERATURE:** Yolo County collects stage and temperature data at seven sites. This data will help with emergency response during flood events, as well as help to calibrate a hydraulic model (HEC-RAS) for the CCRMP. A current hydraulic model will make it feasible to demonstrate creek conditions during various flood events and assist in determining future management and design of CCRMP projects.

- **HEC-RAS:** The County created a base-line hydraulic model of the CCRMP study area as part of the 1995 technical studies, which formed the basis of the CCRMP. A hydraulic model for the Hoppin and Jesus Maria subreaches between County Road 94B and I-5 was created in 2002 to evaluate flood capacity within the lower CCRMP area. Yolo County will update this model to a HEC-RAS model in 2006 once the County retrieves stage and temperature data. The HEC-RAS model provides information about flood capacity, bridge scour potential, channel stability, sediment transport characteristics, and the location of hydraulic constrictions.

- **TRANSECT MONITORING PROGRAM:** Yolo County established 13 transects in December of 2001 and completed monitoring surveys in spring of 2002. Hydraulic modeling efforts and project designs have utilized this data to obtain accurate channel profiles. A County contract for surveys of these transects to monitor channel changes and develop a current hydraulic model of the CCRMP area are scheduled for Spring 2006 (once water level permits access).

- **VISUAL INSPECTION:** Yolo County conducts visual inspections of the creek through an annual public creek walk and as needed to monitor erosion events and project sites.

➢ **Numerous erosion control, habitat enhancement, and open space projects have been implemented within the CCRMP area, described in more detail in Section 7. Some of these projects include:**

- **CORRELL PROPERTY:** Habitat enhancement project (1996-1998)
  The 38.9-acre Correll site was presented as a gift to the County by Mr. Correll in the fall of 1996. The County had a portion of the south bank of the Correll site removed to allow stormwater flows from Cache Creek to move through the site. The Cache Creek Conservancy removed invasive species and planted Cottonwoods *(Populus fremontii)* to increase perch sites and shading.

- **ROGERS DEMONSTRATION WATER RECHARGE AND HABITAT PROJECT:** Groundwater recharge, habitat enhancement, and public access (1997-1999)
  The 30-acre Rogers Demonstration Water Recharge and Habitat Project site, a retired gravel mining site, was transferred from Teichert to the County as part of the long-term off-channel mining permit plan. The two entities negotiated design and implementation of the improvement plan for the site, including the construction of an overlook area for public access and plantings throughout the site.

- **HAYES BOW-TIE: H**abitat enhancement (1997-2000)
  The habitat enhancement project at the Hayes property was a coordinated effort between the landowner, Solano Concrete (Rinker), Yolo County, and the Cache Creek Conservancy which hydraulically connected the 37 acre, formerly mined site, to the active floodplain to encourage silt accumulation and vegetative growth.

- **FLOODWAY SPUR DIKES UPSTREAM OF I-505 BRIDGE:** Erosion control (1998)
  The project, implemented with the cooperation of Caltrans, the County, landowners, and Syar Industries, included the installation of large spur dikes on the north and south bank of Cache Creek between the former Madison Bridge site and the I-505 Bridge and the relocation of the low-flow channel. This project was particularly important because the I-505 bridge supports are curtain walls that are not designed to take the lateral forces that the creek would impose if it flowed under it at an angle.

- **CRAIG PROPERTY:** Erosion control and habitat enhancement (1998)
  The Craig Property site is located in an area that has historically experienced significant amounts of erosion due to channel meander migration. The County obtained permission from the landowner to implement an experimental form of erosion control utilizing straw bales interlocked with willow stakes as bank protection on the site and paid for the plantings. Cache Creek Aggregates (Granite) conducted the earthwork while the Cache Creek Conservancy planted native vegetation.

- **CACHE CREEK NATURE PRESERVE:** Habitat enhancement and public open space (1999-2000)
  Teichert donated the 130-acre property that forms the Cache Creek Nature Preserve to the County in March of 1999, pursuant to a Master Agreement between the County and Teichert. The County and the Cache Creek Conservancy acquired grant funds to trails and constructed wetlands, which are managed by the Cache Creek Conservancy for the County under a License Agreement.

- **DUNBAR PROJECT:** Erosion control and habitat enhancement (2002)
  This erosion control and habitat enhancement project is located on the north bank upstream of the I-505 Bridge. Runoff from adjacent agricultural fields is controlled by grading and directed to a constructed drain at the eastern corner of the site. The County purchased native plants for the project and worked with the Cache Creek Conservancy to plant them while the landowner provided irrigation necessary to get plants established.

- **TUTTLE PROPERTY:** Erosion control and habitat enhancement (2002-2003)
  This Tuttle Property erosion control and habitat enhancement project was a coordinated effort between the County, the landowner, Syar, and the Natural Resources Conservation Service to address bank erosion caused by agricultural tailwater runoff.

- **SALISBURY SLOUGH:** Erosion control and public access (2003)
  This joint project between the County, the Yolo County Flood Control and Water Conservation District, and the Cache Creek Conservancy addressed erosion conditions that threatened the concrete drop spillway and access bridge across the Salisbury Slough.

- **JENSEN PROPERTY:** Erosion control and habitat enhancement (2003-2004)
  The Jensen Property project was a joint effort between the landowner, Cache Creek Conservancy, Granite, and the County utilized that bio-engineering measures for erosion control, which included the use of root wads, rock, and willow and cottonwood pole plantings instead of traditional riprap.

- **HARRISON PROPERTY:** South bank erosion control and habitat restoration project (2004) The Harrison Property project was implemented by the Yolo County Planning, Resources, and Public Works Department, with permission from the landowner, as a habitat enhancement and erosion control project consisting of minor grading, bank stabilization, removal of invasive species, and the planting of approximately 452 riparian plants occurred on the site in 2004.

- **CAPAY OPEN SPACE PARK:** Habitat enhancement and public access (2004-current) The 41-acre site was donated to the County as part of Granite Construction Company's development agreement amendment in December 2002. The County has received a Proposition 40 grant ($198,000) and a Proposition 50 grant ($189,000) for park development. Once developed, the park will provide the public with access to Cache Creek (including access for the disabled), and site improvements including; trails, picnic areas, parking, restrooms, and interpretive panels for environmental education.

- **WILD WINGS OPEN SPACE:** HABITAT enhancement and public open space (2004-current) The County acquired the five-acre site for the purpose of providing public open space and negotiated with Wild Wings LLC to make site improvements. The five-acre Wild Wings Open Space Project, once completed, will provide public creek access, riparian and upland habitat, and an educational trail with interpretive panels.

- **GRUBE-PAYNE PROJECT:** Erosion control and habitat enhancement (2005-current) This project was a coordinated effort between the County, the landowner, California Audubon, Center for Land-Based Learning, Natural Resources Conservation Service, and Teichert. The project was implemented to address uncontrolled runoff from the adjacent farm fields and to provide habitat enhancement along the creek.

- **Invasive Species Removal:** The Cache Creek Conservancy is implementing a CCRMP-wide tamarisk removal program, with some support from the County. The Conservancy initiated the program in 2001 with California State Wildlife Conservation Board ($595,000) and CALFED ($222,000) funding obtained in grant proposals jointly submitted by the Cache Creek Conservancy and the County. This project has been particularly successful due to Conservancy staff expertise and landowner cooperation and involvement.

- **Total Maximum Daily Load Working Group:** The County initiated, facilitated, and funded a Cache Creek mercury Total Maximum Daily Load Working Group comprised of local entities concerned with the impacts of the Cache Creek mercury Total Maximum Daily Load (TMDL) proposed in 2005. This working group included representatives from: Teichert Aggregates, Syar Industries, the Yolo County Flood Control and Water Conservation District, the Cache Creek Conservancy, the Sacramento Regional Sanitation District, and the County. The Working Group succeeded in achieving several significant changes to the proposed TMDL, resulting in the protection of operations of the Yolo County Flood Control and Water Conservation District, aggregate companies, and implementation of the CCRMP. These changes include:

  - A provision that wetlands restoration project proponents are exempt from the no net increase in methyl mercury requirement in the TMDL if they have implemented all available best practices to reduce methyl mercury levels.

  - A requirement that the Regional Water Quality Control Board (RWQCB) prioritize mercury remediation efforts.

- Language to allow turbidity monitoring conducted by the County through the CCRMP to cover turbidity monitoring requirements for individual projects in the CCRMP area.

- **Resources Website:** The County maintains a natural resources website (http://www.yolocounty.org/prm/default.htm) to provide landowners, non-profits, and other agencies with monitoring data and information related to the Cache Creek Management Area.

- **Supplemental Environmental Impact Report (SEIR):** The County reviewed and updated the information provided in the 1996 Program Environmental Impact Report to inform public agency decision makers and the public of the environmental effects of the CCRMP and CCIP on Cache Creek since implementation. The SEIR also acted as an informational document which aided in the County's ability to renew permits from the following agencies: U.S. Army Corps of Engineers (Regional General Permit), Central Valley Regional Water Quality Control Board (401 Water Quality Certification), and California Department of Fish and Game (1601 Streambed Alteration Agreement). The re-issuance of these permits was essential to maintain the streamline permitting process for channel improvement and habitat restoration projects in the CCRMP area.

- **The Landowner's Guide to Bank Stabilization for Cache Creek:** This guide was developed to educate landowners about stream bank management and was produced by the Cache Creek Conservancy with funding obtained by the County from a RWQCB grant.

- **California Community Partnership Award:** Yolo County and the Cache Creek Conservancy were awarded the California Community Partnership Award in 2002 for involving at-risk youth in the restoration of Cache Creek.

- **Open Space Grant Awards:** County staff have submitted applications and received grants for the development of both the Cache Creek Nature Preserve and Capay Open Space Park, two key public open space sites in the CCRMP area.

    - **Cache Creek Nature Preserve:** County staff obtained a million dollar State Water Quality Control Board grant in 1998 to reduce sediment and improve water quality in Cache Creek. This grant was used to pay for revegetation and public access improvements at the Cache Creek Nature Preserve, as well as Rumsey Bridge repairs and bank stabilization and revegetation along the Guinda Bridge.

    - **Capay Open Space Park:** Phase one funding for the development of Capay Open Space Park was awarded in 2005 by Robert Z'Berg Harris – Proposition 40 ($198,000). This funding was used to design and construct primary trails, roads, public access, and utilities infrastructure. Phase two funding, awarded in June 2006 by the River Parkways – Prop 50 ($189,000), will be utilized to finish the trail system, provide handicap access to the creek, and plant the site with native vegetation.

1.3 PROGRAM RECOMMENDATIONS

Yolo County and members of the Cache Creek Technical Advisory Committee (TAC) recommend the following actions to further implement the CCRMP. Each recommended action is a direct response to CCRMP monitoring program and management findings further discussed within this document. Program recommendations are numbered for reference by the section in which they are found within this document. These recommendations are based upon currently available monitoring data and CCRMP area concerns, and as such, are not meant comprise the complete

set of actions necessary to implement the CCRMP. The County may modify, add to, or dismiss any of the recommended actions in response to changing creek conditions and improved knowledge about creek processes.

WATER RESOURCES MONITORING AND MODELING PROGRAM RECOMMENDATIONS

3.2-1 Flood Monitoring: Implement a flood monitoring program in coordination with the Yolo County Flood Control and Water Conservation District, the City of Woodland, and emergency response partners. Monitoring and inspection during flood events provides valuable information about the impact of flood events on Cache Creek, including bank erosion, loss of vegetation, and damage to infrastructure. It also may provide useful information to emergency response partners.

3.2-2 Stream Flow Gages: Install stream flow gages at Capay and Madison. The CCRMP recommends the installation of additional stream flow gages within the CCRMP area to provide a more complete picture of how hydraulic processes in the creek operate. The new gages would complement existing stations at Rumsey and Yolo, and would have real-time telemetering capabilities.

3.4-1 Complete hydraulic (HEC-RAS) model: Utilize up-to-date digital terrain model (DTM) data, transect surveys, and stage data to develop a HEC-RAS model to evaluate increased flooding hazards related to changes in channel morphology.

3.4-2 Flood Capacity: Work with the Cache Creek Conservancy to expand invasive vegetation removal efforts in the Jesus Maria and Hoppin subreaches to address channel flood capacity concerns.

3.5-1 Water Quality Standards: Incorporate regulatory standards that pertain to Cache Creek as they become available from regulatory agencies into the CCRMP Water Quality Monitoring Program. Provide information in the 2007 Annual Report about the relationship between water quality data and regulatory standards, as appropriate.

3.5-2 Water Quality Analysis: Conduct further analysis of pH, ammonia nitrogen, nitrate nitrogen, total kJeldahl nitrogen, Total nitrogen, TPH as diesel, and fecal coliform to identify trends and determine if existing levels are negatively impacting agriculture or the environment. Focus coliform monitoring efforts on the areas between Capay Dam and Gordon Slough to help determine the source of high coliform counts in samples collected near the confluence of Gordon Slough and Cache Creek. Provide an update on these analyses in the 2007 annual report.

3.5-3 Water Quality Monitoring: Continue to refine the water quality constituents to better reflect likely contaminants. Sample collection testing constituents should reflect only those shown to be present in Cache Creek with an annual sampling of constituents listed on the EPA's most current list for surface water recommendations.

3.5-4 Methyl mercury: Work with the Central Valley Regional Water Quality Control Board to develop a 20-year plan for reducing methyl mercury in fish tissue.

3.6-1 Constructed Wetlands Management: Investigate best management practices to reduce methylation of mercury in wetlands environments.

3.7-1 Mercury Total Maximum Daily Load (TMDL): Add three turbidity monitoring sites within the CCRMP area in 2006 such that the turbidity monitoring conducted by the County can take the place of site-by-site monitoring otherwise required by the new mercury TMDL standards.

3.7-2 Turbidity vs. Total Suspended Solids (TSS): Evaluate whether the CCRMP requirements for sediment monitoring can be met with turbidity monitoring instead of sampling for total suspended solids, which the County currently conducts and is more costly and time consuming.

GEOMORPHOLOGY MONITORING PROGRAM RECOMMENDATIONS

4.1-1 Digital Terrain Model (DTM): Utilize Light Detection and Ranging (LiDAR) imagery taken of the CCRMP area that will collect high-resolution elevation data for the creation of the 2006 DTM.

4.2-1 Volumetric Change: Utilize DTM data to conduct a quantitative assessment of significant volumetric changes in channel capacity and areas of excessive erosion between 1997 and 2006.

4.4-1 Channel morphology: Survey transect locations to provide data necessary for calibration of a HEC-RAS model to evaluate increased flooding hazards related to changes in channel morphology.

BIOLOGICAL RESOURCES MONITORING PROGRAM RECOMMENDATIONS

5.2-1 Utilize new technology for improved monitoring and analysis: Conduct digital color aerial photography and utilize LiDAR imagery in 2006 to provide more detailed and accurate analysis of riparian growth trends. Once the mapping process has been adapted for these new technologies, monitoring studies can occur at a much finer level of spatial accuracy. In addition, the County can distinguish various plant communities utilizing the imagery and monitor vegetative growth over time. Use of LiDAR technology also will decrease the time needed for annual updating in comparison to previous digitization methods.

5.2-2 Mapping guidelines: Set specific guidelines for preparing vegetation mapping and riparian vegetation surveys to ensure consistency in data collection.

5.2-3 Increase monitoring detail: Utilize LiDAR imagery for vegetation mapping so the County can monitor riparian community types and growth as well as vegetative coverage.

5.3-1 Monitoring standards: Develop a standard method and process for monitoring human-assisted restoration projects within the CCRMP area that would allow for comparative analysis of projects and provide guidance for future CCRMP area project development consistent with CCRMP goal 4.2-5. During the first few years of plant establishment, the project proponent should count the principal tree and shrub species for survival rate. The project proponent should use this information to determine if some areas are more productive than others. Relative growth rates would also provide indication of site suitability. After a number of years of good growth, percentage of cover in restored areas could be utilized to monitor established vegetation.

5.4-1 Color Aerial Photography: Utilize color aerial photography for tamarisk monitoring to assist in determining annual action plans for tamarisk removal programs throughout Cache Creek watershed and to provide a method of tracking the relative success of invasive species removal over time. Tamarisk and arundo removal outside of the CCRMP area is important because tamarisk and arundo branches from upstream can float down and reestablish plants within the CCRMP area.

CCRMP AREA RECOMMENDATIONS

Capay Subreach Recommendations

6.1-1 Continue resource agency coordination with landowners to promote and implement invasive species removal program: Invasive species management is particularly important in this uppermost subreach of the CCRMP area to prevent the spread of invasive species to areas downstream. Areas with particularly high densities of tamarisk were noted during the 2006 Cache Creek walk at RM27.7 and RM27.2 to RM26.8.

6.1-2 Coordinate invasive species removal efforts with riparian restoration projects: The soil and groundwater characteristics of the Capay subreach are conducive to riparian vegetation, as indicated by the naturally occurring stands of vegetation in the area. The County should ensure that revegetation projects are implemented to fill in areas where invasive species eradication has occurred. The establishment of native vegetation in areas previously occupied by invasive species promotes the preservation of the vegetative corridor that exists within the Capay subreach, increases the habitat value of vegetated areas, and makes re-establishment of invasive species more difficult.

6.1-3 Utilize bioengineering methods for erosion control: Due to the availability of water, presence of alluvium, and minor channel migration in the Capay subreach, erosion control methods utilizing vegetation and in conjunction with engineering ("bio-engineering") approaches are suggested in this area, including upstream of the Capay Bridge.

6.1-4 PG&E Palisades (RM 26.9): Coordinate with PG&E to identify a solution that addresses the exposed pipeline and concrete blanket conditions.

6.1-5 RM 26.6: Determine if erosion on the south bank of the channel downstream of the Palisades has the potential to endanger infrastructure. If so, and the landowner is willing to allow an erosion control project, assist landowner with implementation of an erosion control project, including the potential of mid-channel bar alterations. Also evaluate the influence of upstream activities on the lateral migration of the channel.

6.1-6 Capay Bridge (RM26.3): Monitor aggradation at the Capay Bridge and consult with Public Works Division of the Yolo County Planning, Resources, and Public Works Department on the need for channel reorientation and/or sediment removal to address adverse orientation of the low-flow channel that presents a potential erosion hazards to the bridge abutments. Explore habitat restoration opportunities upstream and downstream of the bridge in coordination with any erosion control projects.

Hungry Hollow Subreach Recommendations

6.2-1 Erosion control and project maintenance: Coarse gravels, scarce summer water, and frequent channel migration make the Hungry Hollow subreach a challenging area for erosion control projects. Infrastructure within this subreach, which may be threatened by the erosion of a channel meander migrating downstream, such as the Esparto Bridge (County Road 87), should be protected by hard points such as spur dikes or protected banks for stabilization. Projects within this subreach that are located within or adjacent to the low-flow channel should anticipate the potential need to reinforce the toe of the erosion control structure as regular maintenance in order to maintain project effectiveness over time.

6.2-2 Human-Assisted Habitat Restoration: Assess soil condition and water requirements for plant species specified in projects. Include soil amendments or topsoil when planting within the Hungry Hollow subreach and ensure the presence of a water source for plant establishment.

6.2-3 Capay Open Space Park (RM26.3): Complete Park plan implementation including additional trails and handicap access to Cache Creek.

6.2-4 Granite Construction bank stabilization project (RM25.7): Monitor reconstruction of the bank toe along the Granite property to protect the integrity of the upper portion of the bank.

6.2-5 Jensen Site (RM25.4): Evaluate the cause(s) of the project's failure with project designers and landowner. Establish guidelines for repair or replacement if warranted.

6.2-6 Esparto Bridge (County Road 87): Implement preventative erosion control measures to protect public infrastructure and evaluate habitat restoration opportunities upstream and downstream of the bridge.

Madison Subreach Recommendations

6.3-1 Lower Madison subreach habitat restoration: The lower portion of the Madison subreach contains patches of riparian vegetation that could potentially be linked as a single corridor if sparser areas are planted and provided with water from agricultural runoff. These plantings would provide erosion control from agricultural drainage areas and potentially the creek channel if allowed the opportunity to establish. At the same time, plantings could connect with existing vegetation to create a valuable habitat corridor for wildlife.

6.3-2 Grube-Payne Site (RM22.3-22.1): Work with landowner, if willing, to develop a habitat restoration project on the ~20 acre area of bank terrace to promote a vegetated corridor along this section of the creek for both habitat value and erosion control. Utilize existing pond and agricultural runoff as a source of water.

6.3-3 Grube-Payne Site: (RM22.1): Monitor reconstruction of agricultural tailwater pipe to ensure compliance with specifications detailed in the original design to prevent further erosion.

6.3-4 Grube-Payne Site (RM21.8): Work with landowner, if willing, to develop a habitat restoration project on the ~24 acre area of bank terrace to promote a vegetated corridor along this section of the creek for both habitat value and erosion control. Utilize agricultural runoff as a source of water.

6.3-5 Old Madison Bridge Site/Dunbar (RM 21.5): Evaluate the need for an erosion control project that deflects the energy of the channel meander located upstream of the Dunbar site and reform the existing upstream spur dike at the Dunbar site to stabilize north bank. Significant accumulation of fine-grained silts has occurred behind the existing spur dikes and both planted and naturally occurring vegetation has flourished showing that in-channel vegetation within this subreach can survive as long as it is protected from high-energy flows. Repair of the eroded spur dike should be investigated as a component of the design of any further bank protection designs for the area.

6.3-6 I-505 Bridge area (RM21): Work with landowner and Syar to provide soil and plantings on upper portions of riprapped slopes. Improve habitat at spur dikes upstream of I-505. Evaluate the need for additional erosion control work to protect the bridge.

Guesisosi Subreach Recommendations

6.4-1 Guesisosi Subreach: Bank stabilization within this subreach should include toe bank protection and the use of vegetation wherever feasible. Restoration opportunities exist in this subreach due to an increase in available water as groundwater is pushed up by a bedrock constriction. Planting techniques, such as trenching, which assist in providing vegetation with access to groundwater should be utilized in the upper portion of the subreach. A series of vegetated trenches several rows deep or other vegetation methods to fill in gaps within the vegetative corridor could be used along this section of the creek for both habitat value and erosion control.

6.4-2 Upper South bank of Guesisosi Subreach: Assist property owner to develop of a plan that addresses bank erosion and required off-channel mining program setback requirements.

Dunnigan Hills Subreach Recommendations

6.5-1 RM 18.6-18.1: Previously constructed spur dikes have almost completely eroded away. This erosion appears to have occurred primarily over the last year. The previously protected bank is vulnerable to erosion and should be reviewed to assess the need to further stabilize the bank at this site in order to protect the infrastructure of the Moore Siphon located downstream. The Dunnigan Hills subreach offers restoration opportunities due to the high groundwater table, although revegetation efforts at this particular site should be paired with additional bank stabilization due to the channel meander that presently directs flows toward the bank.

6.5-2 Moore Siphon (RM18): Assist YCFCWCD in developing a long-term solution to the Moore siphon crossing.

Hoppin Subreach Recommendations

6.6-1 Stephens Bridge (County Road 94B, RM15.9): Evaluate needs to for preventative measures to reduce potential for erosion that threatens the bridge. Evaluate opportunities for habitat restoration upstream and downstream of the bridge.

6.6-2 Correll Pond (RM13.8): Address erosion of the embankment adjacent to the overflow structure.

6.6-3 Correll-Rogers Habitat Restoration (RM13.9-13.7): Develop a site plan that includes habitat enhancement and public access.

6.6-4 Harrison Site (RM13.4): Revegetate lower bank areas. Utilize fencing or other barriers, instead of tubex tubes, for animal predation and protection from ATV usage.

Jesus Maria Subreach Recommendations

6.7-1 Jesus Maria Subreach Flood Control/Invasives Removal: Coordinate with landowners, the Department of Water Resources, and the Cache Creek Conservancy to promote and implement invasive species removal program within the active floodplain.

6.7-2 Huff's Corner (RM11.6): Finalize design and present to the TAC for comments, any new plans for the stabilization of County Road 18 and levee protection at Huff's Corner.

PROJECT DEVELOPMENT RECOMMENDATIONS

7.3-1 Project Prioritization: Establish a protocol and prioritization method for determining how County proposed projects using CCRMP Resources funds, and any privately funded projects will be reviewed, approved, and prioritized by County staff and the TAC. Each project will be reviewed for: consistency with any requirements and recommendations of the CCRMP and the CCIP, design, construction methods, monitoring requirements as necessary, and maintenance. After the project review, prioritization will be determined by County staff with the recommendations of the TAC.

7.3-2 Project Development Guidelines: Develop a project checklist for parties interested in developing projects within the CCRMP. Educate the public about floodplain development permit requirements to improve public understanding of the CCRMP area project evaluation and implementation process.

2.0 INTRODUCTION

2.1 INTRODUCTION

Yolo County adopted the Cache Creek Area Plan (CCAP) in 1996 to protect groundwater, help preserve agriculture, stabilize the floodway and creek channel, restore and enhance riparian habitat, create open space and recreation areas, and regulate aggregate mining. The Cache Creek Area Plan is comprised of the Off Channel Mining Plan (OCMP) and the Cache Creek Resources Management Plan (CCRMP). The CCAP amended the Yolo County General Plan to establish a policy framework to accomplish the plan's goals and objectives

The Off-Channel Mining Plan (adopted July 30, 1996) restricts the location and extent of new mining, eliminates existing vested processing plants and facilities at the end of the mining period, creates a fund to address unforeseen environmental concerns, and adds various measures to protect the environment and monitor aggregate mining beyond the base requirements of state law established by the Surface Mining and Reclamation Act (SMARA). The Off-Channel Mining Plan is accompanied by two implementing ordinances. The first ordinance regulates off-channel mining (mining outside of the creek channel). The second ordinance regulates reclamation of mined areas.

The Cache Creek Resources Management Plan (adopted August 20, 1996 and amended August 15, 2002) eliminated in-channel commercial mining and established an improvement program for implementing ongoing projects to improve channel stability and restore riparian habitat. The CCRMP provides the policy framework for restoration of 14.5 miles of lower Cache Creek and includes specific implementation standards. The Cache Creek Improvement Program (CCIP) is the implementation plan for the CCRMP that identifies categories of specific projects that include: bank stabilization, channel maintenance, revegetation, and habitat restoration according to specific design requirements. Yolo County is preparing an in-channel gravel maintenance ordinance to provide specific regulations for gravel maintenance within the creek channel.

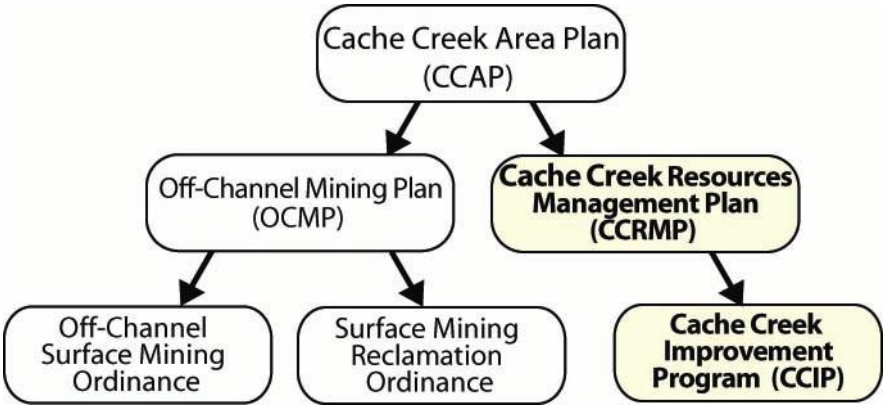

FIGURE 2-1: Cache Creek Area Plan management structure

2.2 CCRMP AREA

Lower Cache Creek and its principle tributaries drain approximately 1,139 square miles of area in Yolo County, California. The CCRMP area encompasses approximately 2,324 acres of the Lower Cache Creek watershed between the Capay Dam and upstream of the I-5 Bridge (See Figure 2.2). This area is defined in the CCRMP as the outermost limit of the combined channel bank and the 100-year floodplain, with the exception of the area located downstream of County Road 94B (Hoppin and Jesus Maria subreaches), which is defined solely by the existing channel bank due to the area's expansive floodplain which extends to the north-west corner of the City of Woodland. While the CCRMP is meant to coordinate management efforts along this entire stretch of channel, it must also be recognized that the CCRMP area resides in the lowermost portion of Cache Creek and is affected by all upstream and downstream activities. Major upstream elements include Clear Lake and the Indian Valley Reservoir while the Cache Creek settling basin and the Yolo Bypass are approximately ten miles downstream.

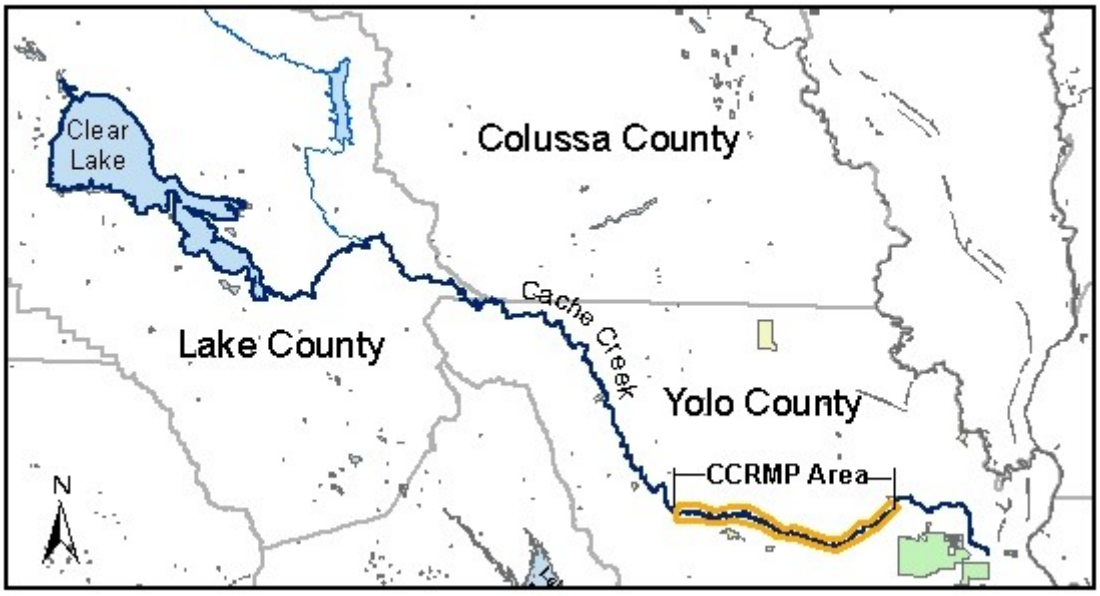

FIGURE 2-2: Location of the Cache Creek Management Plan area

2.3 CCRMP AND CCIP MANAGEMENT

ADMINISTRATION

In 1996, the County assigned responsibility for overseeing the CCRMP and OCMP to the Resource Management Coordinator in the Yolo County Planning, Resources, and Public Works Department, with assistance from the Cache Creek Technical Advisory Committee (TAC), a three-member team of consultants including: a fluvial geomorphologist, a hydrologist, and a riparian biologist. The Resource Management Coordinator position is now the Deputy Director of Parks & Natural Resources Management. Due to an ever-increasing demand on staff time for the implementation of the CCRMP and OCMP, the County created the position of Resource Specialist in 2004.

MONITORING PROGRAMS

The CCRMP recognizes that the collection of scientific information is a critical component of understanding Cache Creek changes and processes. As such, the CCRMP requires the establishment of monitoring programs to provide data on stream flow, water quality, erosion, and vegetation so that the County can make CCRMP implementation decisions can be made on the basis of scientific principles. The monitoring programs provide dependable, up-to-date data on channel conditions from which County staff can base recommendations for the management of the creek within the CCRMP area. In particular, the results of monitoring are utilized to evaluate the need for improvement projects, annual channel maintenance, and hazard response. The Resource Specialist is tasked with overseeing the implementation of monitoring programs while the TAC members are either contracted to conduct the monitoring within the realm of their specialty and/or advise the Resource Specialist in regard to monitoring methods and make recommendations based on monitoring results. Summaries of the various monitoring programs are described in Section 3, Section 4, and Section 5 of this report.

PUBLIC MEETINGS

In-channel management projects such as bank stabilization, habitat restoration, and invasive species removal are a key aspect of the CCRMP. Effective and efficient implementation of these projects are facilitated by CCRMP monitoring data, the general permits (described later in this section), and the Cache Creek TAC meetings.

PROJECTS

In-channel management projects such as bank stabilization, habitat restoration, and invasive species removal are a key aspect of the CCRMP. Effective and efficient implementation of these projects are facilitated by the CCRMP monitoring data which is utilized for both management and design decisions, the general permit which allows for project implementation consistent with the CCRMP and CCIP to commence without the need for the extra expenses or time needed to prepare site specific permits, and the Cache Creek Technical Advisory Committee meetings which provide a forum for project proposals to be brought forward for advice from TAC members and to insure consistency with the CCRMP for permit approval.

The majority of lands within the CCRMP area are privately owned. While the County maintains the general permit and oversees the monitoring and management of the CCRMP area, implementation of the goals and objectives of the CCRMP and CCIP require a high level of cooperation and collaboration between the County, landowners, local resource organizations, aggregate companies, and regulatory agencies. The County and participating resource organizations cannot pursue site-specific projects within the CCRMP area on private property without landowner permission. Likewise, landowners that wish to implement projects within the CCRMP area must bring their project plans to the County to ensure CCRMP compliance and to obtain the necessary permits.

The project implementation process within the CCRMP area allows for all interested entities such as landowners, aggregate companies, the County, and resource agencies to initiate project proposals. The project process varies slightly depending on the initiating party and their available resources. Aggregate companies or landowners that have available resources to implement projects on their own will develop a project concept, present initial designs at a TAC meeting(s) for design recommendations and to insure consistency with the CCRMP and CCIP, revise project designs if necessary, obtain any necessary permits from the County, and implement the project. Landowners that wish to implement a project, but do not have the resources to do so should coordinate with the County or other resource agencies to see if a project on their site would protect public infrastructure, provide habitat value, or otherwise follow the objectives of the CCRMP such that project assistance and coordination is warranted. Resource agencies wishing to implement a project on private property must obtain landowner permission prior to TAC

recommendations and County permit approval. Coordination of projects that are multi-functional and address creek-wide issues and long-term management over site-specific channel events to the extent possible is encouraged.

GENERAL PERMITS

A key component that facilitates effective and efficient management of the CCRMP area is the County's management of state-issued general permits. Prior to the adoption of the CCRMP, any landowner or entity wishing to work within channel banks was required to obtain permit approvals from four different federal, state, and local agencies. Fees for these permits totaled nearly $1,000 and processing required a minimum of 90 days. This provided a strong disincentive for landowners who needed to protect their farms and homes from flooding and erosion. In order to ease the financial burden and red tape involved in obtaining permits for work within the stream channel, Action 6.4-3 was included in the CCRMP, as follows:

> *Pursue joint regulatory efforts with other agencies of jurisdiction in order to streamline and standardize conditions for performing work within the creek. The County shall coordinate with other government agencies that have permit authority over Cache Creek to obtain "blanket" permits for the entire reach of the stream located within the plan area.*

Since CCRMP implementation, the County has been successful in acquiring the permits necessary to implement this program. All of these permits have either recently undergone or will soon be submitted for re-issuance. Although this is a time-consuming process, the County recognizes that the re-issuance of these general permits is essential to maintaining a streamline permitting process for channel improvements and habitat restoration projects in the CCRMP area. The County would also continue to have authority to approve projects that are consistent with the provisions of the CCRMP and CCIP under these permits. A summary of permits and their current status are provided in Section 7.

ANNUAL INSPECTIONS

Each year, the County leads, as a public Cache Creek Technical Advisory Committee meeting, an inspection of the Cache Creek channel and active floodplain. The inspections are conducted as a walking tour of the channel within the CCRMP area, beginning at the Capay Dam and ending at the I-5 Bridge. Usually, the inspection (typically called the "creek walk") is performed during the late spring or early summer, after the flows in the creek have subsided to low-flow conditions and the County has received the annual aerial photographs. The creek walk is conducted over two or three days to cover the entire area and requires moderate physical exertion.

The creek walk inspections are open to the public and on numerous occasions, the attendants have included members of the Board of Supervisors, interested landowners, members of federal, state, and local agencies (including the Regional Water Quality Control Board, the Natural Resource Conservation Service, and the Yolo County Flood Control and Water Conservation District), environmental groups, and students from the University of California-Davis.

The inspections are opportunities to observe and document any changes in channel conditions from the previous year and to verify the aerial photos and DTMs. During creek walks, the Cache Creek Technical Advisory Committee (TAC) and County staff are able to observe the performance of completed bank stabilization and habitat restoration projects implemented under the CCRMP. On many inspections, landowners and specialists involved in these projects are present to discuss achievements and lessons learned during and after implementation of the projects. The public is welcome to spend time with the TAC and County staff in the natural environment of Cache Creek, discuss observations and concerns, and provide input on channel erosion problems and habitat restoration opportunities.

The 2006 Creek Walk was conducted on the 14th, 15th, and 16th of June 2006. TAC members and County staff, as well as 12 to 18 members of the public attended the event each day. A low creek flow of approximately 140 cubic feet per second allowed for inspection of the majority of the channel. The creek walk inspection included evaluations of channel changes and notable erosion that occurred during the significantly high and sustained 2005-2006 winter flows, as well as evaluations of projects completed to date including: damage to the bank stabilization at the Jensen property, erosion at the former Madison Bridge site, and the success of previously completed bank protection and habitat restoration areas. The reach-by-reach observations and recommendations made during the 2006 Creek Walk are described in detail in Section 6.0 with project-specific observations also noted by project in Section 7.0.

3.0 WATER RESOURCES MONITORING AND MODELING PROGRAM

A key element of the CCRMP's adaptive management approach is hydrologic monitoring and hydraulic modeling. Hydrologic monitoring, including collection of flow, temperature, and stage data, flood monitoring, and water quality monitoring, provides critical information for making decisions about CCRMP implementation. Temperature and flow data, for example, provide information about the suitability of Cache Creek for native fish. Water quality monitoring provides important information about the levels of key constituents in Cache Creek that may affect agricultural production or the health of fish and wildlife. Hydraulic modeling, on the other hand, is used to provide information about how the creek channel will react to alterations in the channel under a variety of conditions. The information collected under this program also benefits organizations that are involved with Cache Creek and use this information to inform management or project decisions.

3.1 FLOW DATA

Cache Creek is a "flashy" or episodic hydraulic system that is characterized by brief, intense flows that create dramatic channel changes in a short period of time and transport very high sediment loads. It is capable of changes in flow volume of up to 1,000 percent within a 24-hour period. Stream flows affect both the sediment transport capacity and vegetation within the creek channel. The velocity and duration of flows determine the potential for erosion from the banks and streambeds that provide bed load and suspended load materials. In addition, flow velocity, duration, and volume determine the amount and size of sand and gravel that washes downstream. Extremely high velocities can cause widespread bank erosion and removal of riparian vegetation, while at the same time carrying seeds and other materials that provide the basis for new volunteer plants. At the other end of the flow spectrum, seasonal surface flow is critical for both plant life and wildlife along the low-flow channel.

Gages to measure Cache Creek's flow are currently operating at six points along Cache Creek, including Clear Lake, North Fork, Indian Valley Reservoir, Rumsey, Yolo, and the Yolo Bypass. Real-time information is available for all of these gage stations on the California Data Exchange Center (CDEC) website hosted by the California Department of Water Resources (DWR). Of the stream flow gages currently in operation along the creek, the Yolo gage is the only one within the CCRMP area. The Rumsey gage is the closest upstream gage and is utilized for CCRMP monitoring purposes, particularly for hydraulic modeling and monitoring high flow events. The Yolo County Flood Control and Water Conservation District (YCFCWCD) plans to install an additional stream flow gage at the Capay Dam during the summer of 2006.

During the 1990s, decision makers assumed that the existing DWR stream gage at the Rumsey Bridge and the USGS gage at Yolo provided sufficient information about flow. A review of the flow records at these two gages, however, indicate that there are differences between the measurements at the gages. It is not possible to ascertain whether these differences are solely due to real conditions such as changes in groundwater levels and pumping; or if a discrepancy in the calibration of the gages exists. Flows at the Yolo gage (the downstream gage) are invariably lower than the Rumsey gage. This may be partially due to loss of surface flow in portions of the creek downstream of Esparto where the groundwater levels are lower than the surface flow, otherwise referred to as a losing reach. It is also possible that over time the cross-sections of the channel at the gage locations have changed and the gages have not been accurately calibrated to account for these alterations in stream geometry. The Yolo gage is frequently rated by the USGS. The Rumsey gage data, however, was shown to be below the rating table for most of 2005. DWR developed a new rating table for the Rumsey gage in 2006 to address stages below 4.02 feet.

In part, the concerns regarding accurate data collection at the Rumsey gage will be addressed by the installation of flow monitoring equipment by the YCFCWCD at the Capay Dam. The new gage, midway between Rumsey and Yolo, will provide an additional data set in which to compare the Rumsey flow data for accuracy. This gage is not a replacement for an accurate gage at Rumsey, however. The Rumsey gage, if accurate, provides over 12 hours of warning to the City of Woodland and lower Cache Creek in case of flood flows.

2005 FLOW DATA

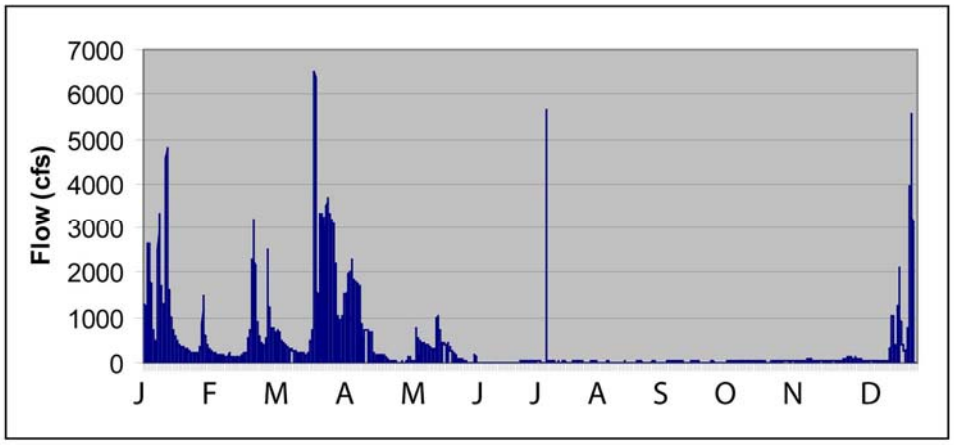

FIGURE 3-1: Cache Creek 2005 Hydrograph at the Yolo Gage Station (USGS)

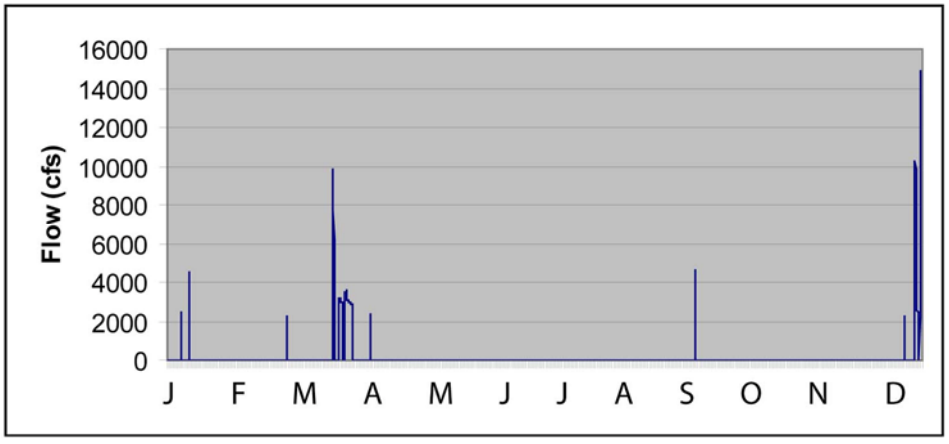

FIGURE 3-2: Cache Creek 2005 Hydrograph at the Rumsey Gage Station (DWR)

***NOTE:** Flows at the Rumsey gage were below the rating table for most of 2005.

3.2 FLOOD MONITORING DATA

The CCRMP recognizes the potential for property damage and changes in creek morphology as a result of low frequency, high-flow flooding events in Cache Creek. Conditions for flooding typically occur during intense or prolonged rainfall periods between December and March. The probability of an event in any given year is the reciprocal of the stated event. Therefore, the probability of a

100-year event is one percent (1/100 = 0.01) while a five-year event has a probability of 20 percent (1/5 = 0.20). The CCRMP designates flow events that exceed 20,000 cubic feet per second (cfs) at the Yolo stream gage as significant flow events. By comparison, the ten-year flow discharge is 32,700cfs cfs while the estimated discharge in a 100-year event is 63,700 cfs (USACOE, 2001). The highest discharge for Cache Creek at Yolo was 41,480 cfs recorded on 25 February 1958. Following implementation of the CCRMP, flows in excess of 20,000 cfs, as measured at the Yolo gage, occurred in January 1997, February 1998, and December 2005 (DWR, 2006).

TABLE 3-1: Cache Creek flood flows in excess of 20,000 cubic feet per second, recorded by USGS at the Yolo gage station since CCRMP implementation.

Date	Peak Flow (cfs)	Peak Stage (ft)
January 1, 1997	20,600	*
February 3, 1998	34,300	84.23
February 8, 1998	26,000	79.31
February 20, 1998	22,500	76.97
February 22, 1998	22,900	76.99
December 31, 2005	26,900	83.22

* No stage data available for Yolo gage station on January 1, 1997

In the rainy season of 2005-2006, the flow in Cache Creek peaked at approximately 26,900 cfs (measured at Yolo) on December 31, 2005 following a sustained period of heavy rainfall (DWR, 2006). During this event the river stage at the Yolo gage rose to the 83 ft. elevation mark. This elevation is approximately two feet above flood stage, which is defined by the Department of Water Resources as the stage at which overbank flows are of sufficient magnitude to cause considerable inundation of land and roads and/or threat of significant hazard to life and property. Localized flooding occurred within portions of the CCRMP, but evidence of overbank flow along Cache Creek within the CCRMP was not observed. During this event, discharge remained higher than 4,000 cfs for 10 days. Significant bank erosion was observed in some areas of the Creek following the event. Specific erosion events are identified in Section 5 and Section 6 of this report.

Recommendations:

3.2-1 Flood Monitoring: Implement a flood monitoring program in coordination with the Yolo County Flood Control and Water Conservation District, the City of Woodland, and emergency response partners. Monitoring and inspection during flood events provides valuable information about the impact of flood events on Cache Creek, including bank erosion, loss of vegetation, and damage to infrastructure. It also may provide useful information to emergency response partners.

3.2-2 Stream Flow Gages: Install stream flow gages at Capay and Madison. The CCRMP recommends the installation of additional stream flow gages within the CCRMP area to provide a more complete picture of how hydraulic processes in the creek operate. The new gages would complement existing stations at Rumsey and Yolo, and would have real-time telemetering capabilities.

3.3 STAGE AND TEMPERATURE DATA

Yolo County uses stage data, or the measurement of the elevation of the stream's surface, to assist with emergency response efforts and to calibrate the County's hydraulic HEC-RAS model,

described in the Section 3.4. The County installed seven stage gages along Cache Creek in November 2005 (See Figure 3-3) to collect stage and temperature data. The data from these gages will be retrieved and analyzed once water levels recede in 2006 and a summary of this data will be presented in the 2007 CCRMP Annual Report.

As a flood wave moves downstream, the stage gages record the height and arrival time of this wave at each monitoring location in the channel. The County uses the stage and temperature data collected from these gages for many uses, including calibration of the HEC-RAS model so it can estimate the peak flow rates along the creek and the time in which it takes for a flood wave to travel downstream during various storm events. Yolo County and the City of Woodland can use the HEC-RAS model to provide accurate predictions of the timing and height of peak flood waves downstream to assist in determining the need for flood warnings to downstream inhabitants. The model will also help determine whether variations in peak flow values between the Rumsey and Yolo gages are attributed to an actual water loss in the system or discrepancies related to gage calibration, as described earlier in this report. Additionally, the gages will provide temperature data to help the County and other organizations make decisions about aquatic habitat issues, such as opportunities for native fish habitat enhancement.

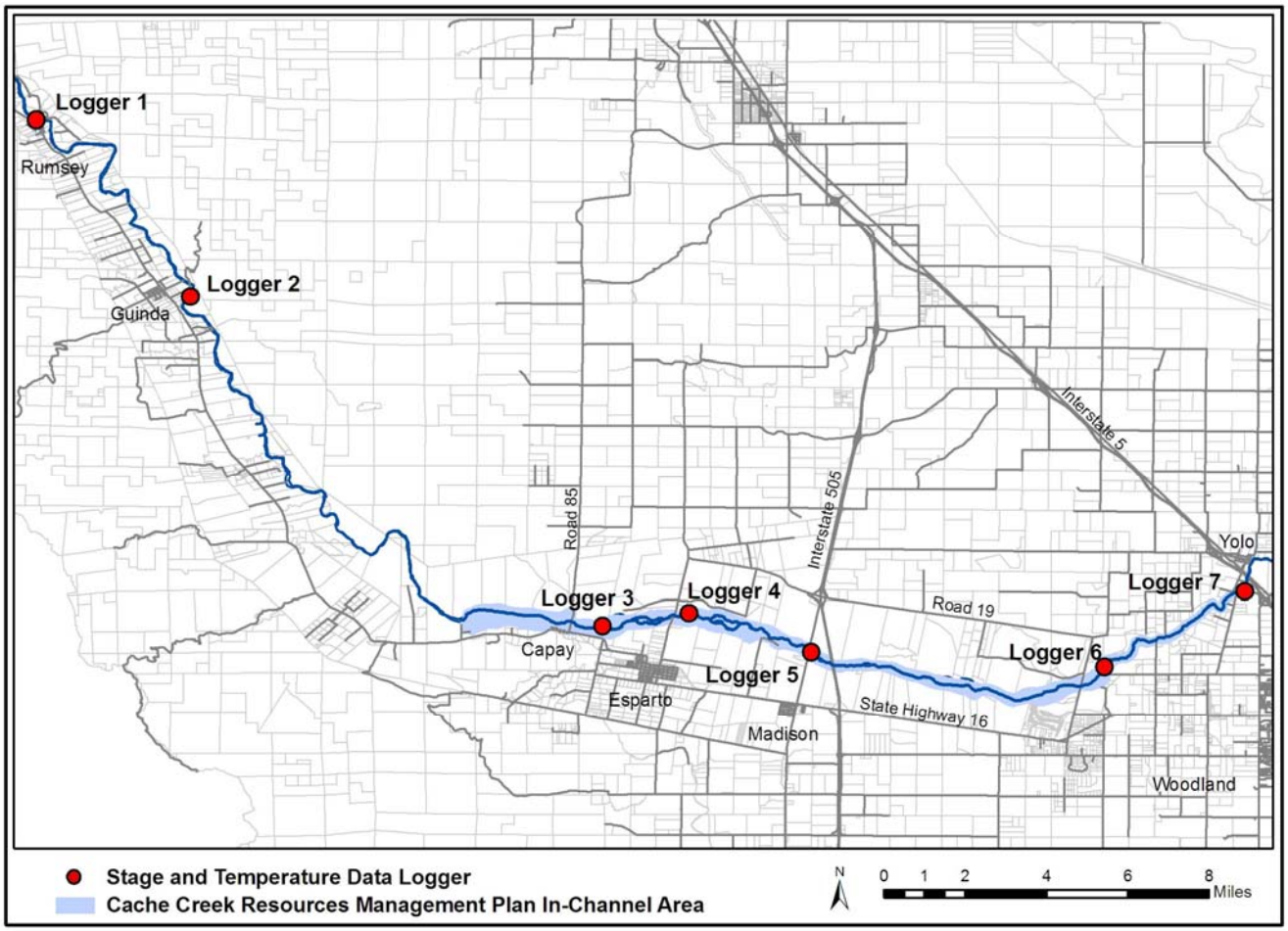

FIGURE 3-3: Stage and Temperature Gage Station Locations

3.4 HYDRAULIC MODELING

Hydraulic modeling is necessary for both the long-term management of the CCRMP area and the design of specific improvement projects. The County created a base-line hydraulic model of the CCRMP study area as part of the 1995 technical studies, which formed the basis of the CCRMP. Yolo County will update this model to a HEC-RAS model in 2006 once the County retrieves stage and temperature data. The HEC-RAS model provides information about flood capacity, bridge scour potential, channel stability, sediment transport characteristics, and the location of hydraulic constrictions (Yolo County, 1996b). The County will continue to revise the model as the creek channel changes over time so that the accuracy of data remains sufficient to address management decisions on Cache Creek. The County also recognizes that over time, the detail and accuracy of hydraulic modeling on the creek will improve as technology changes and monitoring efforts provide additional data used in model calibrations.

As discussed in the stage and temperature data section, the County installed gages and began data collection in 2005 to create an updated HEC-RAS hydraulic model. The County also will conduct surveys at thirteen cross-section locations within the study area, but surveying will not commence until summer of 2006 due to high flows during the 2005-2006 wet season. Once the County collects the data, a HEC-RAS model will be calibrated for the conditions that currently apply in Cache Creek. At that point it will be possible to change the model cross-sections to examine the flood conveyance capacity in past years (utilizing the topographic digital elevation models from these years) and for future years.

STREAMWAY STUDY

The 1995 technical studies prepared prior to adoption of the CCRMP utilized hydraulic (HEC-2) and sediment transport (HEC-6) models prepared by Northwest Hydraulic Consultants to evaluate conditions in Cache Creek at various flow events (NHC, 1995). The County used these models to run three conceptual channel improvement scenarios: (Test 1) all existing bridge openings widened 30 to 240 feet with no other modifications to the stream; (Test 2) the entire study reach was slightly widened and smoothed to eliminate all abrupt width and slope changes upstream of I-5 with bridges lengthened 300 to 900 feet; and (Test 3) similar channel modifications assumed for Test 2 without bridge lengthening but channel bottoms beneath bridges were assumed to be protected against scour during high flows. Under Test 2 and 3 conditions, the entire study reach was smoothed to remove abrupt changes in channel slope and width and the channel sections upstream and downstream of bridges were altered to create smooth hydraulic transitions in and out of constricted zones created by bridges. Of the three conceptual tests, the conceptual Test 2 channel boundary scenario produced the most significant hydraulic improvements. All three test scenarios, however, resulted in a more uniform distribution of sediment load, channel depth, flow velocity, and improved channel stability throughout the study area in comparison to the existing channel condition (NHC, 1995). These three test scenarios each support the goals of the CCRMP and the design guidelines of the CCIP by focusing on maintaining appropriate stable slopes and channel capacities with the recognition that all portions of the creek are hydraulically connected. The Test 3 boundary goal of improving channel stability by smoothing channel transitions while accepting that bridges would continue to act as constriction points was adopted as a CCRMP action 2.4-3 and has been carried out on several projects within the CCRMP area including the Granite Industries bank stabilization and the spur dikes upstream of I-505.

2002 HYDRAULIC ANALYSIS OF CACHE CREEK BETWEEN COUNTY ROAD 94B AND I-5 (HOPPIN AND JESUS MARIA SUBREACHES)

In response to flooding that occurred upstream of I-5 due to the overtopping of the natural bank of Cache Creek in February 1998, the County contracted with MBK Engineers to evaluate historical flood events and proposed management strategies to reduce flood frequency in the Hoppin and Jesus Maria subreaches. This analysis was conducted using a HEC-1 hydraulic model that was

calibrated to the March 6-12, 1995 flood event and the February 1-6, 1998 flood event. Once calibrated, the model was run under three separate proposed management conditions: vegetation removal, sediment removal (skimming gravel bars down to the low water line), and a no-action condition.

The results of the hydraulic analysis showed that water surface elevations within the channel are sensitive to the channel's coefficient of roughness (also noted as the n-value in the Manning's formula for flow calculations in open flow channels). Skimming of gravel bars down to low-flow water levels in the channel area between County Road 94B and I-5 showed less than a 0.10ft change in water surface elevation. The no-action condition showed that in-channel vegetation would continue to accumulate, which could decrease channel capacity and lead to frequent overtopping over time. Of the proposed management conditions tested, the removal of dense, in-channel vegetation present in the wet winter season, such as giant reed (*Arundo donax*) and tamarisk or salt cedar (*Tamarix sp.*), showed the greatest reduction in surface water elevations with up to a 0.75ft change in water surface elevation. The analysis recommends that the removal of in-channel, non-native vegetation should have the highest priority of the three potential actions, but that caution should be taken not to destabilize channel banks through excessive vegetation removal.

Recommendations:

3.4-1 Complete hydraulic (HEC-RAS) model: Utilize up-to-date digital terrain model (DTM) data, transect surveys, and stage data to develop a HEC-RAS model to evaluate increased flooding hazards related to changes in channel morphology.

3.4-2 Flood Capacity: Work with the Cache Creek Conservancy to expand invasive vegetation removal efforts in the Jesus Maria and Hoppin subreaches to address channel flood capacity concerns.

3.5 CCRMP WATER QUALITY MONITORING PROGRAM

Although Cache Creek is not a designated drinking water source, maintaining a high quality supply of groundwater and surface water in the CCRMP area is important for ecosystem well being, agricultural production, and for the overall well-being of the Bay-Delta system, the eventual receiving body for Cache Creek water. Yolo County established the CCRMP water quality monitoring program to provide a general baseline on the overall water quality in the CCRMP area, to detect large-scale change over time, and identify parameters of concern. The County did not intend the program to take the place of detailed scientific studies of individual parameters, such as mercury, but instead to provide a basis for knowing if and when such studies may be warranted.

Water quality affects and is affected by both sediment and vegetation. Mercury, pesticides, and other contaminants are transported through the watershed by absorbing onto sediment carried by the stream flow. In turn, contaminants such as boron or salt can adversely affect the growth and survival of native plants, thereby encouraging the spread of non-native vegetation that provides poor habitat.

The CCRMP water quality monitoring program covers both groundwater and surface water quality. The County monitors a general suite of parameters in both groundwater and surface water. For groundwater, these parameters are; general minerals; inorganics; nitrates; total petroleum hydrocarbons (TPH) as diesel and motor oil; benzene, toulene, ethylbenzene, and xylenes (BTEX); pesticides (EPA 8140 and 8150); and coliform (with E.coli confirmation). For surface water, the County tests for the following parameters; dissolved oxygen, temperature, pH, color and odor, total dissolved solids, total suspended solids, turbidity, ammonia, nitrate, nitrite,

orthophosphate, total Kjedahl nitrogen, petroleum products, boron, mercury, fecal coliform, total coliform, organophosphate pesticides (various) and chlorinated herbicides (various).

Regulatory standards for the water quality parameters present in Cache Creek that are relevant to ecosystem health and agricultural production have varied over the years. New standards are forthcoming in 2006. As a result, the CCRMP monitoring program provides information about the relative levels of parameters in groundwater and surface water utilizing standards set forth by the RWQCB, CA EPA and the Basin Plan.

WATER QUALITY SAMPLING METHODS

The County conducts surface water sampling three times a year when the following conditions are present: typical summer conditions, typical winter conditions, and when the creek is undergoing its first fall or winter storm event of the season in which there is a high initial pollutant load (referred to as the 'first flush'). These three events are considered to encompass the range of conditions encountered in the creek. During winter the inflatable dam at Capay is down and the system is closer to its natural flow conditions (neglecting the effects of Indian Valley Dam and the Clear Lake Dam). In summer, stream flow is significantly reduced due to very low rainfall and the diversion of nearly all flow at the Capay Dam for irrigation supply. Much of the stream runs dry, although in the gaining reaches further downstream there is a significant amount of agricultural return water, which flows into the channel. The first flush event is generally considered to potentially carry a disproportionately large influx of contaminants since it tends to carry a significant amount of surface pollutants that have accumulated throughout the dry summer months. Measuring the first flush event is important in getting a "worst case" scenario for the stream. It should be noted that truly capturing the first flush is extremely difficult. Aside from the logistic difficulties of being at all locations when the peak of the flood wave is passing, a difference of just a few hours can have a large impact on the measurements.

Presently water quality is measured at five locations: Capay Bridge, Cache Creek just upstream of the confluence with Gordon Slough, Gordon Slough, Stevens Bridge, and the I-5 Bridge, providing four points along the main creek as well as the one off-creek location in Gordon Slough. Downstream of the confluence of Cache Creek and Gordon Slough, the mixing zone is unpredictable. For this reason the decision was made to sample Cache Creek water upstream of the confluence (where Gordon Slough has no influence) and Gordon slough itself. At the next downstream location (Stevens Bridge) it is assumed that the creek and slough waters are fully mixed.

FIGURE 3-4: Water Quality monitoring locations.

WATER QUALITY TRENDS

Groundwater

Cache Creek is located within a groundwater basin that is generally defined by the Coast Range to the west, the Sacramento River to the east, the Colusa Basin watershed to the north, and the Putah Creek watershed to the south. The Groundwater Technical Study estimates that the basin has a storage capacity of approximately five million acre feet (NHC, 1995).

The single most significant factor affecting groundwater storage is rainfall. Groundwater levels drop rapidly due to increased pumping and decreased recharge during times of drought, and rise again after prolonged wet periods. Secondarily, the most important change has been the development of irrigated agriculture. The diversion of surface water has reduced in-channel recharge and increased the levels of total dissolved salts in the aquifer, while the widespread use of well pumping has altered groundwater flow patterns and increased the pace at which groundwater is cycled through the aquifer. Both practices have significantly increased the consumption of water for crops, which has resulted in an overall lowering of the water table from levels at the turn of the century (NHC, 1995).

Due to above average concentrations of constituents such as calcium, and magnesium, groundwater quality is rated as hard to very hard in the CCRMP area. Boron is the constituent of most concern, brought down by tributaries of Cache Creek from saline springs in the Rumsey Hills.

Surface water

The surface water of Cache Creek tends to have naturally elevated concentrations of boron. Testing done on the North Fork of Cache Creek and lower Bear Creek during the 1950s showed high concentrations of sodium, chloride, and total dissolved solids (TDS), in addition to boron. Of great concern, the U.S. Environmental Protection Agency designated Cache Creek as an "impaired waterway" due to the high levels of methyl mercury in Cache Creek fish. At high enough levels in fish tissue, methyl mercury can cause neurological and reproductive harm to humans and wildlife. The State Water Resources Control Board will adopt the Cache Creek mercury TMDL in 2006, after which the Central Valley Regional Water Quality Control Board (RWQCB) will start requiring local entities, including Yolo County, to comply with its provisions. The RWQCB will, for

example, identify areas that contribute to mercury loading in Cache Creek and require landowners to implement practices to reduce mercury loading. In addition, the RWQCB and the County Environmental Health Department are currently working on a program to monitor mercury within the creek to identify sources of contamination.

Results of the CCRMP monitoring to date have generally remained consistent with the nature of the watershed and the agricultural activities that take place within it. Elevated values of turbidity and nutrient concentration occur during high flow events, for example. Additionally, turbidity and nutrients are added to the Creek from Gordon Slough during the summer (irrigation) months when agricultural return waters are discharged by the Slough. One area of concern is between the Capay Dam monitoring location and upstream of Gordon Slough where relatively high concentrations of coliform bacteria counts have been observed.

CACHE CREEK SURFACE WATER QUALITY RESULTS SUMMARY (1999-2005):

Dissolved Oxygen (DO): No trends were observed with this analysis. Little difference was observed between sample sites located directly on the creek. Gorgon Slough appeared to have a significantly lower concentration. However, due to a limited data set at this site it is difficult to confirm a significant difference. Decreases in DO concentrations from First Flush through Summer were observed. This trend was expected because DO concentrations are dependent upon temperature and mixing of water.

pH: Little difference was observed between sample sites located directly on the creek. Gorgon Slough appeared to have a significantly lower concentration. However, due to a limited data set at this site it is difficult to confirm a true difference. A slight decrease in pH during the summer was observed, which was likely due to the low results at the I-5 Bridge in Summer 2005. A possible small decrease in pH values may be developing over the last two years. The only result that did not meet the water quality criteria, in addition to the Gordon Slough samples, was the sample taken at the I-5 Bridge during Summer 2005 which had a value of 5.3.

Temperature: No trends were observed with this analysis. A slight decrease in temperature was observed upstream to downstream between sample sites located directly on the creek. Gordon Slough appeared to have a significantly higher temperature. However, due to a limited data set at this site it was difficult to confirm a true difference. An expected increase in temperature from First Flush to Summer was observed. All Summer samples exceeded the water quality criteria.

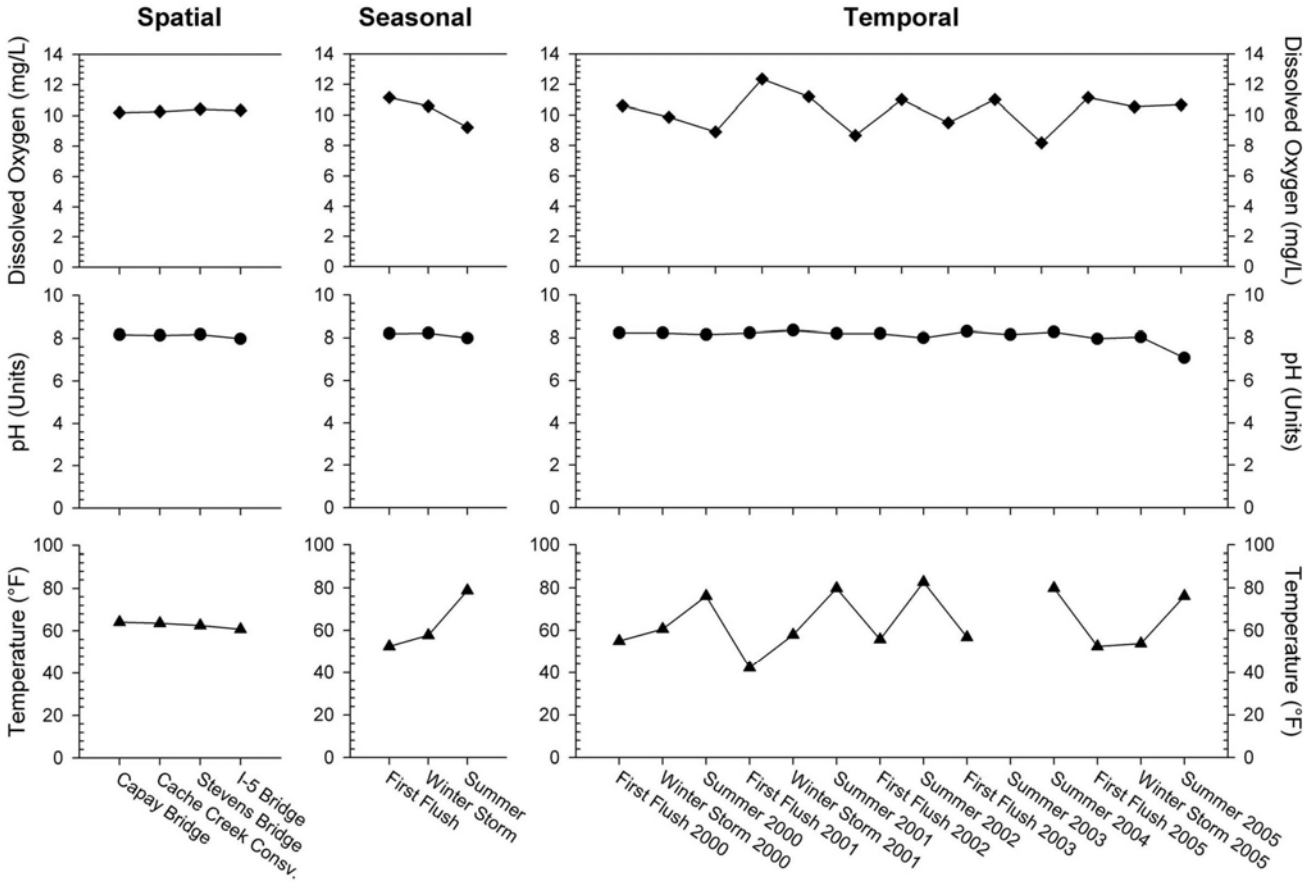

FIGURE 3-5: Dissolved oxygen, pH, and temperature data for the years 2000-2005.

Color: An increase in color from Capay Bridge to upstream of Gordon Slough to Stevens Bridge was observed, with a decrease at I-5 Bridge. Gorgon Slough had significantly lower color. However, due to a limited data set at this site it was difficult to confirm a true difference. A seasonal decrease in color was observed from First Flush to Summer. This was expected because color closely tracks suspended sediment, which is primarily controlled by available material and stream velocity. Consistent sampling with respect to the storm hydrograph would be necessary to identify trends due to its dependence to stream velocity.

Odor: No trends were observed with this analysis. A large spike in Odor was observed during the First Flush 2005 sampling, likely due to the timing of sample collection with respect to the storm hydrograph. This spike significantly skewed the results.

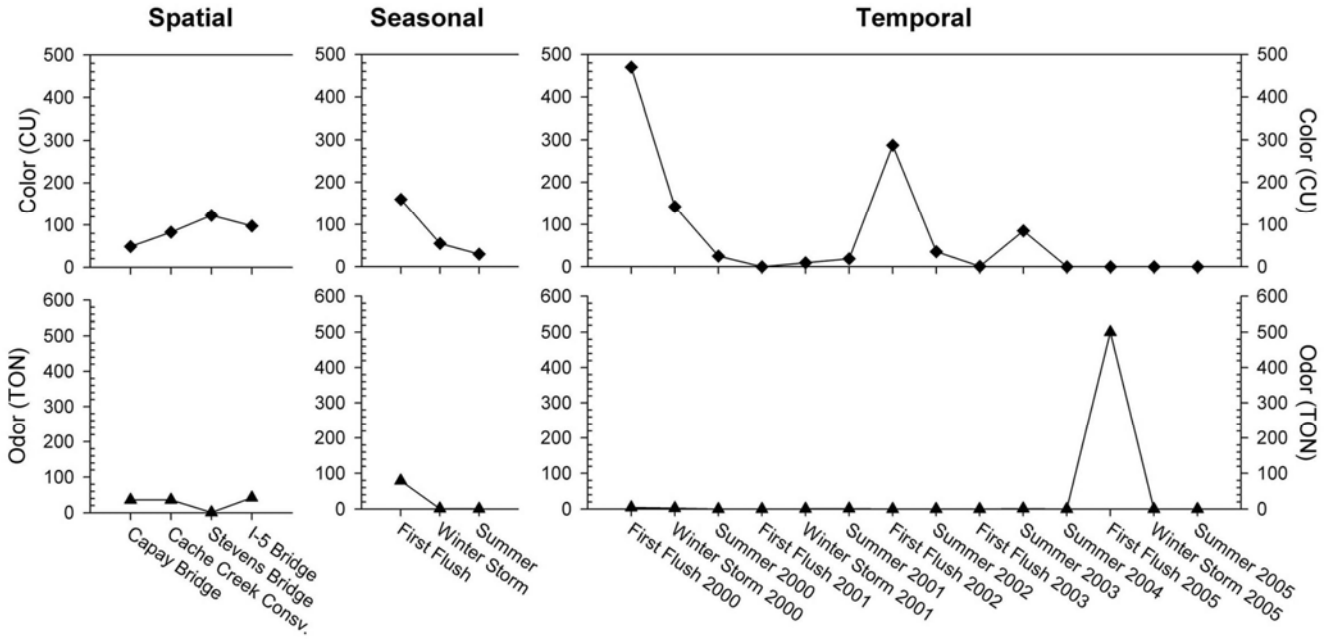

FIGURE 3-6: Color and odor data for the years 2000-2005.

Total Dissolved Solids (TDS): No trends were observed with this analysis. Concentrations remained relatively constant between sampling sites. High concentrations during First Flush were observed, likely due to flushing of the system. Low concentrations were observed during Winter Storms, probably because of dilution during higher flows. Summer concentrations were between the other two sample times, representing low-flow and already leached conditions.

Total Suspended Solids (TSS): A possible increasing trend between sites on the creek may be occurring. Stevens Bridge is significantly lower than the trend would suggest, and may be caused by not including elevated data observed during the last four sampling events. Gorgon Slough had higher concentrations. However, due to a limited data set at this site it was difficult to confirm a true difference. Concentrations decreased from First Flush to Summer samplings, as expected, due to the seasonal fluctuations of flow, which determine the availability of fine material and required velocities. The County conducted a more in-depth study of TSS in Cache Creek during 2004 and 2005. Results of this study are summarized in Section 2.9.

Turbidity: A possible increasing trend between sites on the creek may be occurring. Stevens Bridge is significantly lower than the trend would suggest, and may be caused by, not including elevated data observed during the last four sampling events. Gorgon Slough had higher concentrations. However, due to a limited data set at this site it was difficult to confirm a true difference. Turbidities decrease from First Flush to Summer samplings due to the to the seasonal fluctuations of flow, which determine the availability of fine material and required velocities. The County conducted a more in-depth study of turbidity in Cache Creek during 2004 and 2005. Results of this study are summarized in Section 2.9.

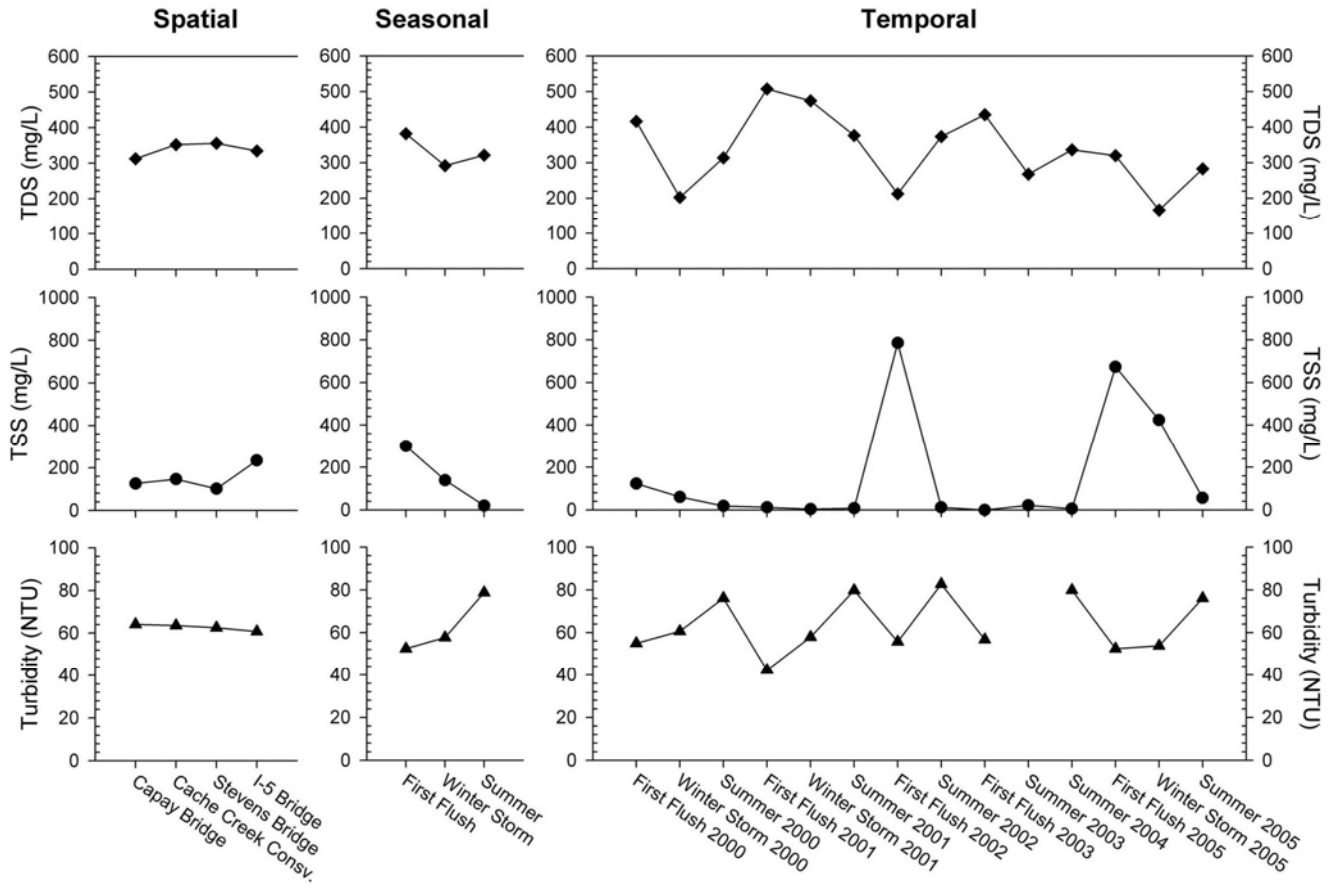

FIGURE 3-7: Total dissolved solids, total suspended solids, and turbidity data for the years 2000-2005.

Ammonia Nitrogen: A statistical trend of increasing Ammonia Nitrogen from upstream to downstream may be occurring. It was difficult to confirm this trend due to a reduced data set for Stevens Bridge and Gordon Slough (due to a change in sampling sites) and the sporadic occurrence of ammonia above detectable limits. The First Flush samples have higher concentrations than Winter Storm or Summer samples, both of which typically do not exceed the reporting limit.

Nitrate Nitrogen: Capay Bridge displayed the lowest concentrations, with an increase at upstream of Gorgon Slough and Stevens Bridge. Concentrations then dropped slightly at I-5, possibly because of dilution. The highest concentrations were observed at Gordon Slough, which may be caused by land use practices, although due to the reduced data set this trend cannot be confirmed. Winter storm samples had the lowest concentrations, likely due to dilution. First Flush samples did not have the highest concentrations as would typically be expected. Instead, Summer samples had considerably higher concentrations than any other sample time. Two possible explanations are: 1) First Flush samples have not properly captured the true first flush, or 2) Summer inputs, likely from land use, are greater than anticipated Nitrite Nitrogen. Only three samples had detectable levels of Nitrite. The small available data set does not show any trends at this time. Seasonal: Nitrite was only detected in the last three sampling events. However, the limited available data set does show a flushing trend with the highest concentrations during First Flush samples, decreasing during Winter Storm samples, and the lowest in Summer samples.

Total Kjeldahl Nitrogen (TKN): A possible increase in concentrations may be occurring since Summer 2004. Concentrations at Capay Bridge, Upstream of Gordon Slough and I-5 Bridge were all relatively similar. However, Gordon Slough and Stevens Bridge were greater than and less

then, respectively, the other three sites. This likely was related to the timing of Gordon Slough replacing Stevens Bridge and the reduced size of each sites data set. A flushing trend with the highest concentrations during First Flush, decreasing during Winter Storm, and the lowest in Summer was observed.

Mineral Nitrogen (Sum of Nitrate Nitrogen plus Nitrite Nitrogen): Due to the relatively high concentrations and occurrences of Nitrate to Nitrite, Mineral Nitrogen trends are the same as discussed for Nitrate Nitrogen above.

Organic Nitrogen (TKN minus Ammonia Nitrogen): Due to the relatively high concentrations of TKN to Ammonia Nitrogen, Organic Nitrogen trends are the same as discussed for TKN above.

Total Nitrogen (Sum of Mineral Nitrogen plus Organic Nitrogen): A possible increasing trend in Nitrogen was observed. Capay Bridge had the lowest observed concentration of all the sites. Upstream of Gordon Slough, Stevens Bridge and I-5 Bridge all had about the same average concentrations, while Gordon Slough was almost 50% higher. This elevated concentration at Gordon Slough was likely due to the reduced data set size and the recent acquisition of the site for sampling. First Flush and Summer have the same approximate concentrations, with Winter Storm being the lowest likely due to dilution.

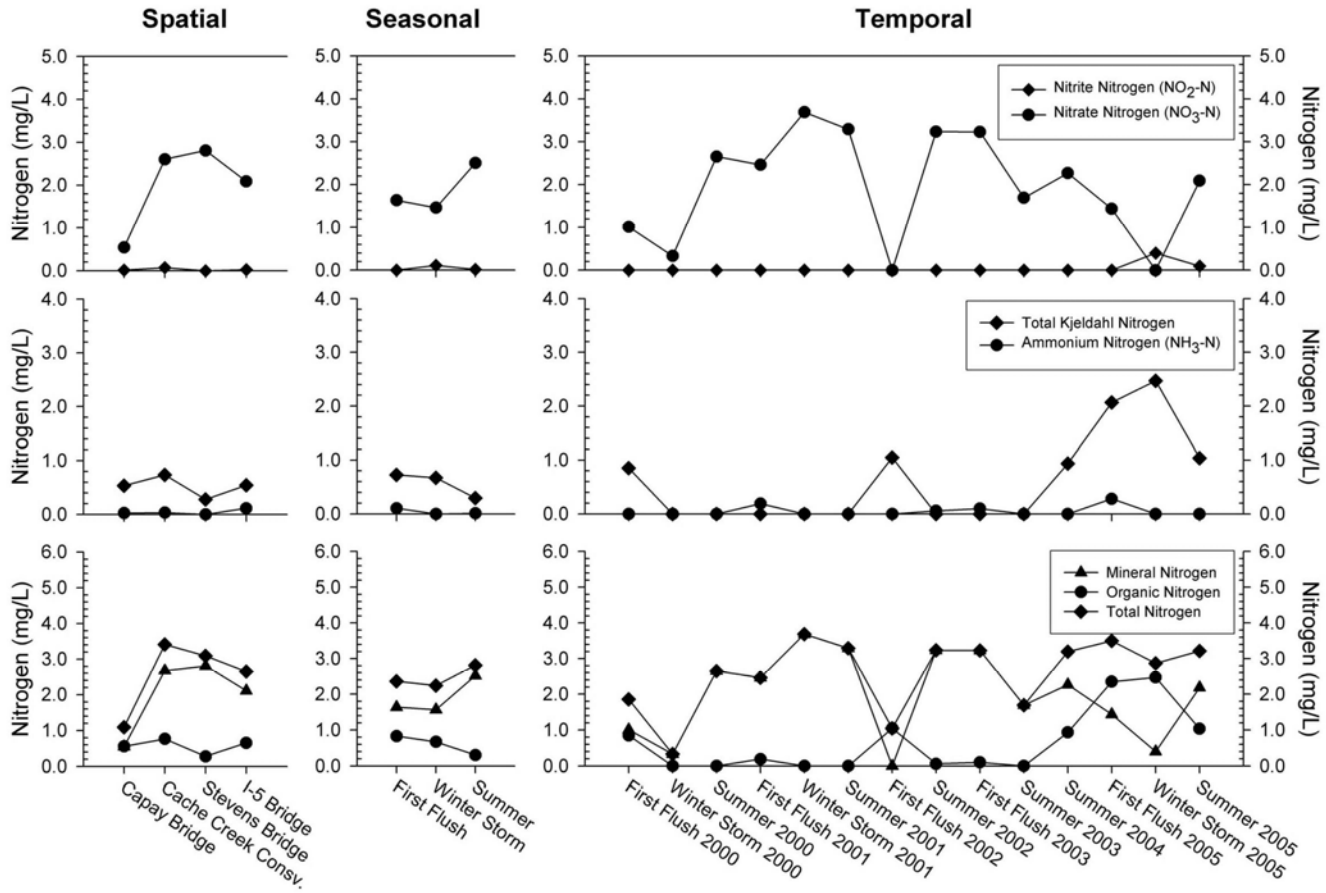

FIGURE 3-8: Nitrogen data for the years 2000-2005.

Orthophosphate Phosphorus: Not detectable in any sample.

TPH as Diesel: The small available data set does not show any trends at this time. Diesel was only detected in the last three sampling events. However, the small available data set does show a flushing trend with the highest concentrations during First Flush, decreasing during Winter Storm, and the lowest in Summer. Results may be indicative of an increasing trend.

TPH as Gasoline: Not detectable in any sample.

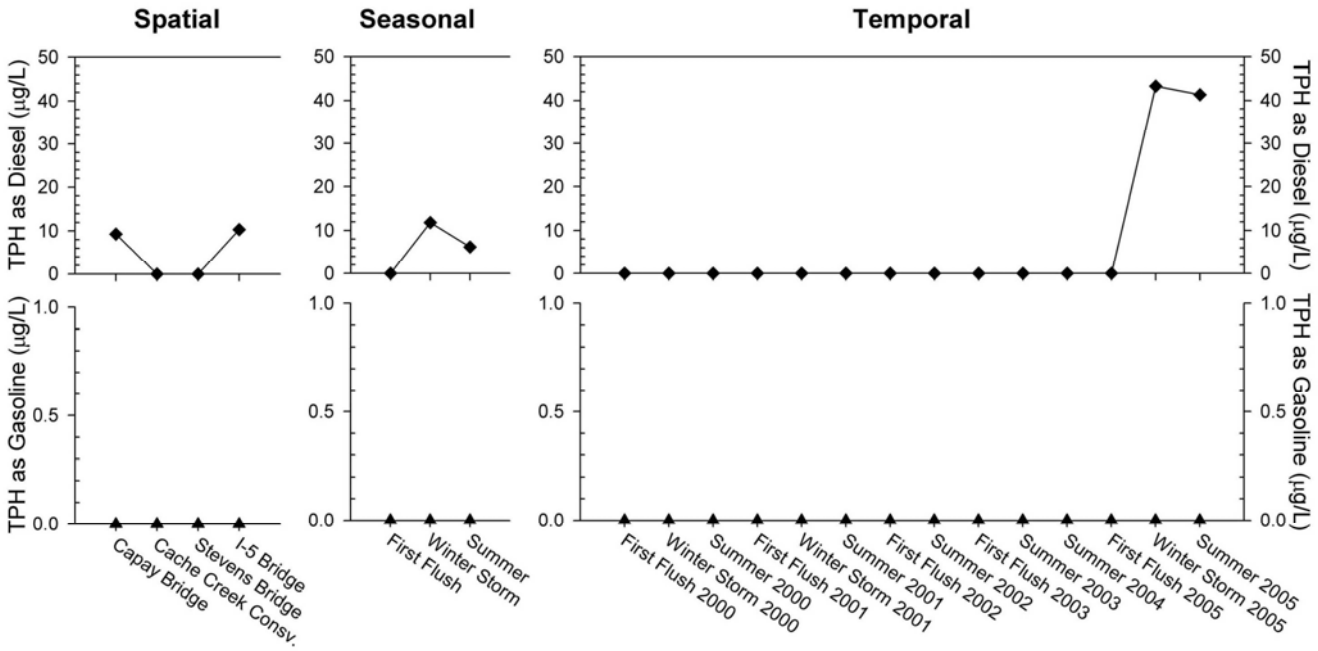

FIGURE 3-9: Petroleum data for the years 2000-2005.

Total Boron: No discernable trend was evident. All sampling events were above the 600 ug/L water quality objective except for First Flush 2002 and Winter Storm 2005. Capay Bridge and Gordon Slough average concentrations are similar and less than upstream of Gordon Slough, Stevens Bridge and I-5 Bridge which also have similar average concentrations. First Flush and Summer have the same approximate concentrations, with Winter Storm being the lowest likely due to dilution.

Dissolved Mercury: No trends were observed. Dissolved Mercury was only detected during the Summer 2004 sampling event.

Total Mercury: No trends were observed with this reduced data set. However, detectable concentrations of Mercury in half of the First Flush samples do indicate a seasonal flushing trend.

Total Mercury was only detected during the First Flush 2000, 2002, 2006 and Summer 2004 sampling events. The extremely elevated concentrations observed during the Summer 2004 compared to all other samplings appear to be an anomaly at this point in time, although further investigation may be warranted. The three First Flush events had average concentrations that were similar to each other, but the Summer 2004 concentration is almost six times greater.

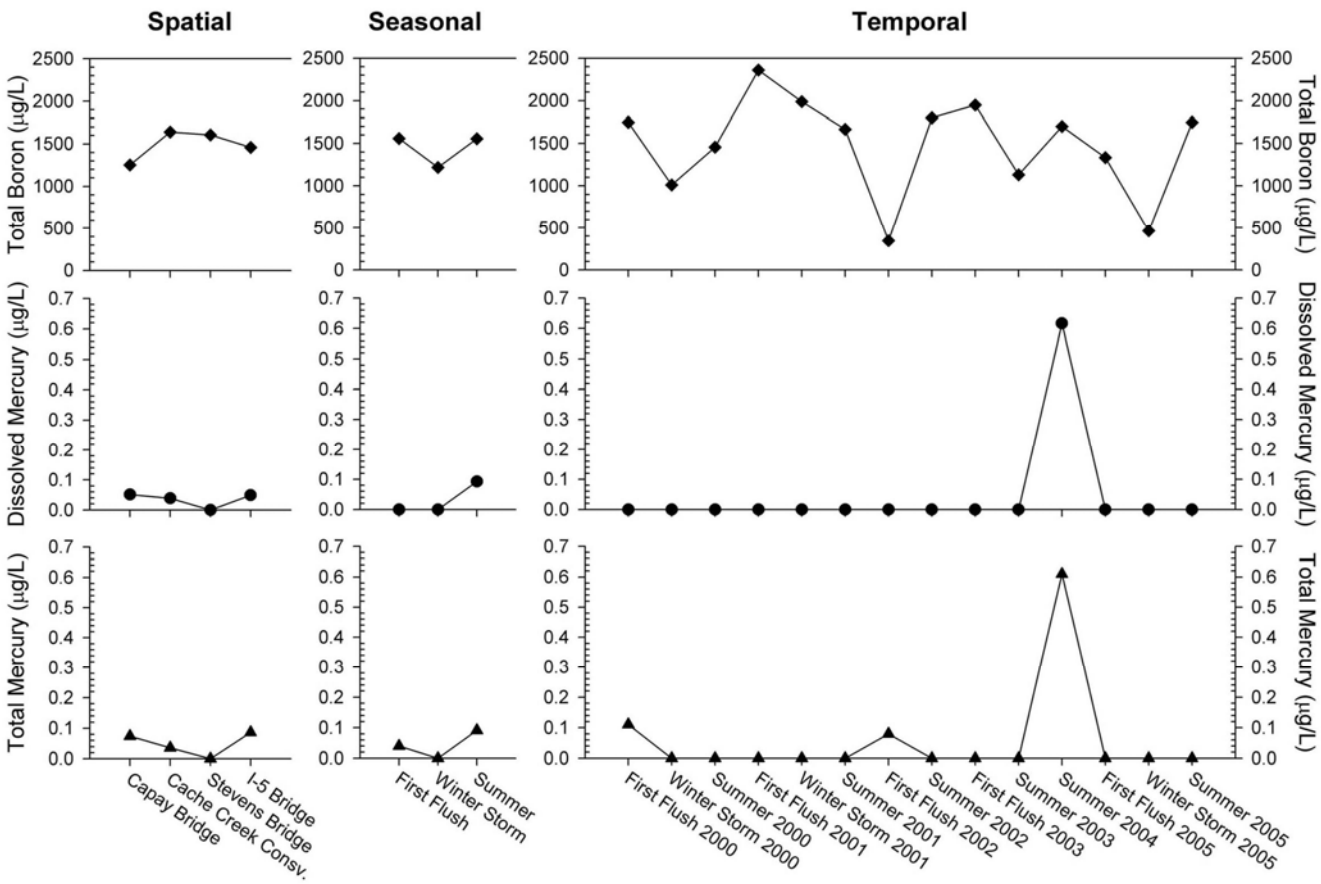

FIGURE 3-10: Boron, dissolved mercury, and total mercury data for the years 2000-2005.

Fecal Coliform: Fecal coliform levels upstream of Gordon Slough was considerably greater than average concentrations at any of the other sites. The increase may be a result of local land use practices.

Total Coliform: The increasing trend observed was primarily due to a change in analysis dilution methods, which allows for accurate detection at higher concentrations. Stevens Bridge was a factor of 10 less than the other sites, likely due to it being sampled only when the analysis had an upper reporting limit. Relatively constant average concentrations at the other four sites indicate uniformity throughout the creek system. A flushing trend may be present with the highest concentrations during First Flush, decreasing during Winter Storm, and the lowest in Summer.

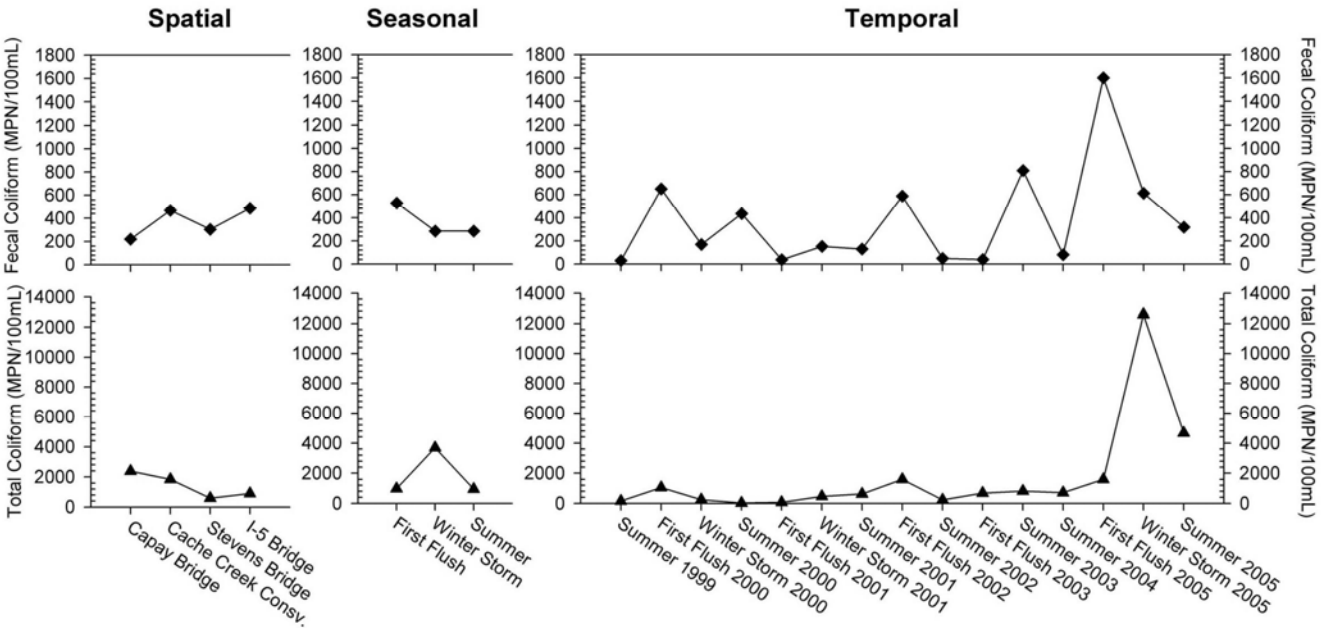

FIGURE 3-11: Bacteria data for the years 2000-2005.

Chlorinated Herbicides: Only detected during the Winter Storm 2005 and First Flush 2006 sampling. 2,4-D was detected at upstream of Gordon Slough during First Flush 2006 with a concentration of 8.9 ug/L. MCPP was detected at Gordon Slough and I-5 Bridge with concentrations of 8 and 8 ug/L.

Orthophosphate Pesticides: Only detected during the Winter Storm 2005 sampling at Gordon Slough and I-5 Bridge. Ronnel and Mevinphos were detected at both sites with concentrations of 0.3 and 0.3 ug/L.

Note: 2005 Cache Creek Surface Water Quality Results: See Appendix A

Recommendations:

3.5-1 Water Quality Standards: Incorporate regulatory standards that pertain to Cache Creek as they become available from regulatory agencies into the CCRMP Water Quality Monitoring Program. Provide information in the 2007 Annual Report about the relationship between water quality data and regulatory standards, as appropriate.

3.5-2 Water Quality Analysis: Conduct further analysis of pH, ammonia nitrogen, nitrate nitrogen, total kJeldahl nitrogen, Total nitrogen, TPH as diesel, and fecal coliform to identify trends and determine if existing levels are negatively impacting agriculture or the environment. Focus coliform monitoring efforts on the areas between Capay Dam and Gordon Slough to help determine the source of high coliform counts in samples collected near the confluence of Gordon Slough and Cache Creek. Provide an update on these analyses in the 2007 annual report.

3.5-3 Water Quality Monitoring: Continue to refine the water quality constituents to better reflect likely contaminants. Sample collection testing constituents should reflect only those shown to be present in Cache Creek with an annual sampling of constituents listed on the EPA's most current list for surface water recommendations.

3.5-4 Methyl mercury: Work with the Central Valley Regional Water Quality Control Board to develop a 20-year plan for reducing methyl mercury in fish tissue.

3.6 CACHE CREEK NATURE PRESERVE MERCURY MONITORING PROGRAM

Due to the existing concerns of mercury bioaccumulation on Cache Creek, compounded by the tendency of an increase in the presence of methyl mercury in some wetland environments, a three-year mercury study was initiated in the fall of 2000 to investigate bioaccumulation of mercury at the Cache Creek Nature Preserve, both within the constructed wetlands area and the adjacent areas of Cache Creek (Slotton et. al., 2004). The study was set up to determine if water discharges from the constructed wetlands on the Cache Creek Nature Preserve site contributed to mercury levels in the adjacent creek channel.

Monitoring studies and assessments for the study were conducted by Darell Slotton and Shaun Ayers of UC Davis. The monitoring included quarterly collections of juvenile fish and aquatic insect samples. These samples were taken from five sites: one upstream of the Cache Creek Nature Preserve (Nature Preserve), one at the Nature Preserve, and three sites downstream of the Nature Preserve outflow.

Data collected during the three-year study period indicate that the Cache Creek Nature Preserve contains levels of methyl mercury bioaccumulation significantly higher than that of its primary water source. Accumulation levels in juvenile fish were also apparent with fall methyl mercury levels from samples generally 50% to 400% higher than spring samples. It is believed that the drastic seasonal differences are attributed to the offset in bioaccumulation rates of juvenile fish caught for sampling (Slotton et.al., 2004).

Recommendations:

3.6-1 Constructed Wetlands Management: Investigate best management practices to reduce methylation of mercury in wetlands environments.

3.7 TURBIDITY AND TOTAL SUSPENDED SOLIDS (TSS)

Turbidity and suspended sediment concentration are of interest as water quality indicators due to water quality pollutants, such as herbicides, pesticides, and nutrients that are frequently attached to suspended and colloidal material. In Cache Creek, a hydraulic system where mercury concentrations are of concern, there is frequently an association between suspended sediment and mercury (Schladow, 2006). The level at which turbidity is increased due to implementation of projects within the active Cache Creek channel has been of concern due to the potential of increased quantities of suspended sediments carrying water quality pollutants and mercury. A turbidity and TSS measurement program was implemented in January 2004 to provide baseline data on the spatial and temporal variation of sediment concentration and turbidity along the lower reaches of Cache Creek. This monitoring program was not intended to measure contaminants associated with suspended sediment, but rather to quantify the seasonal variations in suspended sediment so as to provide a context in which to consider future actions.

The study also examines the correlation of turbidity to that of TSS in Cache Creek in an effort to determine if correlations warrant utilizing turbidity monitoring in lieu of TSS monitoring. The concentration of particles that are suspended in water, TSS, are determined through the time-consuming process of laboratory filtering, drying and weighing. Turbidity is a measure of the optical property that causes light to be scattered and absorbed in water due to suspended and colloidal matter. While less quantitative and subjective than TSS, turbidity measurements have the advantage of being able to be measured directly in the stream without the necessity of collecting

samples for later laboratory analysis. In the two years of monitoring conducted, it has been shown that turbidity and TSS concentration are reasonably well correlated on lower Cache Creek.

Sampling was conducted at six locations along the creek within the CCRMP project area and one site just upstream of the CCRMP at one-month intervals throughout the year. Additionally several monitoring trips were made in response to precipitation events, which caused high discharge conditions in Cache Creek.

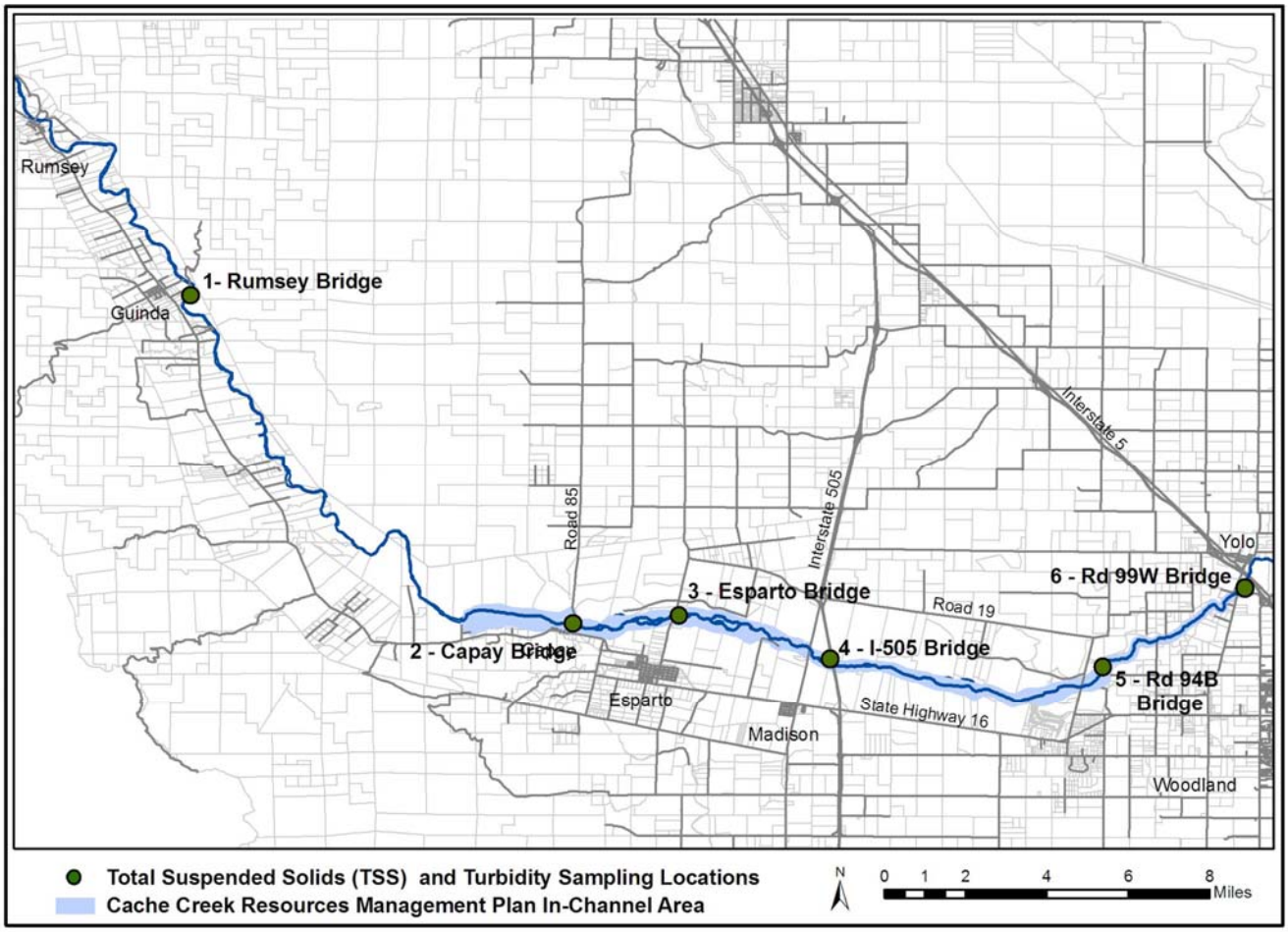

FIGURE 3-12: Turbidity and Total Suspended Solids (TSS) monitoring locations.

2005 TURBIDITY AND TSS RESULTS

During the 2005 monitoring studies, turbidity and TSS concentration continued to be reasonably well correlated. The 2005 results also showed that TSS and stream discharge might be correlated through a power law relationship with an average R^2 of 0.85. That is to say, there exists a very strong relationship between suspended solids and flow rate, with suspended solids increasing dramatically at higher flow rates (See Figure 3-13).

Although Cache Creek is a much smaller hydraulic system than the Sacramento River, the annual average TSS concentration in Cache Creek is of similar magnitude to that of the Sacramento River measured at Freeport. Summer TSS concentrations in Cache Creek are lower than the Sacramento River, while peak winter flow values are an order of magnitude higher. Total mass of sediment passing Yolo in 2005 was 104,101 tons. This was considerably less than the quantity for 2004, which was 265,664 tons. This can be explained, in part, by the higher flow events in 2004.

Over 99% of the sediment mass flux passing Yolo for each year was associated with the two or three large flow events that occurred on Cache Creek during each wet season. There is considerable inter-annual variability in the year-to-year flux of TSS passing through Cache Creek although the County's turbidity and TSS study shows that despite the variability, Cache Creek consistently remains so turbid that the potential increase in turbidity due to projects such as bank stabilization are so small in comparison that they are almost impossible to measure. Gordon Slough also represents a significant source of high turbidity water to Cache Creek during the summer irrigation season.

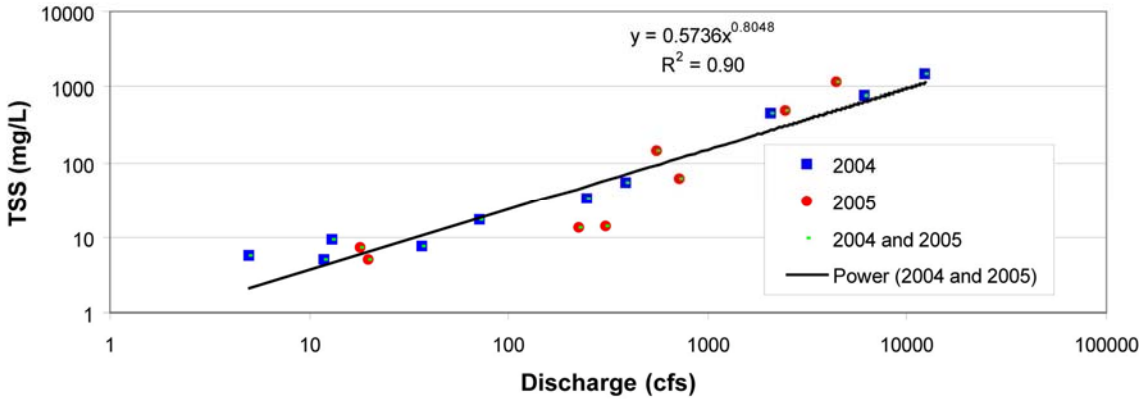

Figure 3-13: Total Suspended Solids (TSS) vs. Discharge for samples taken at County Road 99W during 2004 and 2005 monitoring periods.

Recommendations:

3.7-1 Mercury Total Maximum Daily Load (TMDL): Add three turbidity monitoring sites within the CCRMP area in 2006 such that the turbidity monitoring conducted by the County can take the place of site-by-site monitoring otherwise required by the new mercury TMDL standards.

3.7-2 Turbidity vs. Total Suspended Solids (TSS): Evaluate whether the CCRMP requirements for sediment monitoring can be met with turbidity monitoring instead of sampling for total suspended solids, which the County currently conducts and is more costly and time consuming.

4.0 CHANNEL GEOMORPHOLOGY MONITORING

The natural channel geomorphology, or evolutionary geologic and hydrologic formation of Cache Creek, is highly varied as the creek flows out of the Capay Hills to the Sacramento Valley floor. These regimes include: a relatively straight bedrock channel as the creek emerges through the Capay Hills, a meandering and then a braided alluvial river flowing on the surface of a large alluvial fan within the Capay and Esparto areas, which then transition to an antecedent stream incised into the actively uplifting Dunnigan Hills, and then a transition back into an alluvial stream on the fan deposited on the Sacramento valley east of the Dunnigan Hills. However, in response to a variety of largely anthropogenic conditions such as dam construction and entrapment of sediment, levee protection of agricultural land, and aggregate mining the Creek has become incised along its entire length within the lower Cache Creek basin. As a result, the active floodplain is fairly constricted with relatively well-defined high banks that are prone to erosion, even within the alluvial reaches of the Creek. As part of the CCRMP, the County monitors channel changes such as lateral bank erosion, channel incision, and agradation through the use of aerial photography, digital elevation models, and visual inspection. These monitoring efforts document channel changes over time and provide valuable information, which is then utilized extensively for both CCRMP-wide management and site-specific project design and monitoring.

4.1 DIGITAL TERRAIN MODEL (DTM)

Consistent with the implementation of the CCRMP, the County has contracted for the development of annual digital terrain models (DTMs) for the CCRMP area. The DTMs were developed by three separate contractors: Geonics for 1997-1998, Cunningham Engineers for 1999-2003, and Ayers for 2003-2005. These DTMs were prepared on the basis of aerial photogrammetry to monitor changes in the morphology of the creek. Significant changes can include lateral erosion of the creek channel, lowering of the creek channel (i.e., channel degradation), and deposition of sediment within or adjacent to the channel (i.e., channel aggradation).

DTM data provides the basis for technical evaluations of channel stability, year-to-year channel changes, and opportunities for riparian habitat restoration for the TAC and County staff. The available photographs and topographic maps have been indispensable tools for inspections of the creek conditions during the annual Cache Creek walk, providing the basis for monitoring and documenting adverse conditions as well as completed bank stabilization and habitat restoration projects. The CCRMP DTMs have been used for the design of virtually all significant channel improvement projects and many habitat restoration projects completed to date within the CCRMP. This continually updated information provides the topographic data to determine grading goals for bank stabilization and erosion control projects. Additionally, the data is critical to evaluating hydraulic parameters (including flood stage and flow velocities) for existing and post-construction conditions.

Two examples of the larger improvement projects within the CCRMP area which have utilized DTM data include the bank stabilization projects on the north and south banks of Cache Creek west of the I-505 bridge and the Hayes habitat restoration. The DTMs have been available and used for public works projects, including the replacement of the County Road 87 Bridge at Esparto. Without these DTMs, significant cost for topographic mapping would have been expended by each project.

2005 CACHE CREEK DTM RESULTS: SEE APPENDIX B

Recommendations:

4.1-1 Digital Terrain Model (DTM): Utilize light detection and ranging (LiDAR) imagery taken of the CCRMP area that will collect high-resolution elevation data for the creation of the 2006 DTM.

4.2 AGGRADATION AND DEGRADATION

The alluvial processes within the lower Cache Creek basin result in continuous changes in the patterns of erosion and deposition within the active floodplain of the creek. Erosion and deposition are transient conditions along an alluvial stream such as Cache Creek and represent adjustments, which balance the potential energy of the water flowing in the creek. Aggradation refers to significant deposition of sediment within the floodplain. With aggradation, the net volume of the floodplain and the flood capacity of the channel is reduced. Degradation refers to removal of the previously deposited sediment or bedrock in the channel bed and banks. Degradation results in a lowering of the channel (sometimes referred to as incision) or lateral migration of the channel and bank erosion. Degradation causes an increase in the volume of the floodplain.

The general geomorphic conditions of the CCRMP area favor the deposition of sediment in two distinct areas. As the Creek flows through the Capay Hills (Capay subreach) and into the topographic basin referred to as Hungry Hollow (Hungry Hollow subreach), the gradient (slope) of the channel is reduced and deposition of sediment carried from upstream is favored. Through geologic time, this depositional environment has resulted in the formation of a large alluvial fan. This geomorphic feature is evident on historic and current topographic maps as a topographic bulge, which slopes away from the Creek's position. The current creek channel is incised into this alluvial fan. This depositional setting was the location of extensive in-channel aggregate mining prior to implementation of the CCRMP. The deposited sediments are coarse-grained, ranging from sand to cobbles. The second major depositional environment within the CCRMP occurs downstream in a similar geomorphic setting. As Cache Creek emerges from the relatively narrow valley cut through the Dunnigan Hills and into the Sacramento Valley (Hoppin and Jesus Maria subreaches), the gradient of the stream is again reduced and deposition is favored. Relative to the upstream Hungry Hollow subreach setting, the creek deposits finer sediment (silt, sand, and gravel) in the Hoppin and Rio Jesus y Maria subreaches.

Recommendations:

4.2-1 Volumetric Change: Utilize DTM data to conduct a quantitative assessment of significant volumetric changes in channel capacity and areas of excessive erosion between 1997 and 2006.

4.3 BANK EROSION

In response to a variety of largely anthropogenic conditions such as dam construction and entrapment of sediment, levee protection of agricultural land, levee protection of the City of Woodland, and aggregate mining, the creek became incised along its entire length within the lower Cache Creek basin prior to implementation of the CCRMP area. As a result, the active floodplain is fairly constricted with relatively well-defined high banks, even within the alluvial reaches of the creek. A reach by reach evaluation of bank erosion trends is located in Section 5.

4.4 CHANNEL MEANDERING

Throughout most of the CCRMP area, Cache Creek is classified as a meandering stream or one that experiences many bends and turns. The profile of the creek channel consists of alternating riffles (relatively steep gradient) and pools (more gentle gradient). The meanders are mobile and tend to move slowly downstream. Flow velocities are controlled, to an extent, by the meandering shape of the channel. Velocities are relatively higher on the outside of the meanders, typically resulting in bank erosion. Conversely, the slower velocity of water flowing on the inside of the meander causes deposition. The sediment deposition of the inside of the meanders results in the formation of gravel bars. The gravel bars on Cache Creek are impressive geomorphic features that are easily observed on aerial photographs due to their size and relatively sparse vegetation. As the meanders migrate downstream, the position of erosion on the outside if the meanders and the gravel bars migrate downstream. Nearly all areas of significant erosion along Cache Creek observed during the CCRMP monitoring period occurs at the outside of meanders.

Recommendations:

4.4-1 Channel morphology: Survey transect locations to provide data necessary for calibration of a HEC-RAS model to evaluate increased flooding hazards related to changes in channel morphology.

5.0 BIOLOGICAL RESOURCES MONITORING AND MANAGEMENT

5.1 RIPARIAN VEGETATION

Since the implementation of the CCRMP, there has been considerable natural regeneration of riparian vegetation along Cache Creek. Riparian plant communities naturally begin their regeneration cycle in conjunction with the seasonal hydraulic cycles of flooding and sediment deposition. Seeds are released, dispersed, and alight on moist sediment during naturally occurring periods of high flow. They then germinate and establish as creek and groundwater levels gradually decline. In many areas of the Central Valley, dam construction, channel alterations, agricultural clearing and cultivation, effects of levees, and various "maintenance" activities on highly regulated rivers have severely decimated natural patterns of regeneration. Since Cache Creek still maintains some natural patterns of flooding and deposition, natural regeneration continues to occur along this highly altered landscape.

Riparian vegetation refers to the native plant communities associated with flowing water, particularly rivers and creeks. These plant communities typically consist of multiple layers of vegetation, starting at ground level with grasses and forbs, and progressing upward in the canopy, to shrubs and lianas, small trees, and finally emergent cottonwoods, sycamores and oaks at the highest level. These plant communities are home to a great diversity of plant and animal life such as streamside dependent fishes, mammals, and a great diversity of bird life. Riparian plant communities are both dependent upon fluvial river processes for initiation of primary successional species and maintenance, but in turn profoundly influence stream channel characteristics such as bank stability and water temperature once mature.

Historically, the presence of vegetation along Cache Creek tended to stabilize the banks of both high-flow and low-flow channels. Some historical perspective is revealing; a 1851 Mt. Diablo Meridian Line survey crossed Cache Creek about two miles east of the present day I-505 Bridge. The survey documented a 1400 ft. band of willow and cotton vegetation between a comparatively narrow channel bank to a band of oaks. A 400 ft. band of willow and cottonwood vegetation was found from the opposite bank to where it entered a band of oaks. The channel itself was only 99 ft. wide (Bryan, 1923). Thus, the surveyed reach was characterized by a relatively narrow channel and a wide band of vegetation, in sharp contrast to the average channel width of approximately 700ft. and spotty patchwork of riparian vegetation presently found in that area.

Riparian vegetation is not equally distributed along Cache Creek. In the losing reaches, riparian vegetation is sparse, whereas the most extensive formation of riparian vegetation is found in the gaining reaches. The best regeneration is occurring in the gaining reaches. However, even in the losing reaches, there is some regeneration occurring. This continued process of natural regeneration may be attributed to: 1) cessation of mining in the near channel areas, 2) release of winter floodwaters and sediments which coincides with seed release 3) agricultural tailwater releases, which maintains a higher than normal summer flow and therefore sustains plants that might otherwise perish.

Field observations over the past several years indicate a general increase of vegetation along lower Cache Creek that is coincident with the implementation of the CCRMP. There are however, some areas within the CCRMP area that have experienced a local loss of riparian vegetation. One natural cause is erosion caused by creek flooding. This is exacerbated by the higher than historic stream velocities due to highly narrowed river floodways. Another factor for lateral bank erosion is due to historic bed degradation followed by lateral floodway widening.

5.2 2005 RIPARIAN VEGETATION SURVEYS

RIPARIAN VEGETATION SURVEY METHODS

To assess vegetation survivorship and natural recruitment along Cache Creek, the County used two approaches; a geographic information system (GIS) survey and a qualitative description of the revegetation projects within the CCRMP area. The GIS survey used 2004 black & white orthophotos, high-resolution photos that provide information useful in recognizing certain vegetation patterns. Mature woody vegetation (generally greater than 12-15 feet in height) cast sufficient shade to differentiate this vegetation type from smaller woody vegetation represented in the aerial photography. Discerning specific species of riparian trees within plant communities, however, was not feasible. While oak trees and walnut trees appeared different than cottonwoods and willows, there is sufficient overlap and intermixing that precluded species classification. Therefore, all mature woody riparian species are presently lumped together in a single classification. Clear signatures of stands of giant reed *(Arundo donax)* and tamarisk *(Tamarix sp.)* were discernable, but the degree of intermixing and the scattered nature of small patches made practical mapping problematic.

RIPARIAN VEGETATION SURVEY RESULTS

Over 350 acres of mature riparian vegetation were delineated with the utilization of 2004 black and white orthophotos and ground-truthing assessments conducted in 2005. This study compares to approximately 200 acres mapped in the 1995 Technical Studies report. The comparison is not completely valid because of the differences in mapping techniques and vegetation assessment methodologies, but it is clear that riparian vegetation has significantly increased in the CCRMP area. The earlier survey does not provide a spatially mapped extent of vegetation cover, so a reach-by-reach comparison is not feasible. The 2005 survey however, was mapped in a GIS database that is spatially referenced, as will all future surveys, insuring that all future comparisons are spatially explicit. The earlier survey included some forest stands above Capay Dam, whereas the 2005 study was delineated by the CCRMP area which begins downstream of the Capay Dam. In the earlier study, the classifications of willow scrub (821 acres) and riparian forest (200 acres) were noted although the methodology used to delineate them is unclear. In the 10 years since the initial riparian vegetation survey for the CCRMP, a significant portion of the additional acreage attributed to the larger sized category of riparian forest might be accounted for by growth of the willow scrub type into the larger size category. With much of the riparian forest healthy and growing, this would be a plausible explanation.

See Section 5.0 for figures and descriptions of riparian vegetation coverage by subreach

Recommendations:

5.2-1 Utilize new technology for improved monitoring and analysis: Conduct digital color aerial photography and utilize Light Detection and Ranging (LiDAR) imagery in 2006 to provide more detailed and accurate analysis of riparian growth trends. Once the mapping process has been adapted for these new technologies, monitoring studies can occur at a much finer level of spatial accuracy. In addition, Yolo County can distinguish various plant communities utilizing the imagery and monitor vegetative growth over time. Use of LiDAR technology also will decrease the time needed for annual updating in comparison to previous digitization methods.

5.2-2 Mapping guidelines: Set specific guidelines for preparing vegetation mapping and riparian vegetation surveys to ensure consistency in data collection.

5.2-3 Increase monitoring detail: Utilize LiDAR imagery for vegetation mapping so Yolo County can monitor riparian community types and growth as well as vegetative coverage.

5.3 HUMAN-ASSISTED RESTORATION

Human assisted habitat restorations have had mixed results. Generally, the plantings closer to the Creek have faired better than those on higher terraces where conditions are much drier. On some of the driest sites drought tolerant species should be used. Previous post-implementation monitoring efforts of site-specific projects vary greatly in level of detail and in the types of information presented. Many project sites have almost no monitoring information describing vegetation or environmental conditions that may have contributed to the state of the project post project implementation.

Project-specific assessments are detailed in Section 6.0.

Recommendations:

5.3-1 Monitoring standards: Develop a standard method and process for monitoring human-assisted restoration projects within the CCRMP area that would allow for comparative analysis of projects and provide guidance for future CCRMP area project development consistent with CCRMP goal 4.2-5. During the first few years of plant establishment, the project proponent should count the principal tree and shrub species for survival rate. The project proponent should use this information to determine if some areas are more productive than others. Relative growth rates would also provide indication of site suitability. After a number of years of good growth, percentage of cover in restored areas could be utilized to monitor established vegetation.

5.4 INVASIVE SPECIES

In the early 1900s, local residents introduced tamarisk and giant reed to Cache Creek for the purpose of controlling stream bank erosion. As human settlement in the area increased, anthropogenic activities increasingly disturbed the riparian corridor. Deforestation, mining, grazing, irrigation, flood control, and encroachment by farming and bridge structures contributed to the increased potential for erosion and streambed degradation. In turn, the increased levels of disturbance created conditions more favorable to invasive, non-native species. Tamarisk *(Tamarix sp.)* and giant reed *(Arundo donax)* spread rapidly, forming localized saline soils, drying groundwater strata that fed riparian root zones, and displacing much of the native vegetation. Dense stands of tamarisk and giant reed are also a primary factor in decreased channel capacity (MBK Engineers, 2002).

TAMARISK AND ARUNDO REMOVAL PROGRAM

In 2001 a four-year tamarisk and arundo removal project was implemented by the Cache Creek Conservancy with the issuance of a California State Wildlife Conservation Board (WCB) grant ($595,000) and a CalFed grant ($222,000). Yolo County Flood Control and Water Conservation District donated $30,000 in cash and in-kind services. The County assisted with monitoring, administrative support, and aerial photography. Muller and Sons also assisted the Cache Creek Conservancy with in-channel implementation of the invasive species control program. This project has been particularly successful due to landowner cooperation and involvement. All but one of the forty-four landowners in the project area have signed on to the project.

Phase two of the tamarisk and arundo removal project will begin in the summer of 2006 with an additional $500,000 in funding from WCB and $400,000 in funding from the CALFED Watershed Program to continue work over the next three years.

TAMARISK MONITORING

In April of 1997, the County contracted to have a series of color aerial photos flown of Cache Creek. This was done in order to identify the extent of tamarisk infestation for the purpose of a preparing a joint grant application prepared by the County and the Cache Creek Conservancy for tamarisk removal within the CCRMP area. The photos were flown at a scale of 1 inch = 1,000 feet and covered the area between the town of Rumsey and the Settling Basin, at a time when the tamarisk was still in bloom. County staff then took a transparent grid (five squares per inch, so that one square equals 0.92 acres) and laid it over the color photos to determine the extent of tamarisk infestation. Although this method is somewhat crude, it provides a general indication of the variety of tamarisk density along various sections of the creek. The results of staff's evaluation are shown in the table below.

TABLE 5-1: Extent coverage of tamarisk along Cache Creek evaluated from 1997 color aerial photography.

Segment of Cache Creek Evaluated	Length of Segment	Percent of Total Length Studied	Estimated Acres Infested	Percent of Total Infested Area
Rumsey to Guinda	5.9 miles	13.40%	219 acres	32.40%
Guinda to Tancred	5.0 miles	11.20%	154 acres	22.80%
Tancred to Capay Dam	7.0 miles	15.70%	131 acres	19.40%
Capay Dam to County Road 85	2.1 miles	4.70%	22 acres	3.30%
County Road 85 to County Road 87	2.1 miles	4.70%	8 acres	1.20%
County Road 87 to Interstate 505	3.5 miles	7.90%	10 acres	1.50%
Interstate 505 to County Road 94B	5.3 miles	11.90%	13 acres	1.90%
County Road 94B to Interstate 5	4.9 miles	11.00%	89 acres	13.20%
Interstate 5 to County Road 102	4.9 miles	11.00%	17 acres	2.50%
County Road 102 to Settling Basin	3.8 miles	8.50%	13 acres	1.80%
TOTAL	44.5 miles	100%	676 acres	100%

An additional set of color aerial photography was taken in spring of 2006. This photography will be reviewed to determine the approximate acreage of tamarisk in each reach and to compare current tamarisk distributions to those of 1997. This digital aerial photography will also allow monitoring of future weedy growth trends and assist in the development of annual invasive species management strategies. An assessment of tamarisk distribution along each reach will be included in the 2007 Annual Report.

Recommendations:

5.4-1 Color Aerial Photography: Utilize color aerial photography for tamarisk monitoring to assist in determining annual action plans for tamarisk removal programs throughout Cache Creek watershed and to provide a method of tracking the relative success of invasive species removal over time. Tamarisk and arundo removal outside of the CCRMP area is important because tamarisk and arundo seeds from upstream can float down and reestablish plants within the CCRMP area.

6.0 SUBREACH TRENDS AND ACTIVITIES

In recognition of the geomorphically diverse nature of the creek, Northwest Hydraulics identified nine geomorphically distinct subreaches in the 35 miles from upstream of the Capay Dam to the Settling Basin, in the 1995 Streamway Study prepared as part of the Technical Studies for the Lower Cache Creek basin. Seven of these subreaches are located within the CCRMP area (See Figure 6-1). These subreaches each exhibit distinct geomorphic and hydraulic conditions influenced by a variety of factors, including bedrock, changes in flow volume, and manmade influences such as bridges, levee, and land reclamation. These subreaches, as well as the reaches upstream and downstream, are within a linearly connected corridor. Each subreach affects and is affected by both upstream and downstream activities. In the same regard, however, project proponents must take the distinct characteristics of a subreach into account when designing and implementing site-specific projects within the CCRMP area.

The following descriptions include the natural geomorphic and vegetative trends along each subreach, observations from the 2006 creek walk inspection, and future recommendations based on subreach trends and project monitoring. Descriptions of the numerous projects that have been implemented in each subreach (some as part of the CCRMP, some before the inception of the CCRMP, others simply as part of the review process) are also included to examine and assess creek management strategies in each subreach. The observations provided for specific projects are qualitative descriptions of apparent successes and failures. The 'success' of these projects is largely influenced by site quality and compatibility of site design with the local environment. Generally, projects that include vegetating sites located in areas with low groundwater levels, in the immediate path of scouring creek flows, or on higher terraces with droughty soils have not performed well. Riparian restoration projects on high quality soil, with reliable source of water, generally have performed well.

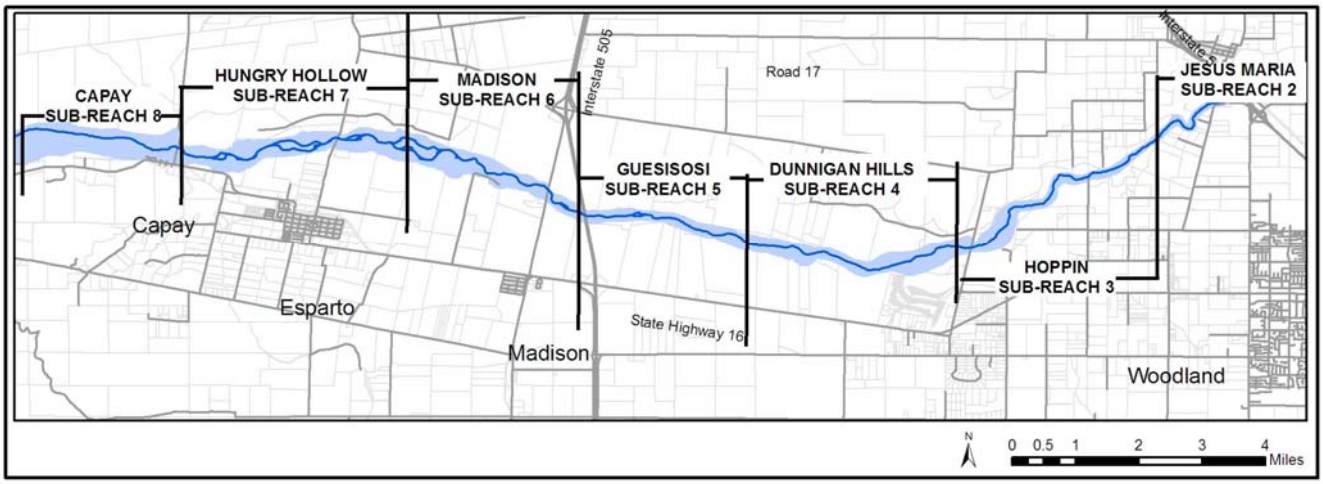

FIGURE 6-1: Sub-Reaches Located Within the CCRMP Area

***Note:** The following descriptions utilize the river-mile marker system, a commonly used river marking system established by the U.S. Army Corps of Engineers in 1964, to reference approximate locations along a flowing water body. The river miles along Cache Creek begin at the Cache Creek settling basin and follow up the channel centerline that they were originally mapped with. Their location remains the same regardless of where the channel shifts over time. Although the river mile (RM) designation no longer accurately measures the distance along the channel centerline due to channel migration, the markers act as geographic place names that assist in defining specific locations referenced along a waterway.*

6.1 CAPAY SUBREACH (REACH 8)

Capay Dam to the Capay Bridge (River Miles 28.3-26.3)

General Characteristics

The Capay subreach is immediately below the Capay Dam spillway and extends approximately two miles downstream to the Capay Bridge (Road 85). The Capay subreach is as a steep, confined, and incised reach formed predominantly on fine-grained bedrock of the Capay and Tehama formations. This reach is a gaining reach, in that groundwater drains into the creek in this subreach during low-flow periods. Riparian vegetation cover the banks of the active channel throughout this subreach while some remnant stands of mature riparian forest are found on the upper terrace.

Geomorphic Trends

The position of the channel has remained relatively constant in the Capay subreach. However, evidence of continued incision of the channel is evident. Yolo County has observed a knick-point (a relatively sharp change in gradient) migrating upstream. It is observable as a large riffle in the creek in the area of the PG&E 'Palisades,' a revetment constructed in the mid-1990s to protect high-pressure natural gas transmission pipelines. The incision of the channel at the lower end of the reach (just upstream of the Capay Bridge) has lowered the channel below the contact of the bedrock and overlying alluvial sediment during low-flow conditions, resulting in the draining of groundwater from the alluvium during summer months. An area of significant lateral erosion of the alluvium on the south bank of the creek extends approximately 500 to 600 feet upstream of the Capay Bridge. This bank has laterally eroded approximately 200 feet between 1998 and 2004; with minor erosion occurring over the last two years. Most of the erosion in this reach occurs during moderate-to-high flows. This erosion could potentially threaten the long-term stability of the south abutment of the bridge.

Vegetative Trends

Relatively good stands of native vegetation exist, especially on the south bank. Agricultural runoff, apparently from adjoining terraces, percolates and seems to sustain the vegetation development on the south bank. Natives include sandbar willow (*Salix exiquia*), arroyo willow *(S. lasiolepis),* black willow *(S. gooddingii),* cottonwood *(Populus fremontii),* creeping wild rye *(Leymus triticoides),* mulefat *(Baccharis salicifolia),* valley oak *(Quercus lobata),* ash *(Fraxinus latifolia),* sedge *(Carex spp),* black walnut *(Juglans hindsii)*. Exotics include giant reed *(Arundo donax)*, tamarisk *(Tamarix sp.)*, and pampas grass *(Cortaderia selloana)*. There is also intentionally planted pampas grass on the south bank.

The lower part of the Capay subreach is characterized by its slightly depositional nature and abundant young cottonwood seedlings. These cottonwoods are now approaching several years of age in some areas. Over the past several years, native regeneration of plants has continued. Only limited growth is anticipated, however, because of the scouring effect of Cache Creek and the restrictive nature of the Tehama bedrock formation.

2006 Creek Walk Observations

Overall conditions observed within the Capay subreach during the 2006 creek walk remain consistent with previous trends. Stands of vegetation, both native and non-native, dominate the banks and upper terraces of this subreach. Little erosion or channel migration has occurred within this subreach over the past year. One area of erosion that was noted in previous years and continues to occur is located on the south bank below the PG&E Palisades site (RM26.9) and directly across from an established point bar.

At the Capay Dam spillway (RM28.4), County staff and TAC members observed groundwater emerging on the south bank at the contact between bedrock and the overlying alluvial sediments.

This condition was observed within the Capay subreach during every previous creek walk inspection. The Capay Dam appears structurally stable with no major erosion occurring immediately downstream.

Immediately below the Capay Dam spillway site, Mr. John Watson of the Cache Creek Conservancy pointed out areas in which substantial progress has been made in regard to eradication of giant reed *(Arundo donax),* a highly invasive species. Mr. Watson also mentioned that several landowners in the upper portion of the Capay subreach have recently agreed to participate in the invasive species removal program. These properties currently have dense stands of tamarisk *(Tamarix sp.).* Removal of these stands would allow opportunities for the establishment of native vegetation through natural recruitment and/or active restoration while also minimizing the potential for tamarisk to colonize in lower subreaches due to branches drifting downstream.

As in previous years, County staff and TAC members inspected the PG&E Palisades (RM26.9). This project was designed and built prior to implementation of the CCRMP to protect an international gas pipeline that crosses the creek. Erosion channels and a slight undulation were observed in the concrete blanket covering the stream crossing of the pipeline. This condition was not observed in previous years. It is believed that water may be eroding the material immediately below the concrete blanket. An opening in the concrete blanket of approximately six feet in diameter, exposing a portion of concrete piping below, was also observed and poses a cause for concern. A knick point in the channel was apparent (as in previous years) as a pronounced riffle that has continued to gradually migrated upstream. The steel pilings and netting have generally succeeded in promoting sediment accumulation, which has allowed for abundant native plant regeneration. Vegetation planted on the upper bank appeared stressed and stunted but were not failing; the results are variable depending upon local soil conditions.

Downstream of the Palisades site, the south bank (RM26.6) experienced approximately 20 feet of lateral erosion during the high winter flows. This erosion has occurred directly across from a large in-channel gravel bar. The areas near the Capay Bridge (RM26.4) were also inspected. The Digital Terrain Model (DTM) data indicates that the retreat of the bank just upstream of the bridge has been minimal in the last year. Dead, mature trees from the top of the bank continue to fall into the channel as the area gradually erodes, providing large woody debris to the local stream environment. The spur dikes on the north bank (RM26.5), immediately upstream of the Capay Bridge, continue to perform well in providing bank protection and riparian habitat is flourishing within the structure.

Capay Subreach Recommendations

6.1-1 Continue resource agency coordination with landowners to promote and implement invasive species removal program: Invasive species management is particularly important in this uppermost subreach of the CCRMP area to prevent the spread of invasive species to areas downstream. Areas with particularly high densities of tamarisk were noted during the 2006 Cache Creek walk at RM27.7 and RM27.2 to RM26.8.

6.1-6 Coordinate invasive species removal efforts with riparian restoration projects: The soil and groundwater characteristics of the Capay subreach are conducive to riparian vegetation, as indicated by the naturally occurring stands of vegetation in the area. Yolo County should ensure that revegetation projects are implemented to fill in areas where invasive species eradication has occurred. The establishment of native vegetation in areas previously occupied by invasive species promotes the preservation of the vegetative corridor that exists within the Capay subreach, increases the habitat value of vegetated areas, and makes re-establishment of invasive species more difficult.

6.1-7 Utilize bioengineering methods for erosion control: Due to the availability of water, presence of alluvium, and minor channel migration in the Capay subreach, erosion control methods utilizing vegetation and in conjunction with engineering ("bio-engineering") approaches are suggested in this area, including upstream of the Capay Bridge.

6.1-8 PG&E Palisades (RM 26.9): Coordinate with PG&E to identify a solution that addresses the exposed pipeline and concrete blanket conditions.

6.1-9 RM 26.6: Determine if erosion on the south bank of the channel downstream of the Palisades has the potential to endanger infrastructure. If so, and the landowner is willing to allow an erosion control project, assist landowner with implementation of an erosion control project, including the potential of mid-channel bar alterations. Also evaluate the influence of upstream activities on the lateral migration of the channel.

6.1-6 Capay Bridge (RM26.3): Monitor aggradation near the Capay Bridge and consult with Public Works Division of the Yolo County Planning, Resources, and Public Works Department on the need for channel reorientation and/or sediment removal to address adverse orientation of the low-flow channel that presents a potential erosion hazards to the bridge abutments. Explore habitat restoration opportunities upstream and downstream of the bridge in coordination with any erosion control projects.

6.1 CAPAY SUBREACH (REACH 8)

Capay Dam to the Capay Bridge (River Miles 28.3-26.3)

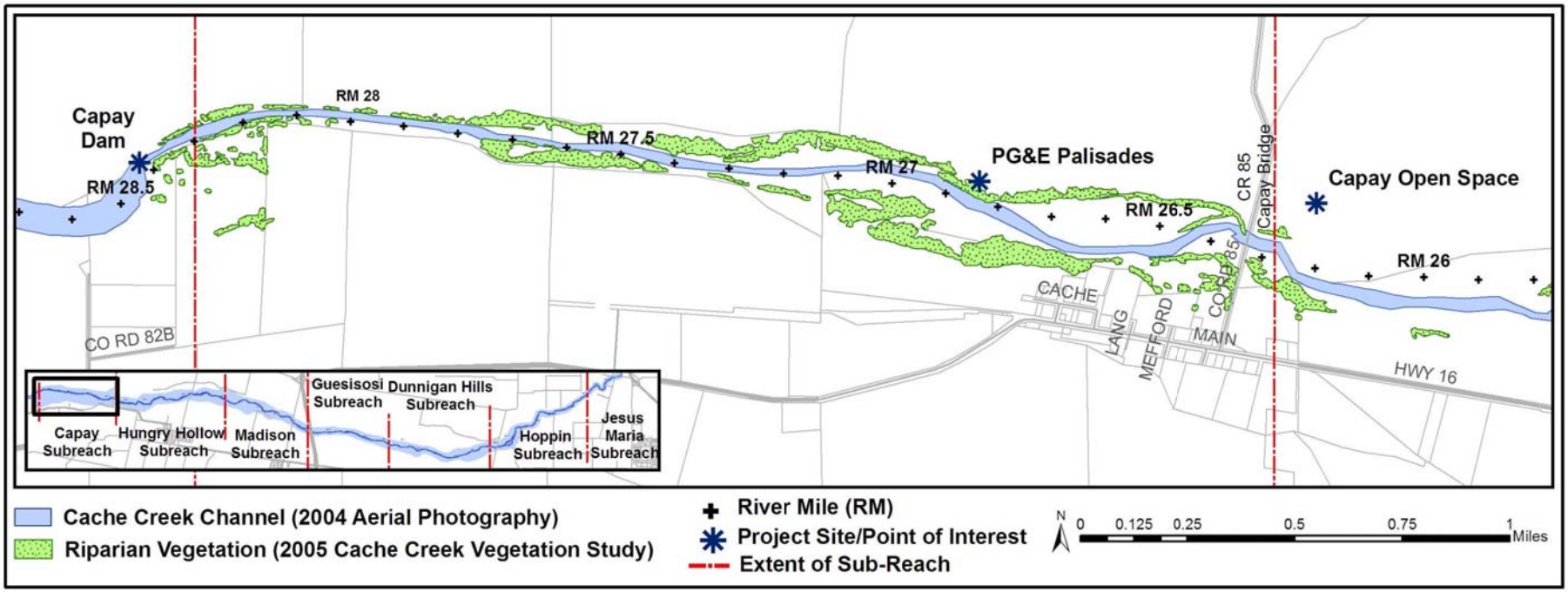

FIGURE 6-2: Capay subreach (Reach 8)

6.2 HUNGRY HOLLOW SUBREACH (REACH 7)

Capay Bridge to Downstream of the Esparto Bridge (River Miles 26.3 – 23.5)

General Characteristics

This 2.8 mile subreach spans from the Capay Bridge to below the Esparto Bridge. The channel is developed variably on bedrock and alluvium within the reach. Exiting the Capay subreach, the channel widens and is braided. Historically the effect of gravel mining in this reach has significantly degraded the channel bed and reduced the degree of braiding and the width of the band occupied by the actively migrating channel. This is the beginning of a losing reach of Cache Creek. The hydrology of this reach appears to be insufficient to support significant vegetation.

Geomorphic Trends

The lateral position of the channel has remained relatively stable, in part, due to major bank stabilization projects conducted by Granite Construction beginning in 2001 on the north bank downstream of the Capay Bridge, and by Syar Industries in 2000 on the south bank downstream of the Esparto Bridge. The County also completed a bank stabilization project in 2004 on the south bank at the Jensen property. Bank protection projects constructed prior to the implementation of the CCRMP on the north bank at the Stevens property (upstream of the Esparto Bridge) and on the south bank at the Jensen property have performed well in minimizing channel migration and bank erosion. Both projects consisted of the placement of spur dikes and sculpted banks. Riparian vegetation has developed between the spur dikes at the Stephens property, a development enhanced by recent revegetation efforts by the landowner in partnership with the Cache Creek Conservancy and the County.

Vegetative Trends

The riparian vegetation survey conducted in 2005 revealed only 4.8 acres of riparian vegetation along this dry, losing subreach. The lack of regeneration on the channel banks in this subreach is apparently due to comparatively higher terraces, which tend to be drier, and lower groundwater levels. There is some presence of herbaceous species propagation on the in-channel gravel bars, although mature vegetation is almost non-existent on these active gravel bars due to their shifting nature, which tends to remove vegetation before it has the opportunity to form a mature root system. Regeneration, mostly of mulefat *(Baccharis salicifolia)* and some cottonwood (*Populus fremontii*) is restricted to a narrow zone adjacent to creek. The presence of occasional individuals of willow (*Salix laevigata*) on some parts of the high terrace cast some doubt on the lack of groundwater availability, at least during the last several years, as being totally restrictive to tree growth.

2006 Creek Walk Observations

The inspection within the Hungry Hollow subreach began at Capay Open Space Park (RM26.3). This 41 acre site was donated to the County as an open space area in 2002. It is currently undergoing the first phase of a parks development project, which has included native plantings as well as the development of trails and public access areas. The most extensive re-vegetated area in the Capay Open Space Park occurs on the upper terrace. The soil quality varies from relatively good conditions at the western portion of the site to relatively poor conditions at the lower and eastern portion of the site as is reflected in the sparse growth of herbaceous vegetation on poor gravelly soils and relatively lush vegetation on soils containing fine-grained sediments. TAC member, Jeff Hart, suggested that soil amendments should be included in future plantings on the site and other sites within the subreach.

Erosion of the north bank toe at the Granite Construction bank stabilization project (RM25.7) was observed in an area where the channel makes a tight curve around a large gravel bar. Mr. Ben Adamo, Plant Superintendent of the Granite Construction site, explained that repairs to the bank stabilization project were made last year following moderately high creek flows. The toe of the

bank eroded again during the 2005-2006 winter flows. The higher embankment area was previously planted primarily with grasses. Cottonwoods (*Populus fremontii*) planted on the top of the banks for aesthetic enhancement are receiving good management and appear to be thriving.

The large gravel bars downstream of the Capay Bridge were generally inspected in a hike across these stream features. As in past CCRMP inspections (and on the basis of aerial photographs and DTM data), the condition of the bars remains relatively constant. The Craig property project site (RM25.7) was inspected. Only remnants of the rice bale erosion protection and willow stakings were observed. Conditions at the spur dikes installed in 2004 along the right bank to provide bank protection at the Jensen property (RM25.4) were also inspected. The 2005-2006 winter flows have demolished this bank protection project. The high bank was completely eroded around the spur dikes and the anchored root wads installed for the project. The active channel is currently flowing against the south bank and further erosion of the bank can be expected. The performance of the project should be further discussed to determine the cause(s) of the project's failure and if current erosion threatens existing infrastructure or high-value agricultural land.

The conditions within the bank protection area located on the Stevens Property (RM24.4), upstream of the Esparto Bridge, continue to support vegetation between older spur dikes. Fine-grained sedimentation (up to 10 inches thick) continues to accumulate. Plants installed in trenches by the Cache Creek Conservancy and landowners are thriving. Downstream of the Esparto Bridge (County Road 87), vertical banks (expressing recent erosion) were observed on the south bank (RM 24.3). Recent erosion was also observed on the tips of spur dikes located on the south bank (RM 24.1 to 23.9) however, the spur dikes do not appear to have been adversely affected.

Hungry Hollow Subreach Recommendations

6.2-5 Erosion control and project maintenance: Coarse gravels, scarce summer water, and frequent channel migration make the Hungry Hollow subreach a challenging area for erosion control projects. Infrastructure within this subreach, which may be threatened by the erosion of a channel meander migrating downstream, such as the Esparto Bridge (County Road 87), should be protected by hard points such as spur dikes or protected banks for stabilization. Projects within this subreach that are located within or adjacent to the low-flow channel should anticipate the potential need to reinforce the toe of the erosion control structure as regular maintenance in order to maintain project effectiveness over time.

6.2-6 Human-Assisted Habitat Restoration: Assess soil condition and water requirements for plant species specified in projects. Include soil amendments or topsoil when planting within the Hungry Hollow Subreach and assure the presence of a water source for plant establishment.

6.2-7 Capay Open Space Park (RM26.3): Complete Park plan implementation including additional trails and handicap access to the creek.

6.2-8 Granite Construction bank stabilization project (RM25.7): Monitor reconstruction of the bank toe along the Granite property to protect the integrity of the upper portion of the bank.

6.2-5 Jensen Site (RM25.4): Evaluate the causes of the project's failure with project designers and landowner. Establish guidelines for repair or replacement.

6.2-6 Esparto Bridge (County Road 87): Implement preventative erosion control measures to protect public infrastructure and evaluate habitat restoration opportunities upstream and downstream of the bridge.

6.2 HUNGRY HOLLOW SUBREACH (REACH 7)

Capay Bridge to Downstream of the Esparto Bridge (River Miles 26.3 – 23.5)

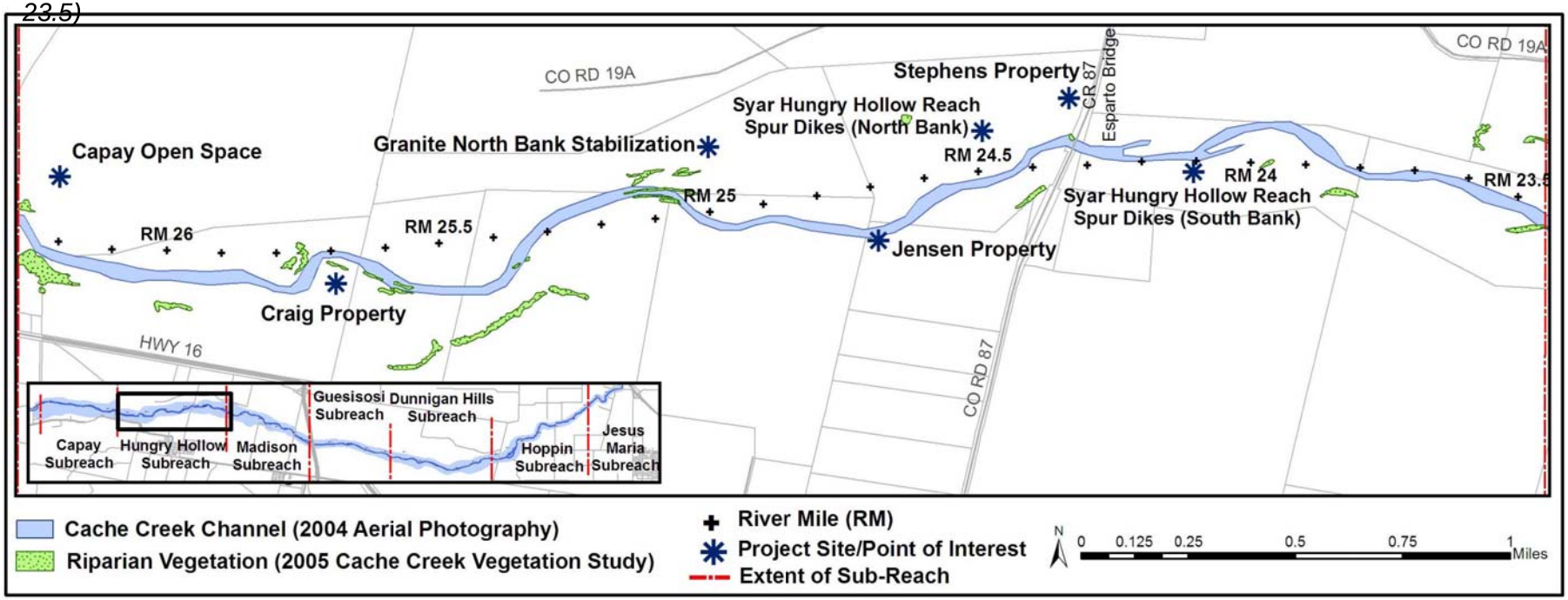

FIGURE 6-3: Hungry Hollow subreach (Reach 7)

6.3 MADISON SUBREACH (REACH 6)

Downstream of the Esparto Bridge to the I-505 Bridge (River Miles 23.5 – 21.1)

General Characteristics

The 2.4 mile long Madison subreach is found between the Esparto Bridge and just upstream of the Highway I-505 Bridge. Of all the subreaches, it has the flattest slope at approximately 12.8 ft./mile. Within the Madison subreach, the amplitude and curvature of the low-flow channel meanders increase. The channel is developed entirely on alluvial sediments. The upstream portion of this subreach is a continuation of the losing stretch of Cache Creek found in the Hungry Hollow subreach. The channel transitions into the gaining stretch present in the Guesisosi subreach as it reaches the lower portion of the subreach. Extensive gravel bars and a lowered water table characterize this subreach. Consequently, there is less water available so vegetation is sparsely developed.

Geomorphic Trends

Within the Madison subreach, the amplitude and curvature of the low-flow channel meanders increase. Significant lateral erosion has occurred and continues. In 1998, a major bank protection project was implemented by Syar on the south and north banks of the creek upstream of the I-505 bridge. This project involved the construction of large spur dikes and relocation of the low-flow channel. The areas containing the spur dikes did not experience significant bank erosion during the period of 1998 to 2004. During the 2005-2006 winter storms however, the face of the upstream-most spur dike on the north bank was partially washed out while approximately 1,200 lineal feet of bank eroded at the former Madison Bridge site due to a channel meander migrating downstream.

Portions of the north bank, upstream of the former Madison Bridge, have been subject to approximately 20 to 50 feet of lateral erosion and bank gullying since 2001 due to runoff from adjacent farm fields. Erosion channels have caused irregularities in the creek bank, exacerbating lateral erosion. In 2005, the County and the Natural Resources Conservation Service (NRCS) partnered with a property owner on the north bank to implement corrective actions for erosion by farm field runoff. Significant deposition has not been observed within the Madison reach.

Vegetative Trends

The riparian vegetation survey conducted in 2005 revealed only 13.83 acres of riparian vegetation. Regeneration in this sub-reach is sparse. The occasional presence of mulefat, red willow *(Baccharis salicifolia)*, arroyo willow *(Salix lasiolepis)*, sandbar willow (*S. exiquia*), and cottonwood *(Populus fremontii)* on the accreting terraces indicates that once established, these trees can become established in this primarily losing reach. It is likely that these occasional patches of vegetation owe their origin to stranded vegetative branches, some of which became established, others of which perished. With increased distance downstream, the creek transitions to a gaining reach. Consequently, regeneration of native trees increases. Variable success in revegetation of the reconstructed slopes has been realized, however other ‘unprotected’ areas within the Madison subreach have experienced significant bank erosion along the outside of meanders.

2006 Creek Walk Observations

At the Teichert Esparto plant Barry Baba, Habitat Restoration Biologist for Teichert Aggregates, spoke to the participants of the creek walk about the bank protection project installed along the north bank of the Madison subreach (RM23.5). This project has been progressively constructed and inspected during creek walks over the past several years. The upstream and earliest portion of the protected bank continues to perform well and was one of the few project sites along Cache Creek where in-channel vegetation may have benefited from high winter flows due to the prism design which effectively slowed and deflected the flows such that they inundated the area and

brought in sediment but, did not wash-out or otherwise adversely affect existing stands of vegetation. The unprotected area of bank immediately downstream (RM 22.9-23.0), in contrast, has eroded severely. The erosion is occurring on the outside of a channel meander and has eroded, in some areas, the entire bank between the channel and a portion of Teichert's aggregate stockpiling area. The access road has completely washed away in this area and a stockpile of processed gravel is sliding into the active channel. Teichert representatives and Mr. Rocko Brown of Questa Engineering discussed potential bank stabilization remedies for the area. Engineering plans will be developed and brought to an upcoming TAC meeting.

In the lower portion of the Madison subreach, additional areas of significant erosion were observed near the former Madison Bridge site. At the Grube-Payne site (RM 22.0-22.2), upstream of the former bridge, signs of bank gullying due to uncontrolled agricultural runoff from an improperly installed pipe are visible. The pipe contributing to the runoff is currently suspended over the gully. Repairs to the main drainage pipe are necessary to minimize further erosion and are anticipated to occur in 2006 according to NRCS specifications. Further downstream, at the location of the former Madison Bridge site (RM 21.6), approximately 1,000 lineal feet and 130 lateral feet (to be confirmed on 2006 DTMs) of the north bank have eroded. The erosion removed a significant section of pavement, threatened the stability of power poles, completely washed out previous bank restoration efforts, took out part of an orchard, and significantly eroded the most upstream of the spur dikes. The erosion removed most of the fine-grained material from two-thirds of the upstream-facing portion of a spur dike previously installed for the purpose of protecting the I-505 bridge, located downstream. The broken concrete core of this spur dike was disturbed although large pieces remained in place and the bank-ward end of the spur dike was not flanked by the high flows. The spur dikes downstream of the damaged spur dike showed little sign of erosion. Vegetation between the spur dikes are thriving and several inches of sediment have accumulated over the past year.

The spur dikes on the south bank just upstream of the I-505 bridge (RM 21.1-21.3) remained generally stable and are successfully providing bank protection in the area of their placement. The tip of the most upstream dike was further eroded (relative to last year) and a relatively deep scour hole had formed in the channel adjacent to the dike. Erosion of the south bank (three to four foot high vertical bank) was noted just upstream of the most upstream dike. No erosion of the bank protected by the spur dikes was observed. Continued fine-grained deposition between the spur dikes was evident.

Madison Subreach Recommendations

6.3-1 Lower Madison subreach habitat restoration: The lower portion of the Madison subreach contains patches of riparian vegetation that could potentially be linked as a single corridor if sparser areas are planted and provided with water from agricultural runoff. These plantings would provide erosion control from agricultural drainage areas and potentially the creek channel if allowed the opportunity to establish. At the same time, plantings could connect with existing vegetation to create a valuable habitat corridor for wildlife.

6.3-2 Grube-Payne Site (RM22.3-22.1): Work with landowner, if willing, to develop a habitat restoration project on the ~20 acre area of bank terrace to promote a vegetated corridor along this section of the creek for both habitat value and erosion control. Utilize existing pond and agricultural runoff as a source of water.

6.3-3 Grube-Payne Site: (RM22.1): Monitor reconstruction of agricultural tailwater pipe to ensure compliance with specifications in the original design to prevent further erosion.

6.3-4 Grube-Payne Site (RM21.8): Work with landowner, if willing, to develop a habitat restoration project on the ~24 acre area of bank terrace to promote a vegetated corridor along this section of the creek for both habitat value and erosion control. Utilize agricultural runoff as a source of water.

6.3-5 Old Madison Bridge Site/Dunbar (RM 21.5): Evaluate the need for an erosion control project that deflects the energy of the channel meander located upstream of the Dunbar site and reform the existing upstream spur dike at the Dunbar site to stabilize north bank. Significant accumulation of fine-grained silts has occurred behind the existing spur dikes and both planted and naturally occurring vegetation has flourished showing that in-channel vegetation within this subreach can survive as long as it is protected from high-energy flows. Repair of the eroded spur dike should be investigated as a component of the design of any further bank protection designs for the area.

6.3-6 I-505 Bridge area (RM21): Work with landowner and Syar to provide soil and plantings on upper portions of riprapped slopes. Improve habitat at spur dikes upstream of I-505. Evaluate the need for additional erosion control work to protect the bridge.

6.3 MADISON SUBREACH (REACH 6)

Downstream of the Esparto Bridge to the I-505 Bridge (River Miles 23.5 – 21.1)

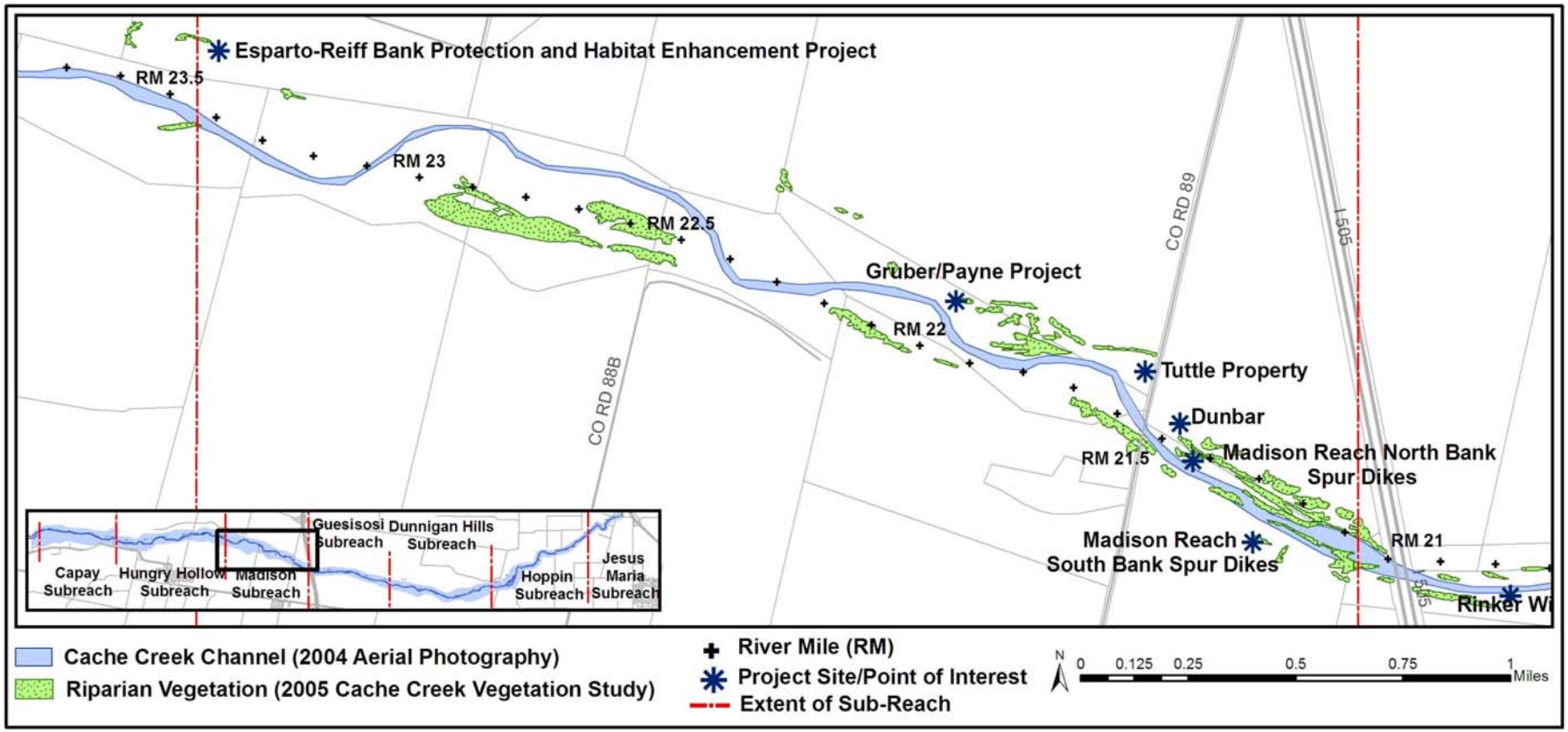

FIGURE 6-4: Madison subreach (Reach 6)

6.4 GUESISOSI SUBREACH (REACH 5)

I-505 Bridge to just upstream of the Moore Crossing (River Miles 21.1 – 18.9)

General Characteristics

The Guesisosi subreach begins just downstream of the Highway 505 bridge and extends for 2.2 miles downstream. Relative to the Madison reach, the channel morphology of the Guesisosi reach is narrower and straighter with the amplitude and curvature of meanders reduced. The channel is developed entirely within an alluvial substrate. The channel varies from somewhat straight in the upper section to meandering in the lower section. Elongated gravel bars persist throughout the subreach. This subreach marks the beginning of a gaining reach, in which the groundwater table is comparatively high due to the presence of a bedrock constriction along the Dunnigan Hills-Plainfield Ridge lineament. Riparian vegetation is more prevalent in this area in comparison to upstream reaches.

Geomorphic Trends

Within this subreach, the main channel trends include significant lateral migration of the channel and some deposition of sediment on the gravel bars. Lateral erosion is occurring on both the north and south banks of the creek. Most of the erosion is occurring on the margins of the elongate gravel bars that characterize this reach. However, within the narrow active floodplain of the reach, the lateral erosion is removing areas of the high bank. This erosion is significant in some areas adjacent to the Rinker Corporation haul road and mining areas south of Cache Creek. The lateral erosion ranges from a few feet to over 100 feet in places. This lateral erosion may be exacerbated by the deposition of sediment within this reach. Aggradation of most of the gravel bar surfaces in the subreach is on the order of approximately one foot over the last five years throughout the reach.

Minor vertical erosion of some portions of bars has occurred; significant deposition has not been observed. Lateral erosion of bars along the low-flow channel was observed in several locations, all on the outside of meanders in the low-flow channel. This erosion is occurring as the downstream migration of meanders within the low-flow channel continues.

Vegetative Trends

The GIS survey revealed 65.1 acres of riparian forest, a significant improvement over the upstream subreach. In addition to regeneration occurring along the immediate stream bank, there are some significant stands of riparian vegetation along upper terrace areas.

2006 Creek Walk Observations

The Guessisosi subreach extends downstream of the I-505 bridge. The meandering channel and associated gravel bars within this portion of the creek have been relatively stable since the inception of the CCRMP. Typically where substantial vegetation is present along the outer floodway, less erosion has occurred. Many sites without vegetation along the outer floodway have experienced erosion during the 2005-2006 winter flows. This is especially evident along some portions of the south bank adjacent to the Rinker property.

Two areas of lateral erosion of the right bank along the Rinker property have historically experienced erosion. The first site is adjacent to the Rinker processing plant site (RM 20.5). Approximately 500 to 700 feet of vertical bank appeared to have been eroded during the previous winter flows. The second site, located adjacent to the Rinker haul road/conveyor, has toe erosion along approximately 300 feet of the south bank (RM20.1-RM20). During the 2005 inspection, the active channel of the creek was primarily against the south bank in this portion of the subreach. In 2006, the channel had shifted to the north bank in this area and the former channel location along the south bank was filled in. These changes minimize the near-term erosion hazard in this area. Current conditions present the potential to repair the overly steepened south bank while the active

channel is on the other side of the active floodplain. A similar condition was addressed by a bank stabilization project on the south bank (RM18.6) constructed in 1998. This previous project consists of relatively short spur dikes and has been observed to be performing as designed.

Guesisosi Subreach Recommendations

6.4-1 Guesisosi Subreach: Bank stabilization within this reach should include toe bank protection and the use of vegetation wherever feasible. Restoration opportunities exist in this subreach due to an increase in available water as groundwater is pushed up by a bedrock constriction. Planting techniques, such as trenching, which assist in providing vegetation with access to groundwater should be utilized in the upper portion of the subreach A series of vegetated trenches several rows deep or other vegetation methods to fill in gaps within the vegetative corridor could be used along this section of the creek for both habitat value and erosion control.

6.4-2 Upper South bank of Guesisosi Subreach: Assist property owner to develop of a plan that addresses bank erosion and required off-channel mining program setback requirements.

6.4 GUESISOSI (REACH 5)

I-505 Bridge to just upstream of the Moore Crossing (River Miles 21.1 – 18.9)

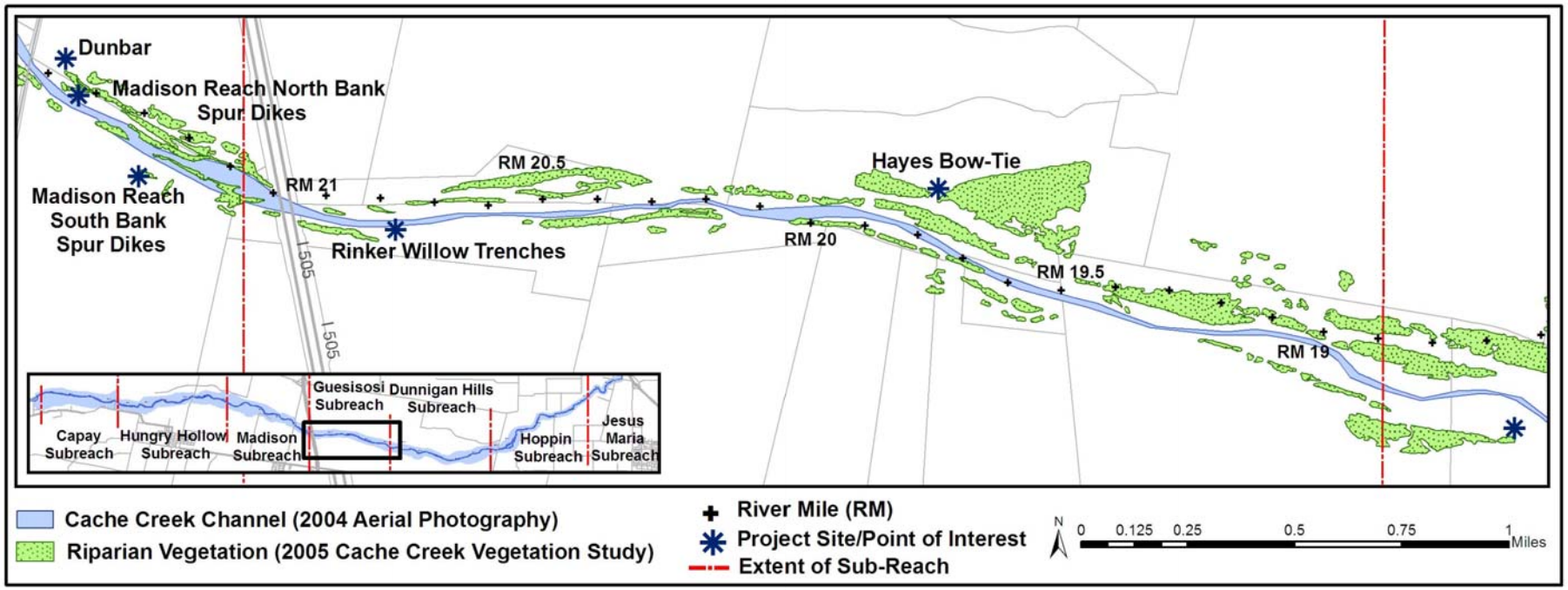

FIGURE 6-5: Guesisosi subreach (Reach 5)

6.5 DUNNIGAN HILLS SUBREACH (REACH 4)

Moore Crossing to Stephens Bridge (River Miles 18.9 – 16.1)

General Characteristics

The Dunnigan Hills subreach extends downstream from the Guesisosi Subreach about 2.8 miles to just above the Road 94B (Stevens Bridge). Compared to the Guesisosi subreach, the slope increases, with a drop of 9.9 ft/mi. The average channel width is 879 feet. Within the Dunnigan Hills reach, the creek is incised into the bedrock, which underlies the hills. The channel is responding to the active tectonic uplift of the hills by continuing to cut down as the land rises. The channel morphology in this reach transitions into a pattern of widely spaced meanders. This is the only area within the CCRMP that includes natural river terraces above the active floodplain.

Geomorphic Trends

Although the lateral position of the channel is relatively stable, erosion of the edges of gravel bars was observed. Additionally, an island is stabilizing within the channel approximately 3,000 downstream of the Moore Crossing. The lateral bars within this reach have been significantly vegetated over the period since implementation of the CCRMP. Within the downstream portion of the reach, significant aggradation (up to two feet) of the bars has been observed between 2000 and 2005.

Erosion of the north and south bank is occurring in the area just upstream of the Moore Crossing. Erosion on the north bank is impinging on an access road that serves the Moore Wildlife Area while erosion on the south bank is occurring on the outside of a relatively tight meander in the low-flow channel. Downstream migration of the meander and the associated bank erosion could present problems at the south abutment of the Moore Crossing. In this area, the north bank of the creek has eroded approximately 50 to 100 feet since 2003. Preliminary discussions for a bank stabilization and habitat enhancement project in this area were presented at TAC meetings in 2005. An emergency repair was made to the Moore Siphon in April 2006.

Vegetation

This subreach has the most significant stand of riparian vegetation, with approximately 175.48 acres of riparian forest being represented. Abundant natural vegetative regeneration is occurring along the immediate floodplain. Older stands of trees are found on higher terraces as well as in former gravel mining depressions.

2006 Creek Walk Observations

The Dunnigan Hills subreach is defined by a change in channel conditions, which begins approximately 0.9 miles upstream of the Moore Crossing of the Adams Canal. The channel width decreases relative to the Guessisosi subreach, riparian vegetation increases, and bedrock is exposed in the channel bed. Spur dikes constructed on the south bank several years ago by Solano Concrete (RM 18.6-18.5) have been almost completely removed by erosion. This erosion appears to have occurred primarily over the last year and the previously protected bank is vulnerable to erosion. Additional erosion of the south bank has occurred over the last year in the area immediately downstream (RM18.3-RM18.1). The erosion is occurring on the outside of a meander bend. On the inside of the bend, a relatively large point bar continues to accrete. The southern portion of the bar is relatively well vegetated.

The Moore Siphon (RM18) underwent emergency repairs in April 2006 after a pipe failure was discovered. Tim O'Halloran, General Manager of the Yolo County Flood Control and Water Conservation District (YCFCWCD), explained that that the pipe failure appeared to have been caused by erosion on the right bank and/or in the channel bed. Approximately 60feet of pipe has been replaced and covered with large diameter riprap as a temporary solution. A relatively 'tight'

(i.e., small radius of curvature) meander continues to present a threat of continued erosion on the south bank.

The bars within the Dunnigan Hills subreach are well vegetated, a condition promoted by groundwater discharge along the banks and increased low-flow discharges. Conditions within the remainder of the subreach were observed to be similar to those during previous creek walks. The conditions included the observation of the relatively higher turbidity in the water discharging from Gordon Slough into Cache Creek upstream of the Stephens Bridge.

Dunnigan Hills Subreach Recommendations

6.5-1 RM 18.6-18.1: Previously constructed spur dikes have almost completely eroded away. This erosion appears to have occurred primarily over the last year. The previously protected bank is vulnerable to erosion and should be reviewed to assess the need to further stabilize the bank at this site in order to protect the infrastructure of the Moore Siphon located downstream. The Dunnigan Hills subreach offers restoration opportunities due to the high groundwater table, although revegetation efforts at this particular site should be paired with additional bank stabilization due to the channel meander that presently directs flows toward the bank.

6.5-2 Moore Siphon (RM18): Assist YCFCWCD in developing a long-term solution to the Moore siphon crossing.

6.5 DUNNIGAN HILLS SUBREACH (REACH 4)

Moore Crossing to Stephens Bridge (River Miles 18.9 – 16.1)

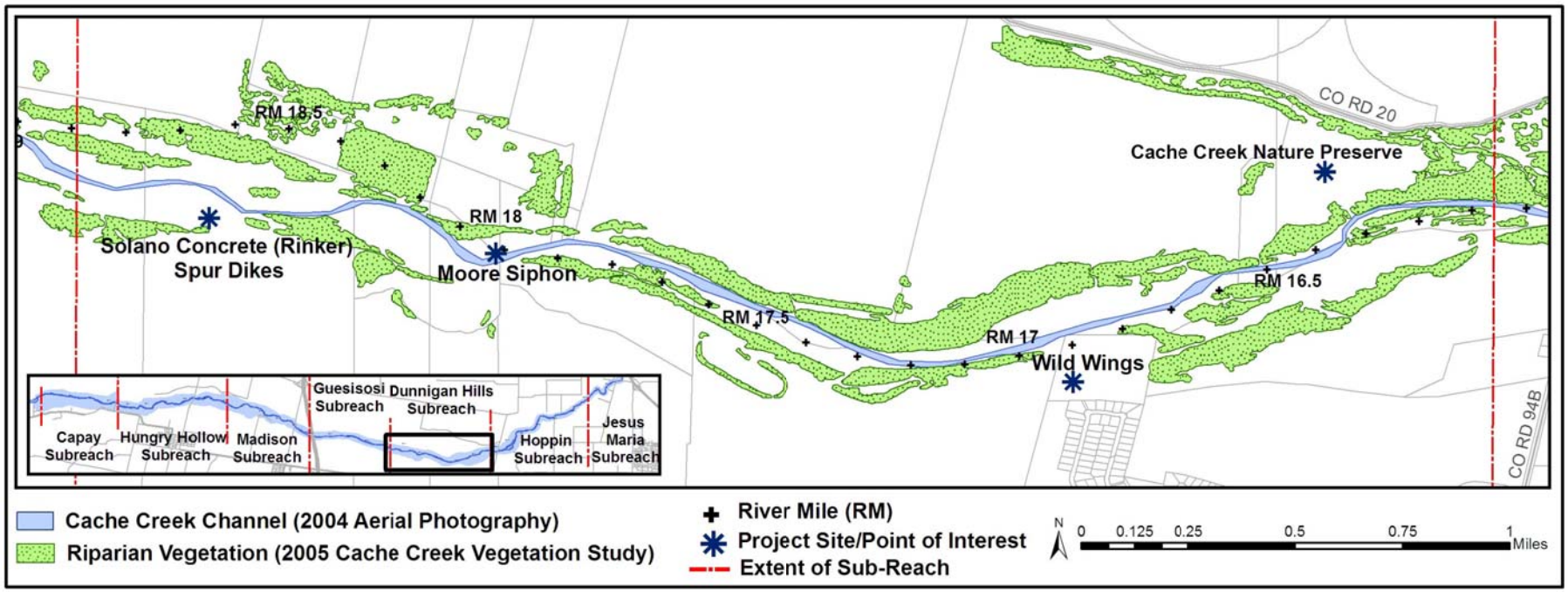

FIGURE 6-6: Dunnigan Hills subreach (Reach 4)

6.6 HOPPIN SUBREACH (REACH 3)

Stephens Bridge to the narrows of leveed portion of channel (River Miles 16.1 – 12.9)Hoppin

General Characteristics

This subreach of the creek extends approximately 3.2 miles downstream of Stephens Bridge and is characterized by a change in channel morphology back to increased meandering, similar to upstream alluvial reaches. It has a relatively gentle slope of 7.4 ft./mile. Compared to immediate subreaches, the Hoppin subreach is wide at 1584 feet and deep at 32.6 feet.

Geomorphic Trends

The Hoppin subreach extends downstream from the vicinity of the Stephens Bridge. It has well developed meanders. Moderate lateral erosion is occurring on the outside of meanders. Significant aggradation has occurred over the last several years as well as the development of islands within the active channel. Colonization of vegetation on gravel bars has also been observed. The comparison of the 2004 and 2005 DTMs indicates that more than two feet of aggradation has occurred within the low-flow channel throughout much of the reach. Sediment deposition within the reach is resulting in potentially significant loss of channel capacity.

Vegetative Trends

This subreach contains good native vegetation development below Stephens Bridge. The riparian vegetation surveys conducted in 2005 noted 67.23 acres of riparian forest. Cottonwood *(Populus fremontii)*, Goodings willow *(Salix nigra var. goodingii)*, red willow *(Salix laevigata)*, sandbar willow (*Salix exiquia)*, mulefat *(Baccharis salicifolia)*, and occasional valley oak *(Quercus lobata)* populate this sub-reach. There is good cottonwood regeneration alongside creek. Abundant stands of invasive tamarisk *(Tamarix sp.)* and giant reed *(Arundo donax)* are also present.

Various factors foster good development of riparian vegetation in the Hoppin subreach compared to upper reaches: 1) This is a gaining reach, where groundwater closer to the surface positively effects availability of moisture to plants, 2) There is a greater presence of fine-grained sediment, which increases moisture availability to plants in this subreach. This is particularly evident in the presence of under story riparian species, such as creeping wild rye *(Leymus triticoides)*, mugwort *(Artemisia douglasiana)*, and wild rose *(Rosa californica)*, species largely absent from the upper reaches, and 3) Increased availability of summer water flows related to irrigation practices, resulting in a more luxuriant riparian forest.

2006 Creek Walk Observations

Stephens Bridge (County Road 94B) marks the approximate upstream margin of the Hoppin subreach. The Hoppin subreach begins in an area with decreasing floodplain width and accelerated channel incision. While vegetation is more prevalent than in the Hungry Hollow and Madison subreaches, a pattern of high terraces and narrow channels creates a separation of water and vegetation. Gravel bar formation is common in this subreach as is channel migration. A significant amount of channel and vegetation disturbance due to illegal ATV activities within the creek was noted during the creek walk, particularly in the upper Hoppin subreach. Several aggregate industry employees and landowners also mentioned recent occurrences of cut fences and damaged property due to ATV activities.

Creek walk participants visited the former off-channel mining areas, which comprise the Correll and Rogers restoration areas (RM13.8). Vegetation within the former mining areas appear to be flourishing. Significant erosion on the north end of the overflow structure connecting the Correll and Rogers areas occurred during 2005-2006 wet season. The Correll pond apparently filled with water from Cache Creek that flowed through the control structure at the northwest corner of the restoration area. The water in the Correll pond then overtopped the separator between it and the

Rogers Pond as it filled up. The overflow structure (a concrete weir and gated pipe) was not able to contain the flow. This caused erosion of the embankment adjacent to the overflow structure.

The lower habitat restoration area on the Harrison property (RM 13.4) implemented by the Yolo County Public Works Department seems to be flourishing on the upper bank and terrace. Invasive species removal conducted by the Cache Creek Conservancy has also drastically improved the growth habits of naturally occurring elderberry shrubs on the site. The plantings on the lower terrace using the tubex tree shelters however, were evidently lost this past winter due to creek flows, which filled the tubes with sediment and water. The point bar north of the habitat restoration area appeared stable and erosion of the north bank has continued as was noted in the 2005 creek walk. The most notable change in this area in the last year occurred on the gravel bar located between RM 13.1 and 13.2. The gravel bar has been accreting significant sediment over the last couple of years. Last year, the active channel was located along the south side of the bar and causing significant erosion on the south bank. It was noted that the previously present upper portions of the bar, including all vegetation (with the exception of the large tree at the head of the bar) had been removed. The channel now occupies the north side of the bar and the former channel along the right bank has been filled. These dramatic changes are unusual relative to other stream processes within the reach. Other bars in the area do not appear to have been eroded and striped of vegetation during the last year's sustained moderate to high flows. The possibility that the bar was modified by human activities was noted and will be evaluated further.

Hoppin Subreach Recommendations

6.6-1 Stephens Bridge (County Road 94B, RM15.9): Evaluate needs to for preventative measures to reduce potential for erosion that threatens the bridge. Evaluate opportunities for habitat restoration upstream and downstream of the bridge.

6.6-2 Correll Pond (RM13.8): Address erosion of the embankment adjacent to the overflow structure.

6.6-3 Correll-Rogers Habitat Restoration (RM13.9-13.7): Develop a site plan that includes habitat enhancement and public access.

6.6-4 Harrison Site (RM13.4): Revegetate lower bank areas. Fence vegetation, rather than using tubex tubes, for animal predation and protection from ATV usage.

6.6 HOPPIN SUBREACH (REACH 3)

Stephens Bridge to the narrows of leveed portion of channel (River Miles 16.1 – 12.9)

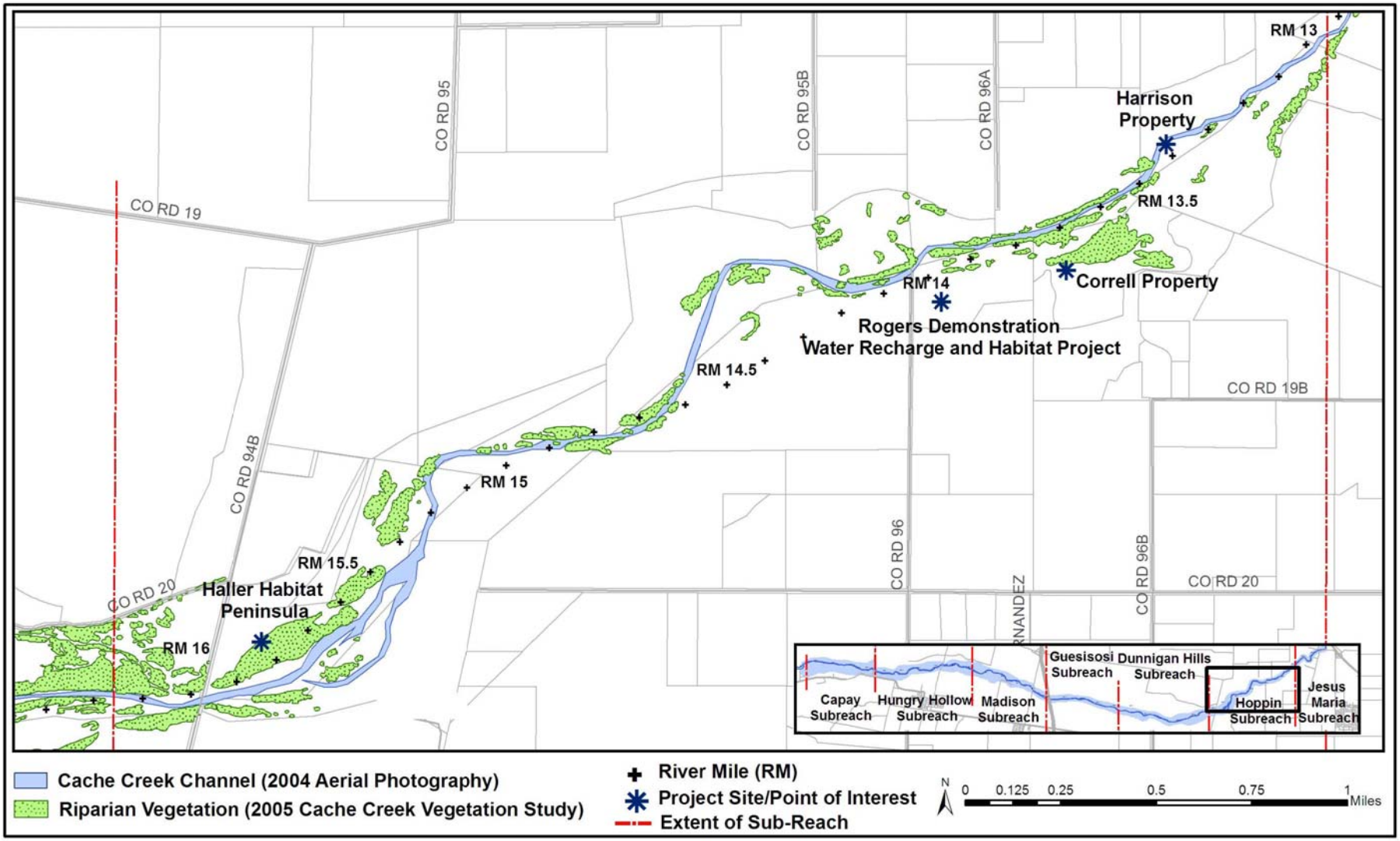

FIGURE 6-7: Hoppin subreach (Reach 3)

6.7 JESUS MARIA SUBREACH (REACH 2)

Sub-Reach Section within CCRMP Area: Upstream of I-5 (River Miles 12.9 – 11.3)

Physical Description

The Jesus Maria is a 7.5 mile long subreach that starts below the Hoppin subreach and extends downstream to the settling basin. It has a relatively gentle slope of 7.0 ft./mile. It has a narrow channel of only 384 feet wide and is deep at 41.6 feet. Only the uppermost 1.6 miles of the Jesus Maria subreach are included within the CCRMP area.

Geomorphic Trends

The Jesus Maria subreach of the creek presents a dramatic change in channel morphology. The channel is deeply incised along tight meanders. This condition occurs within a portion of the creek that is bounded by a DWR levee on the north side of the creek and a smaller private levee on the south. The channel banks are high and steep and developed in poorly consolidated, fine-grained sediment. The banks are inherently unstable due to their height and the low strength of the sediment. Additionally, the stability of the banks is further reduced by erosion of the toe of the slopes by the creek. Significant bank erosion has occurred along the south bank and threatens homes, outbuildings, and developed orchards. A portion of County Road 18 was closed to public use in 2005 due to encroachment by the creek channel.

Vegetation

Only 10.74 acres of riparian forest were mapped in the CCRMP area of this reach. Most of the native vegetation is found on the banks and some in mid-channel areas. Considerable stretches of the creek are occupied with tamarisk *(Tamarix sp.)* and giant reed *(Arundo donax)*. Much of this has at least temporarily been removed, but many areas are being re-colonized as flows bring branches downstream.

2006 Creek Walk Observations

The most downstream portion of the CCRMP is the Rio Jesus Maria subreach. The relatively narrow channel is deeply incised into fine-grained alluvial sediments. The banks are steep and up to 40 feet high. Active erosion of the toe of the banks, especially on the outside of tight meanders that characterize the reach, maintain the steep banks. Bank failures are evident as bank slides on both the north and south bank. Severe erosion has occurred this spring at County Road 18, an area referred to at Huff's Corner (RM11.6). The County is currently working with Questa Engineering to finalize a plan for stabilization of the right bank in the area of the county road.

The problem of intense invasive plant growth within the reach was also discussed during the creek walk. The invasive species removal program implemented by the Cache Creek Conservancy was very successful in removing the majority of invasive tamarisk (*Tamarix sp.*) and arundo (*Arundo donax*) from the south bank within this reach. However, invasive vegetation within the downstream section of the subreach (the area regulated by DWR) and along the north bank remain, reducing channel flood capacity.

Jesus Maria Subreach Recommendations

6.7-1 Jesus Maria Subreach Flood Control/Invasives Removal: Coordinate with landowners, the Department of Water Resources, and the Cache Creek Conservancy to promote and implement invasive species removal program within the active floodplain.

6.7-2 Huff's Corner (RM11.6): Finalize design and present to the TAC for comments, any new plans for the stabilization of County Road 18 and levee protection at Huff's Corner.

6.7 JESUS MARIA SUBREACH (REACH 2)

Sub-Reach Section within CCRMP Area: Upstream of I-5 (River Miles 12.9 – 11.3)

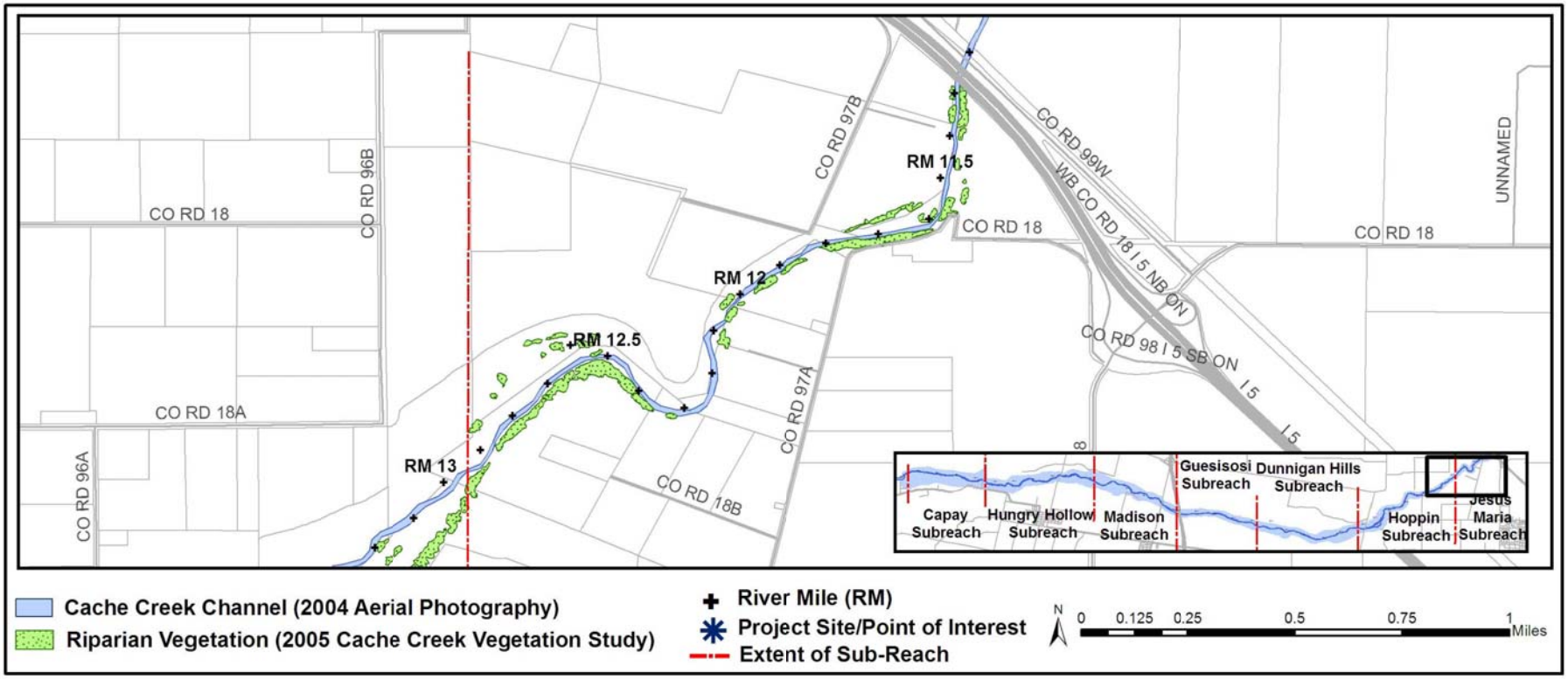

FIGURE 6-8: Jesus Maria sub-reach (Reach 2) section within the CCRMP area.

7.0 PROJECTS AND POINTS OF INTEREST IN THE CCRMP AREA

7.1 BRIDGES

Due to their importance in providing vital transportation links, as well as the tremendous public investment they represent, the protection of bridge structures is one of the highest priorities designated in the CCIP. The study area includes four bridges, three of which are owned by the County and one by the California Department of Transportation (CalTrans). A brief summary of channel conditions at each bridge is provided below.

CAPAY BRIDGE (COUNTY ROAD 85)
During flood events in 1995, the creek washed away a large grove of mature oaks, threatened the integrity of the Adams Canal, and began to outflank the north abutment of the bridge. Despite emergency work, the bridge was undermined and had to be demolished. Reconstruction of the Capay Bridge was completed in October 1997. At that time, the number of bridge spans was reduced in order to allow flows to move easier through the constriction.

Currently the channel bed and bridge approach are stable, although erosion upstream on the south bank should be monitored. The DTM data indicates that the retreat of the bank was minimal in the last year. Dead, mature trees at the top of the bank continue to fall into the channel, providing large woody debris to the local stream environment. The observation was made during the 2006 creek walk that the spur dikes on the north bank (constructed prior to implementation of the CCRMP) upstream of the Capay Bridge continue to perform well in providing bank protection and riparian habitat is flourishing within the structure. Consultation with County Public Works on the need for channel reorientation and/or sediment removal to address adverse orientation of the low-flow channel presenting potential erosion hazard to abutments is recommended.

ESPARTO BRIDGE (COUNTY ROAD 87)
Currently the channel bed appears stable. Minor erosion on the upstream south bank and the gravel bar beneath the south abutment should be inspected and monitored. Vertical banks (expressing recent erosion) were observed immediately downstream on the south bank. Preventative erosion control measures are recommended to protect public infrastructure.

I-505 BRIDGE
Beginning in 1995, a series of well-defined meanders have developed upstream of the bridge, pushing the low-flow channel into both the north and south banks. During the 2006 Cache Creek walk inspection, the low-flow channel was located along the north bank. Erosion upstream on north bank and the bar adjacent to south abutment should be monitored as the meander moves downstream toward bridge. The alignment of the channel relative to the bridge opening appears appropriate. No erosion of the armored bank was observed in 2005. A relatively deep pool is present within the channel at the bridge however, similar pools have been observed, and then filled, when the channel occupied other locations. Plantings on the upper portions of rip-rapped slopes on both banks are recommended to improve habitat and visual impacts at the spur dikes upstream of I-505.

STEPHENS BRIDGE (COUNTY ROAD 94B)
The approach and channel bed are relatively stable. In the past, streambed erosion has occurred along portions of the toe of the north bank upstream of the bridge. Some of this erosion may be

associated with inflow from the Gordon Slough. Vegetation and potential stabilization of the gravel bar downstream should be evaluated for influences on channel scouring.

7.2 OPEN SPACE AND RECREATION

Due to the high proportion of land in private ownership, access to the creek is severely limited. The CCRMP designated six general areas for recreational use. General areas were located at regular intervals of approximately two miles along Cache Creek, from County Road 85 to just downstream of County Road 96, in order to function as trailheads or staging areas for a possible future system of bicycle, pedestrian, and/or horse paths. Additionally, future recreation areas were sited on lands included for mining, where proposed reclamation is to permanent ponds to ensure that no additional farmland would be lost, while taking advantage of the amenities associated with the bodies of water to be reclaimed through mining.

Several open-space sites were either donated to, or acquired by, the County during the past several years. Several areas consist of those identified for reclamation efforts after mining ceased on those lands. The following open-space areas are those currently developed or in the process of being developed for open-space:

- **Rogers Demonstration Water Recharge and Habitat Project:** This site is a retired gravel mining site that was converted into a water recharge and habitat improvement project in 1999 in accordance with the Teichert (Woodland) long-term off-channel mining permit plan. Improvements to the site include the construction of an overlook area for public access and the re-vegetation of three zones based on elevation features: shoreline, middle terrace, and upper terrace.

- **Cache Creek Nature Preserve:** Teichert donated the property that forms the Cache Creek Nature Preserve to the County in March of 1999 pursuant to a Master Agreement between the County and Teichert. The County formed a License Agreement with the Cache Creek Conservancy under which the Conservancy would manage the Nature Preserve for the County subject to the provisions of the License Agreement. The site currently provides education and public access as well as significant wetlands and riparian habitat.

- **Capay Open Space:** Granite Construction donated the 41 acre site to the County as part of their development agreement amendment in December 2002. Once developed, the park will provide the public with access to Cache Creek. Site improvements will include trails, picnic areas, parking, access to the creek (including access for the disabled), restrooms, and interpretive panels for environmental education.

- **Wild Wings Open Space Project:** The County negotiated with Wild Wings LLC in 2004 to make site improvements. Once completed, this site will be transferred to the County to provide public creek access, riparian and upland habitat, and an educational trail with interpretive panels.

7.3 PROJECT SITES

A variety of site-specific projects have been implemented within the CCRMP. These projects were implemented by numerous parties and initiated to address issues of erosion control, habitat enhancement, water quality, and public access. Although each project tends to have a particular

overriding goal, it is the aim of the CCRMP and CCIP that projects utilize integrated approaches that serve multiple issues.

With regards to assessment of the performance of projects, a wide range of definitions of success are appropriate within the context of the CCRMP. The permanent success of bank protection can be at odds with habitat restoration goals. Habitat restoration in the lower basin of the Cache Creek may depend on (or, to an extent, be caused by) the same active channel dynamics that cause erosion. For any proposed project, the project proponents need to clearly identify the expected goals and performance of a project early in the design process in order to appropriately account for the project objectives in both design and implementation. Even with the best planning however, it must be understood that the Creek is a truly mighty and dynamic system and could 'undo' even well-designed projects.

The project summaries below give brief descriptions of project designs and implementation. They also provide a monitoring review of the current status of each project. These reviews are meant to evaluate past projects for their ability to meet project goals and assess implementation methods as a reference in establishing guidelines for future project implementation. Understanding the implementation methods and outcomes of previous projects provides a valuable tool in understanding creek processes and provide reference for future projects. Projects completed prior to the implementation of the CCRMP or conducted independently of the CCRMP are included for the purposes of monitoring and are stated as such.

PG&E PALISADES (RM26.9)

(Not a CCRMP project, although located within the CCRMP area)

Project Type: Erosion control

Size: **Reach:** Capay Reach (8) **Date of Implementation:** mid 1990's

Project Partners: PG&E

Project Description: The PG&E Palisades project is an erosion control project designed to protect a section of the north bank of the Capay subreach adjacent to an international gas pipeline that crosses the creek. The Palisades consist of several steel piles to which a netting material has been placed.

2006 Monitoring: The concrete protective blanket that covers the pipeline within the streambed appeared to be primarily intact although an opening in the blanket, approximately six feet in diameter, has exposed a portion of concrete piping below. Some undulation in the blanket's form also suggests that water may be flowing under the concrete blanket and eroding the subsurface material. The knick point in the channel was apparent (as in previous years) as a pronounced riffle. DTM data indicate that upstream migration of the knick point has been minimal over the last year. The steel pilings and netting have generally succeeded in promoting sediment accumulation, which have allowed for abundant native plant regeneration, primarily cottonwoods. Giant reed *(Arundo donax)* has also begun colonization on the project site. Previous human facilitated restoration associated with Palisades consist of plantings of valley oak *(Quercus lobata)*, red willow *(Salix laevigata)*, redbud *(Cercis californica)*, and deergrass *(Muelenbergia regens)* on the upper bank of the site. Plants have been in the ground for several years now and are prospering fairly well. However, the results are variable depending upon local soil conditions. Vegetation plantings on the upper bank appeared stressed and stunted but were not failing.

CAPAY OPEN SPACE (RM26.3)

Project Type: Habitat enhancement and public access

Size: 41 acres **Reach:** Hungry Hollow (7) **Date of Implementation:** 2004-current

Project Partners: Granite, Yolo County PRPW

Project Description: The Capay Open Space site was donated to the County as part of Granite Construction Company's development agreement amendment in December 2002. The County paid for a park design that went through an extensive public review and was approved by the Yolo County Board of Supervisors. Once developed, the park will provide the public with access to Cache Creek (including access for the disabled), and site improvements including; trails, picnic areas, parking, restrooms, and interpretive panels for environmental education. Approximately 26 acres of the site lies within the active Cache Creek floodway and will not be developed. The remaining 15 acres of the site is located at a higher elevation above the creek in the oak savannah grassland and will provide space for the proposed passive recreation elements.
2006 Monitoring: The most extensive re-vegetated area occurs on the upper terrace area. The site quality varies from relatively good conditions at the western portion of the site to relatively poor conditions at the lower and eastern portion of the site. The variability is the result of differing soil qualities, as is reflected in the sparse growth of the herbaceous growth on poor gravelly soils and relatively lush growth on the better soils. On the deeper loam soils, oak trees are robust and growing very well. On the poor, gravelly soils, many of the trees are stunted. On these tougher sites however, redbud and quail bush are doing relatively well. Results are mixed along the bank protection site. Along the top of bank, wildrose and other small shrubs are surviving. Mid-slope grass plantings appear problematic.

CRAIG PROPERTY (RM25.8 – RM25.6)

Project Type: Erosion control and habitat enhancement
Size: ~1,000 lineal feet **Reach:** Hungry Hollow (7) **Date of Implementation:** 1998
Project Partners: Cache Creek Aggregates (Granite), Cache Creek Conservancy, landowner, Yolo County PRPW
Project Description: The Craig Property site is located on a south bank section of the Hungry Hollow subreach in an area that has historically experienced significant amounts of erosion due to channel meander migration. During the 1997-1998 wet winter season this area lost approximately one acre of riparian terrace as the low-flow channel moved 100 feet from its previous location. The County obtained permission from the landowner to implement an experimental form of erosion control utilizing straw bales interlocked with willow stakes as bank protection on the site and paid for the plantings. Cache Creek Aggregates (Granite) conducted the earthwork while the Cache Creek Conservancy planted native vegetation.
2006 Monitoring: The intention of the straw bales was not to provide a permanent fix but to foster restoration and vegetative recruitment, which in turn might retard bank erosion. The channel moved away from the bank the year after implementation, taking with it the water source needed to establish vegetation. It is unknown as to the effectiveness of the design of the project in providing erosion control or habitat enhancement since channel movement occurred shortly after project implementation. As of the 2006 creek walk, a sparsely populated row of willows and baling twine are all that remain.

GRANITE NORTH BANK STABILIZATION (RM26.1 – 24.8)

Project Type: Erosion control
Size: **Reach:** Hungry Hollow (7) **Date of Implementation:** 2002
Project Partners: Granite, Yolo County PRPW
Project Description: The Granite Bank Stabilization Project included armoring the bank and using fill with a protected toe on areas of the north bank of the Hungry Hollow subreach, where the Granite property is located. Granite also planted native vegetation on the bank and installed drip irrigation to promote successful plant establishment. The County reviewed the project and issued a Flood Hazard Development Permit for this project.
2006 Monitoring: Minor repairs to the bank stabilization project were made following moderately high creek flows in the 2004-2005 wet season. The toe of the bank eroded again during the 2005-

2006 wet season. The higher embankment area was previously planted with a variety of species, such as cottonwood *(Populus fremontii)*, live oak *(Quercus agrifolia)*, ceanothus *(Ceanothus sp.)*, and other species. These plants are receiving good management and appear to be thriving.

JENSEN PROPERTY (RM25.4)

Project Type: Erosion control and habitat enhancement
Size: <1 acre **Reach:** Hungry Hollow (7) **Date of Implementation:** 2003-2004
Project Partners: landowner, Cache Creek Conservancy, Granite, and Yolo County PRPW
Project Description: Recognizing that Cache Creek is a dynamic system, the Jensen project is a downstream component of erosion projects that were previously completed for the purpose of protecting the Capay Bridge from scour as a result of erosion and channel reconfiguration. The project utilized bio-engineering measures for erosion control, which included the use of root wads, rock, and willow and cottonwood pole plantings instead of traditional riprap. The County worked with a consultant to determine the most appropriate project design, reviewed the Flood Development Permit, and paid all planning and implementation costs associated with the project. Granite implemented the project design and the Cache Creek Conservancy implemented plantings. In the summer of 2005, the spur dikes were in place and the installed plants were thriving.
2006 Monitoring: The root wads and boulder bank protection features were washed away during the persistent high flows that occurred in the 2005-2006 wet season. The coarse grained material that makes up this subreach is highly erosive. Moreover, the poor substrate conditions are cause for poor plant growth and there is little likelihood for habitat enhancement measures to be successful. Bank protection measures would likely require larger revetment structures and increased bank armoring.

SYAR HUNGRY HOLLOW REACH SPUR DIKES (NORTH BANK) (RM24.4)

(Not a CCRMP project, although located within the CCRMP Area)
Project Type: Erosion control
Size: **Reach:** Hungry Hollow (7) **Date of Implementation:** 1992
Project Partners: Syar
Project Description: Spur dikes constructed by Syar for the purposes of erosion control on the north bank of the Hungry Hollow subreach upstream of County Road 87. This project was implemented prior to the CCRMP but is included for monitoring purposes.
2006 Monitoring: The areas around spur dikes are relatively well vegetated. To date, there has been no appreciable erosion on the spur dikes or the embankment behind them and additional sediment has been deposited. It is unknown whether this is due to their successful function or that insufficient flows have yet to attack this area.

STEPHENS PROPERTY (RM24.4)

Project Type: Erosion control and habitat enhancement
Size: **Reach:** Hungry Hollow (7) **Date of Implementation:** 2003
Project Partners: landowner, Cache Creek Conservancy, Granite, Yolo County PRPW
Project Description: Land owner has planted various native and non-native species with varying success. An innovative approach was the trenching of elongated pits into which willow cuttings were inserted and partially buried. This project was implemented at the same property as the Syar Hungry Hollow Reach Spur Dikes (North Bank).
2006 Monitoring: See above mentioned monitoring description for the Syar Hungry Hollow Reach Spur Dikes (North Bank).

SYAR HUNGRY HOLLOW REACH SPUR DIKES (SOUTH BANK) (RM24.15 – 23.85)

Project Type: Erosion control

Size: ~4,000 lineal feet **Reach:** Hungry Hollow (7) **Date of Implementation:** 1999

Project Partners: Syar, Yolo County PRPW

Project Description: This erosion control project was implemented in response to the loss of approximately two acres of farmland on the south bank downstream of County Road 87 during the 1997-1998 wet winter season. The low-flow channel was relocated over a length of approximately 4,000 lineal feet and four spur dikes were constructed by Syar under a Flood Development Permit reviewed and issued by the County in September of 1998.

2006 Monitoring: The areas around the dikes have been poorly vegetated, as is consistent with the character of the Hungry Hollow subreach. The tip of each spur dike experienced some minor erosion during the 2005-2006 wet season.

ESPARTO-REIFF BANK PROTECTION AND HABITAT ENHANCEMENT PROJECT (RM23.5)

Project Type: Erosion control and habitat enhancement

Size: 2,200 feet **Reach:** Madison (6) **Date of Implementation:** 1997-current

Project Partners: Teichert, Yolo County PRPW

Project Description: This project was designed and implemented by Teichert to protect approximately 2,200 linear feet of the north bank in the Madison subreach. A riprap prism was constructed to deflect creek flows away from the bank and to allow vegetation to become established. Levees were constructed to protect two wash water ponds. Coir fabric material was used on the prism and portions of the levees to impede erosion along the bank and facilitate sedimentation that would allow for vegetative growth. Teichert also seeded the area with native grasses and planted riparian vegetation between the prism and levee to further retard erosion and provide habitat. The County reviewed and issued a Flood Development Permit for the project.

2006 Monitoring: This project has been progressively constructed and inspected during Cache Creek walks over the last several years. A dense stand of willow has grown up from the trench in which willows stalks were planted. The upstream, first phase portion of the project, continues to perform well. The prism area was inundated with water during the 2005-2006 wet season. This inundation brought in sediment and the prism effectively slowed and deflected flows such that they did not adversely affect existing stands of vegetation. Planted riparian vegetation is surviving and improvements to irrigation have been made as needed. Less mature downstream areas of the project are at various stages of revegetation and appear to have the same potential for success as completed areas.

GRUBE-PAYNE PROJECT (RM22)

Project Type: Erosion control and habitat enhancement

Size: **Reach:** Madison (6) **Date of Implementation:** 2005-current

Project Partners: California Audubon, Center for Land-Based Learning, landowner, Natural Resources Conservation Service (NRCS), Teichert, Yolo County PRPW

Project Description: This project was implemented to address uncontrolled runoff from the adjacent farm fields and to provide habitat enhancement along the creek. The County has coordinated with the landowner, provided a fee credit to Teichert for earth work related to drainage improvements, coordinated with the Natural Resources Conservation Service for drainage design, is coordinating with California Audubon and the Center For Land-Based Learning to develop and implement a habitat enhancement plan, and will pay for habitat enhancement and irrigation on the site. The landowner has agreed to provide in-kind assistance with equipment use and services for the habitat enhancement project.

2006 Monitoring: The pipe drainage system used in this project was not installed to NRCS standards. During the 2006 Creek Walk it was observed that the outlet pipe was suspended above a gully, which has deepened and widened significantly. The County is working with the

owner and tenant to redo the project to NRCS standards to prevent further erosion of the gullies and the bank. Work is scheduled to get underway at the end of the 2006 planting season.

TUTTLE PROPERTY (RM21.6)

Project Type: Erosion control, water quality, and habitat enhancement
Size: <1 acre **Reach:** Madison (6) **Date of Implementation:** 2002-2003
Project Partners: landowner, Syar, Natural Resources Conservation Service, and Yolo County PRPW
Project Description: This project was implemented to address bank erosion caused by agricultural tailwater runoff. The County obtained landowner permission to implement the project and provided a fee credit to Syar to build a settling pond that would slow down and filter agricultural tailwater before entering the creek.
2006 Monitoring: The project plantings consisting of oak *(Quercus sp.)*, box elder *(Acer negundo)*, wild rose *(Rosa californica)*, creeping wild rye *(Leymus triticoides)* and deer grass *(Muhlenbergia rigens)* were very successful however, upstream erosion caused by a naturally occurring meander is threatening the entire project

FLOODWAY SPUR DIKES UPSTREAM OF I-505 BRIDGE (RM21.6 – 21.4 AND RM21.3 – RM21.1)

Project Type: Erosion control
Size: ~12 acres **Reach:** Madison (6) **Date of Implementation:** 1998
Project Partners: Caltrans, landowner, Syar, Yolo County PRPW
Project Description: In 1998, Syar constructed an erosion control project upstream of the I-505 bridge to straighten the channel heading towards the bridge. The project, implemented with the cooperation of Caltrans, the County, landowners, and Syar Industries, included the installation of large spur dikes on the left and right bank of Cache Creek between the former Madison Bridge site and the I-505 bridge and the relocation of the low-flow channel. The County obtained Army Corps, Fish and Game, and RWQCB permits and was granted landowner permission necessary to implement the erosion control project. This project was particularly important because the bridge supports are curtain walls that are not designed to take the lateral forces that the creek would impose if it was to come under it at an angle. The County paid for the engineering design, negotiated the design of the erosion control project with Caltrans, and provided fee credit to Syar to construct groins and relocate channel.
2006 Monitoring: The spur dikes remain stable and are successfully providing bank protection in the area of placement. The position of the relocated low-flow channel has shifted over the last couple of years. Erosion of the dikes has been minimal with the exception of the most upstream dike on the north bank, which has eroded. This erosion exposes a very large concrete block (salvaged from the former Madison bridge), which was placed during construction. Exposed broken concrete riprap facing the dikes are not supporting significant volunteer vegetation however, fine-grained sediment is gradually accumulating in the area between the dikes, providing planting medium for volunteer riparian vegetation. Grasses have primarily vegetated the areas between the dikes along with some willow and cottonwood growth. The invasive plant known as perennial pepperweed *(Lepidium latifolium)* is present in some areas and should be eradicated. Significant growth of young willows is present along the margins of the low-flow channel. The growth enhances the quality of riparian habitat but could expand to create a significant change in channel roughness and hydraulics.

DUNBAR PROJECT (RM21.5)

Project Type: Erosion control and habitat enhancement
Size: <1 acre **Reach:** Madison (6) **Date of Implementation:** 2002
Project Partners: landowner, Cache Creek Conservancy, Yolo County PRPW

Project Description: This project is located on the north bank upstream of the I-505 Bridge. The landowner provided irrigation necessary to get plants established. The County purchased native plants for the project and worked with the Cache Creek Conservancy to plant them. Native plants have been planted on a low berm constructed on the high bank at the margin of a farm field and on the bank slope. Runoff from adjacent fields is controlled by grading and directed to a constructed drain at the eastern corner of the site. Portions of this site were included in a previous re-vegetation plan, which was not successful. In the opinion of the TAC during previous inspections, the initial plan failed due to poor selection of plants and the unavailability of a sustained irrigation source. In addition to the upper bank plantings, the property owner and the Cache Creek Conservancy planted willows and other riparian species in trenches excavated and backfilled at the base of the bank. This technique was developed with input from the TAC in order to access groundwater as a moisture source for the plants.
2006 Monitoring: Inspections conducted in 2005 indicated that the revegetation effort was initially successful, however approximately 550 linear feet of bank erosion during the 2005-2006 wet season took out all revegetated areas, a portion of orchard, and threatened to take out a power line pole. The apex of the curve eroded approximately 120 feet of bank.

SOLANO CONCRETE (RINKER) HABITAT ENHANCEMENT AND EROSION CONTROL WILLOW TRENCHES (RM20.8 – RM20.7)

Project Type: Erosion control and habitat enhancement
Size: ~700 lineal feet **Reach:** Guesisosi (5) **Date of Implementation:** 1998
Project Partners: Solano Concrete (Rinker), Yolo County PRPW
Project Description: This project was implemented due to erosion occurring north of the Solano Concrete (Rinker) processing plant. It consisted of a curtain wall of riprap keyed into the streambed at a depth of six feet, a two foot weir extending above the ground surface, and the planting of two hundred willows behind the weir. Solano Concrete (Rinker) implemented this project with a Flood Development Permit that was reviewed and issued by the County.
2006 Monitoring: The willow plantings have continued to persist although, as single rows they do not provide much assurance in their ability to provide future bank stabilization or erosion control. Additional re-vegetation efforts made to increase the depth and density of the willow stand would more effectively buffer the bank from erosion.

RINKER HABITAT ENHANCEMENT AND EROSION CONTROL (RM20.2)

Project Type: Habitat enhancement and erosion control
Size: **Reach:** Guesisosi (5) **Date of Implementation:** 2002-2005
Project Partners: Rinker, Yolo County PRPW
Project Description: Rinker conducted this project along the south bank of the Guesisosi Sub-reach where the Rinker facility is located. This project includes upper terrace and reclaimed pit plantings. The County reviewed the reclamation plan for this site.
2006 Monitoring:

HAYES BOW-TIE (RM19.8)

Project Type: Habitat enhancement
Size: ~37 acres **Reach:** Guesisosi (5) **Date of Implementation:** 1997-2000
Project Partners: Cache Creek Conservancy, landowner, Solano Concrete (Rinker), Yolo County PRPW
Project Description: The Hayes Bow-Tie was formerly a gravel mining area in the 1960's. The site habitat enhancement project was a coordinated effort between the landowner, Solano Concrete (Rinker), Yolo County, and the Cache Creek Conservancy. The County obtained the permission of the landowner to implement the project and provided Solano Concrete (Rinker) with a fee credit to do the earthwork necessary to hydraulically connect the site to the active floodplain.

Solano concrete worked with the county to cut into an elevated access road in the middle of the bow-tie to allow water to flow into the old pit sites to encourage silt accumulation and vegetative growth.

2006 Monitoring: The overflow structure appears to be stable. The grassland planting project that occurred in the dry terrace has generally been unsuccessful, whereas the sites with better soils adjacent to the riverbank and the overflow pits have better vegetative cover.

SOLANO CONCRETE (RINKER) EROSION CONTROL SPUR DIKES (RM18.6)

Project Type: Erosion Control

Size: 1,200 lineal feet **Reach:** Guesisosi (5) **Date of Implementation:** 1998

Project Partners: Rinker, Yolo Co. PRPW

Project Description: This project site is located upstream of Moore's Crossing and consisted of downstream facing spur-dikes implemented to repair erosion damage on the south bank. The slopes were seeded to assist in erosion control. Solano Concrete (Rinker) implemented this project with a Flood Development Permit that was reviewed and issued by the County.

2006 Monitoring: Spur dikes have been almost completely removed by erosion. This erosion appears to have occurred primarily over the last year and the previously protected bank is vulnerable to erosion.

WILD WINGS OPEN SPACE (RM16.9)

Project Type: Habitat enhancement and public open space

Size: 5 acres **Reach:** Dunnigan Hills (4) **Date of Implementation:** 2004-2006

Project Partners: Wild Wings LLC, Yolo County PRPW

Project Description: The five acre Wild Wings Open Space Project, once completed, will provide public creek access, riparian and upland habitat, and an educational trail with interpretive panels. The County acquired the site and negotiated with Wild Wings LLC to make site improvements. As part of the development agreement Wild Wings LLC was required to develop terrace park landscaping and a half-mile loop trail. A bridge was installed on the site to cross the Yolo County Flood Control and Water Conservation District canal to provide public access from the neighboring Wild Wings development to the Wild Wings Open Space site. Significant discharge of water to the creek, unmeasured but estimated to be approximately five cubic feet per second, through a newly installed culvert system was observed during the 2005 Cache Creek walk. The discharge was considered unusual for the early summer period. The source of the discharge could not be determined but TAC members and County staff speculated that it could represent irrigation runoff, seepage from the Adams Canal, or a combination of effects.

2006 Monitoring: The project has been planted with natives although non-natives appear to be aggressively competing for space. An aggressive invasive species management plan must occur in order to keep invasive species from on out competing native grasses and herbaceous species on the site.

CACHE CREEK NATURE PRESERVE (RM16.4)

Project Type: Habitat enhancement and public open space

Size: 130 acres **Reach:** Dunnigan Hills (4) **Date of Implementation:** 1999-2000

Project Partners: Cache Creek Conservancy, Teichert, Yolo County PRPW

Project Description: The Cache Creek Nature Preserve provides valuable riparian and wetland habitat as well public access and educational opportunities. Teichert Land Company donated the property that forms the Cache Creek Nature Preserve to the County in March of 1999 pursuant to a Master Agreement between the County and Teichert. The County formed a License Agreement with the Cache Creek Conservancy under which the Conservancy would manage the Nature Preserve for the County subject to the provisions of the License Agreement. The County in

coordination with the Cache Creek Conservancy, acquired grant funds to construct wetlands and trails on the site.

2006 Monitoring: Managed vegetation has thrived in the wetlands areas and significant natural recruitment has occurred. The site currently provides education and public access as well as significant wetlands and riparian habitat.

SALISBURY SLOUGH

Project Type: Erosion Control, Public Access

Size: <1 acre **Reach:** Dunnigan Hills (4) **Date of Implementation:** 2003

Project Partners: Cache Creek Conservancy, YCFCWCD, Yolo County PRPW

Project Description: This project addressed erosion conditions that threatened the concrete drop spillway and access bridge across the Salisbury Slough. A structural collapse of these structures would have eliminated the only access road to the Cache Creek Conservancy and blocked the diversion system for the East Adams Canal. The County acquired all permits for this project. Costs were split between the CCC, YCFCWCD, and Yolo County to widen the stream, stabilize banks and structures, and conduct necessary mitigation efforts. This project followed the processes of the CCRMP although it was outside of the CCRMP general permitting area. Permitting was significant because the project is outside of CCRMP general permit area and because of potential impacts to the Valley Longhorn Elderberry beetle.

HALLER HABITAT PENINSULA (RM15.8)

Project Type: Habitat enhancement

Size: 8+ acres **Reach:** Hoppin (3) **Date of Implementation:** 1996-1999

Project Partners: Teichert, Yolo County PRPW

Project Description: This project consists of approximately eight acres of a former mining pit area downstream of County Road 94B. The site was planted with a variety of riparian species including: valley oak, California box elder, toyon, cottonwood, and western redbud. The site was also planted with 366 blue elderberry seedlings to provide habitat for the federally-listed valley elderberry longhorn beetle (VELB). Teichert has conducted maintenance and monitoring on the site over the past ten years. The County has negotiated and holds a conservation easement on the property.

2006 Monitoring: The Haller Habitat Peninsula project has been relatively successful. As described in a monitoring report by Tiechert, over an eight year monitoring period, total plant survival has remained above 80% for each year. Overall plant health is good although some areas of the project, such as south facing slopes with poor soil development have not thrived.

ROGERS DEMONSTRATION WATER RECHARGE AND HABITAT PROJECT (RM13.8)

Project Type: Groundwater recharge, habitat enhancement, and public access

Size: 30 acres **Reach:** Hoppin (3) **Date of Implementation:** 1997-1999

Project Partners: Teichert, Yolo County PRPW

Project Description: The Rogers Demonstration Water Recharge and Habitat Project site is a retired gravel mining site that was converted into a water recharge and habitat improvement project in accordance with the Teichert (Woodland) long-term off-channel mining permit plan (Development Agreement No. 96-286). Site ownership was transferred from Teichert to the County and the two entities negotiated design and implementation of the improvement plan for the site. Improvements to the site include the construction of an overlook area for public access and the re-vegetation of three zones based on elevation features: shoreline, middle terrace, and upper terrace.

2006 Monitoring: Planted vegetation such as Oregon ash *(Fraxinus latifolia)*, coyote brush *(Baccaris pilularis)*, and sycamore *(Patanus racemosa)* are flourishing at the site while live oak

(Quercus agrifolia) plantings have had little success. The site has significant volunteer recruitment of both native and non-native plants.

CORRELL PROPERTY (RM13.7)

Project Type: Habitat enhancement project
Size: 38.9 acres **Reach:** Hoppin (3) **Date of Implementation:** 1996-1998
Project Partners: Cache Creek Conservancy, landowner, Yolo County PRPW
Project Description: The Correll site, once a part of the Lone Star gravel operation, was presented as a gift to the County by Mr. Correll in the Fall of 1996. In 1998 a portion of the south bank of the Correll site was removed in order to allow sediment to be brought in to enhance the site for riparian vegetation and to allow stormwater to exit the site. Cottonwoods *(Populus fremontii)* were planted to increase perch sites and shading and invasive species were removed.
2006 Monitoring: Vegetation within the former mining areas appeared to be flourishing. There were no indications that bank overflow from the creek into the managed area had occurred in the last year. However, recent evidence of sedimentation in the area east of the restoration site indicated that some flow into low-lying areas had occurred. During the 2005-2006 wet season, water levels within the Correll site filled the area and poured over the concrete and rock spillway into the Rogers pond causing erosion along the north side of the spillway bank.

HARRISON PROPERTY (RM13.4)

Project Type: South bank erosion control and habitat restoration project
Size: 1.85 acres **Reach:** Hoppin (3) **Date of Implementation:** 2004
Project Partners: landowner, Yolo County PRPW
Project Description: The Harrison Property project was implemented by the Yolo County Planning, Resources, and Public Works Department, with permission from the landowner, as a habitat enhancement and erosion control project in conjunction with the demolition and replacement of the 99W bridge located approximately 2.25 miles downstream from the Harrison Property site. The Harrison site consists of a 1.85 acre, narrow riparian corridor, located on the north bank of the Hoppin Sub-reach. Minor grading, bank stabilization, removal of invasive species, and the planting of approximately 452 riparian plants occurred on the site in 2004. The County will continue to maintain and monitor the site through 2006. This project follows CCRMP guidelines and utilized the CCRMP General Permit although no CCRMP resources funds were used to implement this project.
2006 Monitoring: Overall, the results of this project have been positive. The overall percent survival was 89% for the species planted, thus meeting the two year success criteria of 80% (Yolo County PPW, 2005). The removal of invasive plants has been effective. The response of the native plants on the upper terrace has been very good however, the plantings on the lower terrace using the tubex tree shelters has evidently been lost this past winter due to excessive creek flows.

Recommendations:

7.3-1 Project Prioritization: Establish a protocol and prioritization method for determining how County proposed projects using CCRMP Resources funds, and any privately funded projects will be reviewed, approved, and prioritized by County staff and the TAC. Each project will be reviewed for: consistency with any requirements and recommendations of the CCRMP and the CCIP, design, construction methods, monitoring requirements as necessary, and maintenance. After the project review, prioritization will be determined by County staff with the recommendations of the TAC.

7.3-2 Project Development Guidelines: Develop a project checklist for parties interested in developing projects within the CCRMP. Educate the public about floodplain development

permit requirements to improve public understanding of the CCRMP area project evaluation and implementation process.

8.0 ADMINISTRATION

8.1 FINANCES

The CCIP is funded through fees generated by a surcharge on the weight of aggregate resources sold (not mined) within the County. The purpose of the CCRMP Implementation Fee is to fund implementation of the CCRMP and CCIP, including but not limited to:

(1) Design and construction of projects for channel stabilization and bridge protection;
(2) Design and construction/implementation of channel maintenance projects and activities;
(3) Monitoring, modeling, and flood watch as described in the CCIP;
(4) Compensation of the Technical Advisory Committee.

The collecting of these fees is provided for by Yolo County Code Title 8, Chapter 11: GRAVEL MINING FEE ORDINANCE which was adopted by Board of Supervisors on November 25, 1996, and supported by Yolo County Code Title 10, Chapter 4: Fees: Maintenance and remediation fund. Per County regulation, the per-ton fees are for:

1) Cache Creek Area Plan administration;
2) Future environmental remediation if ever needed; and
3) Creek stabilization and creek restoration pursuant to the detailed project list and specifications of the Cache Creek Resources Management Plan (CCRMP), which has undergone a separate environmental review. The conditions that may be added would be for the purposes of further improving air quality and ensuring coordination with other regulatory permits that protect the environment.

The ordinance requires a series of fees to be placed on each ton of gravel sold within the plan area, for monitoring and restoration of the creek, as well as administration of the CAP program. The fees identified in this section are mandatory fees totaling twenty (20¢) per ton that apply as described herein to all aggregate materials sold after January 1, 1997 in the unincorporated areas of Yolo County along Cache Creek.
The ordinance establishes five fees as follows:

- A CCRMP Implementation Fee of $0.10 per ton, to be used for the design and construction of projects for channel stabilization and bridge protection; the design and construction of channel maintenance projects; monitoring and modeling activities; and compensation of the TAC.

- A Cache Creek Conservancy Contribution of $0.05 per ton, to be used for habitat restoration and enhancement along Cache Creek, and revegetation projects that support implementation of the CCIP.

- An OCMP Administration Fee of $0.03 per ton, to be used for the implementation of the OCMP, administration of the long-term mining permits and development agreements, and inspection of mining and reclamation operations.

- A Maintenance and Remediation Fee of $0.02 per ton, to be used for the correction of mercury bioaccumulation problems after reclamation has been completed, if necessary; clean-up hazardous materials contamination after reclamation is completed, if necessary; extended environmental monitoring of the off-channel mines, beyond that required in the mining permits; and maintenance of publicly held lakes within the plan area.

- A Twenty Percent Production Exception Surcharge of $0.10 per ton, for any amount of aggregate sold in excess of annual permitted production, to be divided evenly between the

CCRMP Implementation fund and the Maintenance and Remediation fund. The purpose of the Maintenance and Remediation Fee is to fund a long-term, interest-bearing account for the following future activities (as identified in Section 10-4.803, Mining Ordinance of the County Code):

(1) Remediation of problems related to mercury bioaccumulation in wildlife, should they occur;
(2) Remediation of hazardous materials contamination, should it occur;
(3) Environmental monitoring including data gathering and groundwater modeling beyond, or as an extension of, that required by the operators under the CCAP and permits issued or extended under the CCAP, should it be necessary;
(4) Ongoing site maintenance of publicly held reclaimed lakes including but not limited to fencing, berms, drainage and levees. No expenditures may be drawn from the Maintenance and Remediation fund for thirty (30) years. Starting in January 2027, the fund shall be made available for the activities identified in subsection (b) of this section.

In January 2047, the County shall determine whether the fund is still merited.

Recommendations:

8.1-1 Project Prioritization: Establish a protocol and prioritization method for determining how CCRMP Resources funds will be utilized to fund design, construction, and maintenance of projects proposed on both public and private property.

8.2 SUPPLEMENTAL PROGRAM ENVIRONMENTAL IMPACT REPORT (SEIR)

The SEIR is an informational document that was adopted in 2002 by Yolo County in accordance with the California Environmental Quality Act (CEQA). The purpose of the SEIR is to inform public agency decision makers and the public of the environmental effects of the CCRMP and CCIP on Cache Creek since implementation. The County determined that the review and updating of the information provided in the 1996 Program Environmental Impact Report was necessary prior to the County seeking new permits from the following agencies: U.S. Army Corps of Engineers (Regional General Permit), Central Valley Regional Water Quality Control Board (401 Water Quality Certification), and California Department of Fish and Game (1601 Streambed Alteration Agreement). The re-issuance of these permits would continue the streamline permitting process for channel improvement and habitat restoration projects in the CCRMP area, and the County would continue to have authority to approve projects within the CCRMP area that are consistent with the provisions of the CCRMP and CCIP.

8.3 GENERAL PERMITS

Prior to the adoption of the CCRMP, private parties wishing to work within channel banks were required to obtain permit approvals from four different federal, state, and local agencies. Fees for these permits totaled nearly $1,000 and processing required a minimum of 90 days. This provided a strong disincentive for landowners who needed to protect their farms and homes from flooding and erosion. In order to ease the financial burden and red tape involved in obtaining permits for work within the stream channel, Action 6.4-3 was included in the CCRMP, as follows:

> *Pursue joint regulatory efforts with other agencies of jurisdiction in order to streamline and standardize conditions for performing work within the creek. The County shall coordinate with other government agencies that have permit authority over Cache Creek to obtain "blanket" permits for the entire reach of the stream located within the plan area.*

Since CCRMP implementation, the County has been successful in acquiring the permits necessary to implement this program. This effort has included obtaining permits, as well as passing special legislation to allow the CCRMP to serve as the functional equivalent for the Reclamation Plan process under the Surface Mining and Reclamation Act. The legislative provisions that allow the CCRMP to serve as a reclamation plan and all permits held by the County for the CCRMP area have either recently undergone or will undergo re-issuance. Although this is a time-consuming process, the County recognizes that the re-issuance of these general permits is essential to maintaining a streamline permitting process for channel improvements and habitat restoration projects in the CCRMP area. The County would also continue to have authority to approve projects that are consistent with the provisions of the CCRMP and CCIP. A summary of each approved permit and current status are provided below.

U.S. ARMY CORPS OF ENGINEERS (ACOE)

Construction activities within wetland areas, as defined under the Federal Clean Water Act, require prior approval of a Section 404 permit from the ACOE. On July 1, 1997, the ACOE issued a General Permit No. 58 for in-stream activities conducted within the CCRMP area. Issuance of this permit is under the authority of Section 404 of the Clean Water Act (33 U.S.C. 1344), and is in accordance with provisions of the "Regulatory Programs of the Corps of Engineers", 33 CFR 322.2 (f). As long as a proposed project shows that it is consistent with the requirements of the CCRMP by obtaining a Flood Hazard Development Permit from Yolo County, and meets the conditions required by the ACOE for the General Permit, a separate Section 404 permit from the ACOE is not required. This regional Section 404 permit was most recently renewed May 1, 2004 and will require renewal May 1, 2009.

U.S. FISH AND WILDLIFE SERVICE (FWS)

As a part of the approval process for the Section 404 permit, the ACOE is required to consult with the FWS regarding a project's potential effects on threatened and endangered species. In its biological opinion issued on October 7, 1997, the FWS focused on the impacts of the CCRMP on the valley elderberry longhorn beetle (VELB), the giant garter snake, and the bald eagle.

The FWS determined that the CCRMP would have no adverse impacts on either the giant garter snake or the bald eagle. Although the plan would not result in the destruction or modification of critical habitat for the VELB, project implementation may result in the harassment of beetles within individual elderberry shrubs. In order to comply with Federal regulations regarding incidental take, the FWS has attached a number of conditions to the Section 404 permit. This authorization from the FWS allows for the disturbance of up to 20 acres of elderberry shrub disturbance annually over a 10-year period. A new biological opinion will be required by the FWS to renew the Section 404 permit in 2007.

CALIFORNIA DEPARTMENT OF FISH AND GAME

Construction activities within stream channels require prior approval of a 1601 Permit (Stream Alteration Agreement) from the CDFG. On June 12, 1997, a 1601 Permit was issued by the CDFG for in-stream projects within the CCRMP area. The agreement was approved by the Board of Supervisors (Minute Order 97-176) and formally entered into on July 15, 1997. As long as a proposed project shows that it is consistent with the requirements of the CCRMP by obtaining a Flood Hazard Development Permit from Yolo County, and meets the conditions required by the CDFG for the 1600 Permit, a separate Stream Alteration Agreement from the CDFG is not required. This 1600 permit was renewed may 17, 2002. Stream alteration work authorized by this agreement expires on August 30, 2007.

REGIONAL WATER QUALITY CONTROL BOARD (RWQCB)

On July 1, 1997, the County submitted it initial application to the RWQCB for a general 401 Water Quality Certification, which is required in order to implement the Army Corps 404 Permit. On December 11, 1998, the RWQCB recommended to the State Water Recourses Control Board (SWRCB) that the general 401 permit be approved, subject to additional mitigation measures regarding water quality. The Executive Director of the SWRCB approved Certification on June 11, 1999. As long as a proposed project shows that it is consistent with the requirements of the CCRMP and meets the conditions required by the SWRQCB, a separate 401 Certification from the SWRQCB is not required. However, the 401 Certification states that projects subject to these provisions which propose new emergent wetlands or stream bank armoring would require separate review. The certification was approved for renewal on August 28, 2002. An update to the certification will occur with issuance of the CCRMP Update as an environmental document.

8.4 CCRMP AREA PERMITS

As required under Section 8-3.404 of the Yolo County Flood Damage Prevention Ordinance, the TAC is responsible for making recommendations on all proposed projects located within the CCRMP area. When a landowner within the CCRMP area wishes to conduct projects in-channel, they bring their project to the TAC for review. The TAC's recommendations are then forwarded to the Floodplain Administrator for final consideration. This is in keeping with the intent of the CCRMP, which seeks to balance the County's need for a thorough review process with the landowner's need to complete erosion and flood control measures in a timely manner.

2005 PERMITS

In 2005 a Flood Hazard Development Permit was issued in the CCRMP area. This permit was issued to Teichert to allow for installation of a seasonal haul road that crosses the creek channel. This temporary road includes five 36" culverts to allow flow of water downstream during summer low-flows. The operator has used the same seasonal creek crossing point since 2000. The crossing is constructed using local aggregate and the location does not disturb any existing native vegetation or other critical habitat.

Recommendations:

8.4-1 Project Development Guidelines: Develop a project checklist for parties interested in developing projects within the CCRMP and educate the public as to the requirements of floodplain development permits such that there is a better public understanding of the CCRMP area project process.

8.5 AGGREGATE RESOURCES

OFF-CHANNEL MINING PLAN

Off-channel mining is currently regulated under Chapter 2 of Title 8 of the Yolo County Code, which governs use permits as they pertain to the zoning ordinance. In order to supplement the regulation of off-channel mining provided in Chapter 2 of the County Code, the Board of Supervisors passed Minute Order No. 94-306 which established specific standards and application requirements for the short-term off-channel applications.

OFF-CHANNEL MINING PERMITS

Under the authority of the OCMP and both implementing ordinances, the BOS approved five off-channel mining and reclamation permits in November of 1996. These permits were each for a 30-year period and they were contingent on individual Development Agreements (DAs) which were

executed in January of 1997. All off-channel mining permits are currently undergoing a required ten-year review process. The process for completing a ten-year review of the mining permits issued to mining operators along Lower Cache Creek in 1996 must be completed by January of 2007 concluding with action by the Commission. In order to allow adequate opportunity for review and comment, including from members of the Commission and the Board of Supervisors, and the public, several discussion papers have been released over a year and a half period of time. Throughout the two processes, the Cache Creek Technical Advisory Committee (TAC) and the Commission will serve as the primary forum for receiving comment.

Discussion Paper #1 (released April 20, 2005) addressed the "Scope of the Interim Review". This paper concluded that the main scope of the interim review is to respond to changes in environmental regulations, and that the secondary scope is to re-examine the per-ton regulatory fees. This paper set out a process for addressing these issues.

Discussion Paper #2 (released September 26, 2005) examined changes in environmental regulations and/or statutes that have occurred since November 1996 when the off-channel mining and reclamation permits were originally approved. The staff concluded in this paper that there have been no such significant relevant changes in environmental regulations and/or statutes that merit modification of the permits as a part of the interim review. In only one instance did one of the agencies make recommendations for consideration by the County. The Yolo Solano Air Quality Management District (YSAQMD) identified the following to improve air quality:

1) Encourage improvements in the electrical utility infrastructure to allow for the use of electrical power (rather than diesel) to crush pea gravel in order to make sand.

2) Continue to encourage the use of cleaner vehicles and equipment and/or the retrofit of existing vehicles and equipment with diesel particulate filters (DPFs).

3) The applicant shall be in full compliance and good standing with the terms of other required agency permits.

Discussion Paper #3 (released March 26, 2006) examined whether any unanticipated or unmitigated environmental changes have occurred since the 1996 approvals and whether CEQA is triggered by the interim permit reviews, and if so, what type of environmental analysis is necessary to provide appropriate CEQA clearance. This discussion paper concluded that overall, there were no documented unanticipated or unmitigated environmental changes. Items of concern that were identified in the Inspection Reports and Compliance Reviews in all cases related to environmental issues that were anticipated during the approval process and mitigated through existing regulatory processes, conditions of approval, and/or CEQA mitigation measures. In all cases items were corrected or otherwise satisfactorily addressed over time pursuant to the terms of the approval. To the extent that the interim review results in modified terms for the approved mining permits, this action would be subject to CEQA but would likely qualify for a "general rule" exemption.

AGGREGATE REGULATIONS AND COMPLIANCE

Under the State Surface Mining and Reclamation Act (SMARA), the State assigns each regulated mine an identification number and requires regular self-monitoring, plus inspections by the responsible agency. In Yolo County, the County serves as the inspecting agency for the State. The State requires a surety bond or "financial assurance" to ensure performance pursuant to the applicable regulations. As each specific mining operation is completed and reclaimed, this regulatory oversight process concludes with release of the performance bond. Hence there is an

ongoing system of checks and balances to ensure minimum performance. The County has combined the State-required inspection process with local oversight needed to ensure performance under the CCAP permit approvals issued in 1996.

Each year of the program all operations and operators have been found to be in compliance with the conditions of approval, mitigations measures, and applicable regulations. Observations relating to water quality reporting and erosion control were provided in satisfaction of conditions subject to continued monitoring and/or correction. In many cases groundwater samples have be shown to contain elevated constituents, however this condition has been documented to result from turbidity during the sampling or pre-existing conditions (such as farming) and not from the mining operation.

There were some other documented concerns and/or “violations”, however most were in the form of failure to meet a specific aspect of an individual requirement and most were related to timeframes for performance (e.g. completion of a roadway improvement by a specified date or prior to a next step). This appeared often to be accompanied by information recognizing factors outside of the operator’s control and/or a formal amendment of the condition through the public hearing process to allow more time for performance. There was occasionally an observation that a particular concern should be revisited prior to the next annual review (e.g. within six months). Modifications to the approvals and changes in ownership were also reported.

Each report is based on staff's independent analysis of aerial photographs, field inspections, and information submitted by the mining operators in order to establish whether the mining is being conducted in a manner that is in conformance with the requirements of the Yolo County Surface Mining and Reclamation Ordinance, permit conditions of approval, California SMARA, mitigation monitoring plans, and approved Development Agreements. The reports, which contain a detailed description of the compliance status of each operation, are on file at the Planning, Resources and Public Works Department (Parks and Natural Resources Management Division).

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APPENDIX A: 2005 CACHE CREEK WATER QUALITY MONITORING DATA

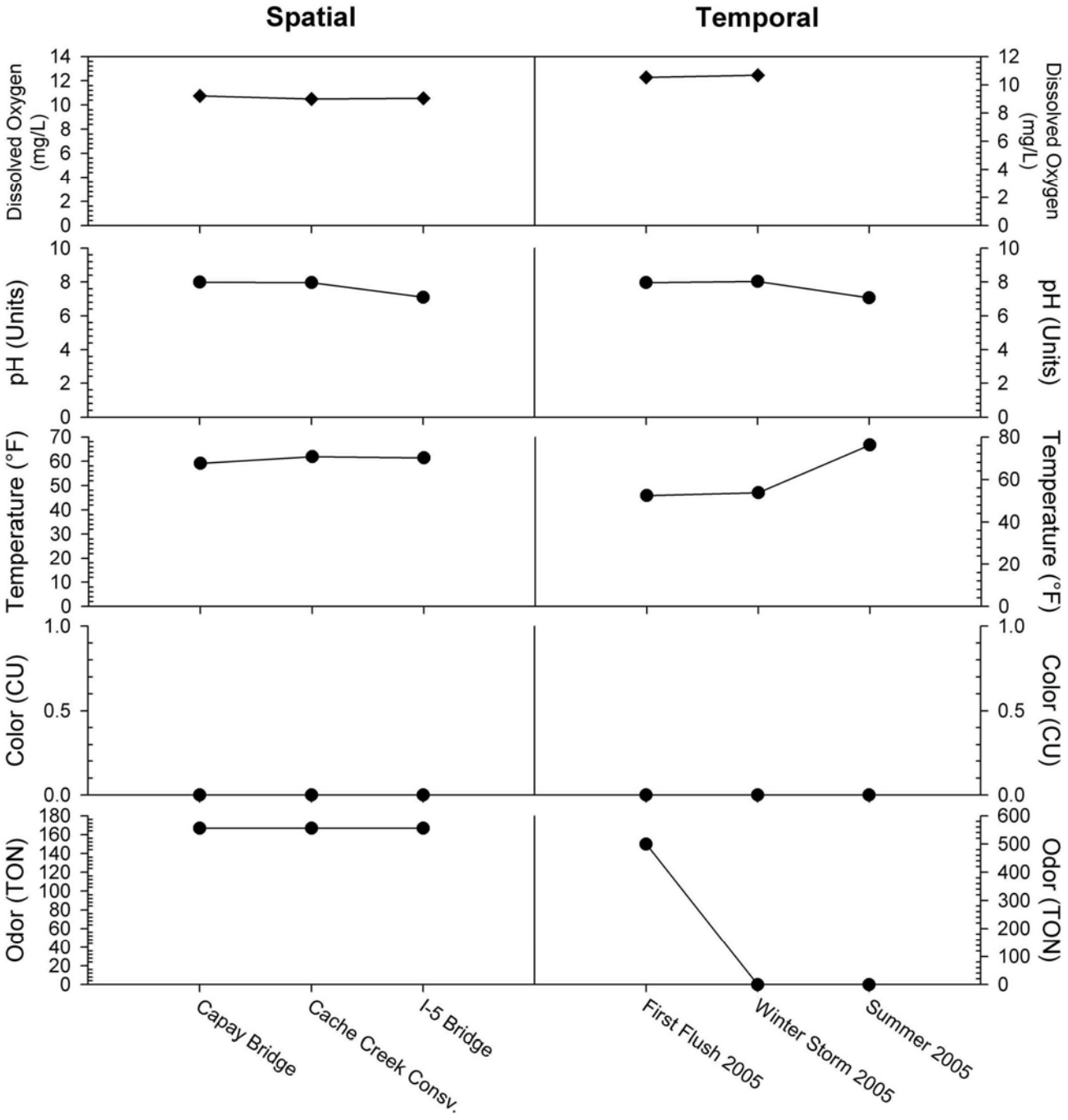

FIGURE A-1a: Water quality data collected in 2005.

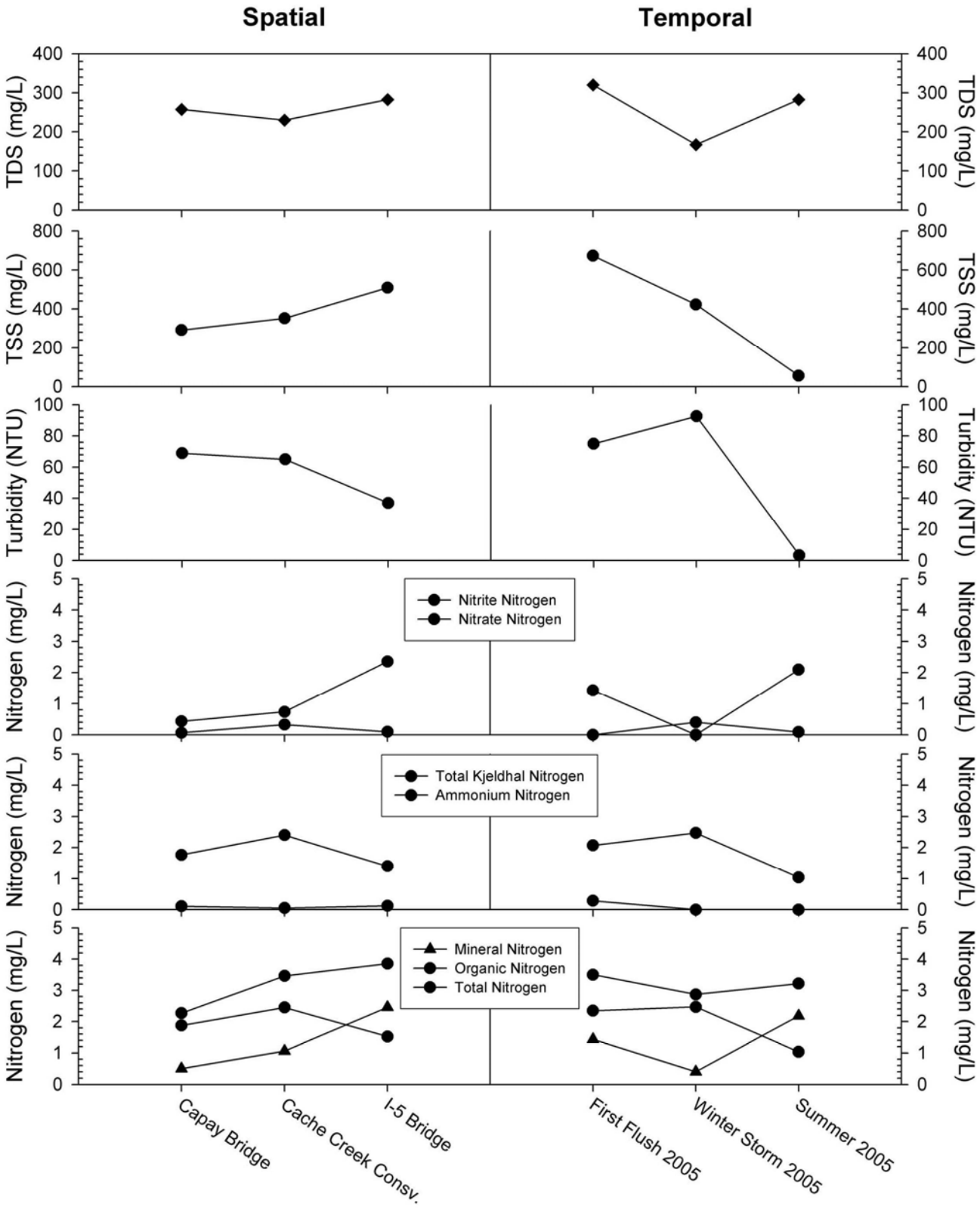

FIGURE A-1b: Water quality data collected in 2005.

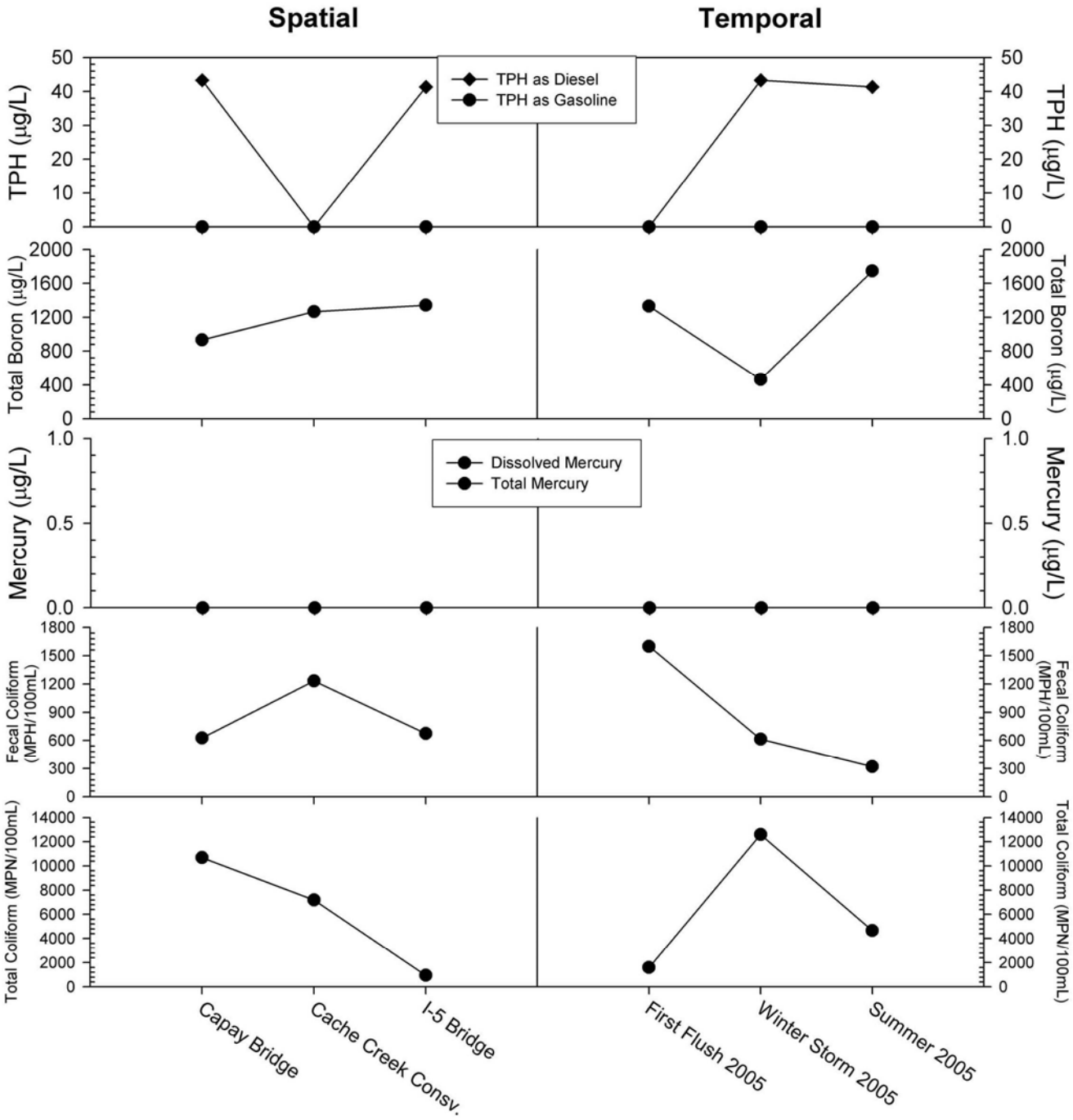

FIGURE A-2: Water quality data collected during 2005 at Gordon Slough.

APPENDIX B: 2005 DTM COVERAGE

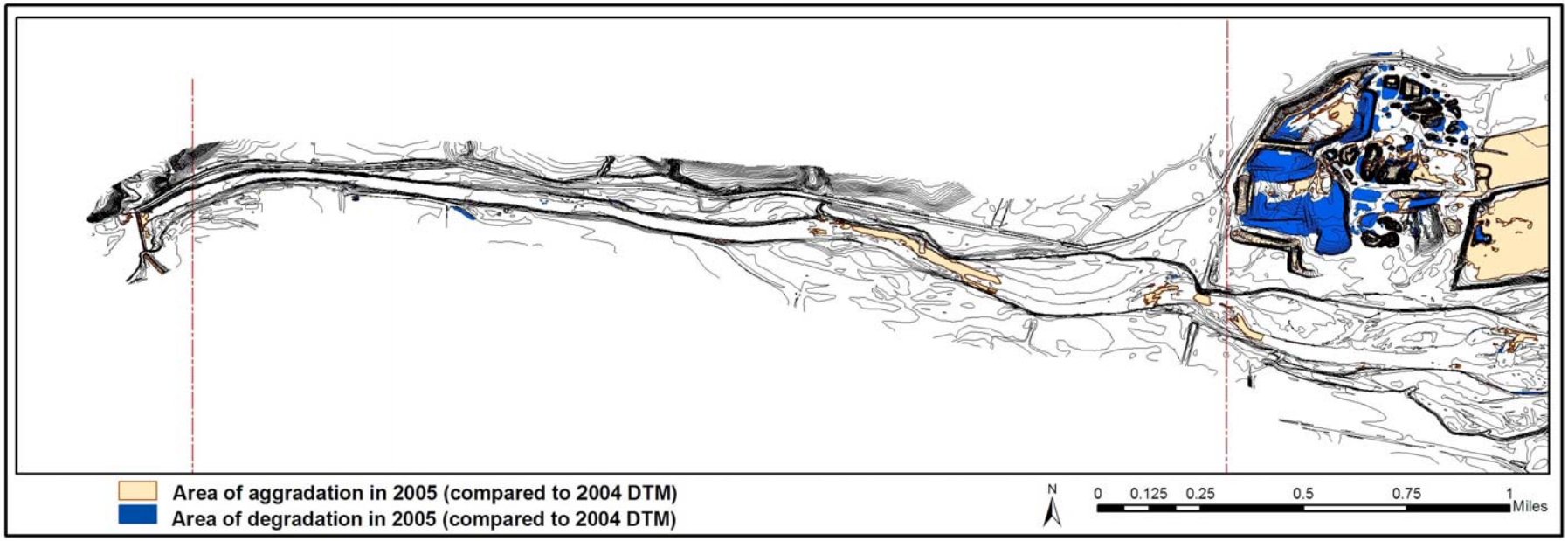

FIGURE B-1: The 2005 Capay subreach (Reach 8) DTM.

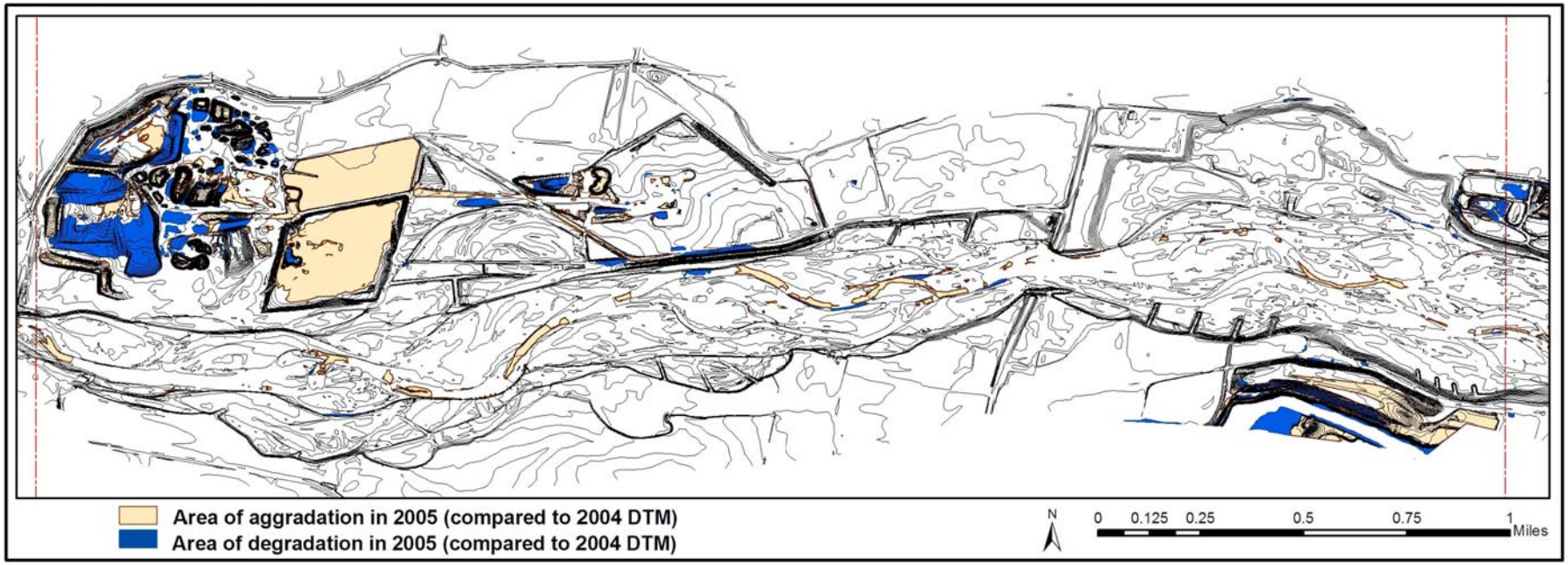

FIGURE B-2: The 2005 Hungry Hollow subreach (Reach 7) DTM.

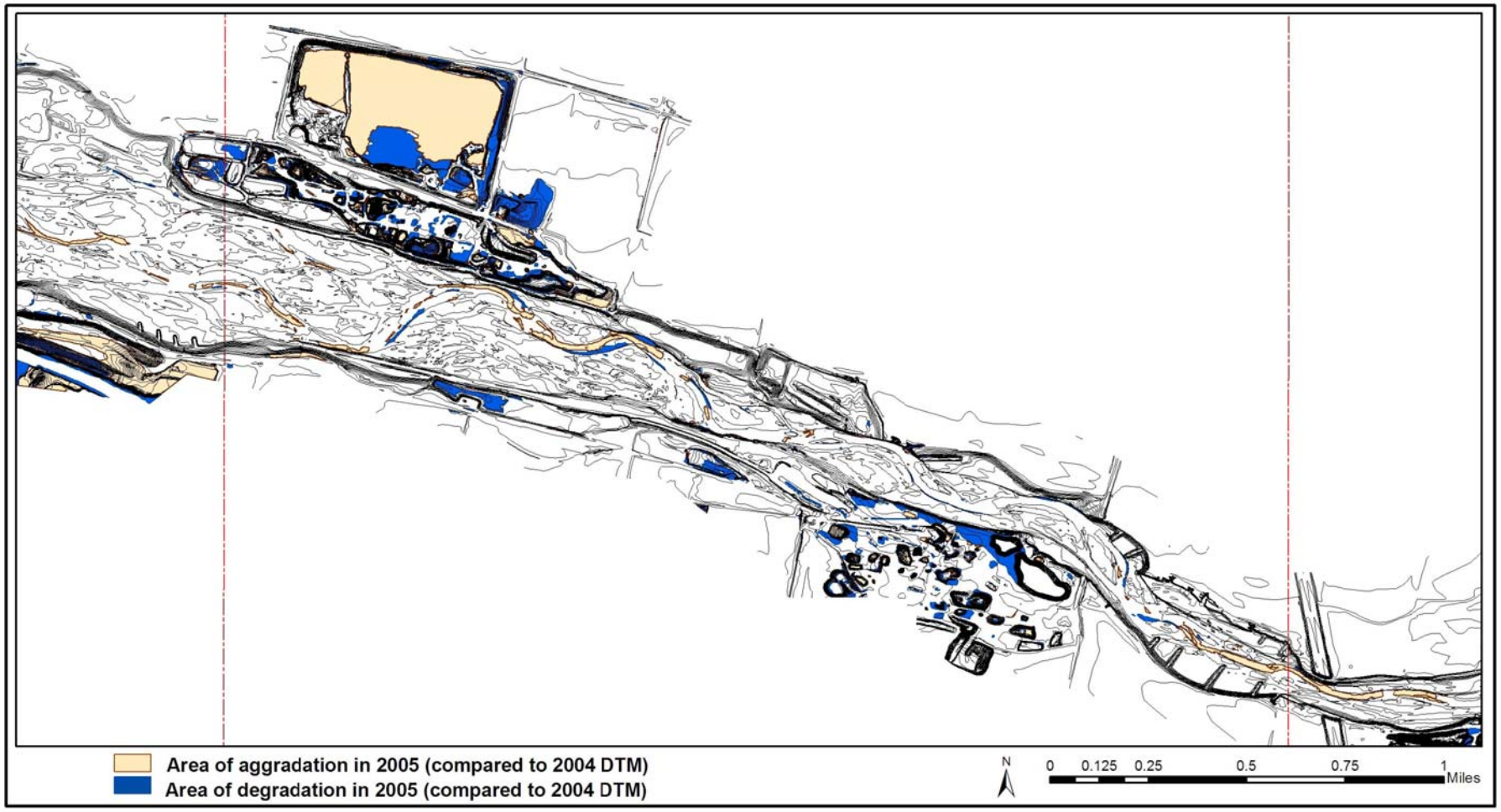

FIGURE B-3: The 2005 Madison subreach (Reach 6) DTM.

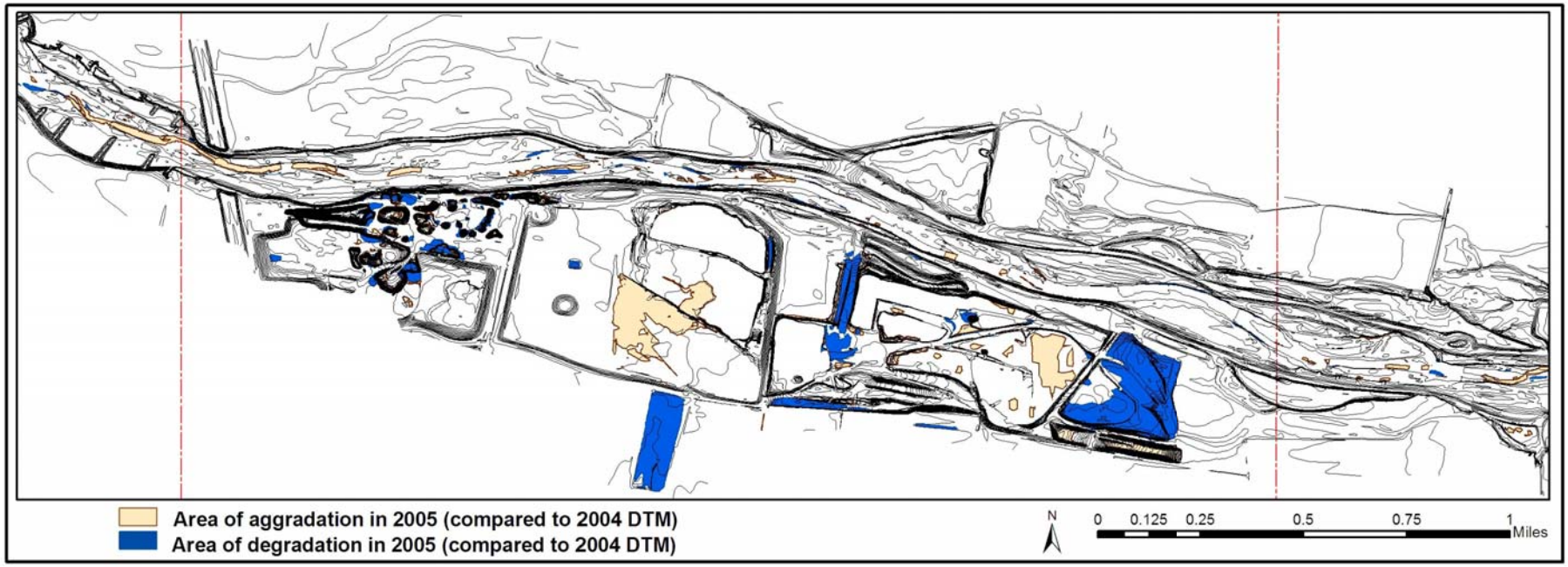

FIGURE B-4: The 2005 Guesisosi subreach (Reach 5) DTM.

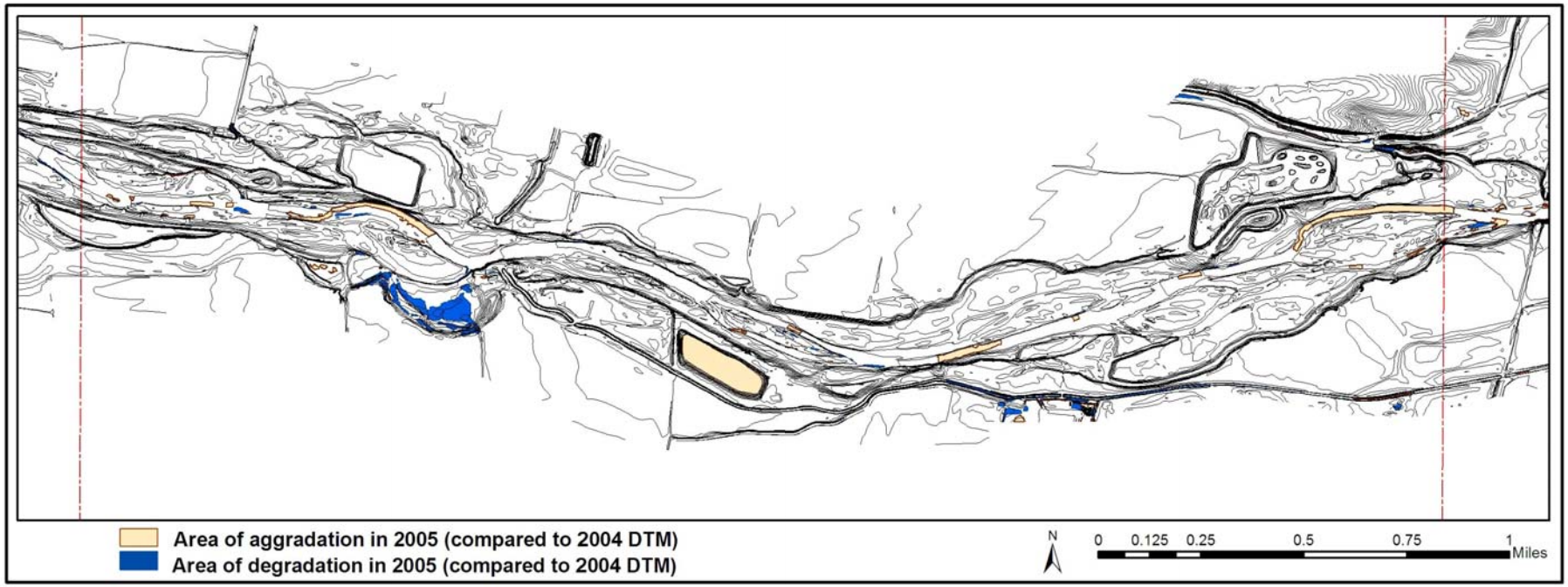

FIGURE B-5: The 2005 Dunnigan Hills subreach (Reach 4) DTM

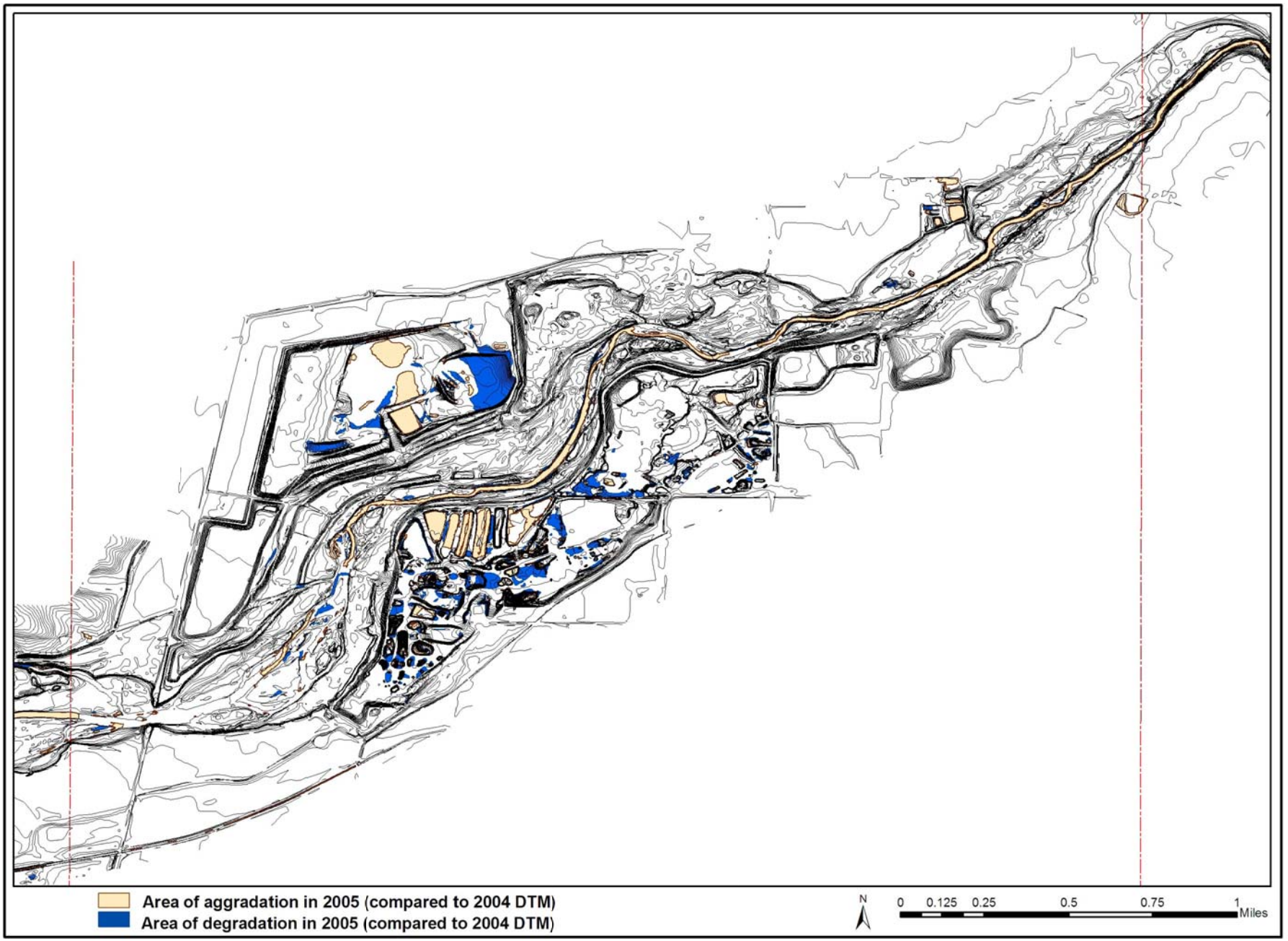

FIGURE B-6: The 2005 Hoppin subreach (Reach 3) DTM

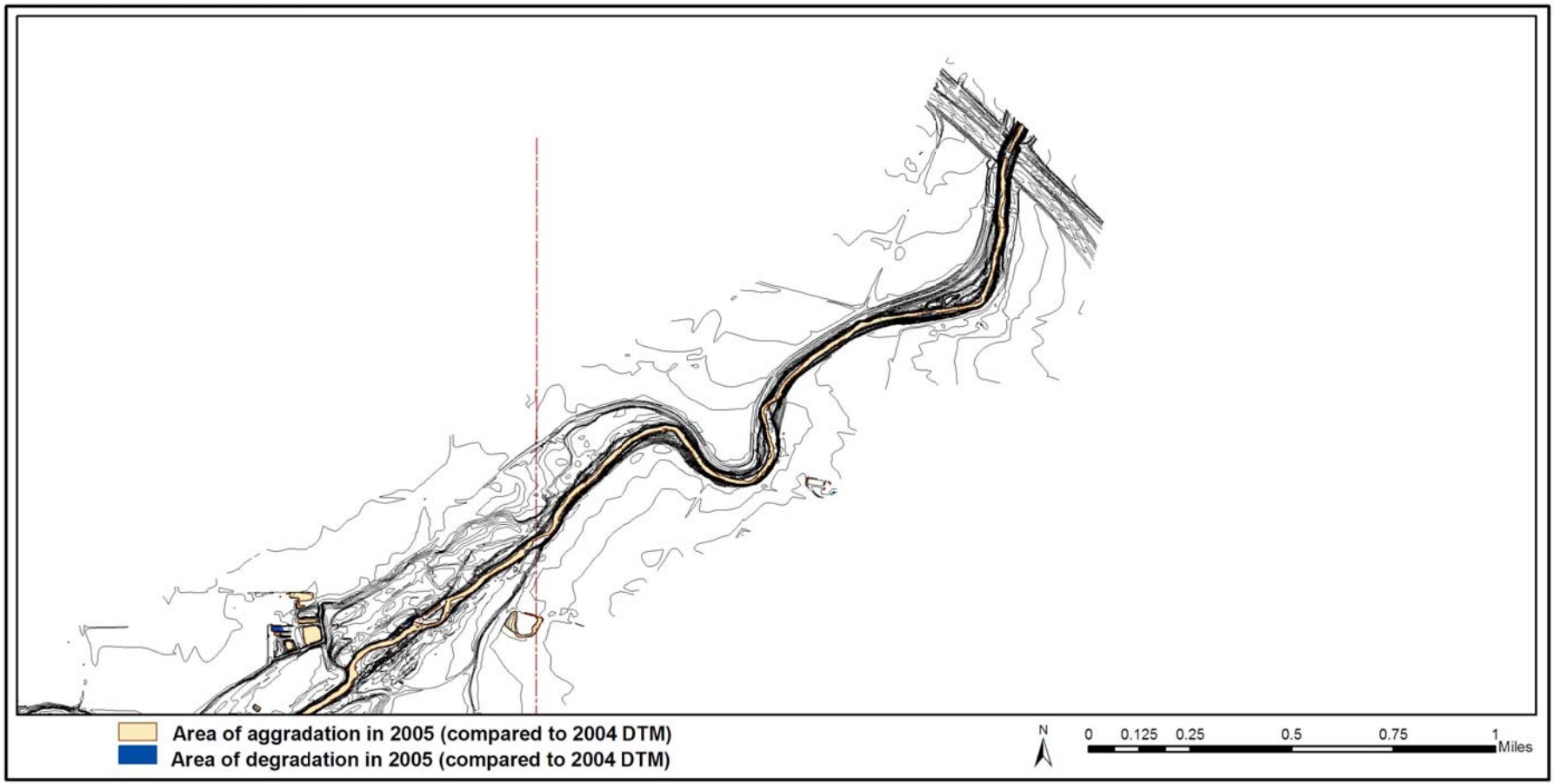

FIGURE B-7: The 2005 Jesus Maria subreach (Reach 2) DTM