TOMALES BAY
INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Submitted To:
State of California
State Water Resources Control Board

Submitted By:
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In conjunction with:
Burdick & Company
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We, the undersigned members of the Tomales Bay Watershed Council, have worked together to develop the actions, projects and management strategies and priorities contained in the Tomales Bay Integrated Coastal Watershed Management Plan.

Once the document has been accepted by the State of California, we intend to continue working together to restore, enhance, and protect the Tomales Bay region and critical coastal areas. The actions, projects and strategies that we have identified in this plan are intended to be used by agencies, and community members, either individually or collectively to improve management of the Tomales Bay.

SIGNATURES BELOW

ACKNOWLEDGMENTS

TOMALES BAY WATERSHED COUNCIL MEMBERS

Special thanks to the TBWC member representatives who met monthly throughout the process to debate, discuss, and direct the work effort. Their collective wisdom and teamwork is a tribute to the power of group collaboration.

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TBWC FOUNDATION BOARD & EXECUTIVE COMMITTEE

The Tomales Bay Watershed Council Foundation Board & Executive Committee worked tirelessly to ensure a successful project outcome and guide the Council's process.

Jerry Abbott
Gordon Bennett
Robert Berner
Liza Crosse
Stan Gilmar
Carlos Porrata
Michael Mery

TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee met frequently and extensively throughout the process of Plan development, demonstrating tireless commitment to the project. The insight and expertise contributed by this group is of incalculable value to the future of the Tomales Bay Watershed.

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The interested parties supported the Technical Advisory Committee's work effort through their tireless attendance and valuable input.

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Don Neubacher (Point Reyes National Seashore)
Gail Seymour (California Department of Fish and Game)
Tom Yarish (SPAWN)

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Estos miembros de la comunidad dieron generosamente de su tiempo y energía a diseñar un programa de alcance de comunidad
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Mike McMaster (NMWD)

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN THIS PLAN

ACR – Audubon Canyon Ranch, Cypress Grove Research Center
ASBS – Area of Special Biological Significance
AFY – Acre feet per year
Basin Plan – RWQCB Water Quality Control Plan
BCPUD – Bolinas Community Public Utility District
BMP – Best Management Practices
CCA – Critical Coastal Area
CCC – State of California Coastal Commission
CDHS – State of California Department of Health Services
CDFG - State of California Department of Fish and Game
Council – Tomales Bay Watershed Council
CWA – Clean Water Act
CWC – California Water Code
DWR – California Department of Water Resources
EAC – Environmental Action Committee of West Marin
EHS - Marin County Department of Environmental Health Services
EQIP – Environmental Quality Incentives Program
ESA – Endangered Species Act
GFNMS – Gulf of the Farallones National Marine Sanctuary
GGNRA – Golden Gate National Recreation Area
GIS – Geographic Information Systems
ICWMP – Integrated Coastal Watershed Management Plan
IRWM – Integrated Regional Watershed Management
IRWMP – Integrated Regional Watershed Management Plan
IPUD – Inverness Public Utility District
JARPA- Joint Aquatic Resources Permit Application
LWD – Large Woody Debris
MALT – Marin Agricultural Land Trust
MCDHHS – Marin County Department of Health and Human Services
MRCD – Marin Resource Conservation District
MCSTOPPP – Marin County Stormwater Pollution Prevention Program
MMWD – Marin Municipal Water District
NGO – Non-governmental organization
NOAA – National Oceanic and Atmospheric Administration
NMWD – North Marin Water District
NPS – Nonpoint source pollution
NRCS – Natural Resources Conservation Service
NSSP – National Shellfish Sanitation Program
OSDS – Onsite Sewage Disposal System
PRBO – Point Reyes Bird Observatory Conservation Science
PRNS - Point Reyes National Seashore
PRNSA - Point Reyes National Seashore Association
QA/QC – Quality assurance /Quality control

RWQCB - Regional Water Quality Control Board
SCWA – Sonoma County Water Agency
SFRWQCB - San Francisco Bay Regional Water Quality Control Board
SPAWN – Salmon Protection and Watershed Network
SWAMP – Surface Water Ambient Monitoring Program
SWQCB - State Water Quality Control Board
SWQPA – State Water Quality Protection Areas
TAC - Technical Advisory Committee
TBA- Tomales Bay Association
TBAG – Tomales Bay Agriculture Group
TBSTAC – Tomales Bay Shellfish Technical Advisory Committee
TBWC- Tomales Bay Watershed Council
TMDL – Total Maximum Daily Loads
TSS – Total Suspended Sediments
TU – Trout Unlimited
UCCE – University of California Cooperative Extension
UC –University of California
UCD – University of California at Davis
UNESCO – United Nations Educational, Scientific and Cultural Organization
USACE – U.S. Army Corps of Engineers
USCG – U.S. Coast Guard
USDA – U.S. Department of Agriculture
USDA-CREP – Conservation Reserve and Enhancement Program
USEPA – U.S. Environmental Protection Agency
USFWS – U.S. Fish and Wildlife Service
USGS – U.S. Geological Survey
USNPS – National Park Service
WDR – Waste Discharge Requirements
WMI – SWRCB Watershed Management Initiative
WMS – Waste Management Systems
WQS – Water Quality Standard

1

Introduction & Regional Water Management Group

Photo by Greg Filbrandt

1. INTRODUCTION & REGIONAL WATER MANAGEMENT GROUP

STATE IRWM REQUIREMENTS: A. Regional Agency or Regional Water Management Group. Describe the regional water management group or regional agency responsible for development and implementation of the Plan. Include the member agencies and organizations and their management responsibilities related to water. Demonstrate that all agencies and organizations, including but not limited to, public agencies, not-for-profit organizations, and privately owned water utilities regulated by the Public Utilities Commission, that were necessary to address the objectives and water management strategies of the Plan were involved in the planning process.

1-1 INTRODUCTION

Water resource issues ranging from water supply reliability and water quality to stormwater management and ecosystem enhancement have been at the forefront for agencies, organizations, residents and agricultural producers in the Tomales Bay region for over three decades. The Tomales Bay region's water resources provide water supplies and support extraordinary and diverse ecosystems. The region has a history of resource management and protection initiated by various agencies and organizations working together over the past thirty years to preserve this unique area. This legacy is the result of collaboration of many agencies, organizations and individuals.

The Tomales Bay region is located in western Marin County, northwest of San Francisco, except for a small portion of the Tomales Bay watershed that is located in Sonoma County. Figure 1 illustrates the location of the Tomales Bay region, which is further described in Chapter 2. The Tomales Bay Integrated Coastal Watershed Management Plan (ICWMP) planning area includes seven "critical coastal areas" (CCAs): Tomales Bay, Lagunitas Creek, Walker Creek, and four ASBS (Areas of Special Biological Significance) areas. The planning area includes the watersheds of and areas adjacent to the CCAs.

The ICWMP is a cooperative effort by the Tomales Bay Watershed Council (TBWC), Bolinas Community Public Utility District (BCPUD), Inverness Public Utility District (IPUD), Marin Municipal Water District (MMWD), and North Marin Water District (NMWD) to identify regional management strategies projects that meet multiple objectives for the Tomales Bay region. Each of these entities has

investigated and evaluated various water resource and management issues and options for the overall health and well being of the watershed and the water and environmental resources within their jurisdictions. The history of collaboration within the region demonstrates the collective and individual capacity of local, state and federal agencies and private organizations to address regional water resource and watershed issues. It also provides the foundation that will support future actions to protect and enhance water supplies, water quality, critical coastal areas, and important ecosystems of the Tomales Bay watershed region. The ICWMP will integrate these efforts within the greater Tomales Bay region, identify and prioritize regional projects, and provide the overall framework for watershed and water resource planning and project development.

1-2 REGIONAL WATER MANAGEMENT GROUP

The regional water management group consists of four Marin County water and public utility districts and one stakeholder group – the Tomales Bay Watershed Council (TBWC). The TBWC represents local, state and federal agencies; non-profit groups; and other stakeholders with interests in water supply, water quality, stormwater management, habitat enhancement and conservation, agriculture, mariculture, land use and watershed management in the Tomales Bay Watershed Region. The final ICWMP will be adopted by all five partners. Figure 2 illustrates the boundaries of the watershed region and the water district service areas. Figure 3 depicts the organization of the Tomales Bay ICWMP regional water management group and its participants. The following summarizes the management responsibilities related to water resource issues for each of the five regional water management group entities.

WATER SUPPLIERS

The four water suppliers are: Bolinas Community Public Utility District (BCPUD); Inverness Public Utility District (IPUD); Marin Municipal Water District (MMWD); and North Marin Water District (NMWD). All water districts derive their water supplies from the surface and groundwater supplies within the Tomales Bay region and provide water service to residents and customers primarily within the region, except for MMWD which also serves other parts of Marin County and also derives part of its water supply from imported sources.

MMWD and NMWD are municipal water districts formed pursuant to the State Water Resources Code. MMWD provides water service, including treatment plant and system maintenance, to approximately 190,000 residents in Marin County within an approximately 150-square mile area. The District obtains the majority of its water supply from the Tomales Bay watershed, and serves a portion of the San Geronimo area in the Tomales Bay watershed. It conveys most of the water supplies obtained from the Tomales Bay watershed to serve urban areas in Marin County that are located outside of the Tomales Bay region.

NMWD provides water service, including treatment plant and system maintenance, to the greater Novato area outside of the Tomales region, primarily in and around the city of Novato in eastern Marin County (76 square miles and some 60,000 residents via 20,193 service connections) and to the

West Marin Point Reyes area (23 square miles). The NMWD's West Marin system in the community of Point Reyes provides service to several unincorporated areas in the Tomales Bay region, including Pt. Reyes Station, Inverness Park, Bear Valley, Olema and Paradise Ranch Estates area and serves approximately 760 active service connections supplying water to approximately 1,800 people.

BCPUD and IPUD are public utility districts formed pursuant to the State Public Utilities Code. BCPUD provides domestic water service, solid waste disposal, and sewage collection and treatment to the unincorporated community of Bolinas in the southern portion of the planning area. The District serves approximately 1,400 residents within a 5-square mile service area. The IPUD provides domestic water service and fire protection to the unincorporated community of Inverness. IPUD serves approxi-mately 700 residents within a 2.2-square mile service area.

TOMALES BAY WATERSHED COUNCIL

The Tomales Bay Watershed Council (TBWC) was formed in January 2000 to develop a plan to improve the water quality of Tomales Bay and tributary streams and to protect and restore the entire watershed in a manner that sustains human activities and natural resources. The aim of TBWC is to provide an ongoing, collaborative forum to comprehensively manage and protect Tomales Bay and its watershed and the interests of stakeholders. The TBWC is currently the only organization considering issues facing the future of the Tomales Bay watershed in which all primary stakeholders participate, and TBWC has successfully used consensus to make decisions for over 7 years, thereby ensuring the long-term participation of a wide spectrum of stakeholders in watershed stewardship.

The TBWC's 32 members are drawn from local interest groups and agencies affected by or responsible for the watershed and its resources. The TBWC includes representatives from local, state and federal agencies; environmental organizations; citizen and residential groups; agricultural and shellfish industry interests; and recreational interests. Many of these entities are already involved in efforts to protect and improve the health of the watershed either individually or through partnerships with others.

Photo by Greg Filbrandt

All partners who manage water resources or areas that drain to or are within the watersheds of Tomales Bay, critical coastal areas, and/or "Areas of Special Biological Significance" (ASBS) are included within the regional water management group. Thus, all public agencies, non-governmental organizations, and other entities that were necessary to address the objectives and water management strategies of the ICWMP were involved in the planning process. The combination of these agencies and groups address all key issues identified in the ICWMP planning process: water supply and reliability, water quality, stormwater and flood management,

habitat and ecosystem protection and enhancement, and watershed management. Further discussion of stakeholder identification and involvement is included in Chapter 13.

1-3 OVERVIEW OF ICWMP PROCESS

PROPOSITION 50 BACKGROUND

Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, was passed by California voters in November 2002. It amended the California Water Code to add, among other articles, Section 79560 et seq., authorizing the Legislature to appropriate funding for Integrated Regional Water Management (IRWM) projects. The intent of the IRWM Grant Program is to provide funding via competitive grants for projects to protect communities from drought, protect and improve water quality, and improve local water security by reducing dependence on imported water while encouraging water management on a regional level. This legislation also includes a provision for coastal watershed and wetland protection.

The IRWM Program is administered jointly by the State Water Resources Control Board (SWRCB) and the State Department of Water Resources (DWR). Upon completion of IRWM (or ICWM) Plans, the State envisioned two rounds of implementation grant funding. The first funding cycle of the IRWM Implementation Grants was made available in March 2005, and seven applicants were awarded grants in late 2006.

In late January 2007, the SWRCB and DWR considered the status and future of a second round of Implementation Grant funding due to a variety of factors, including the recent passage of Proposition 84. Draft Grant Program Guidelines for Round 2 of Proposition 50, Chapter 8 funding were released in April 2007, and final guidelines are expected in June 2007. Step 1 grant applications are due August 1, 2007. Up to approximately $21 million may be available to northern California.

ICWMP PREPARATION

The key goals in development of the Tomales Bay ICWMP were to:

- Review and assess water supply and operations demands and needs within the planning area's critical coastal areas.
- Identify mutually agreeable solutions to address issues related to water supply, water quality, flood control, and ecosystem and habitat concerns.
- Develop narrative describing the existing conditions, summarizing existing data, and identifying data gaps for ASBS and CCAs.
- Develop an adopted ICWM Plan that addresses impacts on ASBS and CCA sites in the region.

- Use ICWM Plan as guiding document to develop proposals for implementation funds and manage the watersheds cooperatively among stakeholders.

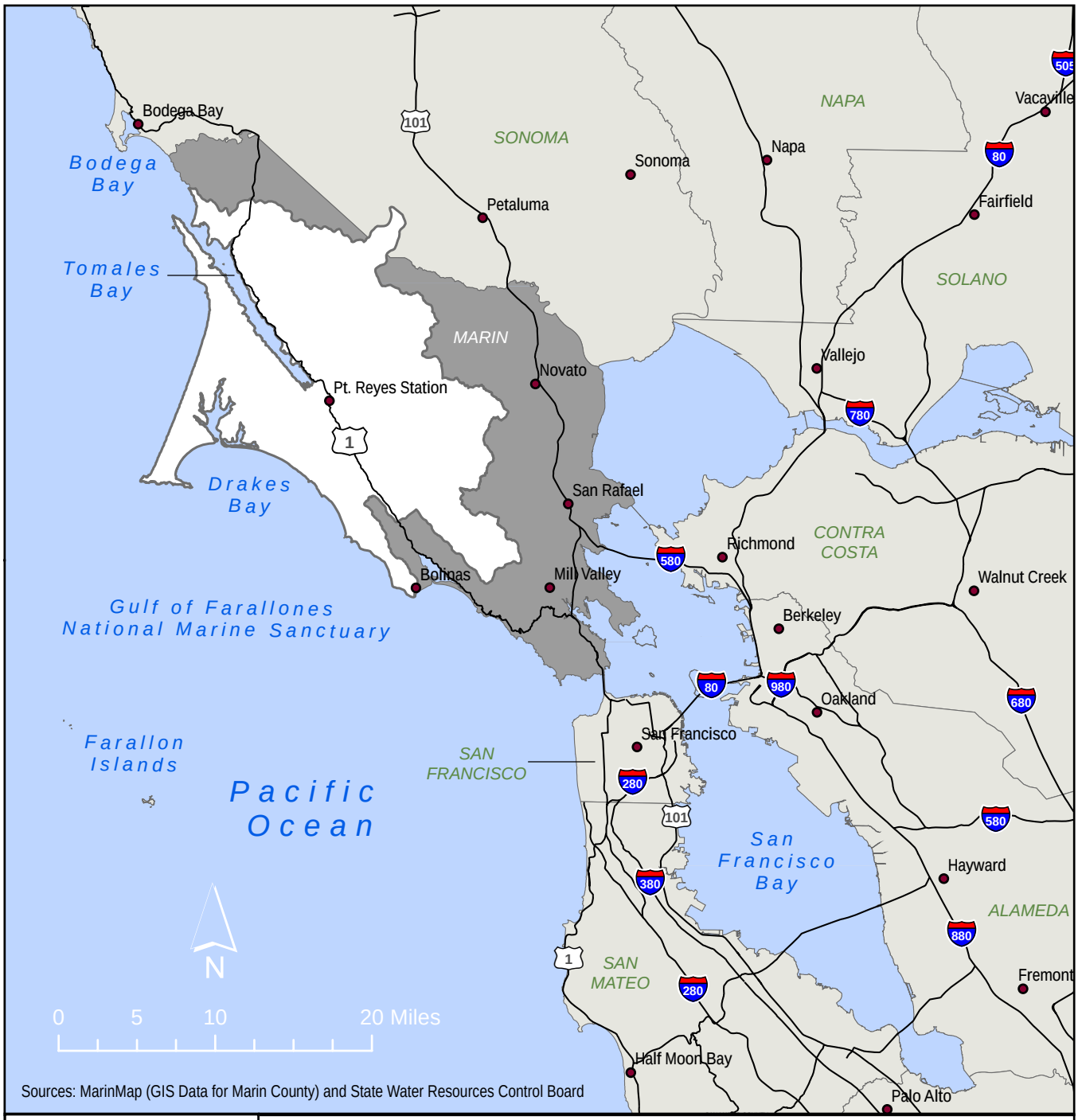
The ICWMP has been prepared in accordance with State Proposition 50 Guidelines. The ICWMP was prepared via a combination of methods, including review of existing management plans and studies, stakeholder input, and preparation of three technical reports to supplement existing data. These supporting analyses and work products are included in Appendices K, L, and M and include:

- Watershed assessments for the four ASBS areas in the region.
- Evaluation of municipal stormwater management networks and source area and condition of stormwater facilities.
- Implementation of a septic outreach and education program and include public discussions regarding the development of maintenance and monitoring programs to identify community based septic management solutions.

Preparation of the ICWMP was overseen by a Technical Advisory Committee (TAC), composed of eleven members from the TBWC member groups and water agencies, as well as representatives from the Marin County Public Works Department. Subcommittees were further established as needed to work on specific technical issues. (See Figure 3.) As discussed throughout this Plan, The TAC and its subcommittees provide input on issues, formulation of objectives, review of projects, and review of Plan sections and technical data. Public meetings and outreach efforts were held throughout the process. Detailed descriptions of the stakeholder, agency and public involvement components are included in Sections 13 and 14. Written and oral public comments on the ICWMP were received during the public review period (June 19 through July 20, 2007), and the Draft ICWMP has been revised accordingly.

1-4 REPORT ORGANIZATION

The ICWMP chapters follow the Proposition 50 "IRWM Plan Standards" (Appendix A of the Grant Guidelines). The Plan chapters are organized to follow these topics that are outlined from "A" through "O." The ICWMP combines the State's topics "D" and "E" (Management Strategies and Integration, respectively) into a single chapter. Figures are included at the end of the chapter in which they are first referenced.



Legend

- Study Area Boundary
- Marin County Outside Study Area
- Other Counties
- Major Highway

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 1. Regional Location

Sources: MarinMap (GIS Data for Marin County) and State Water Resources Control Board

Legend

- Study Area Boundary
- Bolinas Community Public Utility District Service Area
- Inverness Public Utility District Service Area
- North Marin Water District Service Area
- Marin Municipal Water District Service Area
- Areas of Special Biological Significance

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 2. Tomales Bay Region & ASBS Areas

TOMALES BAY WATERSHED COUNCIL

BROAD STAKEHOLDER INVOLVEMENT

- Local, State & federal agencies
- Community groups
- Agricultural interests
- Environmental groups
- Mariculture interests
- Recreational interests

WATER DISTRICTS

ALSO PARTICIPANTS IN TBWC

- Bolinas Community PUD
- Inverness PUD
- Marin Municipal Water District
- North Marin Water District

↘ ↙

ICWMP TECHNICAL ADVISORY COMMITTEE

TECHNICAL REPRESENTATION:

- → Water Suppliers (NMWD)
- → Water Quality (RWQCB, County EHS)
- → Resource Management (PRNS, RCD, TBWC, UCCE)
- → Stormwater Management (County)
- → Environmental & Citizens Groups (Sierra Club, East Shore Group)
- → TBWC Representative
- → Agricultural Interests (MRCD)

↙ ↘

TAC SUBCOMMITTEES

WATER SUPPLIERS	SEPTIC	ASBS	STORMWATER	PROJECT REVIEW

Figure 3. Tomales Bay ICWMP Management Group

2

Tomales Bay Watershed Regional Description

Photo by Greg Filbrandt

2. REGION DESCRIPTON

STATE IRWM REQUIREMENTS: B. Region Description. Explain why the region is an appropriate area for integrated regional water management. Describe internal boundaries within the region (boundaries of municipalities; service areas of individual water, wastewater, and land use agencies, including those not involved in the Plan; groundwater basin boundaries, watershed boundaries, county boundaries, etc.), major water related infrastructure, and major land-use divisions. Describe the quality and quantity of water resources within the region, including surface waters, groundwater, reclaimed water, imported water, and desalted water. Describe water supplies and demand for a minimum 20-year planning horizon. Describe important ecological processes and environmental resources within the regional boundaries and the associated water demands to support environmental needs. Describe the social and cultural makeup of the regional community; identify important cultural or social values. Describe economic conditions and important economic trends within the region. In certain cases, individual agencies or organizations may participate in different regional efforts depending on geography, Plan objectives, or other relevant factors. For such cases, the application should include an explanation of why participation in various regional efforts is appropriate.

2-1 SUITABILITY FOR INTEGRATED COASTAL WATERSHED MANAGEMENT

The Tomales Bay region is located in western Marin County, northwest of San Francisco, except for a small portion of the Tomales Bay watershed that is located in Sonoma County (see Figure 1 in Chapter 1). The ICWMP planning area encompasses seven Critical Coastal Areas (CCS), including Tomales Bay, its primary tributaries (Lagunitas Creek and Walker Creek) and four "Areas of Special Biological Significance" (ASBS) areas.

The Tomales Bay region is one of unsurpassed beauty and environmental diversity. Tomales Bay is one of the major estuaries on the California coast, supporting abundant aquatic and terrestrial wildlife. The Bay's two primary tributaries, Lagunitas and Walker Creeks and their tributaries, provide habitat for multiple listed species, including coho salmon, steelhead, California freshwater shrimp, tidewater goby, and California red-legged frog, with Lagunitas Creek being of statewide significance for coho salmon. The coastal areas in the region are largely protected and managed as part of the Point Reyes National Seashore, except for the east, south and southwest shores of the bay that are privately owned.

Tomales Bay has long been recognized as a special place deserving a high level of protection by citizens and local, state and federal agencies. The region's ecological significance is reflected in the numerous designations and protections afforded to the area. Most of the bay and its shoreline were

included in the National Park System through the creation of the Point Reyes National Seashore (PRNS) in 1962 and Golden Gate National Recreation Area (GGNRA) in 1972. The PRNS is one of only ten national seashores in the United States and the only one on the west coast.

Photo by Greg Filbrandt

In 1979 the California Coastal Commission (CCC) adopted a resolution designating Tomales Bay as a "Special Resource Area." This designation covers "the coastal waters and immediately adjacent uplands of Tomales Bay" and was made "to denote the Commission's commitment to the protection, enhancement, and where feasible, restoration of the unique and important natural resources of this area." The bay is a state designated ecological reserve, and is also part of the Golden Gate Biosphere Reserve. Because of large numbers of wintering and migrating shorebirds, Tomales Bay qualifies for inclusion as a wetland of regional importance under the Western Hemisphere Shorebird Reserve Network (Tomales Bay Watershed Council, July 2003). In 2002, UNESCO included Tomales Bay as a "Wetland of International Importance" under an international treaty called the RAMSAR Convention on Wetlands. The Gulf of Farallones National Marine Sanctuary (GFNMS) was established in 1981 for protection of offshore and marine resources. The Sanctuary protects an area of 948 square nautical miles (1,255 square miles) off the Marin County coast, including parts of Tomales Bay.

In addition to supporting a diverse natural resource system, the Tomales Bay watershed and region provides water supply sources to the domestic customers and some agricultural users in the watershed and region, as well as to urbanized Marin County areas located outside of the Tomales Bay region. The Marin Municipal Water District (MMWD) obtains approximately 70% of its water supplies from the Tomales Bay watershed. The majority of the MMWD's watershed lands are comprised of lands within the Lagunitas Creek sub-watershed of Tomales Bay. The watershed provides and protects the major source of domestic water for 190,000 residents in southern and central Marin County. Beyond the primary purpose of providing the major source of domestic water, the District-owned watershed lands (within the MMWD's larger Mt. Tamalpais watershed) are held in trust as a natural wildland of great biological diversity, as scenic open space and as an area for passive outdoor recreation for Marin and much of the Bay Area (Marin Municipal Water District, July 2005).

Past and present human uses and activities within the region have impacted water quality, habitats, and special status species in Tomales Bay and its tributaries, resulting in a need for comprehensive watershed management. These activities include residential development, agriculture, forestry, construction of reservoirs, mining, recreation, road construction, and septic and waste disposal. Sedimentation from tributary streams has resulted in infilling of Tomales Bay over the last 200 years

and has affected aquatic habitats. Salmon habitat has been diminished to less than half of the original range. The water quality of the bay and its two tributaries are listed as impaired by the Regional Water Quality Control Board, San Francisco Bay region (SFBRWQCB) for pathogens, sediment, mercury and nutrients. During recent years, water quality monitoring has resulted in the posting of human health advisories for Tomales Bay and its tributaries for water contact and the consumption of seven species of sport fish regularly caught in the bay, as well as periodic closure of shellfish harvesting. Non-point source pollutants in stormwater runoff, if detected, would be potential discharge concerns in the ASBS areas in the region. Additionally, all water suppliers and users have constrained water supplies under existing and/or long-term conditions due to supply limitations, reliability issues and/or infrastructure constraints.

The Tomales Bay region is an appropriate region for an ICWMP for several reasons. The areas within the region drain to critical coastal sites, including Tomales Bay, its primary tributaries (Lagunitas and Walker Creeks) and ASBS areas. Watershed and water resource issues have been at the forefront of agencies, organizations and residents in the Tomales Bay region. The common issues related to water supplies, water quality, ASBS protection, ecosystem protection and restoration, and watershed management, as well as some overlapping interests in stormwater management and recreation and public access, make the Tomales Bay region ideal for integrated planning.

Comprehensive watershed management must consider all the resources and ecosystems. Good management and stewardship of watershed lands protects and assures viable water supplies, which also aids efforts toward water quality improvement and ecosystem enhancement. Coordinated watershed management has been pursued by the Tomales Bay Watershed Council (TBWC) which produced a *Watershed Stewardship Plan* in 2003 that addresses the water quality and resource issues identified in the region. The ICWMP joins the TBWC's watershed management efforts with those of the water suppliers in the region to comprehensively address the management issues that confront all stakeholders, and in many cases, are collaboratively being addressed by these entities as summarized below in section 2-11. There is also some interagency coordination between the water suppliers including emergency water supply backup between North Marin Water District (NMWD) and Inverness Public Utility District (IPUD. In order to assure sustained and reliable water supplies and protect and restore the health and vitality of Tomales Bay, its watershed and other critical coastal areas in the region, the collaboration of the TBWC (and its' member stakeholder groups) and the water districts of west Marin County will promote effective coordination and implementation of water management strategies that directly addresses watershed and water resource issues.

2-2 BOUNDARIES

The Tomales Bay region encompasses approximately 300 square miles within the unincorporated area of west Marin County. The planning area encompasses seven "Critical Coastal Areas" (CCAs), including Tomales Bay, its primary tributaries (Lagunitas and Walker Creeks) and four ASBS areas (see Figure 4). The region encompasses all areas that drain west to Tomales Bay (northern limit), the Pacific Ocean, and to the southern limit of the Bolinas Mesa. Most of these watershed lands drain to Tomales Bay, although the western edge of the region drains to the four ASBS sites: Duxbury Reef, Double Point, Point Reyes Headlands, and Tomales Point/Bird Rock. The Tomales Bay watershed,

which consists of the Lagunitas Creek and Walker Creek sub-watersheds, extends from Mount Tamalpais and Bolinas Ridge, east to the headwaters of Walker Creek and Nicasio and Lagunitas Creeks, and west to the Inverness Ridge. Figure 5 illustrates boundaries of the watersheds, sub-watersheds, and ASBS areas, as well as, key hydrological features.

The Tomales Bay planning area accommodates thirteen unincorporated communities within the region. The County of Marin has primarily jurisdiction for land use planning and regulations, storm water management. Figure 2 (in Chapter 1) presents the boundaries of the water district service areas and location of the communities within the region. The lands adjacent to Tomales Bay and the Pacific Ocean are within the coastal zone (see Figure 4) pursuant to the California Coastal Act.

The Tomales Bay region is not included within State-designated groundwater basins, except for a small area in the northeastern corner of the region near Dillon Beach. In this location, the Sand Point Area basin is located just south of the town of Dillon Beach. The adjacent Wilson Grove Formation Highlands extends from the area near Dillon Beach eastward into Sonoma County (see Figure 6).

2-3 CRITICAL COASTAL AREAS

Tomales Bay, Lagunitas and Walker Creeks, and the ASBS areas are all state identified "Critical Coastal Areas" (CCAs). The CCA program, part of the state's Non-point Source (NPS) Plan, is a non-regulatory planning tool to coordinate the efforts of multiple agencies and stakeholders, to ensure that effective management measures are implemented to protect or restore coastal water quality in CCAs. CCA identification supports the acquisition of grant funding by prioritizing protection efforts. A summary of key features of the Tomales Bay region's critical coastal areas is provided below. Figure 5 illustrates the ASBS locations and watershed boundaries.

TOMALES BAY WATERSHED

Tomales Bay CCA

The Tomales Bay watershed comprises an area of approximately 220 square miles and has two main tributaries – Lagunitas Creek and Walker Creek. Tomales Bay, a shallow coastal estuary that opens at the southern end of Bodega Bay, is one of the major estuaries on the Pacific Coast of California, supporting abundant wildlife. The bay is approximately 12 miles long and less than one mile wide with an average depth of less than 20 feet (Tomales Bay Watershed Council, July 2003) and a surface area of approximately 11 square miles (Regional Water Quality Control Board, March 2004). Tomales Bay also is a geologic feature of high significance as it delineates the north, northwest trending San Andreas Fault Zone (California Department of Water Resources, February 27, 2007), and the bay is a rift valley formed by the fault (U.S. Department of Commerce, National Marine Sanctuary Program, October 2006).

Tomales Bay supports a diversity of intertidal, subtidal , benthic and wetland habitats, including coho salmon habitat, as further discussed below in section 2-8. Tomales Bay is one of four commercial oyster-growing areas in the state. Marin County has the second largest mariculture industry in the

TOMALES BAY IS A ...

STATE-DESIGNATED ECOLOGICAL RESERVE

PART OF GOLDEN GATE BIOSPHERE RESERVE

WESTERN HEMISPHERE SHOREBIRD RESERVE NETWORK
WETLAND OF REGIONAL IMPORTANCE

UNESCO "WETLAND OF INTERNATIONAL IMPORTANCE"

PART OF THE ONLY NATIONAL SEASHORE
ON THE WEST COAST (ONE OF TEN IN THE US)

CALIFORNIA COASTAL COMMISSION "SPECIAL RESOURCE AREA"

Photo: Greg Filbrandt

state, which consists primarily of Tomales Bay and Drakes Estero. Pacific herring runs in Tomales Bay support a small commercial fishery. The bay also is used recreationally for hiking, boating, camping, picnicking, clamming, fishing and bird watching.

Coastal upwelling of the California current, which is the primary oceanographic influence in Tomales Bay, provides cool seawater with elevated nutrient levels and high primary productivity. The influence of coastal upwelling is greatest in the outer bay, which receives the greatest flushing from tidal exchange. Tidal exchange transports nutrients that are brought up by coastal upwelling. This upwelling is episodic, dependent upon the northerly winds, and tends to be strongest between April and September, a period that coincides with the period of the minimum freshwater flow in the dry summer (Tomales Bay Watershed Council, July 2003).

The Tomales Bay watershed has two main tributaries: Walker and Lagunitas Creeks, and approximately 20 intermittent streams that enter the bay from the eastern and western shores. Lagunitas Creek and its tributaries comprise approximately 52% of the watershed drainage, and the Walker Creek watershed covers approximately 35% of the Tomales Bay watershed. Drainage from the east and west shores account for the remaining 13% of the watershed area (Fisher et. al. 1996).

Water flow in the watershed affects the habitats of the bay and its tributaries. Approximately 67% of freshwater inflow to Tomales Bay comes from the Lagunitas Creek watershed and about 25% from the Walker Creek watershed (Fisher et. al. 1996). It had been estimated that MMWD has diverted approximately 25-40%[1] of these flows for municipal water supplies. At least one of these estimates was made prior to the State Water Resource Control Board's (SWRCB's) Order for MMWD in 1995. According to the MMWD, while diversions were higher prior to the State Order, over the last 10 years, MMWD's diversions (and evaporation) have totaled about 27,400 AFA from Lagunitas and Walker Creeks and reservoir's surfaces (MMWD, email communication). Thus, MMWD operations lower Lagunitas Creek flow to Tomales Bay by about 27% and decreases total freshwater flow to the bay by about 14% (Ibid.). The volume of freshwater inflow to Tomales Bay has been further reduced by other tributary diversions (e.g., dams, water impoundments, irrigation systems, etc). Low freshwater flows can affect the bay by concentrating pollutants, thus diminishing water quality, and by degrading spawning and rearing habitat for salmonids and Pacific herring. Freshwater inflow reduces the bay's salinity, and provides cleansing action by removing pollutants, organic detritus and bottom sediments, which drain into the bay from the lands above (Tomales Bay Watershed Council, July 2003).

Lagunitas Creek CCA

Comprising 103 square miles, the Lagunitas Creek watershed is the largest drainage to Tomales Bay. Lagunitas Creek originates on the north slope of Mt. Tamalpais and flows in a northwesterly direction for about 25 miles before discharging into Tomales Bay. Lagunitas Creek is fed by six main tributaries: Olema, Nicasio, San Geronimo, Bear Valley, Devil's Gulch and Cheda Creeks. Olema Creek is the largest tributary in the Lagunitas Creek watershed flowing for nine miles along the San Andreas Fault Zone before it flows into Lagunitas Creek near the confluence with Tomales Bay. Much of the stream

[1] Marin County LCP, 1981 (25%) and Tomales Bay Watershed Council (40%).

flow in mainstem Lagunitas Creek is regulated by dams and collected into various reservoirs upstream of the San Geronimo confluence, with Olema and San Geronimo creeks being the largest uncontrolled tributaries (Tomales Bay Watershed Council, July 2003). Figure 5 illustrates major streams.

Plant communities within the watershed include coast redwood forest, mixed evergreen forest, oak woodland, non-native grassland, northern coastal scrub, coastal riparian forest, chaparral, freshwater marsh, and coastal salt marsh. The mainstem Lagunitas Creek, through Samuel Taylor State Park and several tributaries have areas of dense redwood growth and cool water year round. Several groves of old growth redwoods are retained in state and county parks and an area of serpentine soils above Woodacre and San Geronimo supports a stand of Sargent cypress trees as well as other uncommon plants. Olema Marsh at the confluence of Olema Creek, Bear Creek, and Lagunitas Creek is one of the largest freshwater marshes in Marin County (Prunuske Chatham, Inc., August 2005).

The Lagunitas Creek watershed supports a mix of land uses: agricultural, residential, recreational and water supply. A large part of the Lagunitas Creek watershed is owned by public agencies, including the National Park Service (largest landowner), State Department of Parks, MMWD (second largest landowner), and the Marin County Open Space District.

The upper part of the watershed is owned and managed by MMWD for water supply. MMWD has five reservoirs in the watershed—four on mainstem Lagunitas Creek and Nicasio Reservoir on Nicasio Creek—that provide water supplies to communities in Marin County. These reservoirs have been constructed and enlarged over the last century. Much of the Lagunitas Creek watershed is preserved as open space and managed for water supply, habitat, and public use by the MMWD.

The Lagunitas Creek watershed is of statewide significance for coho salmon and California freshwater shrimp, as well as steelhead trout, as further discussed in section 2-8. Reservoirs in the watershed have had a significant impact on terrestrial and aquatic habitats, resulting in blockage of anadromous fish passage to spawning and rearing habitat, altered streamflows, and prevention of bedload transport from the upper reaches of the watershed (Tomales Bay Watershed Council, July 2003). The watershed has been the focus of salmonid restoration efforts for over twenty years as further discussed below in section 2-8. The Lagunitas Creek watershed also has reported occurrences of California freshwater shrimp, northern spotted owl, and California-red legged frog (Prunuske Chatham, Inc., August 2005).

Walker Creek CCA

Elevations in the 76-square mile Walker Creek watershed ranges from 1,500 feet to sea level, where the creek empties into Tomales Bay just south of its mouth. Walker Creek flows from southeast to northwest with four major tributaries. Steep hills enclose a narrow alluvial valley along Walker Creek, Salmon Creek, and lower Arroyo Sausal and Chileno Creek (Prunuske Chatham, Inc., August 2005). The watershed contains a 220-acre natural lake, Laguna Lake, at the top of Chileno Valley. Soulajule Reservoir, constructed in 1968 in Arroyo Sausal and enlarged in 1980, is managed by the MMWD.

The watershed is composed of four main subwatersheds that have distinct physical characteristics. These include Chileno Creek, which flows through Chileno Valley; Arroyo Sausal and Salmon Creek, which flow through Hicks Valley; and Keyes Creek, which flows through the low hills east of the community of Tomales. The Arroyo Sausal, Salmon Creek, and Chileno Creek subwatersheds consist of steep, partially wooded hills surrounding narrow valleys while Keyes Creek flows through gentle, grassy hills. The upper watershed contains extensive areas of coast live oak forest. Mainstem Walker Creek contains areas of thick riparian forest, some of which are contiguous to upland forest. (Prunuske Chatham, Inc., August 2005).

Photo by Greg Filbrandt

Laguna Lake is used extensively for migrating and breeding waterfowl. Wetlands at the mouth of Walker Creek are also important habitat for waterfowl. The Walker Creek grasslands are used by raptors, and restored riparian corridors in Chileno Valley attract a variety of neotropical songbirds species, including warblers, vireos, flycatchers, and thrushes. Walker Creek is a protected habitat for coho salmon, although the salmonid fishery within the Walker Creek watershed has been degraded over the last century. It does support a steelhead population as discussed further in section 2-8. The California Department of Fish and Game (CDFG) recently reintroduced coho on an experimental basis). Steelhead trout, California freshwater shrimp, California red-legged frog, yellow-legged frog, Tomales roach, tidewater goby, and northwestern pond turtle have been observed in the watershed, as well as some special status plants (Prunuske Chatham, Inc., August 2005).

Land uses within the Walker Creek watershed are primarily grazing and agriculture. Ninety-five percent of the Walker Creek watershed is in private ownership. MMWD owns land around Soulajule Reservoir, and the Marin County Office of Education operates the Walker Creek Ranch as an outdoor education facility (Prunuske Chatham, Inc., August 2005).

Intensive land use practices, in conjunction with highly erosive soils and heavy winter rainfall events have led to extensive landscape changes and ecosystem degradation in the Walker Creek watershed, although periods of incision and aggradation are a natural process in the Walker Creek watershed. Stream channels in the upper watershed, including Arroyo Sausal, Salmon Creek and the main stem of Walker Creek, have downcut dramatically since the 1800s, leaving old stream terraces high above the stream channel. Channel development and incision has led to loss of productive rangeland, lowering of the water table, and increased sediment loads in the system. The increased sediment loads

have caused channel aggradation in the low gradient portions of the watershed and loss of channel form throughout the system (siltation of pools and riffles) (Prunuske Chatham, Inc., August 2005).

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

The state-designated "Areas of Special Biological Significance" (ASBS) were intended to afford special protection to marine life through prohibition of waste discharges within these areas. As of January 2005, ASBS areas were redesignated as a subset of "State Water Quality Protection Areas" (SWQPAs) that require special protection. Section 36700(f) of the Public Resources Code defines a state water quality protection area as "a nonterrestrial marine or estuarine area designated to protect marine species or biological communities from an undesirable alteration of natural water quality, including but not limited to, areas of special biological significance."

The four ASBS areas within the study area are located entirely within the PRNS, except for the southern portion of Duxbury Reef. PRNS, part of the Golden Gate Biosphere Reserve, protects more than 80 miles of coastline to the north of the San Francisco Bay. This coastline area has been recognized as one of the most highly productive and ecologically diverse eastern Pacific areas. The nearshore waters off Point Reyes and Drakes Bay provide important feeding habitat for multiple Central Valley Chinook runs. Figure 5 illustrates the ASBS locations and watershed boundaries.

All of the ASBS areas are within the Gulf of Farallones National Marine Sanctuary. GFNMS is characterized by the widest continental shelf on the West Coast, which reaches a width of 32 nautical miles (U.S. Department of Commerce, National Marine Sanctuary Program, October 2006).

ASBS No. 11: Duxbury Reef Reserve and Extension

The Duxbury Reef ASBS is located on the southern tip of the Point Reyes peninsula near the community of Bolinas. The ASBS area extends south from the mouth of Arroyo Hondo Creek to the southern extent of a wavecut bedrock bench which creates the reef. The watershed covers approximately 5 square miles (3,089 acres), and the ASBS includes 3.8 miles of coastline. The ASBS watershed includes Alder Creek and Jack's Creek (which each drain portions of the Bolinas Mesa), Arroyo Hondo, and numerous intermittent streams. The ASBS area includes approximately 3.8 miles of shoreline, which is split in ownership between the National Park Service (Arroyo Hondo South to Poplar Road) and private lands on the Bolinas Mesa. The Duxbury Reef State Marine Conservation Area and Extension, managed by the California Department of Fish and Game, and extends offshore for a distance of 1,000 feet.

Duxbury Reef is the largest shale reef in California (State Water Resources Control Board, 1979). Depths are primarily shallow, approximately 30 feet at 0.5 miles from shore, and 60 feet at 1 mile from shore. A narrow beach at the base of the cliffs provides limited sandy subtidal habitat mixed with large smoothed boulders. The cliffs are unstable and also subject to wave erosion.

THE TOMALES BAY PLAN AREA

THE PLAN AREA COVERS 220 SQUARE MILES

TOMALES BAY IS
11 SQUARE MILES, 12 MILES LONG, 1 MILE WIDE
20 FEET DEEP

THE PLAN AREA CONTAINS
2 MAIN TRIBUTARIES (LAGUNITAS AND WALKER CREEKS)
20 INTERMITTENT STREAMS

Graphic: Emily Shepard

ASBS No. 12: Point Reyes Headland Reserve and Extension

The Point Reyes Headlands ASBS is located at the tip of the Point Reyes Peninsula. The ASBS watershed area includes approximately 1,260 acres. The Point Reyes Headlands ASBS includes 4.8 miles of coastline, managed by the USNPS, and extends 2,000 feet offshore from the mainland. The ASBS also includes the CDFG designated Point Reyes Headlands State Marine Conservation Area ,extending offshore for a distance of 1,000 feet.

The physical characteristics are strongly influenced by the San Andreas Fault that marks the eastern boundary of the PRNS and is adjacent to the Point Reyes peninsula. The Headland cliffs rise approximately 500 feet above small pocket beaches and rocky headlands. Under high tide or swell conditions, waves break at the base of the cliffs, resulting in bluff erosion. The ASBS watershed area covers 284 acres. There are no perennial streams emptying into the ASBS. Thirteen natural gullies, located in the coastal cliffs, drain into the ASBS.

Much of cliff area has been invaded by iceplant, a non-native invasive species. The USNPS initiated a 3-year project in 2002 to restore ecological integrity of a rare coastal bluff scrub plant community with removal of non-native invasive species, resulting in restoration of 100.5 acres of coastal bluff habitat and removal of iceplant from approximately 35 acres of cliffside habitat.

ASBS No. 13: Double Point

The Double Point ASBS consists of 86 acres approximately 2.5 miles north of Duxbury Reef Reserve and Extension ASBS. The ASBS has two points jutting into Drakes Bay and a concave beach between these two points, known as Bolsa Beach. It is between these two points that freshwater from the only lake in the Double Point watershed, Pelican Lake, enters Bolsa Beach. From the creek outlet there are approximately 3,700 feet of northern shoreline; and the southern shoreline has approximately 1,900 feet. The total watershed area is 179 acres. The Double Point ASBS includes 0.7 miles of coastline managed by the National Park Service.

Double Point is located in the sandstones of the Monterey Formation. The topography in the area is strongly influenced by massive landslides which occurred approximately 10,000 years ago. Scientists believe these slides are still occurring (State Water Resources Control Board, May 1979). The Double Point watershed and surrounding area is a series of hills and valleys with natural lakes occupying the depressions. Pelican Lake is one of these lakes with its outflow creek flowing to Bolsa Beach. The toes of these landslides have been eroded by ocean waves, creating high cliffs (approximately 420 feet) between North and South Point. Due to the steep cliffs the beach is inaccessible to hikers (State Water Resources Control Board, May 1979).

ASBS No. 14: Bird Rock

The Bird Rock ASBS is located just to the southwest of Tomales Point in PRNS, and encompasses 72 acres and 0.3 miles of coastline. The ASBS area surrounds a large sea stack island called Bird Rock and the surrounding smaller rocky pinnacles and reefs. The perimeter of this ASBS extends 1,000 feet

in all directions from the principal rocks and includes some 90 feet of mainland coastline. The Bird Rock ASBS is located approximately 1,000 feet offshore of the Tomales Point peninsula.

Bird Rock and the surrounding pinnacles and reefs are all composed of granite. The portion of the ASBS area extending towards Tomales Point includes the sandy beach along the shoreline.

2-4 LAND USE

The Tomales Bay region is a rural area with low human population density. Primary land uses include:

- Residential uses with limited commercial development within unincorporated communities,
- Agricultural uses,
- Mariculture and commercial fisheries, and
- Parks, recreation and open space uses.

Other notable land uses include the U.S. Coast Guard facilities in Point Reyes Station. This facility is part of the Coast Guard Communications Area Master Station Pacific (CAMSPAC), which provides communication services throughout the Pacific, in addition to weather warnings and safety information to commercial and recreational vessels. The 37-acre property consists of 36 family housing units and offices for staff.

About 70% of the approximately 140,000 acres in the Tomales Bay watershed is privately owned and the remainder is publicly owned (Tomales Bay Watershed Council, July 2003). Undeveloped public lands occupy the majority of the northwestern watershed. Figure 7 illustrates existing land uses in the region. Figure 8 identifies publicly owned lands, including watershed lands owned by the water districts.

Historical land uses also included logging and mercury mining. Logging and the production of paper began in the Lagunitas Creek watershed in the 1850s, and in 1856, Samuel P. Taylor built the west's first paper mill on mainstem Lagunitas Creek near Devil's Gulch. This mill operated 24 hours a day until it closed in 1893. Logging continued in the Olema Creek Watershed until 1962. In addition to the significant watershed effects associated with large-scale logging, major fires have burned portions of the watershed several times (Tomales Bay Watershed Council, July 2003).

Mercury mining occurred at seven locations within the watershed between about 1940 and 1970, although the majority of the mining in the watershed took place between 1968 and 1971. Although mercury mining no longer occurs in the watershed, mercury contamination in downstream reaches of Walker Creek continues to be a problem as further discussed below in subsection 2-7. Additional resource extraction activities included gravel and sand mining from the streambed at the confluence of Lagunitas and Nicasio Creeks until a short time after Nicasio Dam was constructed in 1960. Ranchers regularly harvested small amounts of streambed gravel to maintain ranch roads through the 1980s (Tomales Bay Watershed Council, July 2003).

The Tomales Bay area is part of the "West Marin" planning area of Marin County's Countywide Plan (Marin County Community Development Department, May 2007). The West Marin area also includes Stinson Beach, Muir Beach and lands to the north and west of the Tomales Bay region. The Draft Countywide Plan for the area seeks to: encourage agricultural and maricultural uses, avoid large-scale development, maintain village character of towns, allow only small scale tourist facilities, and designate lands outside community plan areas for agricultural uses. Additionally, the County has adopted area plans for the Bolinas, Inverness, Point Reyes Station, and San Geronimo Valley areas within the region.

The lands adjacent to Tomales Bay and the Pacific Ocean are within the coastal zone pursuant to the California Coastal Act. Marin County's Local Coastal Program (LCP) includes the following Tomales Bay region communities in the Tomales Bay ICWMP planning area: Olema, Point Reyes Station, Inverness, Dillon Beach and Oceana Marin, Marshall, Tomales, and Bolinas. Originally certified by the California Coastal Commission in 1981, the LCP for the area is currently being updated.

RESIDENTIAL LAND USE & POPULATION

West Marin has been a long-time target for urban development, primarily due to its proximity to the San Francisco Bay Area. In 1964, the West Marin Preliminary Master Plan envisioned a population of 66,330 in West Marin, although the population in the area at the time was 2,271. During four years of rezoning (from 1972 to 1975) the number of potential building sites in the watershed was reduced from 1.2 million to 3,000. A large proportion of the Tomales Bay watershed is currently zoned A-60 zoned, with a 60-acre minimum parcel size for agricultural lands (Tomales Bay Watershed Council, July 2003).

Twelve small unincorporated towns comprise approximately 10% of the Tomales Bay watershed. The watershed region also supports the community of Bolinas in the southern portion of the region. On the shores of the bay there are a number of private homes in addition to visitor-serving commercial operations that include hotels and bed and breakfasts, a resort, oyster farms, kayaking businesses, boat works, and restaurants (Tomales Bay Watershed Council, July 2003). Point Reyes Station has been recognized as the commercial center in the region (Marin County, 1981).

The residential communities in the Tomales Bay watershed include: Inverness, Inverness Park, developments at Paradise Ranch Estates and Bear Valley, and Marshall along the periphery of the bay; Olema, along Olema Creek; Woodacre, San Geronimo, Forest Knolls, and Lagunitas along San Geronimo Creek; Nicasio on Nicasio Creek; and Point Reyes Station near the mouth of Lagunitas Creek. In the northern part of the watershed are the towns of Tomales and Dillon Beach, which includes Lawson's Landing- a commercial facility with approximately 233 full-time trailers and 1,000 additional camping sites and hook-ups (Tomales Bay Watershed Council, July 2003).

The twelve small towns within the Tomales Bay watershed have a combined residential population of approximately 11,000 (Tomales Bay Watershed Council, July 2003), and the community of Bolinas supports approximately 1,300 permanent residents. According to the U.S. 2000 Census data compiled by the County of Marin, the Point Reyes Station-Inverness Park is the largest community with 1,894

residents (counted as one community because they share a zip code), followed by Lagunitas-Forest Knolls (1,835 residents), Woodacre (1,393 residents), and Bolinas (1,246 residents) (County of Marin website, http://demographics.marin.org/). Approximately 19% of the West Marin population is Latino, and the median age is approximately 44 years old. Population in the unincorporated portion of Marin County (including, but not limited to the Tomales Bay region) is projected to increase by 10.3% in the next 25 years for a total of 7,161 additional residents throughout the unincorporated area (Nichols Berman, January 2007).

The small rural community of Bolinas in the southern portion of the region includes an approximate-300 acre area west of the town known as the "Gridded Mesa." This area was subdivided in the 1920s into approximately 5,300 small lots (2,000 square feet) and sold as part of a newspaper subscription promotion. The vast majority of these lots have since been consolidated into larger single property sites with approximately 350 developed properties on the Mesa. The subdivision consists of a grid pattern superimposed over a former dairy farm without regard to drainage patterns, slope, bluff erosion or other natural features. Only a few streets are paved and over the years some roads have eroded into the ocean and others have been abandoned. The Mesa accounts for about two-thirds of the total dwelling units in Bolinas, each of which are served by on-site sewage disposal systems (Marin County, November 1984). A moratorium on new connections to the municipal water supply imposed in 1971 because of the limited nature of the raw water supply has been an impediment to development in this area since that time.

AGRICULTURE

Agricultural uses, primarily dairy farms and grazing, have been predominant in the region since the 1800s. Dairy and grazing uses account for almost 55% of the total watershed acreage (Regional Water Quality Control Board, San Francisco Bay Region, March 2004). The number of dairies have decreased over time (Ibid.). Currently, there are ten producing dairies in the watershed located on private and public lands. The rest of the rangeland is used for beef, sheep, and replacement heifers.

Land use in the Walker Creek watershed has been almost exclusively agricultural. A majority of the lands within the watersheds of Walker Creek and the small streams on the east shore of Tomales Bay are used for land-extensive livestock agriculture. Agricultural use makes up a lesser part of the Lagunitas Creek watershed, which has a large component of public land and more densely wooded areas. Within the Lagunitas Creek watershed, the main agricultural areas are within the Nicasio Reservoir watershed, and in the Golden Gate National Recreation Area on the western side of Olema Creek and from Platform Bridge to Cheda Ranch. Ranching, on both private lands and on land leased from the USNPS, continues in the Olema and Nicasio Valleys, and in lower Lagunitas. Approximately 18,000 acres of PRNS lands are managed for grazing under Special Use Permit authority within the ICWMP planning area.

Agriculture in Marin County is very much a family business and most farms and ranches are owned and operated by families or a partnership of family members. Many ranches have been handed down within the same family for generations. Marin County's agricultural landscape has always been comprised of a mosaic of many different types of agricultural products and operations. Animal

agriculture has long provided the foundation of Marin's agricultural industry with smaller vegetable, fruit, and flower farms, vineyards, and silage and hay fields. Animal products produced in the County include dairy products, beef, sheep, poultry and eggs, and aquacultural products such as oysters, mussels and clams. Although animal agriculture, particularly dairying, continues to produce a majority of the agricultural revenue in the County, increasingly, specialty products such as olive oil, range fed eggs, organic products, locally grown and handmade products such as farmstead cheeses and specialty meats such as grass fed beef supplement traditional farm income. Marin County's farmers and ranchers also produce poultry and eggs, lamb, wool, hay, silage, nursery crops, fruits, nuts, and vegetables. Marin is a leader in organic agriculture as one of the first Counties in the State to offer organic certification through the Agricultural Commissioner's office.

Local producers and support agencies have mounted a concerted effort over the past several years to encourage product diversification as a means to increase overall farm and ranch profitability. Diversification of farm and ranch products and services provides opportunities for producers to increase income, spread "risk" between varied crops or enterprises and to take advantage of special attributes of their operation. In recent years, vineyard development has spread into the eastern edge of the watershed.

MARICULTURE

Oyster farming is the primary focus of mariculture on Tomales Bay, which had its origins in the region in the early 1900s. Mariculture leases are administered by the California Department of Fish and Game (CDFG), and the safety and quality of harvested products are monitored by the California Department of Health Services (DHS). Currently, six leasees hold twelve leases totaling 513 acres; of this total approximately 135 acres are actually footprinted by mariculture operations (Tomales Bay Watershed Council, July 2003).

Tomales is one of only four estuaries in California to be legally certified by the DHS as suitable for commercial oyster farming. Other mariculture species include Manila clams and mussels. In the 1990s, attempts to farm-raise abalone in the bay were unsuccessful, and currently abalone is not a permitted species on any of the mariculture leases (Tomales Bay Watershed Council, July 2003).

The shellfish growing areas of Tomales Bay have been given conditional approval by DHS due to concerns over microbial contamination. The purpose of the conditionally approved classification is to provide a mechanism for the declaration of harvest closures during periods when the growing areas do not meet National Shellfish Sanitation Program (NSSP) standards for harvesting shellfish for direct marketing for human consumption. In Tomales Bay, periods when harvesting shellfish are suspended, typically occur during significant rainfall events (0.4 inches to 0.6 inches) within a 24-hour period. In the winter months, harvest and sales of shellfish can be restricted for prolonged periods.

COMMERCIAL AND RECREATIONAL FISHERIES

Tomales Bay supports both commercial and recreational fishery operations. The primary commercial fishery in Tomales Bay is Pacific herring, an oceanic fish related to the sardine, which groups into large schools in the winter and migrates to spawn in the bay. This fishery began in the 1870s as San Francisco's herring populations were already being depleted, and currently is almost exclusively for the Japanese herring roe market. After a three-year closure by CDFG in the late 1980s, fisheries managers have established quotas based on a combination of the previous year's spawning biomass and the current year's estimated abundance; quotas are approximately 15% of the spawning biomass estimate with a 20% maximum. Since the 1989-1990 closure of the fishery, catches have been within these ranges. Lesser commercial fisheries in Tomales Bay include halibut, perch and live-bait. (Tomales Bay Watershed Council, July 2003).

The recreational halibut fishery attracts the largest number of anglers to Tomales Bay; peaking during the summer months; over 200 boats/day have been counted while other anglers fish from the shoreline. Horseneck (gaper) clamming draws thousands of recreational users out onto the bay's northern shoals during extreme low tides. Washington clams, the smaller Pacific littlenecks, and the non-native manilas are also taken. CDFG has speculated on the apparent declines in the populations of these smaller clams, citing the influences of agricultural runoff, septic material, sediments, and above-average rainfall (Tomales Bay Watershed Council, July 2003). Other recreational fisheries in the bay include Dungeness and rock crabs, jacksmelt, perch, sole, striped bass, sturgeon, sharks and rays. In the late 1990s, tissue samples from some of the most commonly taken species were analyzed for toxins and in 2000, the Marin County Department of Health and Human Services (MCDHHS) issued a health advisory and recommended consumption levels for sport-caught halibut, perch, smelt, sharks, and rays because of detected mercury levels (Tomales Bay Watershed Council, July 2003).

Tomales Bay once supported large coho salmon and steelhead trout fisheries. State and Federal Endangered Species Act (ESA) guidelines have completely closed these fisheries (except for the catch and release of steelhead in the tidal reach of Walker Creek). Fishing on all tributaries of the watershed is now restricted to the waters upstream of the six major MMWD water impoundments (Tomales Bay Watershed Council, July 2003).

PARKS, RECREATION AND OPEN SPACE USES

Western Marin County has been a long-time favorite recreational destination, especially for San Francisco and other Bay Area residents. Major parks include: the PRNS, Golden Gate National Recreational Area, Samuel P. Taylor State Park, Tomales Bay State Park, and several County and local parks (Agate Beach, Chicken Ranch Beach, Whitehouse Pool, Miller Park), as shown on Figure 8. The PRNS and Tomales Bay State Park, together include approximately 80 miles of shoreline in Marin County north of Bolinas, and provide most of the public access and recreational opportunities available in the watershed. Public lands with shoreline access to Tomales Bay include: PRNS; Tomales Bay State Park including Tomasini Point, Millerton Point and lands adjacent to Cypress Grove; Tomales Bay Ecological Reserve; and county parks Whitehouse Pool, Chicken Ranch Beach, and Miller Park.

The Tomales Bay watershed offers opportunities for a wide variety of recreational activities in area parks and at numerous private facilities. Recreational uses include hiking, camping, kayaking, bird watching, swimming, boating, fishing, clamming, hunting, gathering, bicycling and horseback riding. Visitation to this area has increased significantly in the last several decades, and approximately 2 to 2.5 million visitors come to this area annually (Tomales Bay Watershed Council, July 2003).

Photo by Greg Filbrandt

Non-agricultural open space in the Tomales Bay watershed can be found mostly within the Lagunitas Creek watershed area. Approximately 40% of the Lagunitas Creek watershed is publicly-owned open space, including: 91,575 acres are managed by the National Park Service; 17,000 acres that are owned by MMWD; the 2,010 acre Samuel P. Taylor State Park; six properties owned by the Marin County Open Space District, totaling approximately 2,040 acres; and a 42-acre wildlife preserve on Olema Marsh owned by Audubon Canyon Ranch. In the Walker Creek watershed, non-agricultural open space lands include 2,750 acres owned by MMWD; the 1,740-acre Walker Creek Ranch owned by Marin County Office of Education; and 20 acres at the confluence of Walker Creek and Keyes Creek owned by the CDFG (Tomales Bay Watershed Council, July 2003).

All National Park System lands are within the Point Reyes National Seashore Management Area, and the PRNS manages the north district lands of GGNRA through a Memorandum of Understanding (MOU). The USNPS is currently updating its *General Management Plan*, which was adopted in 1980. A General Management Plan is a strategic planning document that outlines the future management of a National Park Service site for the next 15 to 20 years. The plan will set the basic philosophy and broad guidance for management decisions that affect the park's resources and the visitor's experience.

2-5 WATER SOURCES, SUPPLIES AND DEMAND

Surface water, groundwater, and springs provide domestic water supply in the Tomales Bay region. MMWD and NMWD provide water to portions of the Tomales Bay area, but most of their service area is located outside the Tomales region, Bolinas and Inverness are served by small community water systems (BCPUD and IPUD). Wells, farm ponds, and springs provide water for rural residences and agricultural operations not served by the four area water districts. This section summarizes:

- Water District Water Sources and Supplies
- Water District Demand and Supply Constraints
- Water Supplies in Areas Outside of Water District Service Areas

- Groundwater Resources
- Global Climate Change Implications

WATER DISTRICT SOURCES AND SUPPLIES

Marin Municipal Water District

The MMWD, the first municipal water district in California, covers approximately 147 square miles and serves a population of approximately 190,000, mostly in the populous eastern corridor of Marin County (excluding Novato). The MMWD supplies water to residential and agricultural water users in both west and east Marin County. The MMWD service area in the region is shown on Figure 2 in Chapter 1.

The District's primary water source is from surface sources. As previously indicated, approximately 70% of MMWD's water supplies originate in the Lagunitas Creek watershed where streamflow is collected into a series of reservoirs. The remaining supplies are obtained from imported Russian River water (approximately 10-30%) and the Las Gallinas recycling facility (3%). Following the 1970s drought, MMWD expanded its water conservation programs, added more surface water storage, developed its recycled water program, and improved supplies with the ability to import water from the Sonoma County Water Agency (SCWA) from the Russian River.

SURFACE SUPPLIES. The MMWD has five reservoirs within the Lagunitas Creek watershed and one in the Walker Creek watershed. MMWD diversions of water from the Lagunitas Creek basin are regulated by the State Water Resources Control Board (SWRBC). In 1995 the SWRCB issued Order WR95-17, which establishes minimum instream flow requirements and other measures to protect fishery resources in Lagunitas Creek that were impacted as a result of the District's raising of Peters Dam in 1982, which increased the storage capacity of Kent Lake. Instream flows are subject to augmentation via reservoir releases depending on gauged discharges in the lower reach of creek. The provisions of the Order WR95-17 are included in Appendix J.

In compliance with the SWRCB order, MMWD has developed and is implementing the *Lagunitas Creek Sediment and Riparian Management Plan*, which is further described below in section 2-8. In establishing this order, the SWRCB also noted that due to the limited water availability in the Lagunitas Creek watershed, the need for water to serve municipal and domestic uses must also be considered. The total volume allowed to be diverted to storage and use is about 86,000 acre-feet per year (AFY), and MMWD releases an average of 13,000 AFY to Lagunitas Creek and Arroyo Sausal (Walker Creek) (Nichols Berman, January 2007).

IMPORTED WATER: MMWD has contracted with the SCWA since 1975 for supplemental water, the primary source of which is the Russian River. Under the existing agreement, which expires in 2034, MMWD can take deliveries of up to 14,300 acre-feet per year throughout the year with seasonal maximum limitations on water delivery rates. SCWA deliveries to the MMWD are subject to available pipeline capacity in facilities owned by SCWA and the NMWD. The existing delivery system is not able to deliver to MMWD more than the current level (approximately 8,000 acre-feet).

RECYCLED WATER SUPPLIES: The MMWD recycled water system, in operation since 1981, consists of 25 miles of pipeline, 1.7 MG of storage, and four pump stations, and provides an average of 650 acre-feet per year to 323 service connections. Irrigation remains the primary recycled water user (95%), but MMWD has pioneered non-traditional uses of recycled water (i.e., retrofit of Marin County Jail toilets, car washes, HVAC cooling towers, and one commercial laundry). There are few additional large-scale users of recycled water and severe saltwater intrusion into sewer collection systems limits expansion due to increased treatment costs.

DESALINATION PILOT PLANT: A pilot study was conducted in 1990, but an updated study was conducted in 2005-2006 in order to explore changes in desalination treatment processes, site variables, and bay water quality. Based on data and findings, a concept-level plan will be developed for a 10-15 mgd facility. An EIR is being completed for the full-scale desalination plant and is anticipated to be completed in 2007.

GROUNDWATER: Groundwater supplies are limited and MMWD studies have not identified groundwater as a viable source.

CONSERVATION: Following the drought of the 1970s, water conservation programs were expanded, and by 1987 MMWD water demand had returned to pre-drought levels. With improved supplies, requests for mandatory water use reductions were reduced during the drought of the late 1980s and early 1990s. Despite increased population and water service connections since 1970, water use in 2004 was essentially the same as use in 1970. MMWD is committed to exploring water conservation potential as fully as possible, and is currently engaged in development of a revitalized and aggressive demand management program. A water rationing plan has been developed. Future water supply planning includes mandatory rationing of no more than 25% with a frequency of once in 60+ years; water waste prohibitions, and emergency response planning.

WATER SUPPLY OPTIONS: In 1990, MMWD embarked on a series of water supply studies and plans, and considered two options for augmenting MMWD's water supply: a 10,000 acre-feet per year desalination plant and construction of an 8-mile pipeline from near Petaluma to Novato (Sonoma-Marin Transmission Line) to convey SCWA's Russian River to MMWD's conveyance and distribution system. MMWD's 1992 Integrated Water Resources Management Program (IWRMP) calls for water conservation, increased water recycling and phased implementation of new supply projects. At that time, the District's supply alternative choice was construction of the pipeline project to convey SCWA water. However, concerns arose in the mid-1990s regarding the reliability of future increased water deliveries to MMWD due to SCWA delivery system impairments and deficiencies, as well as legal challenges against SCWA's Water Supply Transmission System Project. These developments led the MMWD Board in 2000 to reconsider desalination as the best alternative for a reliable water supply to meet current and projected needs.

North Marin Water District

The NWMD was formed in 1948 to provide water to Novato and surrounding areas, and has provided service to the Tomales Bay area since 1971. The NMWD service area in the region is shown on Figure 2

in Chapter 1. The two NMWD service areas (Novato and West Marin) have separate sources of supply and are not interconnected. The NMWD also provides wastewater collection and treatment for the Oceana Marin residential area near Dillon Beach in the northern portion of the Tomales Bay region.

Water supply to the Novato service area is provided from two prime sources: 1) imported water from SCWA (Russian River System) that supplies 80% of the total water to the Novato area; and 2) a local reservoir (Stafford Lake, located outside of the Tomales Bay region), which provides approximately 20% of the total water supply in the Novato area. Additionally, the District is working with the Novato Sanitary District on a joint recycled Water Project which will be on line in April 2007.

West Marin Point Reyes Service Area. NWMD provides water service to approximately 1,800 residents in West Marin in the Tomales Bay watershed via approximately 750 service connections. The Point Reyes service area covers approximately 24 square miles, and includes Point Reyes Station, Olema, Bear Valley, Inverness Park, Paradise Ranch Estates. Service is provided from NMWD's Point Reyes water system, which was acquired by the NMWD in 1971. NMWD's West Marin supply also serves the PRNS Headquarters, the U.S. Coast Guard Housing Facility in Point Reyes Station, and two West Marin dairies.

Water supplies for West Marin are obtained mainly from two wells, which are on Coast Guard property (with a total 550 gpm pumping capacity) with a smaller amount transferred from NMWD;s Novato service area via MMWD in very dry years. The two wells (known as the Coast Guard wells) are in the tidal reach of Lagunitas Creek about 50 feet north of the creek. The wells are screened in a gravel formation between depths of 20 to 60 feet, but the site and Lagunitas Valley are not within a Department of Water Resources (DWR) defined groundwater basin (per DWR Bulletin 118). (Figure 5 shows the groundwater basins in the region.) Water supply is dependent primarily on the amount of water flowing in the creek, and water pumped from these wells is considered subsurface stream flow by the SWRCB (October 1995). The NWMD well production in 2004 was 363 AFY, slightly down from 372 AFY in 2001. The 2004 annual withdrawal represents approximately less than one percent of the total flow from Lagunitas Creek (Nichols Berman, January 2007).

Since the Coast Guard wells are located within the tidal reach and within the flood zone of Lagunitas Creek, they are subject to tidal saline intrusion (from Tomales Bay) and dissolved contaminants from the creek. This results in occasional increased and excessive chloride and sodium concentrations in drinking water. Until 1997, the impacts of tidal influence was blocked by annual installation of a seasonal gravel dam on downstream private property (Giacomini). As part of SWRCB Decision WR95-17, installation of the dam was discontinued beginning in 1997 in an effort to protect anadromous fish passage. Without construction of the gravel dam, the District's wells are susceptible to saltwater intrusion which detrimentally affects domestic water supplies. NMWD has implemented an off-tide pumping plan that continuously monitors salinity levels and avoids pumping during high tide and low creek flow conditions. If salinity levels increase, the wells are periodically shut off before and after high tide conditions. Public notices are issued in local newspapers when sodium levels exceed secondary drinking water standards. The wells have never exceeded primary drinking water standards (NMWD, email communication).

In 1995, the State Water Resources Control Board (SWRCB) issued Order WR 95-17 directing NMWD to find an alternative water supply during the summer months (July through October) of dry years. NMWD has an Intertie Agreement with MMWD (through 2034) in which water can be released by MMWD into Lagunitas Creek from Kent Lake in exchange for an equal amount delivered to MMWD from NMWD's Novato water system (from the Russian River imported water supply) to satisfy the SWRCB requirement. Although NMWD has adequate water in east Marin, it does not have a pipeline to transport water to west Marin. The agreement provides for a maximum of 250 acre-feet of water to be exchanged annually (about 0.8% of MMWD's total water production). Additionally NMWD acquired a 0.67 cfs senior water right from the Giacomini Ranch and has a recently approved agreement from the SWRCB to change the place and purpose of use from irrigation on Giacomini Ranch to municipal supply in the West Marin service area.

NMWD has developed an emergency well adjacent to Lagunitas Creek at the Gallagher Ranch, upstream of any possible tide water (salt water) influences of Tomales Bay. It is located about 2 miles upstream of the Coast Guard wells and treatment plant. District plans call for development of another well on this site with construction of an approximate 2-mile distribution pipe to connect to the District's water treatment plant. This would provide a reliable second source of supply to meet summer water demands during high tide occurrences and peak month demands. It would also serve as an emergency source of water during those times when the Coast Guard Wells may be inundated by flood waters in Lagunitas Creek.

NMWD's West Marin service area and neighboring Inverness Public Utility District (IPUD) have an emergency water agreement that allows for the transfer of water between the two district's water systems through an intertie in the event of an emergency. During a water supply availability or distribution catastrophe, up to 40 gpm of water can be sent from either the NMWD or IPUD water systems to the other on a temporary basis. The emergency agreement is not intended to provide for a sustainable water supply during drought or for any portion of regular customer demand (Nichols Berman, January 2007).

Bolinas Community Public Utility District

BCPUD provides service to about 1,500-2,000 people in the community of Bolinas with approximately 590 active connections. The full-time population within BCPUD's service area is approximately 1,500, however the local population increases on weekends during the summer and on holidays due to popular recreational and visitor destinations in the area. The BCPUD service area in the region is shown on Figure 2 in Chapter 1.

Surface supplies from Arroyo Hondo (from springs and runoff from upland lakes) and two unnamed streams that feed Woodrat #1 and Woodrat #2 reservoirs northwest of Bolinas provide the water source for BCPUD. Water rights permits limit diversion rates. The water rights permits for Arroyo Hondo allow diversion of up to .268 cubic feet per second (cfs) (approximately 100 gpm). The water rights permits for Woodrats #1 and #2 allow diversion of up to 56 acre-feet annually. At Arroyo Hondo, water is diverted from a small dam and flows by gravity to the Woodrat treatment facility. Surface water from Arroyo Hondo (the primary water supply) is diverted throughout the year to the extent that it is available, except during periods of heavy precipitation when the surface diversion

facilities are shut off because of the high turbidity in the creek. At Woodrat #1, water is pumped to the Woodrat treatment facility. At Woodrat #2, water is pumped to the Woodrat #1 reservoir.

The Arroyo Hondo watershed is within a heavily forested, steeply sloped area within the Point Reyes National Seashore; there are no uses or developed trails in the watershed (except for BCPUD unpaved service road) and hiker access is limited. The Woodrat watershed is partially owned by BCPUD (about 56 acres) and the National Park Service (about 100 acres). The watershed is surrounded by pasture land, but there are no grazing uses within the watershed.

Inverness Public Utility District

IPUD supplies the town of Inverness, serving approximately 700 residents. The 2.2-square mile service area accommodates 501 connections (all are active except for four, and all are single-family residential except 18 public and commercial connections). Total connections at buildout are estimated at 525. The IPUD service area in the region is shown on Figure 2 in Chapter 1.

The IPUD watershed covers approximately 580 acres; approximately 80% is owned by the State of California (Tomales Bay State Park) and IPUD. Privately owned lands have limited development potential. Uses within the watershed area are mostly limited to low-intensity day hiking, and controlled road access for maintenance. There are no agricultural, mining, or timber harvesting activities in the watershed. No chemical vegetative or invertebrate control procedures (herbicides or pesticides) are used in the watershed. Erosion control measures are in place on IPUD access roads.

Water sources for IPUD are primarily surface supplies with a small amount from groundwater. IPUD obtains its primary water supply from a series of eight surface water diversions (High Intakes) on IPUD-owned land; IPUD has pre-1914 prescriptive water rights at these diversions. IPUD also has three low-yield wells (classified as groundwater under the influence of surface water) and two permitted stream diversions (Low Intakes) at lower elevations. Stream flows are sufficient except during relatively dry months; flows can be marginal from August through October, at which time water is obtained from the 3 wells and 2 Low Intakes (approximately 57,600 gpd).

WATER DISTRICTS' DEMAND AND SUPPLY CONSTRAINTS

Table 2-1 summarizes existing and projected future water demand for the water districts over a 25+-year planning horizon based on future demand projections developed as part of the recently released *Marin Countywide Plan Draft EIR* (Nichols Berman, January 2007). These projections take water supplier plans into account and include domestic, business, institutional, and irrigation demands, as well as overall system losses. All water suppliers face water supply availability/reliability constraints regarding supplies for future demand and/or adequate supplies during seasonal periods.

Marin Municipal Water District

The overall annual operational yield of MMWD's supplies is 29,300 acre-feet (Marin Municipal Water District, January 18, 2006). MMWD's service area population is projected to increase from 190,800 in 2005 to 212,256 in 2030, which represents approximately one-half percent per year (Marin Municipal

Water District, January 2006). Future demand is estimated at 38,720 AFY in the year 2030. According to information provided by MMWD, gross per capita water demand is 136 gallons per capita per day (gpcd), which includes commercial and industrial uses. Average residential water demand is 89 gpcd and average single-family residential demand is approximately 96 gpcd.

TABLE 2-1
EXISTING AND FUTURE WATER DEMAND (AFY)

	MMWD	NMWD (Point Reyes Service Area	BCPUD	IPUD
2005	30,000	347	165	95
2010	32,500	385	165	96
2015	33,600	423	165	97
2020	34,200	462	165	98
2025	34700	485*	165	99
2030		485*	165	100

SOURCE: Marin Municipal Water District (January 2006), Nichols Berman, January 2007, and North Marin Water District (*)

Overall, MMWD's present supply and storage capacity are insufficient to meet demand in a prolonged drought and long-term supply deficits have been projected. MMWD's imported water supply allotment is potentially limited due to limited conveyance pipeline capacity shared with other agencies. Other potential limitations and constraints to MMWD water supplies include water rights limitation of creeks that supply the reservoirs and associated environmental concerns downstream of the reservoirs (Nichols Berman, January 2007).

MMWD is investigating several options to augment supply and/or reduce use, including construction of a desalination facility, review of potential expansion of imported water, and limited expansion of recycled water supplies. However, legal and environmental impacts and challenges to SCWA supplies may delay or reduce availability of future imported water increases (Ibid.). MMWD's implementation of other water management options (i.e., increases in customer efficiency, leak detection and repair, and public outreach, education, and incentive programs) could partially offset future water supply deficits according to the District's *Urban Water Management Plan*.

North Marin Water District - Point Reyes Service Area

The overall annual operational yield of NMWD's Point Reyes Service Area (PRSA) supplies is 505 acre-feet (NMWD, email communication). NMWD estimates an increase in demand from a current level of approximately 350-370 AFY to approximately 485 AFY at buildout.

The primary constraints and limitations to NMWD's PRSA are water quality and quantity limitations and water rights limitations on Lagunitas Creeks. The PRSA water supply is adequate to accommodate buildout as presently projected during normal years. During dry years, water is limited during the summer months. During flood periods the supply is subject to temporary interruptions. Water treatment capacity is limited during some periods of the year due to water quality issues (saltwater intrusion potential into the existing wells). The NMWD has plans to develop the Gallagher well system and construct an approximate 2-mile pipeline to connect to the existing Point Reyes distribution system to provide a reliable second source of supply during peak-month demands, when existing well quality may be impaired or system threatened by saline intrusion or flood conditions, and for buildout. As discussed in the next section, NMWD's treatment plant requires treatment upgrades and expansion of capacity to meet existing summer and future buildout demand.

Bolinas Community Public Utility District

No additional future development/water demand is anticipated within the BCPUD service area. A moratorium on new connections has been in effect since 1971 due to the limited available water supply. However, BCPUD is relatively isolated with no existing interties to other water systems. The Arroyo Hondo watershed and facilities are vulnerable to periodic flooding and sedimentation due to slope failures and landslides, and all facilities are subject to seismic hazards. Additionally, water treatment and distribution pipeline improvements are needed as further discussed below in section 2-6.

Inverness Public Utility District

The overall annual operational yield of IPUD's supplies is 125 acre-feet (Inverness Public Utility District, email communication). The community of Inverness is nearly built out and future growth is constrained by the surrounding PRNS and Tomales Bay State Park. A slight increase in water demand is projected for IPUD (approximately 6 AFY). Historically, the high demand period tends to be on weekends with demand leveling off on the weekdays, due in part to presence of summer and vacation homes that are not occupied year-round. However, with the advent of automatic landscape irrigation, higher demand through the summer and fall tends to be more constant. According to information provided by IPUD, per capita water demand is approximately 120 gallons per capita per day (gpcd),

IPUD's water supply system is subject to interruption during times of flooding and vulnerable during drought and seismic conditions and to damage from potential landslides in the watershed. As discussed in the next section, IPUD needs to develop additional treated water storage capacity. IPUD has indicated that it may be able to optimize demand through water conservation measures, such as: residential and commercial water surveys; system water audits; public information programs; school education programs; and conservation pricing. If grant funds become available, IPUD would institute a residential plumbing retrofit program, a program for large landscapes, and rebates for washing machines and ultra-low flow toilets.

WATER SUPPLIES OUTSIDE WATER DISTRICT SERVICE AREAS

Domestic Supplies

In addition to the water suppliers identified above, there are also a number of small public water systems serving specific uses in the region, which primarily are from wells. Dillon Beach is served by two private water companies that have a combined capacity of 10,000 gallons per day from seven groundwater wells and a permitted stream diversion on a tributary to the Estero de San Antonio (Clearwater Hydrology, August 2000).

Wells and springs provide water for rural residences and agricultural operations. Small wells, springs and a couple of cisterns serve Marshall, on the east shore of the bay. Spring-based systems are often susceptible to severe capacity drops during extended drought periods. Further discussion of wells is provided below under the "GROUNDWATER RESOURCES" subsection.

There are several landowners adjacent to Lagunitas Creek who divert relatively small quantities of water for domestic use under claim of riparian right. There are also a number of appropriative water rights to divert relatively small quantities of water from Lagunitas Creek or its tributaries under permits issued by the SWRCB (California State Water Resources Control Board, October 1995).

Agricultural Supplies

Agricultural uses are primarily ranching for livestock production and dairying, including irrigated pasture, with some production of irrigated specialty crops. Water supply sources for ranch and dairy operations include wells and springs for domestic use and stock watering supply, and surface water stock ponds. According to the MRCD, water supplies for livestock and dairy operations come from on-farm reservoirs, wells, springs, and, in very limited areas, from water districts. Row crop irrigation water is supplied by wells, riparian water rights, and on-farm reservoirs.

According to the MRCD, row crop farms are few and generally small (under 20 acres with a few exceptions), but increasingly, such operations are being developed on livestock ranches to add diversity to farm income. Lack of a reliable water supply is a factor limiting intensive (irrigated) agriculture in Marin County (Nichols Berman, January 2007). The major area of irrigation (over 300 acres of pasture) formerly occurred at the southern end of Tomales Bay, and is based on surface water rights to Lagunitas Creek (Ibid.). However, agricultural uses have been discontinued at this site as part of the Giacomini Wetland Restoration Project.

A reliable and secure agricultural water supply was an issue raised at the TBWC TAC during preparation of the ICWMP. Implementation of grazing and agricultural BMPs to improve/protect water quality, such as fencing off creeks, often requires that an alternative water source be developed. The extent of the problem is unknown. Table 2-2 summarizes potential alternative water suppliers for agricultural users.

TABLE 2-2
EXISTING AND POTENTIAL AGRICULTURAL WATER SOURCES

Source	Geographical Locations	Constraints	Permits Needed
Well water	Limited areas have good potential for wells	▪ Geology in most of Marin County limits potential well output to 10 gpm or less ▪ Small areas may have adequate groundwater for small-scale irrigation	Well permit from County
Riparian water	Throughout County where there are perennial streams	Highly complex - environmental restrictions, especially in fish-bearing streams, limit practical use of riparian water	Various
Dams/reservoirs	Exist throughout the County, mostly on livestock ranches. Constructing new dams is probably not possible because the State Water Board is not issuing Water Rights Permits	Dams constructed in canyons, streams or drainage ways require acquisition/perfection of water rights from the State Water Board Resources Control Board, which are extremely difficult to obtain, time-consuming (at least 5 years) and costly	Water Rights permit from State Water Board and County dam permit; possibly Army Corps and DFG permits
Rainfall catchment ponds	Could be constructed on any site with appropriate topography, preferably not steep	▪ Need adequate soil and watershed; level to gently rolling terrain preferable ▪ Should be constructed to hold 1.5 to 2 times the volume needed for irrigation to account for evaporation and other losses ▪ Dams must be under the size that triggers state dam safety size limits	May require a County grading permit. Agricultural grading permit exemption may be granted.
Treated wastewater	Tomales – secondary treatment	▪ Allowed by organic certification but is controversial for row crops; public perception may prevent use ▪ Development of a distribution system could be very costly ▪ Could be used for irrigated pasture in areas adjacent to treatment plants	Discharge permit from State

SOURCE: Lisa Bush (unpublished)

GROUNDWATER RESOURCES

The Tomales Bay watershed and region are not included within State-designated groundwater basins, except for a small area in the northeastern corner of the region near Dillon Beach. In this location, the Sand Point Area basin is located just south of the town of Dillon Beach. The adjacent Wilson Grove Formation Highlands extends from the area near Dillon Beach eastward into Sonoma County (see Figure 5).

The Sand Point Area groundwater basin is a small, coastal basin located just south of the town of Dillon Beach and is bounded to the west, south and southwest by Tomales Bay. The basin's northern

boundary lies just south of Dillon Beach and adjoins the Wilson Grove Formation Highlands basin. This groundwater basin covers approximately 140 square miles in Marin and Sonoma Counties and is bound by rugged coastal mountains on the north and south, by the Pacific Ocean on the west, and by the Santa Rosa Valley on the east (USGS, 2006). There is no published hydrologic information for these basins.

In general, groundwater conditions in the County have not been well documented. The bulk of unserved areas are underlain by poorly permeable rock with limited storage capacity. A 1972 regional study generally estimated well yields in unserved areas as ranging from 0.1 to 10 gallons per minute (gpm). Except for the Pt. Reyes peninsula and Bolinas Point, only small pockets of alluvial valleys are projected to yield in excess of 10 gpm, a few of which are located in Lagunitas Valley, such as the NMWD Pt. Reyes wells that have a much higher yield of approximately 250-300 gpm (Clearwater Hydrology, August 2000). Background reports for the Marin County General Plan Update recommends exploring the possibility of having the USGS conduct a regional groundwater study of the Tomales Bay watershed, including the Walker, Lagunitas and Olema Creek watersheds (Ibid.).

There are 464 private wells in the Tomales Bay region based on information from the Marin County Planning Department (Nicols Berman, January 2007). These include wells in the areas of Nicasio (252), Tomales (100), Marshall (85), and Inverness Park (27). Approximately 7% are classified as irrigation wells (Ibid.). Wells also serve developed properties outside of the boundaries of the BCPUD; specifically, along Olema-Bolinas Road, Horseshoe Hill Road, portions of Mesa Road and several properties on Rafael and Marin Ways.

A focused review of well construction and pumping rates for approximately 60 wells in the Tomales areas was conducted as part of the Marin Countywide Plan EIR process. The review reveals that wells are screened in fractured sandstone of the Franciscan Complex with yields ranging between two and 30 gpm. The results indicated that fractured bedrock can provide only a limited water supply to rural communities (Nichols Berman, January 2007). Installation of private wells for domestic and/or groundwater resources could affect groundwater resources, and supply availability is not known (Ibid.). Marin County's *Draft Countywide Plan Update* has several proposed groundwater programs, including conducting a groundwater availability study in the Tomales Bay watershed and requiring documentation of effects of development projects on groundwater basins and/or surface flows (Marin County Community Development Agency, May 2007).

GLOBAL CLIMATE CHANGE IMPLICATIONS

Recent reports released by the State of California indicate that climate change could have profound impacts on California's water supply and usage. In the recent report prepared by the California Climate Change Center, "Our Changing Climate: Assessing the Risks to California" (2006), the State's top scientists consider global warming to be a very serious issue requiring changes in resource, water supply, and public health management. According to Governor Schwarzenegger's website on global warming, California's water supply has already been affected by climate change, and models indicate that continued climate change could produce even more extensive economic and environmental consequences as the problem escalates. In the future, more extreme seasons, varying patterns of water

runoff and precipitation, and raising sea levels will create challenges for water management and supply.

According to the Department of Water Resources, climate change could affect California's water resources in the following ways: a 25 percent decrease in the Sierra snow pack by 2050; more variant weather patterns causing severe winter and spring flooding and longer, drier droughts; increased pressure on levees and dams as they are forced to manage unprecedented levels of high water during peak events. Rising sea levels will threaten coastal communities, including houses, businesses, and parks, as well as fishery habitat and aquaculture operations. Some reports project a 3-foot minimum rise in sea level by 2100. These rising sea levels, caused primarily by melting glaciers, could ultimately erode 59 miles of area beaches, cliffs and coastal wetlands. Additionally, as hydroelectric energy becomes less reliable due to fluctuating water availability, energy costs could rise affecting the cost of providing domestic water (i.e.: treatment, pumping, and distribution).

Photo by Greg Filbrandt

The State of California's website describes the importance of enabling the development of new and innovative technologies, enhancing institutional flexibility, providing financial support, and changing the cultural norms of water usage as important first steps in creating a culture to overcome the water-usage challenges presented by climate change. The Department of Water Resources cited several possible solutions to overcome the consequences of climate change, including increased water storage, developing alternative energy sources, large scale water conservation and possibly water-metering and restoration of wetlands and deltas. Because climate change causes more severe winters and longer, drier droughts, new groundwater and surface water storage solutions are paramount for consistent water availability.

In addition to effects on water supplies, warmer temperatures, more severe droughts and floods, and sea level rise could have a wide range of impacts to the Tomales Bay region. Sea level rises could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, and saltwater contamination of drinking water. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding. The fragile environment of Tomales Bay could be at risk from increased flooding and the upstream movement of saltwater from the bay. All these stresses can also pose risks to terrestrial and aquatic ecosystems, and important economic resources such as agriculture, forestry, and fisheries.

Most water management plans and studies have not fully accounted for changes in climate variability, which could significantly affect water availability. Water resources are affected by changes in precipitation as well as by temperature, humidity, wind, and sunshine. Changes in streamflow tend to magnify changes in precipitation. The seasonal pattern of runoff into reservoirs could be susceptible to climatic warming. Winter runoff most likely would increase, while spring and summer runoff would decrease. This shift would be problematic, because existing reservoirs and storage tanks are not large enough to store the increased winter flows for release in the summer and fall. Increased winter flows to the Tomales Bay could increase the risk of flooding.

Further complicating the issue of climate change is the high level of complexity and uncertainty associated with modeling and predicting climate behavior. While it is clear that damage resulting from weather-related events is already on the rise, it is not known whether future changes will be gradual or abrupt nor is the full spectrum of impacts clearly understood (Marin County Community Development Agency, May 2007).

In 2006, the California Legislature passed AB 32, which will become part of the State Health and Safety Code. This legislation requires the State Air Resources Board (ARB) to develop statewide emissions limits for greenhouse gases and emissions reduction measures to meet these limits. The legislation further notes that while national and international actions are necessary to fully address the issue of global warming, but action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act. The legislation directs the State ARB to coordinate with State agencies, and consult with the Public Utilities Commission and other community, industry, and environmental organizations in the development of emissions reduction measures, including limits on emissions of greenhouse gases applied to electricity and natural gas providers regulated by the Public Utilities Commission. Additionally, the County of Marin has prepared a "Greenhouse Gas Reduction Plan" (October 2006), and in its Countywide Plan Update process has proposed policies to coordinate with water and agencies in planning for climate change as well talking it into account in countywide planning decisions.

2-6 MAJOR WATER-RELATED INFRASTRUCTURE

WATER DISTRICTS

Marin Municipal Water District

The MMWD owns and operates seven reservoirs and two water treatment plants within the Tomales Bay region, as well as additional facilities outside the region. System-wide MMWD operates four water treatment plants, 98 active pump stations, approximately 900 miles of distribution and transmission pipelines, and 140 water storage tanks in service at 117 tank sites (Marin Municipal Water District, June 2006).

Six MMWD reservoirs are in Tomales Bay watershed area: Walker Creek (Soulajule Reservoir for emergency use) and Lagunitas Creek (4 reservoirs on Lagunitas Creek and Nicasio Reservoir on Nicasio Creek). The upper Lagunitas Creek watershed is owned and managed by MMWD. There are two MMWD water treatment plants in the region; one within the San Geronimo Valley and another near the Bon Tempe Reservoir. Key facilities within the Tomales Bay region are shown on Figure 9.

Lagunitas Lake, the first of these reservoirs, was constructed in 1872 and was the first interurban transfer of water in Marin County. The development of Lagunitas Lake was followed by Alpine Lake in 1919, and by Bon Tempe in 1949. Peters Dam, built in 1954 to form Kent Lake, was raised 45 feet in 1982, nearly doubling reservoir capacity from 16,600 acre feet to 33,000 acre feet. Nicasio Reservoir was constructed in 1960. Soulajule Reservoir was constructed in 1968 in Arroyo Sausal and enlarged in 1980.

The total reservoir capacity within Lagunitas Creek is approximately 69,000 acre-feet with the majority of this storage within the Kent Reservoir). The storage capacity of Soulajule Reservoir is documented at 10,572 acre-feet. Nicasio and Soulajule Reservoirs provide 40 percent of MMWD's storage capacity and 15 percent of their annual supply. Reservoir capacity (in acre-feet) is summarized below (from MMWD website- http://www.marinwater.org/controller?action=menuclick&id=223):

- Lagunitas Lake: 350 AF
- Alpine Lake 8,891 AF
- Bon Tempe Reservoir: 4,017 AF
- Kent Lake: 32,895 AF
- Nicasio Reservoir: 22,430 AF
- Soulajule Reservoir: 10,572 AF

Two of MMWD's water treatment facilities are located within the Tomales Bay planning area, both of which are conventional process surface water treatment facilities that receive water diverted from the District's reservoir system. The San Geronimo Plant has a rated capacity of 35 million gallons per day (mgd) through its actual production is limited to less than 28 mgd by distribution system restrictions. The Bon Tempe Plant has a rated capacity of 20 mgd (Marin Municipal Water District, June 2006).

Planned capital improvements within the Tomales Bay region as identified in MMWD's "Long Range Capital Program (2006-2015)" (Marin Municipal Water District, June 2006) include:

- Kent Lake Pump Replacement;
- Installation of a new section of raw water pipeline between Kent Lake and the Inkwells area at the junction of San Geronimo and Lagunitas Creeks;
- Improvements to the Fairfax Transmission Line Storage Tank that will improve the efficiency of the San Geronimo booster pump station, the District's largest pump station;
- Replace the Soualjule Pump Station diesel fuel storage tank with a tank that meets current fuel storage regulations;
- Replace and upsize the old, undersized electrical transformer at the San Geronimo Pump Station;
- Process Control / Reservoir Level Measuring Equipment Replacement.

North Marin Water District

NMWD West Marin facilities include a water treatment facility and 13 storage tanks, ranging in size from 10,000-300,000 gallons. Three tank replacements and other tank and pump station upgrades have been completed since 2002. NMWD has a 6-inch intertie with IPUD, constructed in 1982 to provide an emergency water supply to IPUD of up to 40 gallons per minute, which can also be used to provide back-up supply to the Inverness Park area served by NMWD. Location of key facilities are shown on Figure 9.

The existing treatment system treats mainly for iron and manganese, which at times exceed US EPA "Maximum Contaminant Level" in its raw water supply (prior to treatment. Iron and manganese levels at the Coast Guard Wells are not considered to be a health threat. During periods of high flow, manganese treatment is not optimal, resulting in reduced water quality. Treatment capacity is strained during summer months with increased potential for water shortages. Additional filtration capacity is required to provide redundant back-up service to reduce the possibility of a supply interruption during summer months.

NMWD treatment facility requires treatment upgrades (for manganese and chlorides) and expansion of capacity to meet existing summer and future buildout demand. Other identified system improvements include a storage tank replacements at Inverness Park and Paradise Ranch Estates in the next fiscal year.

Bolinas Community Public Utility District

BCPUD water infrastructure includes: diversion facilities; treatment plant (microfiltration); Mesa Road treated water storage tanks (860,000 gallon combined capacity); and distribution line. Location of key facilities are shown on Figure 9.

All treatment works are consolidated at Woodrat Water Treatment Plan ("WTP"), northwest of the service area. With the exception of five connections to the west of the Woodrat WTP, which are served through a converted transmission main, all consumers are supplied potable water with a gravity feed line from the Mesa Road storage tanks near Woodrat WTP. Since 1996, both tanks have been rehabilitated. The Woodrat WTP employs a microfiltration process. Treatment facility improvements are planned to supplement production capacity and improve water quality (due to the periodic presence of certain chlorine disinfection byproducts in the treated water).

The Mesa Road storage tanks are located approximately 1/4 mile east of the Woodrat WTP and have a combined capacity of 860,000 gallons. Since the first Watershed Sanitary Survey report in 1996, both tanks have been rehabilitated. The east tank was rebuilt in 1998, with the top ring and roof being replaced with new steel. The west tank needed only minor remedial work.

Water is conveyed by gravity from the Mesa Road Storage Tanks to the service area via a 10-inch asbestos-cement pipeline. Water is conveyed to five connections west of the Woodrat WTP through a 5-inch pipeline.

Planned facility improvements in addition to the treatment facility improvements identified above include:

- Pre-applications to State DHS for three water treatment improvements, including but not limited to technology to eliminate the district's ongoing chlorine disinfection byproduct exceedenances.
- Expansion of raw water storage capacity.
- Replacement of distribution pipeline system from treated water storage tanks to community.
- Woodrat #1 reed removal and treatment plant intake line upgrade; Woodrat #2 reed removal and road improvements.
- Installation of a fifth filter to supplement current water treatment capability.
- Evaluation of potential improvements to the upper Arroyo Hondo raw water catchment and diversion facility.

Inverness Public Utility District

IPUD owns and operates two treatment plants. The main treatment plant, F1, operates year-round; the other plant, F3, operates on an as-needed basis, usually only during the summer and early fall high-demand season. Both plants provide filtration using microfilament membrane package units and disinfection by means of chlorination. The water from the High Intakes is piped to F1 and F3 for treatment and distributed through a series of mains to water storage tanks. Location of key facilities are shown on Figure 9.

Treated water storage is provided in ten storage tanks: two steel and eight redwood treated water storage tanks at four sites with a combined total capacity of 325,000 gallons. The major components of the tank storage system (IPUD has no reservoirs or other raw water holding facilities) are mostly in excellent condition. However, two aging tanks (10,000 gallons each) have been taken out of service, resulting in reduced and limited storage capacity. Plans are being developed to replace four storage tanks, which would increase storage by 64,000 gallons. A new tank site on a proposed subdivision would add 100,000 gallons for a total of 489,000 gallons.

Distribution is provided by an almost exclusively gravity flow pipeline network. The distribution system has few trouble spots. Approximately 50% of the mains have been replaced since 1981, and a substantial portion of the remaining mains were installed in the late 1960s and in the 1970s.

Planned facility improvements include:

- Expand treated water storage facilities; plans to replace 4 existing tanks in progress.
- Replace approximately 500 linear feet of distribution pipeline.
- Develop a comprehensive asset management program to provide long-term planning through systematic analysis of maintenance data and infrastructure condition in order to achieve a sustainable infrastructure with the lowest overall cost.
- Upgrade water treatment plants to reduce the formation of disinfection byproducts and to keep pace with technological advances. Consider ways of capturing water from washing and clarifying systems.

STORMWATER INFRASTRUCTURE AND FLOOD CONTROL

Stormwater Infrastructure and Management

Municipal stormwater management within unincorporated communities within the Tomales Bay watershed is primarily accomplished through ditches and limited storm drains without any inlet management or treatment. Until recently, the stormwater system and water quality in West Marin had not been identified, and thus, stormwater impacts on water quality not been known. However, recent mapping and monitoring was undertaken as part of the ICWMP process. The storm drainage conditions were recently mapped for Point Reyes Station, Woodacre, and Bolinas (see Figures 10 through 12), and are currently being mapped for Tomales, San Geronimo Valley, and Inverness Ridge area.

The BCPUD assists landowners in maintaining non-county drainage channels and culverts in the Bolinas area. This District also has a drainage improvement plan that is implemented by homeowners with District staff resources as staffing and financial resources permit. The Bolinas Mesa area is drained by a network of drainageways which vary in size. The main watercourse is Alder Creek which runs along the center of the Mesa from east to west, emptying into the Pacific Ocean across Agate Beach (EDAW, Inc. and The Mesa Plan Resource Group, March 1985). Just before Alder Creek empties onto the beach, an unnamed tributary flows through a culvert and joins Alder Creek from the south.

ASBS Discharges

There are no known stormwater management facilities in the Bird Rock and Double Point ASBS watersheds. In the Point Reyes Headlands ASBS watershed, stormwater generally flows via sheet flow into rills and gullies before flowing down the Headland cliffs to the beach below.

Six of the ten discharges to Duxbury Reef ASBS are located within the rural residential portion of the Bolinas Mesa. Two of the discharges are located on property owned by Marin County, near the Agate Beach parking lot. One of these is a discharge from an unnamed tributary to Alder Creek which flows through a culvert before joining Alder Creek. The second discharge at this location is the trail leading from the Agate Beach parking lot to Duxbury Reef. The remaining four discharges are located on private property and discharge potential urban runoff from houses on the Bolinas mesa. Stormwater from Bolinas is regulated under the new Phase II MS4 General Permit which is implemented by the MCSTOPP (see discussion below).

Flood Management

FEMA-designated 100-year floodplains are limited in the Tomales Bay region (see Figure 13). The primary flood-prone area is Inverness, however, other areas in the region have been subject to periodic, localized flooding, including Woodacre and Bolinas. In Inverness, eleven creeks and streams originate along Inverness ridge and flow down the ridge under Sir Francis Drake Boulevard and enter Tomales Bay. Much of the damage in Inverness in 1982 was due to higher than normal rainfall throughout the season and a high intensity storm (Marin County Community Development Department, 1983).

San Geronimo Valley also has been subject to periodic flooding. San Geronimo Creek has changed its course frequently with each flood flow which caused it to overflow its banks. A majority of the stream has become deeply entrenched to a depth of 10 to 15 feet throughout and is mostly confined to its channel (Marin County, 1997). With succeeding storm runoff, the channel has entrenched itself deeper and wider. Efforts have been undertaken to build grade control structures to prevent the channel from deepening any further, but it has been difficult to stop banks from scouring, sloughing off, and being carried away (Ibid.). Increased impervious surfacing (roads and houses) increases runoff, which further impacts the creek (Ibid.). In addition, a network of fire roads extend throughout many of the slopes and along ridgetops. Many of them are improperly drained and maintained and are the source of erosion of steep canyon slopes. The annual maintenance of the creeks helps to prevent flooding and protects homes located along the creek (Ibid.). The San Geronimo Valley Area Plan recommends formation of a flood control district (Ibid.).

Flood capacity of culverts and stream channels has decreased due in part to infrequent maintenance due to budget and permit constraints, increasing flood risks. During flood periods water supply systems are subject to temporary interruptions for NMWD and IPUD. Severe storms in 1982 caused widespread flooding and landslides, primarily along the west side of Tomales Bay. The storms caused flooding of roads, as land debris obstructed or completely filled drainage ways.

The Marin County Flood Control and Water Conservation District was formed in 1955. In response to flood events occurring at different times the County has formed a total of eight flood zones in the county. Each zone has an "Advisory Board" of 5 or 7 residents, which are appointed by the Board of Supervisors. These Boards review Zone budgets and master plans and advise the Board on these matters. Inverness Flood Zone 10 is the only flood zone in the Tomales Bay watershed, and the only flood zone not located in a principally urban area, and was formed after the disastrous January 1982 storms. The Zone collects taxes to clear and maintain local creek channels free of debris and sediment. During the late 1980s, the Zone received Coastal Conservancy grant funding for creek maintenance in Haggarty Gulch and Fish Hatchery Creek. Figure 13 illustrates flood zones in the Tomales region.

2-7 WATER QUALITY

This section summarizes water quality concerns for: 1) the Tomales Bay watershed, including Lagunitas and Walker Creeks; and 2) the ASBS areas. As further discussed below, Tomales Bay, Lagunitas Creek and Walker Creek are federally listed as impaired water bodies. It should be noted that Bolinas is not located within the Tomales Bay watershed.

Concern about the water quality of Tomales Bay surfaced in the early 1960s when studies showed high fecal coliform counts in the winter months, and it was concluded that a mixture of rural and livestock non-point source pollution was the most likely source of high bacterial counts in the bay (Tomales Bay Watershed Council, 2003). Over the years, a number of agencies and organizations have sampled and monitored water quality within the region including the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), the California Department of Health Services (DHS),

USNPS, CDFG, the County of Marin, University of California Cooperative Extension (UCCE), and SPAWN.

In 2006, the TBWC, in conjunction with PRNS Association (PRNSA), received a Prop 50 implementation grant that will fund the first 3 years of a watershed-wide, long-term Water Quality Monitoring Program, and the Council is actively pursuing additional funding to sustain this program for a minimum of 10 years. The SFBRWQCB is currently investigating the impacts of mercury washed from the Gambonini Mine in the Walker Creek watershed into Tomales Bay. Other water quality monitoring programs that are currently being implemented or planned to be implemented include efforts by the SFBRQWCB, USNPS, SPAWN, TBWC and the County of Marin. Further description of existing monitoring programs is included in Chapter 9 of this plan, and a summary of historical water quality monitoring efforts is included in Appendix E. Key findings and results of these past and current efforts are summarized, where relevant, in the following section.

TOMALES BAY WATERSHED

Tomales Bay, Lagunitas Creek and Walker Creek are on the federal 303(d) list (Clean Water Act) of impaired waterbodies for pathogens (Tomales Bay and Lagunitas Creek), nutrients and sedimentation/siltation (Tomales Bay, Lagunitas Creek, and Walker Creek), and mercury (Walker Creek). Tomales Bay flows into a Marine Protected Area (Tomales Bay Ecological Reserve), and was also one of the original 25 Critical Coastal Areas identified in 1995 as an impaired water body. Tomales Bay receives Nonpoint Source (NPS) inputs from tributaries and runoff along the east and west shorelines. NPS inputs include runoff from animal waste (dairies and rangelands), failing septic systems, erosion of stream banks and unpaved roads, surface storm drainage, boating activities, and heavy metal pollutants from mines and marine facilities. Identified water quality impacts include seasonal closure of shellfish beds, high bacterial counts in several swimming areas along tributaries to the Bay, sedimentation of the estuary, and elevated mercury levels in fish. Other potential sources of NPS pollutants include the use of pesticides and herbicides on private lands adjacent to waterbodies, metals and other unknown parameters that may as more information becomes available regarding source areas affecting water quality.

The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), which includes Tomales Bay, is required to develop, adopt and implement a Water Quality Control Plan (Basin Plan) for the San Francisco Bay region. The beneficial uses described in the Basin Plan define the resources and goals to protect and achieve high water quality within the basin. The Basin Plan identified beneficial uses for affected streams and water bodies, which serves as the basis for establishing water quality objectives and discharge prohibitions to attain this goal. Beneficial uses are identified for all tributaries of a waterbody (including groundwaters, marshes, mudflats, and surface waters within a watershed).

Beneficial uses for the Tomales Bay watershed water bodies are summarized in Table 2-3, and the table from the Basin Plan that identifies beneficial uses for all identified tributaries is included in Appendix D.

If a waterbody exceeds the maximum allowable pollution level or fails to meet a recognized designated beneficial use, it is deemed "impaired" and a TMDL (Total Maximum Daily Load) must be developed to addresses the causes of impairment, sources of pollution, and necessary actions to restore the waterbody. To date, TMDLs have been developed for pathogens and mercury for Tomales Bay as further discussed below. The following subsections summarize conditions and issues related to the four identified constituents for which Tomales Bay, Lagunitas Creek, and Walker Creek are listed as impaired: pathogens, mercury, sediment and nutrients.

Pathogens

Tomales Bay and Lagunitas Creek are listed as impaired for pathogens. High fecal coliform levels have been found in Tomales Bay since studies began in1967. The bay has been listed as impaired due to pathogens for the following reasons:

- Tomales Bay is closed to shellfish harvesting for an estimated 90 days a year, therefore it is assumed that the standards set by the RWQCB (basin plan), DHS and U.S. Food and Drug Administration (FDA) are exceeded 90 days per year.
- Under the state's Shellfish Protection Act (California Water Code), Tomales Bay is considered "threatened" due to the shellfish harvesting closures listed above.
- DHS prohibits shellfish harvesting during periods of rainfall based upon the results of bacteriological studies. In 1997, closure rules for shellfish harvesting were made more stringent. Thus, the beneficial use of shellfish harvesting is not protected during the wet weather season.
- During periods without rainfall and when bacteriological objectives were met there was a major human illness outbreak of a virus of human origin from consumption of oysters. This fact shows that the beneficial uses of Tomales Bay were not protected even when water quality objectives were met.

Photo by Greg Filbrandt

The California Shellfish Protection Act of 1993 requires the RWQCB to form a technical advisory committee for any commercial shellfish growing area that is determined to be threatened. One criteria for formation is if a shellfish harvesting area is closed for more than thirty days in each of three consecutive years. Tomales Bay met this requirement. The Tomales Bay Shellfish Advisory Committee (TBSTAC) was formed in February 1994 and undertook a two-year investigation into non-point source pollution sources.

The portions of the bay most seriously affected by bacteria contamination resulting from rainfall and runoff are the inner bay, Millerton Point to the south, and the east side of the outer bay, inside the mouth including the Walker Creek Delta. Agricultural runoff in the watershed and on-site sewage disposal systems (OSDS) are considered significant sources of

pathogens to the bay, and municipal stormwater runoff and discharges associated with recreational boating are potential sources.

In 2004, the SFBRWQCB issued a TMDL Final Project Report for Pathogens in Tomales Bay that was adopted as a Basin Plan Amendment in September 2005. Sampling at 20 locations at the bay and within the watershed conducted as part of the RWQCB report confirmed findings of previous studies that rainfall-induced runoff has a deleterious effect on water quality of Tomales Bay. The fecal coliform concentrations for all sampling stations significantly exceeded the designated water quality objective for shellfish harvesting and in most cases exceeded the non-contact water recreation objective. The concentrations and loadings remained high during all rainfall events sampled in all watersheds (Regional Water Quality Control Board, San Francisco Bay Region, July 2005).

TABLE 2-3
BASIN PLAN BENEFICIAL USES

HUMAN CONSUMPTIVE USES

- Agricultural water supply (Lagunitas Creek);
- Municipal and Domestic Water Supply (Lagunitas Creek, Walker Creek, Kent Lake, Nicasio Reservoir, Nicasio Creek, Alpine Lake, Bon Tempe Lake, Lake Lagunitas);
- Freshwater Replenishment (Soulajule Reservoir, Nicasio Reservoir, Nicasio Creek);

AQUATIC LIFE

- Ocean, Commercial and Sport Fishing (Tomales Bay);
- Shellfish Harvesting (Tomales Bay);
- Cold freshwater habitat (Lagunitas Creek, Walker Creek);
- Marine Habitat (Tomales Bay);
- Fish migration (Tomales Bay, Lagunitas Creek, Walker Creek, Nicasio Creek, Olema Creek);
- Preservation of rare and endangered species (Tomales Bay, Lagunitas Creek, Walker Creek);
- Fish spawning (Tomales Bay, Lagunitas Creek and some tributaries and lakes, Walker Creek);
- Warm freshwater (Walker Creek, Soulajule Reservoir, Lagunitas Creek and some tributaries and lakes,

WILDLIFE

- Wildlife habitat (Tomales Bay, Lagunitas and Walker Creeks and some tributaries and lakes,

RECREATIONAL USES

- Water contact recreation--swimming, boating, etc. (Tomales Bay, Lagunitas Creek and some tributaries and lakes, Soulajule Reservoir and potentially Walter Creek);
- Non-water contact recreation--(hiking, bird-watching, picnicking (Tomales Bay, Lagunitas Creek and some tributaries and lakes, Soulajule Reservoir and potentially Walter Creek);

See Appendix D for full list.

SOURCE: "Water Quality Control Plan (Basin Plan) for the San Francisco Bay Area.

Results of water quality sampling conducted as part of the TMDL study found that in general, the Walker Creek and Chileno and Keyes Creeks subwatershed had the highest level of overall fecal coliform loadings, and the Lagunitas/Olema subwatersheds had a significant overall loading. Some high levels were detected in some eastside tributaries with the lowest loadings found in the areas along the west side of Tomales Bay. In 2001, the lower Walker Creek subwatershed contributed the highest one-time and highest overall fecal coliform loadings. The RWQCB concluded that runoff from dairies and livestock grazing is the primary source in the Chileno and Walker Creek subswatersheds, while failing septic systems, stormwater runoff, and runoff from equestrian facilities were most likely the major contributors in the San Geronimo Creek subwatershed, although currently there is no data to make a direct linkage. Although the number of dairy farms have decreased, it is possible that the remaining dairies, as well as the existing cattle ranches, hold a greater number of animals than in the past (Regional Water Quality Control Board, San Francisco Bay Region, July 2005). Approximately 11,000 cows are estimated in the watershed (Ibid.).

A water quality sampling project was conducted by UCCE between 2004 and 2005 at five sites, including Lagunitas and Walker Creeks. In general, the project estuaries received their highest concentrations of fecal coliforms and *E. coli* during storm flow conditions of winter and spring, except for Lagunitas Creek. Relative to the other study areas, Lagunitas Creek exhibited the highest bacteria counts during the dry season base flow conditions. This suggests that the source of bacteria for Lagunitas Creek during summer is not the result of a source that relies on precipitation and saturated soils to create overland flow conditions, but is instead a source of bacteria that is directly discharged into the creek. Alternatively, the tidal regime and high residence time of water in the lower portion of Tomales Bay and therein Lagunitas Creek may be concentrating bacteria. Extending the sampling network to sites further upstream may identify the point or non-point source of these bacteria given the likely proximity of this bacteria source to Lagunitas Creek. Further data analysis is being conducted (University of California, May 2007).

There are nine permitted sewage treatment systems in the Tomales Bay watershed that are regulated by the SFBRWQCB, namely: the Tomales Wastewater Treatment Plant, Marconi Conference Center, Borello Sewage Ponds, Skywalker Ranch, Olema Ranch Campgrounds, Samuel P. Taylor State Park, Blue Mountain, Spirit Rock and Walker Creek Ranch. These systems vary in their treatment methods, waste sources and capacities. The SFBRWQCB regulates all of these facilities through their waste discharge permitting system because of the size of the facility or the treatment methods used. Some of these facilities produce sewage onsite (e.g. Samuel P. Taylor State Park), while others receive waste from haulers (e.g. Borello Sewage Ponds).

TOMALES BAY PATHOGEN TMDL

The Pathogen TMDL contains numerical water quality targets for: 1) the Tomales Bay and its major tributaries; 2) water contact recreation; 3) a shellfish harvesting closure target of less than 30 days per year; and 4) zero discharge of human waste into the bay and tributaries. The numerical targets are based on fecal coliform bacteria concentrations aimed at protecting shellfish harvesting and contact and non-contact water recreation beneficial uses. Fecal coliforms are used as targets instead of total coliforms as they are a better indicator of fecal contamination and their use as an indicator is

consistent with how DHS regulates the shellfish growing industry. By requiring water quality in the entire bay to meet the shellfish harvesting fecal coliform objective, the less stringent objectives assigned to other beneficial uses (water contact and non-contact recreation) will also be met (SFBRWQCB, July 2005).The TMDL requires that the water quality of the entire bay (not just shellfish growing areas) be maintained to ensure a median of 14 MPN/100 mL of fecal coliform with no more than 10% of the samples in the bay exceeding 43 MPN/100 mL.

The TMDL numerical targets (desired future conditions for the Bay and its tributaries) are as follows:

1. Water Board's Basin Plan water quality objective (WQO) for Tomales Bay shellfish growing areas as presented in Table 2-4.
2. Water Board's Basin Plan WQO for water contact recreation for all the major tributaries to Tomales Bay; and
3. A zero discharge of human waste for the bay and its tributaries.

TABLE 2-4
PATHOGENS TMDL
Numeric Targets for Fecal Coliforms for Tomales Bay and Its Tributaries[b]

Water Body	Fecal Coliform
Tomales Bay (SHEL WQO)[c]	Median<14 (MPN[a]/100 mL) 90th percentile <43 (MPN/100 mL)
Tomales Bay Tributaries [c]	Log mean<200 (MPN/100 mL) 90th percentile <400 (MPN/100 mL)

[a]. Most Probable Number (MPN) is a statistical representation of the standard coliform test results.
[b]. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
[c]. All samples should be collected at the knee-high depth.
SOURCE: SFBRWQCB, July 2005

The TMDL identifies and sets density-based waste load allocations for nine pollutant sources in the watershed, including: onsite sewage disposal systems; small wastewater treatment facilities; boat discharges; grazing lands; dairies; equestrian facilities; municipal stormwater runoff; open space; and in-bay background (marine wildlife). The Pathogen TMDL includes trackable implementation measures for each source category.

- *On-site sewage disposal systems (OSDS)* are considered to be a significant source of pathogens. The Pathogen TMDL requires Marin County to submit a plan and implementation schedule to evaluate OSDS performance for the Tomales Bay watershed and to bring identified OSDS up to County's repair standards, which are expected to be submitted to the SFBRWQCB by January 2007.
- *Agricultural runoff* from cattle, dairy, sheep farms, equestrian facilities are considered to be significant sources of pathogens. Dairies and/or ranchers that own or lease grazing lands are required to submit Report of Waste Discharges to the SFBRWQCB by January 2009 that

provides a description of the facility, identification of necessary site-specific grazing management measures that will be needed to reduce animal waste runoff and an implementation schedule. Dairy facilities are required to comply with applicable Waiver of Waste Discharge Requirements (WDRs) for confined animal facilities or requirements specified in applicable individual WDRs. By January 2009, equestrian facilities will be required to file a Report of Waste Discharge that contains the same information required for grazing operations.

- *Municipal stormwater runoff* is suspected as being a potential source of pathogens in the watershed. The County of Marin Stormwater Pollution Prevention Program is required to submit a stormwater management plan that includes management measures to reduce pathogens in stormwater runoff, and a schedule for implementation of identified management measures, which will be submitted to the SFBRWQCB by January 2009.
- *Discharges associated with recreational boating* are considered to be potentially significant sources of pathogens. The SFBRWQCB will act as the lead agency, in coordination with interested stakeholders to determine the adequacy and/or need for on-shore restroom facilities and boater disposal/pumpout facilities and prepare a management plan and schedule for implementation by January 2009.
- *Small wastewater treatment facilities* are not considered to be significant sources, unless an accidental discharge occurs. The Pathogen TMDL requires that the SFBRWQCB shall inspect and evaluate all permitted WDR facilities and update WDRs as warranted. This effort is to be completed by January 2009.

Potential sources related to agricultural runoff, onsite sewage disposal, and municipal stormwater runoff are further described below.

PATHOGEN SOURCES

Agricultural Runoff. Since the early 1970s the California Department of Fish and Game (CDFG) has been involved with the dairy industry to assist in the promulgation of guidelines to reduce waste material from confined animal operations to enter streams. In response to dairy waste pond failures, CDFG found that soluble organics, principally ammonia, was a potentially significant pollutant because certain forms of ammonia can be extremely toxic to aquatic organisms. A monitoring program was conducted from 1991 through 2001. Data from 1998 through 2001 indicated that the water quality was very good: total ammonia and the toxic form of ammonia were both low. The results of the monitoring effort indicate that the adoption of best management practices have improved water quality downstream of dairy operations in the watershed.

The USNPS conducted fecal coliform testing from 1999 through 2001 in various locations throughout the watershed. The monitoring program included two wilderness watersheds and sites associated with grazed watersheds, and dairy operations. The mean concentration of the fecal coliform for the wilderness watershed were less than 200 FC MPN/100ml. In grazed watersheds, the simple mean ranges from approximately 1,000 to 46,000 FC MPN/100ml.

Since 1999, the Tomales Bay Agriculture Group (TBAG) with support from the UC Cooperative Extension (UCCE), NRCS and MRCD, has been working with agricultural interests in the watershed to monitor water quality and implement best management practices to protect water quality and reduce the discharge of pathogens from grazing and confined animal facilities. Over the y ears, the MRCD received federal, state and local funding to work with ranchers in the watershed to implement conservation practices on farms to improve and protect water quality.

The University of California's "Tomales Bay Water Quality Project" conducted storm runoff sampling on cooperating Bay ranches during the 1999-2000, 2000-2001, and 2001-2002 winters. The project was developed and implemented to determine whether there was a science-based link between coliform inputs to the Bay and agricultural practices, and if so, to identify animal waste management practices or modifications could be modified to reduce pollutant loading to bay waters.

The results indicate that fecal coliform loading in control watersheds is less than loading in watersheds with active animal agriculture operations, which illustrates the link between pollutant inputs to Tomales Bay and agriculture practices in the watershed. The Project initiated an evaluation of animal waste management practices that included investigation of the effectiveness or vegetative buffers, dry lot and corral management, and improved pasture management to reduce pollutant loads. Water quality results from treated and untreated lots indicate that reductions in fecal coliform concentration can be achieved through mulching and seeding, as well as continuing the practice of removing animals during the winter storm season. Vegetative buffers, designed to act as filters that slow runoff thus allowing sediment, such as manure, to settle and become trapped provide some reduction in concentration. However, given variability of site-specific conditions, buffers can serve as a beneficial component of a larger coordinated plan of practices for on-farm water quality management but should not be expected to provide total reduction of impacts by themselves (University of California, December 2004).

Dairy managers generally store dry and wet manure in a network of lagoons and stockpiles during the winter storms and applied primarily late the following summer on fields and pastures. The Tomales Bay Water Quality Project also reviewed the duration of storage to determine effects on the quantity of bacteria in applied manure. Although this part of the investigation is not complete, the initial results indicate that the holding of manure approximately 150-200 days can result in a considerable reduction of bacteria in applied manure, and that bacteria concentrations in applied manure will be considerably less in approximately 20 to 30 days after application. These findings provide some direction to producers on how to manage manure to improve water quality (University of California, December 2004).

The Farm Bureau, County Agricultural Commissioner and UCCE work with local ranchers and farmers to help address water quality problems. These efforts include water quality monitoring to help identify water quality problem areas and to work with ranchers and farmers to develop and implement solutions.

Onsite Sewage Disposal. Tomales Bay communities and residential areas primarily utilize OSDS for wastewater treatment and disposal. The Marin County Environmental Health Service (EHS) estimates that there are approximately 7,000 septic systems in Marin County. These systems vary from redwood

box cesspools to highly engineered modern pressure dosed systems. An inventory completed by the County indicates that within the Tomales Bay watershed, there are approximately 4,415 parcels utilizing OSDS and 1,578 parcels (or 35 percent) are located within 100 feet of a stream (Economic & Planning Systems (EPS), 2003). Figure 14 shows the location and distribution of parcels with OSDS systems within 150 feet of the Bay and/or stream within the watershed based on the SFBRWQCB's Pathogen TMDL report. A 2001 study inspected thirty seven (37) septic systems during the winter of 2001-2002, 75% of which were adjacent to Tomales Bay. The inspection included visual inspections, hydraulic loading analysis, and dye tests. Of the 37 systems inspected, 22 (60%) were ranked adequate; 6 (16%) were ranked marginal, and 9 (24%) were ranked failing. All but one of the failing systems where located alongside the Bay. Approximately 95% of the studied systems were along the Bay and had their effluent disposal systems within 50 feet of the Bay waters (CSW/Stuber-Stroeh Engineering Group, July 2002).

The 2002 California Department of Health Services (DHS) sanitary survey for Tomales Bay, which included a bacteriological water quality analysis, concluded that of the parcels surveyed many are unsuitable for onsite sewage disposal; the majority of parcels do not have sufficient land available to install onsite systems that meet the required minimum sanitary setbacks and construction standards; and properly functioning onsite sewage disposal systems are unlikely at many residences due to adverse site conditions. DHS also developed a simple dilution model to simulate the impacts of failing septic systems along the bay. The model examined a total length of 6.8 miles of shoreline on both the east and west shores of Tomales Bay. Results of the model suggested that rates of onsite system failure greater than 25% could result in significant impacts to at least two certified shellfish growing areas: the Hog Island Oyster Company in Marshall and the Cove Mussel Company in Marconi Cove.

Since 2003 a citizen based monitoring program has conducted water quality monitoring in the Lagunitas Creek watershed. Various sites were sampled during the summer and winter months. The results of the winter testing detected elevated levels of fecal coliform bacteria, nitrate and orthophosphate downstream of the villages of Woodacre and Lagunitas, indicating that onsite wastewater systems are impacting Lagunitas and San Geronimo Creek. The elevated levels are attributed to failing septic systems in these communities (Salmon Protection and Watershed Network, June 2006). Several factors lead to the failure of onsite sewage disposal systems, including: the conversion of seasonal to year round occupancy on small parcels with old and substandard septic systems that become overloaded; poor soil conditions; high groundwater condition; improper or lack of maintenance; substandard design; and/or age.

The community of Marshall has recently conducted a voluntary septic monitoring program via a partnership between the East Shore Planning Group (ESPG) and the County of Marin. Based on the monitoring results, the ESPG and the County have subsequently developed substantial grant funds for septic improvements in Marshall. Currently, the community and an engineering team are exploring options for septic improvements, feasibility and cost benefits. These studies will allow Marshall and Marin County to collaborate further on decisions regarding the most cost effective use of grants and homeowner finances for septic system improvements and local community septic management.

The On-Site Septic Policy and Technical Advisory Committee (SepTAC) was formed by the Marin County Board of Supervisors in June 2000 to provide recommendations on how to improve the management of on-site waste water systems in Marin County and to define the extent of the problem based upon agreed upon criteria. Several have been implemented by the Marin County EHS. Currently, EHS is developing a program that will provide a comprehensive inventory that will include location, type of system, and an evaluation of system function and associated environmental risk. In addition, EHS is in the process of reviewing septic permitting procedures and some sort of operation and maintenance process is anticipated in the next few years.

In 1996, Marin County in cooperation with the San Francisco Bay RWQCB established and currently manages the Alternative Sewage Disposal Systems Program, which oversees the permitting, and installation of alternative systems, and places these systems under operating permits to allow for ongoing inspection and performance. A review of the Marin County EHS Alternative Sewage Disposal Systems inventory indicates that there are approximately 91 alternative onsite wastewater systems operating in the Tomales Bay watershed. A number of other efforts are underway to reduce pathogen contaminants in Tomales Bay and Lagunitas Creek as summarized in Chapter 4.

Despite studies and efforts to date, there is insufficient knowledge of baseline conditions and effects of on-site wastewater systems on surface and ground waters due to an incomplete inventory of existing on-site systems, inadequate tracking of these systems, unknown number of systems failing, and sporadic water quality monitoring. Furthermore, there is a lack of a comprehensive management program(s) to conduct routine inspection of OSDS, provide education and outreach to owners/users, provide technical and financial assistance for repair/upgrades, and to conduct ongoing and long-term monitoring and maintenance of systems. Financial and staffing constraints have limited the County's program. Additionally, the current regulatory process creates significant disincentives for land owners to obtain permits for repair or upgrades, and severely limit the opportunities for the use of alternative technology. Lastly, many residents in the watershed do not perceive a problem and/or the management of onsite wastewater issues is not a high priority. Public education and outreach efforts have limited success. Absentee land owners, renters, and seasonal/part-time occupants are difficult to engage in a community process.

As part of the preparation of this ICWMP, a separate work effort was initiated to develop a "Septic Solutions" Report (SSR), which is contained in Appendix L. The scope for the SSR included the evaluation of existing management plans to document findings and/or conditions within selected communities, prioritization of "problem" communities and provision of forums for community-based discussions to identify management options. Four target communities were identified: Inverness, Woodacre, Bolinas and the San Geronimo Valley, and an active septic outreach and education program was developed for Woodacre and Inverness. (See Chapter 13 for more discussion of this public outreach process.) As a result of these efforts, an educational brochure on care and maintenance of septic systems was prepared and distributed to over 500 households in Inverness. In Woodacre, two ongoing possible activities were identified for the community: conducting free septic system inspections and seeking funding for a feasibility study or sanitary survey that would document existing conditions (via monitoring and testing), identify and quantify existing problems, define a potential service area, and a setoff alternatives for wastewater (ranging from improvements to individual systems to a community-based system). Additional meetings will be held in the future to

further consider these and/or other possibilities for the community. The communities of Bolinas and the San Geronimo Valley will be approached though already existing groups or boards during the fall of 2007.

Municipal Stormwater Runoff. Non-point source pollution from stormwater runoff is an issue in Tomales Bay and Lagunitas and Walker Creeks. Overall, developed areas account for approximately 3.4% of all land use in the watershed (Regional Water Quality Control Board, San Francisco Bay Region, July 2005). Municipal runoff can carry waste from pet or feral animals, hydrocarbons and petrochemicals from cars, as well as pathogens from leaking/failing OSDSs. The RWQCB documented elevated pathogen loads delivered through stormwater outfalls within Point Reyes Station, and the second highest loading of pathogen-indicators to the bay was from the San Geronimo Valley subwatershed, whose primary land use is low density residential (Ibid).

While the County and RWQCB have identified septic parcels within 100 feet of surface waters in the Tomales Bay watershed, there is no information related to condition or proximity of stormwater management facilities to other septic fields within the upland areas. As part of the preparation of the ICWMP, a Stormwater Assessment Report was initiated to document the location, condition, inlet and outfall of stormwater networks in all critical coastal areas, including the ASBS areas. Based on the *Tomales Bay Watershed Stewardship Plan* and the RWQCB Tomales Bay Pathogen TMDL Report, a number of detailed issue topics were identified for assessment and development of implementation priorities. The stormwater assessments would target municipal stormwater management measure objectives, specifically to implement stormwater management plans, discharge detection and elimination programs in the Tomales Bay watershed.

As part of the preparation of the ICWMP, a separate storm water quality assessment was conducted in Point Reyes Station, Tomales, and San Geronimo Valley (see Chapter 9 and Appendix M). Recent planning studies have shown some stormwater systems to be highly permeable, and therefore susceptible to inflow from groundwater sources. Water quality monitoring of inflow and outflow locations will be used to determine if there are potential inflow sources associated with failing networks. Issues associated with stormwater management and discharge would be evaluated, with specific management measures identified to address stormwater conveyance, pollution, and discharge issues.

The County of Marin Department of Public Works Department mapped the stormwater networks in Tomales, Point Reyes Station and Woodacre. Based on the mapped networks a monitoring plan was devised and a strategy for water quality monitoring developed. The program was implemented with the first rain of the season. However, the winter of 2006/2007 was unusually mild and a very small sampling effort resulted. The results were not considered conclusive but did indicate the following general conditions, and monitoring and assessment will continue in the fall and winter of 2007.

Total and Fecal Coliform – All of the samples exhibited fecal colifom counts in excess of EPA standards for human contact (200 MPN/100ml). The levels of fecal Coliform (or *E. coli*) were highly variable depending on the storm event and location. In some cases the levels of bacteria found suggest animal rather than human sources, however the community of Woodacre exhibited

elevated levels below the community (compared to those above the community) suggesting that septic system effluent may be entering the system.

Nitrate – There were several stations in Woodacre that exceeded the EPA standard (3.0 mg/l) at each sampling event. There were also several stations in Tomales and Point Reyes Station that consistently exceeded standards. These results may indicate shallow groundwater with elevated levels of nitrate is entering the stormwater system, and/or that suspended solids in surface runoff are enriched with nitrate. (Given the historical use and density of septic systems in each of these communities it is likely that shallow groundwater, which would periodically enter the storm drain system, would contain elevated levels of nitrate.)

Conclusion – In conclusion, the quality of stormwater runoff from the three communities is typical of runoff from other urbanized areas in the region. Elevated levels of coliform bacteria, nitrate, ammonia and MBAS in the community of Woodacre is likely attributed to the relatively high density of septic systems. As insufficient data exists to perform a reliable evaluation, it is hoped that additional testing during the 2007 rainy season will help to expand the database to a point where recommendations can be made. As it stands there is insufficient data to develop any meaningful stormwater system improvement recommendations.

Mercury

Walker Creek and Soulajule Reservoir are listed as impaired for mercury. Walker Creek is impaired because mercury adversely affects beneficial uses, including wildlife habitat and all uses supporting aquatic life. Mercury concentrations in Walker Creek exceed the mercury freshwater aquatic life acute toxicity objective established to protect aquatic organisms. Terrestrial species that primarily or exclusively eat fish are at risk from exposure to mercury due to its tendency to bioaccumulate in the food web. Soulajule Reservoir is impaired due to mercury levels that may pose health risks upon frequent consumption of fish from the reservoir. Although the largest mercury source, the Gambonini mine, has been stabilized, the mercury remains in sediment moving through the stream system and into Tomales Bay. High mercury levels were also found in fish collected from Tomales Bay.

The following sources have the potential to discharge mercury to surface waters in the Walker Creek watershed:

- **Gambonini Mine site** – An inactive mercury mine and the largest mercury processing facility in the watershed. Mining waste was not properly contained onsite, and consequently the site discharged large quantities of mercury-laden sediments prior to cleanup (initiated in 1998).
- **Soulajule watershed and Reservoir** – Two abandoned mercury mines are located in this watershed. Soulajule reservoir discharges into Walker Creek just upstream of the Gambonini Mine drainage. Data on the significance of the reservoir's mercury loads to the watershed is lacking, but mercury levels in fish are elevated and greater than fish from other Bay Area reservoirs (San Francisco Bay RWQCB, August 2006).

- **Downstream depositional features** – Mercury-laden sediments in depositional areas (creek beds, banks, and floodplains) downstream of the mercury mines, which discharge mercury to the creek during storms.
- **Background** – Mercury is presently at low concentrations throughout the watershed. Background levels account for atmospheric deposition and naturally occurring mercury found in the watershed's soils. The Walker Creek watershed background suspended sediment mercury concentration is 0.2 mg mercury per kg dry sediment.

The SFBRWQCB established a concentration-based TMDL for mercury in the Walker Creek watershed that prescribes actions and monitoring necessary to implement and maintain the TMDL. The numeric targets, allocations, and associated implementation plan will ensure that Walker Creek and Soulajule Reservoir attain applicable water quality standards and achieve the TMDL. To protect wildlife and rare and endangered species, the mercury concentration in fish consumed by piscivorous birds shall not exceed 0.05 mg mercury per kg fish, measured in whole fish 5–15 cm in length, average wet weight nor shall it exceed 0.10 mg mercury per kg fish, measured in whole fish 15-35 cm in length, average wet weight. The goal of these targets, which are consistent with the State bioaccumulation objectives, is to ensure that controllable water quality factors do not cause detrimental mercury concentrations in Walker Creek wildlife. To protect aquatic organisms, water column mercury concentrations shall not exceed the water quality objective of 2.4 μg/l (one-hour average). To protect humans who consume Soulajule Reservoir and Walker Creek fish (assuming future conditions allow for the consumption of Walker Creek fish), water column mercury concentrations shall not exceed the California Toxics Rule (CTR) criterion of 0.050 μg/l (averaged over a 30-day period). If the CTR is updated or replaced with a fish tissue concentration value, the human health target shall be that new objective.

The Mercury TMDL load allocation is set at four points of compliance: Gambonini Mine site, the Soulajule watershed and reservoir; downstream depositional features in Walker Creek; and lastly background levels.

- Soulajule watershed and Reservoir: 0.05 ug/L in water samples and 0.5 mg mercury per kg suspended sediment
- Gambonini Mine site: 5 mg mercury per kg suspended sediment,
- Downstream depositional features: 0.5 mg mercury per kg suspended sediment
- Background: 0.2 mg mercury per kg suspended sediment

The TMDL implementation plan builds upon previous and ongoing successful efforts to reduce mercury loads in Walker Creek and its tributaries and sets implementation at the four key sites mentioned above. Effectiveness of implementation actions, monitoring to track progress toward targets, and the scientific understanding pertaining to mercury will be periodically reviewed and the TMDL may be modified, if required.

Sediment

Tomales Bay, Lagunitas Creek, and Walker Creek are listed as impaired for sediment. The effects of sedimentation in the watershed include the subsequent infilling of Tomales Bay, accretion of its marshlands, and loss of pools and spawning habitat. The reduction in the size of the bay can be seen

by the formation of deltas at the mouths of Lagunitas and Walker creeks. The loss of habitats including eelgrass beds and shoreline marshes such as at the mouth of tributary creeks (e.g., Olema Marsh and Livermore Marsh) has occurred due to their sensitivity to turbidity. Sediment is often a carrier of toxic chemicals, coliform bacteria and nutrients. Re-suspension of sediments in the bay during high winds and winter runoff can expose the system to new pulses of contaminants. Sedimentation also adversely affects salmonid habitat as further discussed below in section 2-8.

Major sediment sources include: stream bank erosion in the upper watershed; the network of old logging, fire control, private access, and ranch roads; and livestock-related erosion. In the Walker Creek watershed, grazing and agricultural practices in the early 1900's in combination of with highly erodible soils, resulted in a dramatic period of erosion. The Walker Creek watershed continues to produce significant quantities of sediment. The SFRWQCB plans to initiate the Tomales Bay sediment TMDL in the near future.

There are numerous agencies and non-governmental groups working on erosion and sedimentation issues as further summarized in section 2-11 below and in Chapter 4. The MRCD has offered outreach and assistance programs to the landowners in the Walker Creek watershed since its founding in 1950, and addressing erosion and drainage issues has been a primary focus. MRCD developed the Walker Creek Watershed Enhancement Plan that identified priority erosion sites. A number of sediment reduction projects have been implemented and are being undertaken by MMWD in Lagunitas Creek, as discussed further below in section 2-8. MMWD contracted with MRCD to implement the San Geronimo Bedload and Sediment Control Program and conduct ten years of monitoring. The monitoring program, now in its tenth year, includes an evaluation of general streambed conditions and measurements of the channel bed elevation, bed surface composition, and bed core composition. The analysis will increase understanding of how the sediment transport function influences critical habitat features such as pool riffle complexes and bed material composition. This information is critical to the design of effective restoration projects.

The MRCD has received Prop 50 funding for a project called "Conserving Our Watersheds (COW): TMDL Implementation in Tomales Bay and Stemple Creek watershed." To improve the environment, the goal of the COW program is to support ranchers implementing 20 to 30 successful, voluntary conservation practices on agricultural lands in the Tomales Bay and Stemple Creek watersheds. It is anticipated that many of these projects will result in reduced sediment delivery into Tomales Bay by as much as 75-95% from gullies and streambanks and by 50-75% from riparian fencing and revegetation projects (Tomales Bay Watershed Council, Spring 2007, "Bulletin Number 6").

Nutrients

Tomales Bay was listed as impaired due to elevated nutrient levels in the tributary streams. Studies conducted in the Lagunitas Creek Watershed by the USNPS and SPAWN indicate that nutrients and ammonia levels are very low and nutrients do not appear to be an issue in this watershed. Nearly all of the samples collected from the larger stream systems, and most of the tributary samples were below detection limits. However, the SPAWN data show certain areas of the San Geronimo Valley as source areas for nitrates, likely due to failing septic systems (Salmon Protection and Watershed Network, June 2006). The SFRWQCB expects to initiate the Tomales Bay nutrient TMDL in the near future.

While a large number of scientific papers address various monitoring results, hydrological models, and geochemical reconstruction, there remains limited data on eutrophication or the extent of nutrient loading from the watershed to Tomales Bay. Circulation and nutrient dynamics in Tomales Bay are predominantly influenced by the bay's physical shape, tidal cycles and watershed runoff. Tomales Bay exhibits significant variations in nutrient and salinity levels throughout the year, due largely to the varying strength of offshore coastal upwelling and changes in the freshwater inflows. Tomales Bay has two seasons of nutrient inputs: rainfall and surface water runoff are high in the winter months (November - April); in the summer (May - October), stream flow and runoff to the bay are greatly reduced.

Nutrient cycling in the bay is driven by the decomposition of organic material. The influence of nutrient rich runoff into the bay and tributary streams from agricultural lands and septic systems throughout the watershed is greater in the inner bay, which extends from Pelican Point to the Lagunitas Creek estuary. Coastal upwelling, the primary oceanographic influence in Tomales Bay, provides cool seawater with elevated nutrient levels and high primary productivity. The influence of coastal upwelling is greatest in the outer bay, from Pelican Point to Sand Point. This area receives the greatest flushing from tidal exchange, which transports nutrients that are brought up by coastal upwelling. This upwelling is episodic, dependent upon the northerly winds, and tends to be strongest between April and September. This period coincides with that of the minimum freshwater flow in the dry summer. Nutrient cycling and sources are not well understood in the bay. More effort is needed in understanding primary productivity in Tomales Bay, before much can be said about winter nutrient loading and summer algal growth as contaminants problems in the bay.

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

As previously indicated, the state-designated "Areas of Special Biological Significance" (ASBS), now a subset of the "State Water Quality Protection Areas" (SWQPAs) were intended to afford special protection to marine life through prohibition of waste discharges within these areas. A recent ASBS Status Report prepared by the State Water Resources Control Board (August 2006) found the following concerns and priorities for the ASBS areas in the study area:

- **Duxbury Reef:** The State Water Board considers this a "high priority ASBS" due to the drainage from homes, roads, parking lot and other sources. The homes on the Mesa to the east of this ASBS area are on septic systems. Alder Creek drains a watershed with rural residential, grazing and some agricultural uses. A parking lot for Agate Beach is served by a storm drain ditch that empties into the ASBS at the mouth of Alder Creek.

- **Point Reyes Headlands:** The State Water Board considers this a "medium to low" priority ASBS. One concern is the potential for dairy grazing related wastes reaching the ASBS.

- **Bird Rock:** The State Water Board considers this a "medium to low" priority ASBS. The majority of runoff is from general sheet flow and from tidal outflow from Tomales Bay. The drainage is a wilderness watershed; non-point sources on the rock are heavily

influenced by bird droppings on the Island rock. The only concern relates to Bird Rock's proximity to Tomales Bay and the influence of Tomales Bay discharges on the ASBS. Bird Rock ASBS is located approximately one half mile from the mouth of Tomales Bay, which is 303(d) listed for metals, nutrients, pathogens and sediment from nonpoint sources.

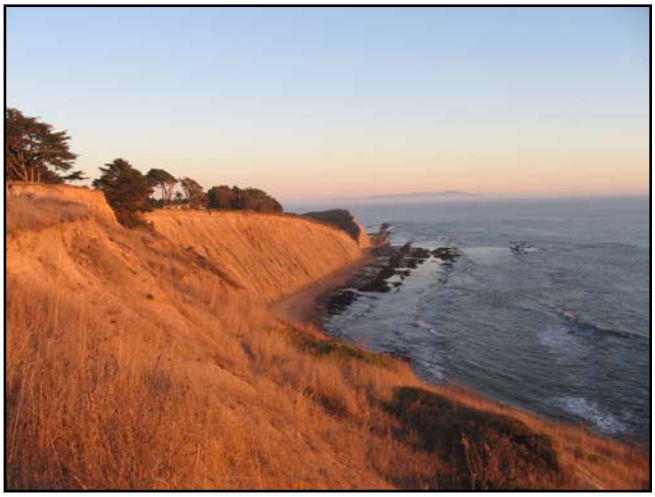
- **Double Point:** The State Water Board considers this a "low" priority ASBS. This small ASBS lies in the Philip Burton Wilderness of the Point Reyes National Seashore and is accessible only to hikers and has primitive trail camps. Overflow from the naturally occurring Pelican Lake is the main drainage source into the Double Point area.

As part of the ICWMP preparation, a separate work effort was completed, which included preparation of watershed assessments for each of the region's four ASBS watersheds including Duxbury Reef and Reserve, Double Point, Point Reyes Headlands and Reserve, and Bird Rock. The assessments include field surveys, review of existing data, and resulted in identification of discharges, water quality, pollutant sources, management issues, data gaps, and project recommendations. This work built on the SWRCB Discharge Report completed in 2003. The assessments documented all information identified as essential through the Critical Coastal Area Program. A full description of the watershed assessment methodologies and findings are included in Appendix K. Key findings related to discharges, water quality and management issues are presented below.

There is limited information regarding ASBS water quality and discharge compliance history. Some water quality monitoring is planned in 2006-2007, coordinated through the USNPS and Marin County. The SWRCB's 1979 and 1980 reconnaissance survey reports for the ASBS areas reported that overall Duxbury ASBS was in excellent health. The 1980 Reconnaissance Survey for the Headlands deemed the water quality high in comparison to the marine waters closer to the urban center in San Francisco. The 1980 Reconnaissance Survey for Bird Rock and the 1979 Survey for Double Point deemed the water quality adequately protected at both areas due to remoteness of the areas from discharges and population centers. Known water quality data, discharges and pollution sources for each ASBS watershed are summarized below.

Duxbury Reef ASBS

Fifty-two drainages were documented in the Duxbury Reef ASBS (State Water Resources Control Board, 2003). Thirty-seven of these fifty-two drainages were classified as springs/seeps or outlets; of these eighteen were considered uncontaminated and one a potential non-point source. The remaining drainages included ten discharges and five unknowns. Of the ten discharges identified in the 2003 survey, four are located within the PRNS portion of the Duxbury Reef watershed. These four discharges have been described



as "pathways" or "trails", and all traverse the cliff above the reef to access the narrow beach below the mesa. Although, the trails are located on public land, they are not formal trails and are not managed by the USNPS, and in this regard are referred to as "social trails". The sites identified are narrow and indicative of sporadic pedestrian use only, although equestrian access was observed during the ASBS watershed assessment field surveys. Potential sources from these discharges are eroded sediment from these paths which is carried to the beach. Six of the ten discharges are located within the rural residential portion of the Bolinas mesa as discussed under section 2-6 above. Figure 15 illustrates the discharge points into the Duxbury Reef ASBS.

Marin County collected water quality samples in the Duxbury Reef watershed on April 24, 2006. Samples were collected at the outflow of Alder Creek and a seawater sample was taken at the confluence of Alder Creek with the ocean. In addition a sample was taken at the outflow of the unnamed discharge and at a point on the unnamed drainage between the culvert and the Agate Beach Parking lot.

The analyzed constituents did not exceed the 'Objectives for Protection of Marine Aquatic Life' instantaneous maximum limiting concentration, as outlined in Table B of the California Ocean Plan. Total nickel concentrations was elevated in the sample collected from an unnamed discharge draining into Agate Creek. The concentration exceeded maximum limiting concentration according to Water Quality Objectives outlined in the California Ocean Plan. The source of the nickel is unknown, but could be associated with contaminated runoff from the street(s) and parking areas or potentially from natural sources.

Potential pollutants in the Duxbury Reef watershed include:

(1) Sediment from coastal bluff erosion and social trails created along the bluff and at access points to the beach;
(2) Non-point sources in stormwater runoff from the residential area on Bolinas Mesa;
(3) Non-point discharges related to erosion/sedimentation and nutrients and pathogens in surface runoff due to cattle grazing in watershed;
(4) Potential offshore point sources (boat vessel discharges) and potential non-point sources (oil spills and erosion from development); and
(5) Potential septic system non-point source discharges from the Bolinas Mesa, although no such discharges have been observed, reported or documented.

Point Reyes Headlands ASBS

Twenty drainages were documented in the Point Reyes Headlands Reserve and Extension ASBS (State Water Resources Control Board, 2003). Thirteen of these twenty drainages were identified as gullies, or earthen channels, conveying surface runoff over the sheer Headland cliffs. Of the remaining seven discharges, six were identified at the lighthouse house complex and one at the Sea Lion Overlook visitor area. One discharge is associated with drainage from the cement pad adjacent to the visitors center, three discharges are associated with the stairs to the lighthouse), one discharge is associated with the pad around the lighthouse, and one discharge represents a water faucet located at the lighthouse area. The entire surface area of infrastructure for the six lighthouse discharges is approximately 8,000 square feet and is entirely accessed by pedestrians with no vehicle access. The

2003 SWRCB report identified one discharge point from the Sea Lion Overlook visitor area. Figure 16 illustrates the discharge points into the Point Reyes Headlands ASBS.

Current potential pollutants in the Headlands watershed include:

(1) Sediment from coastal bluff erosion and social trails created along the bluff;
(2) Non-point sources in stormwater runoff from the Lighthouse area; and
(3) Non-point discharges related to erosion/sedimentation and nutrients and pathogens in surface runoff due to cattle grazing in watershed.

The 1980 Reconnaissance Survey completed in the Headlands ASBS (State Water Resources Control Board, April 1980) identifies potential point sources (sedimentation from potential gold/mineral dredging based on a 1968 mineral rights state permit from the State Land Division encompassing 5,800 acres that allows rights to gold, silver, platinum, uranium, and yttrium)[2] and potential nonpoint sources (radioactive materials from radioactive waste disposal near Farallones Islands from 1946-1965 and potential boat vessel oil spills and discharges).

Bird Rock ASBS

Eight drainages were documented in the Bird Rock ASBS (State Water Resources Control Board, 2003). All eight drainages were identified as outlets, with the majority of runoff from the watershed area coming from sheet flow over coastal cliffs (State Water Resources Control Board, July 2003). Current potential pollutants include natural bacteria sources within stormwater runoff from animal excrement from birds that inhabit Bird Rock and from tule elk and wildlife on the Tomales Point peninsula. Potential non-point pollution could also enter the Bird Rock ASBS area from the tidal outflow of nearby Tomales Bay, a 303(d)-listed impaired waterbody.

Double Point ASBS

Three drainages were documented in the Double Point ASBS (State Water Resources Control Board, 2003). Two of the three drainages were identified as outlets and the third as an uncontaminated spring/seep, which is the outlet of Pelican Lake. The 1979 ASBS study identifies potential pollutant source from boat vessel oil spills.

2-8 ECOLOGICAL PROCESSES & ENVIRONMENTAL RESOURCES

The Tomales Bay planning area with its critical coastal areas supports a diversity of wildlife and plant species. This section provides an overview of the following:

- Tomales Bay watershed habitats and special status species,
- Coho salmon and steelhead trout habitats,
- Wetland and riparian habitats, and
- ASBS and marine habitats.

[2] This was the first offshore mineral permit issued in California. No action or operation on the 1968 permit had been taken as of 1980.

TOMALES BAY WATERSHED HABITATS

The lands within the Tomales Bay watershed includes a diversity of aquatic and terrestrial habitats, including Douglas fir, bishop pine and mixed evergreen forests; oak woodlands; annual and perennial grasslands; freshwater and saline wetlands; coastal dunes and prairies; tidal flats composed of mud and sand; eelgrass beds and open waters of the bay. These habitats sustain a rich diversity and abundance of plant and animal life, as they provide critical shelter, foraging, nesting and rearing habitat.

Nearly 900 plant species, 490 bird species, hundreds of invertebrate species, and sensitive, threatened and endangered species inhabit the Tomales Bay planning area. The region supports nearly forty species of land mammals including bobcat, mountain lions, and coyote; marine mammals; river otters; and hundreds of species of birds. The watershed is an important foraging and haul out site for marine mammals and over-wintering area and a migratory stop along the Pacific Flyway for approximately 20,000 shorebirds and 22,000-25,000 waterfowl species. Approximately 45% of all bird species in North America have been recorded in the adjacent Point Reyes peninsula, while as many as 50,000 waterbirds may depend on Tomales Bay during winter (Prunuske Chatham, Inc., April 2004). Tomales Bay also provides important foraging, spawning and nursery habitat for many marine and anadromous fish species (Tomales Bay Watershed Council, July 2003).

Photo by Greg Filbrandt

Tomales Bay Habitats

Tomales Bay habitats include: intertidal, subtidal, and benthic habitats, dunes, mud flats, salt marshes, and freshwater marshes. Dense eelgrass supports a diverse invertebrate community, including snails, shrimp, nudibranchs and sea hares. Pacific herring use the eelgrass beds for spawning. Large eelgrass beds grow in the northern half of the bay with smaller ones lining the eastern shore. Small islands provide roosts for birds and haul out areas for marine mammals (Prunuske Chatham, Inc., April 2004). As previously mentioned, Tomales Bay is a recognized wetland of international importance.

Tomales Bay also supports seasonal populations of coho salmon, steelhead, sardines and lingcod. The shallow bay's sandy bottom attracts a variety of bottom-dwelling fish including sole, habitat skates and rays. Leopard sharks are common in Tomales Bay and occasionally blue sharks are sighted. Great white sharks hunt for seals and sea lions that haul out on the sandy beaches and rocks near the mouth of Tomales Bay (U.S. Department of Commerce, National Marine Sanctuary Program, October 2006). Approximately 300-600 harbor seals live in Tomales Bay. Gray whales forage at the mouth of the bay and at times enter the bay (USDA, 2001). Pacific herring runs support a small commercial fishery. Tomales Bay has the second largest mariculture industry in the state (Prunuske Chatham, Inc., April 2004).

REINTRODUCED IN 1978 WITH 10 ANIMALS, THE TOMALES POINT TULE ELK HERD NOW NUMBERS 400, ONE OF THE LARGEST POPULATIONS IN CALIFORNIA.

RECENTLY A S MALL HERD OF 30 ANIMALS WAS REINTRODUCED TO THE LIMANTOUR WILDERNESS AREA

THE TOMALES BAY WATERSHED IS HOME OR STOPOVER POINT FOR OVER 490 SPECIES OF BIRDS

THE WATERSHED SUPPORTS OVER 900 SPECIES OF PLANTS

TOMALES BAY WATERSHED IS HOME TO OVER 50 RARE, ENDANGERED OR THREATENED SPECIES

LAGUNITAS CREEK IS DESIGNATED OF STATE-WIDE SIGNIFICANCE FOR COHO AND SHRIMP

TOMALES BAY SUPPORTS:

1 OF 4 COMMERCIAL OYSTER AREAS IN THE STATE

2ND LARGEST MARI CULTURE INDUSTRY IN THE STATE

Graphics: Emily Shepard

Terrestrial Habitats

Terrestrial habitats and wildlife use also are diverse. Lagunitas Creek supports coho salmon, steelhead trout, tidewater goby, California freshwater shrimp, California-red legged frog, and other fish species. Chinook salmon also occur within the Lagunitas Creek watershed. The Walker Creek watershed supports several special status species including: coho salmon, steelhead trout, California freshwater shrimp, California red-legged frog, foothill yellow-legged frog, Tomales roach, tidewater goby, and northwestern pond turtle have been observed in the watershed (Prunuske Chatham, Inc., April 2004). . The U.S. Fish and Wildlife Service has designated the estuary of Lagunitas Creek as critical habitat for tidewater goby, but no parts of the Walker Creek watershed are designated critical habitat for this species (U. S. Fish and Wildlife Service, November 2006). Walker Creek watershed is designated as critical habitat for the California red-legged frog and California freshwater shrimp.

The upper Lagunitas Creek watershed is steep and fairly heavily forested. Parts of San Geronimo Creek, Olema Creek, and mainstem Lagunitas Creek through Samuel P. Taylor State Park have areas of dense redwood growth and cool water year-round. These reaches provide spawning and rearing habitat for salmonids. Except for a few open areas, most of Lagunitas Creek downstream of the state park is thickly forested with willows and alders. The valley opens below Tocaloma Bridge to broader, more gently sloping hills that are primarily used for livestock grazing.

Plant communities include coast redwood forest, mixed evergreen forest, oak woodland, non-native grassland, northern coastal scrub, coastal riparian forest, chaparral, freshwater marsh, and coastal salt marsh. Roy's Redwoods, a Marin County Open Space District (MCOSD) property in San Geronimo Valley, retains a beautiful grove of old growth redwood trees, as do parts of Samuel P. Taylor State Park. An area of serpentine soils on Carson Ridge above Woodacre and San Geronimo supports a stand of Sargent cypress trees as well as other uncommon plants, including serpentine reed grass. Several tributaries, such as Devil's Gulch, have excellent examples of mature riparian forest with a rich diversity of plants, including redwoods, California nutmeg and many shrub species. Olema Marsh at the confluence of Olema Creek, Bear Creek, and Lagunitas Creek is one of the largest freshwater marshes in Marin County.

The Walker Creek watershed is a mosaic of grassland, valley foothill riparian forest, coastal scrub, and oak bay woodland. A small stand of redwood trees is growing in the upper reaches of the Arroyo Sausal drainage. Laguna Lake in Chileno Valley is a shallow natural lake. Officially classified as a vernal pool, it retains water year round although it diminishes significantly in area during the summer. The lake is used extensively for migrating and breeding waterfowl. Wetlands at the mouth of Walker Creek are also important habitat for waterfowl (Prunuske Chatham, Inc., April 2004).

Along the western shore the primary vegetation communities consist of coastal scrub, oak bay woodland, and grassland habitats. The eastern shore is largely grassland with isolated patches of oak bay woodland, coastal scrub, and eucalyptus. Fresh and saltwater marshes line Tomales Bay (see description of Tomales Bay for more information). Scattered stands of coastal terrace prairie are found within the tributaries along the east shore (Prunuske Chatham, Inc., April 2004). Because of their small size, many of these drainages offer important opportunities to restore connectivity from upper watershed areas through riparian corridors to bay wetlands. Audubon Canyon Ranch staff has

undertaken a significant native grassland restoration effort at Cypress Grove (Prunuske Chatham, Inc., April 2004).

Habitat loss, species decline and exotic, invasive species are significant concerns in the Tomales Bay watershed. Spread of invasive species in Tomales Bay, the watershed and study area include European green crabs, which has led to major declines of several key invertebrate species, and non-native perennial grasses and other plants on adjacent coastal terraces (see list in Appendix N). Other invasive plant species (including thistle, gorse broom, and ivy) are a concern throughout the watershed. Control of non-native species is an important component of habitat protection (Prunuske Chatham, Inc., April 2004).

Special Status Species

The Tomales Bay region also provides sanctuary to 26 federally protected species, notably remnant populations of coho salmon and steelhead trout. "Special status species" include: 1) species that are state or federally listed as threatened or endangered; 2) species that are proposed for listing; and 3) federal "Species of Concern" and state "species of special concern." Special status species that are known in the Tomales Bay watershed include the following (from Prunuske Chatham, Inc., April 2004).

- Coho salmon, Chinook salmon, Steelhead trout, Tidewater goby, Tomales roach
- California freshwater shrimp
- California red-legged frog, Foothill yellow-legged frog
- Northwestern pond turtle
- Western snowy plover, California brown pelican, northern spotted owl, clapper rail, California least tern
- Myrtle's silverspot butterfly
- Point Reyes jumping mouse
- Steller sea lion
- Baker's larkspur, Checker bloom, Tiburon paintbrush, Marin dwarf-flax, Fragrant fritillary, Point Reyes bird's-beak, San Francisco owl's-clover, swamp harebell.

(*) Listed Species

Other species of interest include a variety of raptors found on the grasslands in the Walker Creek watershed, including Swainson's hawks, ferruginous hawks, and golden eagles. Restored riparian corridors in Chileno Valley attract a variety of neotropical songbirds species, including warblers, vireos, flycatchers, and thrushes (Prunuske Chatham, Inc., April 2004). Chinook salmon adults have been observed in Lagunitas Creek every year since the 1999/2000 spawning season; chum salmon adults were observed during 5 out of 6 years between 2001/02 and 2006/07 per information provided by MMWD. winters. Pacific lampreys spawn in Lagunitas Creek. Until the early 1980s, green sturgeon used the lower reaches. Mountain lions are frequently seen in the Lagunitas Creek watershed. Foothill yellow-legged frogs occur in some of the smaller tributary streams, and river otters have frequently been sighted in the mainstem of Lagunitas Creek. Serpentine endemic plants are also found within the Lagunitas Creek watershed (Ibid.).

Steelhead trout have been recorded in Millerton Gulch and Tomasini Canyon. California red-legged frog are also abundant in drainages along the east shore. Many of the streams that drain Inverness Ridge (west shore drainages) are perennial, and many support steelhead populations.

The TBWC's Habitat Committee has created a process for identifying Species of Local Interest (SOLI). This is a process that summarizes existing information about species present in the Tomales Bay Watershed that are already identified as threatened, rare, of special concern or invasive. Using a clear set of criteria, the SOLI also includes organisms that are of local importance by incorporating the recommendations by watershed residents and experts into its process. As summaries of existing data are completed and recommendations are made, the list of the species identified by this process will grow. Each subsequent version of the list will better represent the organisms whose habitats deserve attention or prioritization above others when the TBWC engages in projects that enhance the quality of the watershed. Expanded discussion of SOLI and existing species' lists, including invasive species, is provided in Appendix N.

COHO SALMON AND STEELHEAD TROUT

The local populations of coho and steelhead trout depend on many tributary streams that flow to Tomales Bay, and on the bay itself. During the last century, salmonid habitat in the Tomales Bay watershed has diminished to less than half of the original range due the construction of reservoirs and roads, and remaining habitat has been compromised by other human activities. West Marin County's watersheds are important to the recovery of coho salmon. Figure 18 identifies sensitive fish streams in the Tomales Bay watershed.

Factors that affect fishery habitat include stream flow, sedimentation, instream habitat conditions (i.e., large woody debris and refuge areas), barriers to fish passage, water temperature and removal/alteration to riparian vegetation adjacent to creeks. (Figure 18 also identifies fish passage barriers.) In 2004, the CDFG prepared the "Recovery Strategy for California Coho Salmon." The plan identifies goals and specific recommendations and implementation measures for the Tomales Bay watershed to achieve delisting of the species (see Appendix I). An overview of recommendations for each subwatershed is provided below.

Efforts have been undertaken by a number of agencies and organizations to protect, assess and enhance/restore salmonid habitat in the watershed over the past few decades, including MMWD, MRCD, SPAWN, Trout Unlimited, Tomales Bay Association, PRNS, CDFG, Marin County, FishNet, SF Bay RWQCB, Coastal Conservancy, and others as further described below in section 2-11.

Lagunitas Creek

The Lagunitas Creek watershed has been the focus of salmonid restoration efforts for over 25 years. Lagunitas Creek once supported substantial runs of coho salmon of 3,000-5,000 (State Water Resources Control Board, 1980). Coho salmon populations have rebounded from the early 1980s to an average of 500 adults the past few years with up to 800 returning in some years (Tomales Bay Watershed

Council, July 2003). The Lagunitas/Olema Creek watershed now supports significant population of wild coho salmon, estimated as 10% of the population for the Central California Coast Evolutionarily Significant Unit (ESU) and the largest and most stable population south of the Noyo River. Steelhead population also decreased over historic levels.

Fish monitoring is and/or has been conducted by MMWD, SPAWN, and PRNS. Recent annual MMWD surveys (2005/06) indicate that the juvenile coho population has increased while the steelhead population has not shown a change over the last 11 years. Density-based population estimates show a four-fold increase in coho and a 50% increase in steelhead in the last 11 years compared with 1980s estimates. Monitoring data and review by the MMWD for 2005 estimate a population of 22,590 juvenile coho in the Lagunitas Creek study area, as well as an estimated population of 43,630 juvenile steelhead in the same area (Marin Municipal Water District, March 2006). Table 2-5 summarizes juvenile salmonid population and coho redds over the last 10 years based on sampling surveys.

A significant portion of the coho and steelhead populations that use Lagunitas Creek use San Geronimo Creek, Devil's Gulch and other tributaries for spawning and rearing. Devil's Gulch, a smaller Lagunitas tributary, has perennial surface flows and good salmonid habitat characteristics, which make it an important coho spawning stream. Olema Creek also has been identified as being important to coho recovery. According to information from USNPS staff, Olema Creek is the largest undammed tributary of the Lagunitas Creek watershed and represents 10-30% of the spawning population annually. Other tributaries that are known to support coho include Cheda and McIsaac Creeks.

The San Geronimo Creek watershed is the major source of sediment deposition below Peters Dam which has impaired Lagunitas Creek habitat. Significant habitat impairment has been caused by excessive coarse sand and fine gravel deposition in the Lagunitas channel bed in the reach below Peters Dam and below the outlet of San Geronimo Creek due to excess sediment yield from the San Geronimo Creek watershed. A series of investigations began in 1979 for MMWD in order to develop a sediment management plan that would support a viable salmonid fishery. Coarse sand and fine gravel, 1 to 8 mm size range, was found as the impairing sediment for rearing habitat. Reducing the coarse sediment delivery from San Geronimo Creek by 10 to 20%, would likely offset the diminished flushing capacity" caused by the raising of Peters Dam.

In 2003, the Marin Resource Conservation District (MRCD) and SWRCB with assistance from a Lagunitas Advisory Group which included representation from local non-governmental agencies as well as state and federal agencies, sponsored the "Lagunitas Creek Watershed Limiting Factors Analysis" as part of a Proposition 13, Coastal Nonpoint Source Control Program grant. The overall purpose of the grant is to fill information gaps related to physical and biological factors controlling salmonid population dynamics within the watershed, and preparation of this study was one of the recommendations in CDFG's Coho Recovery Strategy.

TABLE 2-5
TOTAL JUVENILE SALMONID POPULATION ESTIMATES
1995-2006

Based on extrapolations from average density with each habitat type.

Lagunitas Creek

Fish Type	1995*	1996*	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
0+ SH	24,547	11,411	33,717	25,118	26,466	21,312	23,042	41,128	23,256	28,232	23,517	22,188
1+ SH	1,583	2,395	1,404	1,656	1,089	863	1,258	1,072	1,811	931	1,413	1,150
Total SH	26,130	13,806	35,121	26,774	27,555	22,175	24,300	42,200	25,067	29,163	24,930	23,338
Coho	2,686	2,468	8,678	727	2,553	2,273	7,011	7,675	5,952	4,560	8,597	463

San Geronimo Creek

Fish Type	1995^	1996^	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
0+ SH	9,449	13,160	9,563	32,186	22,000	23,354	12,955	19,878	18,475	15,958	15,093	21,969
1+SH	464	1,426	842	1,020	1,611	2,351	1,778	782	1,388	1,358	1,084	1,166
Total SH	9,913	14,586	10,405	33,206	23,611	25,705	14,733	20,660	19,863	17,316	16,177	23,135
Coho	1,286	4,295	6,112	3,026	1,189	1,458	10,114	16,712	4,990	13,076	8,341	1,842

Devil's Gulch

Fish Type	1995^^	1996^^	1997^^	1998	1999	2000	2001	2002	2003	2004	2005	2006
0+ SH	6,484	1,827	2,242	9,307	5,401	6,344	3,412	2,619	704	1,821	2,204	6,616
1+ SH	39	358	79	548	676	883	939	583	363	273	319	380
Total SH	6,523	2,185	2,321	9,855	6,077	7,227	4,351	3,202	1,067	2,094	2,523	6,996
Coho	1,192	1,717	2,172	641	2,012	550	6,456	9,238	3,089	4,289	5,652	397

Total for All Streams

Fish Type	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
0+ SH	40,480	26,398	45,522	66,611	53,867	51,010	39,409	63,625	42,435	46,011	40,814	50,773
1+SH	2,086	4,179	2,325	3,224	3,376	4,097	3,975	2,437	3,562	2,562	2,816	2,696
Total SH	42,566	30,577	47,847	69,835	57,243	55,107	43,384	66,062	45,997	48,573	43,630	53,469
Coho	5,164	8,480	16,962	4,394	5,724	4,281	23,581	33,625	14,031	21,925	22,590	2,702

Notes:

0+ SH = Young-of-the-year steelhead (<1 year old)
1+ SH = One to three year old steelhead
Estimates are based on extrapolations from average density within each habitat type (riffle, run, pool).
Estimates based on this method were not made in 1993 or 1994.

Lagunitas Creek

* Estimates are based on the distance from Nicasio Creek to Shafter Bridge (12.2km).
Estimates since 1997 are based on the distance from Nicasio Creek to Peters Dam (~13km).

San Geronimo Creek

^ Estimates are based on the distance from Lagunitas Bridge to Dickson Weir, upstream of Woodacre Creek (5.5km).
Estimates since 1997 are based on the distance from the creek mouth to Dickson Weir (~7.6km).
One sample site was added starting in 1998.

Devil's Gulch

^^ Estimates are based on the distance from the mouth to 2.3km upstream.
Estimates since 1998 are based on the distance from the mouth to ~3.3km upstream.

SOURCE: Marin Municipal Water District, May 2006, "Lagunitas Creek Salmon Spawner Survey Report, 2005-2006."

TABLE 2-6
COHO REDDS IN THE LAGUNITAS CREEK WATERSHED
1982/83 - 2005/06

Years	Lagunitas Creek	San Geronimo Creek	Devil's Gulch	Other Tributaries	Total	Olema Creek (for comparison)
1982/'83	65	47	27	No Data	139	No Data
1995/'96	70	6	10	No Data	86	No Data
1996/'97	98	115	41	No Data	254	No Data
1997/'98	80	107	52	14	253	126
1998/'99	92	46	32	14	184	42
1999/'00	139	58	3	3	203	27
2000/'01	119	56	11	18	204	142
2001/'02	79	102	59	46	286	90
2002/'03	71	39	24	24	158	17
2003/'04	124	139	48	72	383	109
2004/'05	120	140	112	124	496	137
2005/'06	53	48	33	56	190	7

Notes: Other tributaries include Arroyo Creek, Larsen Creek, Evans Canyon, Woodacre Creek, San Geronimo Creek above Woodacre Creek, and Cheda Creek.
Lagunitas Creek is surveyed from Tocaloma to Peters Dam.
San Geronimo Creek is surveyed from its mouth to its confluence with Woodacre Creek.
Devil's Gulch is surveyed from its mouth to an impassable cascade roughly two miles upstream.

Redds are small pits in the stream gravel where females deposit their eggs.

SOURCE: Marin Municipal Water District, May 2006, "Lagunitas Creek Salmon Spawner Survey Report, 2005-2006."

The findings of the two-phase study indicate that for coho salmon in the Lagunitas Creek watershed, winter habitat constrained population growth during most years within the last decade. In 2006, the majority of coho smolt production occurred in San Geronimo Creek or in the Tocaloma Reach of Lagunitas Creek, with very little production observed in the confined channel of Devil's Gulch and upper reaches of Lagunitas Creek. Maintaining or restoring connectivity between the main San Geronimo channel and its low gradient tributaries is recommended as it is hypothesized that many of the small, low gradient tributaries to San Geronimo Creek provide quality winter refuge habitat during periods of high stream flow (Stillwater Sciences, February 2007). As with coho salmon, winter habitat appears to limit the steelhead population in Lagunitas Creek.

In confined channels within Devil's Gulch, San Geronimo Creek, and the upper reaches of Lagunitas Creek, constructed wood jams could increase winter carrying capacity as a net loss of woody debris from Devil's Gulch was observed as a result of export to the Lagunitas Creek channel during winter storms in 2006. Recommendations for addition of woody debris (including type and placement) were made in the study. The study also indicated that currently, the most important reach for coho smolt production appears to be the Tocaloma Reach of Lagunitas Creek. It is recommended that habitat in this reach be protected from development of the floodplain to preserve the quality winter refuge that this reach provides (Stillwater Sciences, February 2007).

During years of low fall abundance of juvenile coho, such as occurred in 1998, 1999, and 2000, the winter carrying capacity of the Lagunitas watershed does not appear to limit smolt production. In these years, early life-stage mortality appears to limit the production of coho from the watershed (Stillwater Sciences, February 2007). The analysis recommended that future investigations be conducted to determine whether summer flow patterns, cooler than average stream temperatures, or particular habitat characteristics of these two sample sites enabled juvenile coho to reach such high densities in the lower reaches of Lagunitas Creek during 2005. Restoration actions aimed at improving overwinter habitat by increasing large woody debris cover within confined reaches of Lagunitas Creek, San Geronimo Creek, and Devil's Gulch are also likely to improve fry retention during spring (Ibid.).

The Limiting Factors Analysis Studies also studied steelhead. The study found that steelhead smolts appear more evenly distributed across the Lagunitas watershed in contrast to coho salmon (Stillwater Sciences, February 2007). Recommendations were made for improvement of winter habitat by substrate enhancements and woody debris additions (Ibid.).

The Coho Recovery Strategy presents 21 recommendations for Lagunitas Creek that address: sediment source reduction, fish passage, migration barriers, woody debris retention, removal of non-native fish in stock ponds, riparian enhancement, water quality improvement, education and outreach, and monitoring efforts. Restoration is specifically recommended in Nicasio Creek, Olema Marsh, Bear Valley Creek and the mouth of Olema Creek. Additionally, the Recovery Strategy recommends restoration of natural channel form and function in the upper watershed to protect summer flows into San Geronimo Creek.

As previously indicated, approximately 70% of MMWD's water supplies originate in the Lagunitas Creek watershed where streamflow is collected in a series of reservoirs, and past estimates indicate

that approximately 25-40% percent of the total bay inflows is diverted by MMWD for municipal water supplies, at least one estimate of which was made prior to SWRCB's Order for MMWD in 1995. According to information from MMWD, while diversions were higher prior to the order, over the last 10 years, MMWD's diversions (and evaporation) have totaled about 27,400 AFA from Lagunitas and Walker Creeks and reservoir's surfaces. Thus, MMWD operations lower Lagunitas Creek flow to Tomales Bay by about 27% and decreases total freshwater flow to the bay by about 14% (MMWD, email communication). (See discussion above under subsection 2.3.) Irrigation systems, small dams, and domestic water supply systems also reduce flow. Freshwater is important in the bay for diluting pollutants, moderating salinity levels, and maintaining the bay's natural circulation patterns (Prunuske Chatham, Inc., April 2004).

MMWD diversions of water from the Lagunitas Creek basin are regulated by SWRCB Order WR95-17 which was issued in 1995. The Order establishes minimum instream flow requirements and other measures to protect fishery resources in Lagunitas Creek that were impacted as a result of the District's raising of Peters Dam in 1982 that increased the storage capacity of Kent Lake. The minimum instream flow requirements are specified for different periods of the year and for a "normal and dry" year to reflect coho needs during different life stages. The Order also establishes maximum water temperature requirements[3], and prohibits discharge of water from Nicasio Reservoir directly into Lagunitas Creek, which would help meet the water temperature requirement and reduce water turbidity. The Order also requires MMWD to implement measures to protect water quality, a sedimentation control plan, and a riparian vegetation management plan and to conduct annual fish monitoring. Finally, the order discontinued construction of the Giacomini seasonal gravel dam at the lower end of Lagunitas Creek. This eliminated the physiological barrier to salinity mixing at the upper end of the Lagunitas estuary. (Appendix J includes provisions of SWRCB Order WR95-17.)

The SWRCB Order indicates that given the significant changes that have occurred in the Lagunitas Creek basin, it is not realistic to suggest that the established requirements can restore the fishery to what existed in the unimpaired condition, but that the SWRCB had to regulate the diversions in a manner that maximizes the competing beneficial uses of water, maintains fish in good condition, and protects public trust resources where feasible. Furthermore, the SWRCB concluded that it believes that the flows established in the order, in combination with the other required measures, will be sufficient to keep fish in good condition and protect resources in Lagunitas Creek (SWRCB, October 1995).

In compliance with Order WR95-17, MMWD has developed and is implementing the *Lagunitas Creek Sediment and Riparian Management Plan*, the primary purpose of which is to mitigate for the change in naturally occurring stream flows that occurred as a result of raising Peters Dam at Kent Lake. Through a variety of projects, the goals of the plan are to provide an appreciable, long-term improvement to streambed conditions in Lagunitas Creek for the benefit of coho salmon and steelhead and to enhance instream fish habitat in Lagunitas Creek. MMWD's Fisheries Program implements projects identified for this purpose, such as riparian vegetation management, placement of woody debris structures in Lagunitas Creek, and erosion control projects such as road decommissioning or restoration, for the purpose of reducing the amount of fine sediment entering the steam system and improving fish

[3] A mean daily water temperature of 58 degrees Fahrenheit or less between May 1 and October 31, and 56 degrees between November 1 and April 30, as measured at the USGS gage at Taylor State Park.

habitat. The Plan also identifies measures to reduce the delivery of fine gravel and sand to Lagunitas Creek and to increase larger gravel and cobble between Peters Dam and Shafter Bridge. The program seeks to reduce the annual fine sediment load from San Geronimo Creek by 600 tons or approximately 15% through a combination of source control and small sediment traps. MMWD is continuing to prioritize and undertake projects to improve bed conditions in Lagunitas Creek. Recently, the District commissioned a survey to assess the sources and amount of potential sediment contribution resulting from unpaved roads on MMWD Mt. Tamalpais watershed lands.

The *Lagunitas Creek Sediment and Riparian Management Plan*; and *Aquatic Resources Monitoring Workplan for the Lagunitas Creek Drainage*, prepared in response to State Water Board Order WR95-17. These plans were approved by the District Board and the State Water Board, and adopted as 10-year plans in 1997. As part of this effort, MMWD established the Lagunitas Creek Technical Advisory Committee (Lagunitas Creek TAC) to provide MMWD with constructive review of the implementation of specific programs and projects in the Sediment and Riparian Management Plan, as well as to provide continuing consultation and advice on the management plan.

As of this writing (July, 2007), the ten-year implementation period has come to a close, and MMWD has conducted the projects and programs defined in the above-mentioned plans. However, the District's position is that successful implementation of these projects and programs does not relieve the District of its responsibilities, and the MMWD Board of Directors' is currently evaluating in what form to continue MMWD's Lagunitas Creek management actions. MMWD will continue its compliance with Order WR95-17. The District will prepare a 10-year analysis and summary report on the Lagunitas Creek Sediment and Riparian Management Plan. MMWD will also develop, through a public review process, a new fisheries management plan for MMWD activities in Lagunitas Creek.

The Lagunitas Creek TAC has been a valuable partner in MMWD's efforts during the past ten years to improve the habitat and biological resources of Lagunitas Creek. The District has benefited greatly from the TAC's advice through the implementation of the projects and programs included in the Sediment and Riparian Management Plan; because of the TAC, the District has been able to go beyond the Plan and to implement additional projects and programs that are consistent with the goals of the Plan. In addition, the TAC has proven to be an important and valuable forum for resource agencies and organizations to communicate, coordinate, and collaborate on watershed management and the enhancement of fishery resources in the Lagunitas Creek watershed. The opportunity now exists to build on this successful record and implement an integrated planning and management approach, as presented in this ICWMP.

In 2001, a Memoranda of Understanding (MOU) was initiated by MMWD and signed by MMWD, County of Marin, Marin County Open Space District, California Department of Parks and Recreation (CDPR), USNPS, and MRCD. The MOU provides uniform standards for the maintenance and management of unpaved roads in the Lagunitas Creek watershed to help reduce sedimentation.

Additionally, In 2007, a Memorandum of Understanding (MOU) was signed by MMWD, County of Marin, the MCOSD, CDPR, USNPS, and MRCD for woody debris management. The MOU provides guidelines regarding the management and prioritization of naturally occurring woody debris and potential woody debris in riparian areas for stream habitat enhancement.

Walker Creek

Historically, Walker Creek had excellent spawning populations of coho salmon and steelhead trout. Although declining, steelhead are still present, particularly in the area near the confluence of Chileno and mainstem Walker Creeks, but coho sightings have been very rare in the last fifteen years. Little quantifiable information exists for coho and steelhead populations.

Fisheries studies conducted in the 1970s and 1980s indicate that sedimentation and high temperatures were limiting salmonid populations in Walker Creek. In 1976, MMWD and CDFG entered into an agreement that specified summer and winter stream flows in normal, dry and critically dry years from Soulajule Reservoir. Approximately 200 erosion sites have been identified on 58% of the watershed below Soulajule Reservoir and Laguna Lake by MRCD.

In 2001, CDFG collected small numbers of coho fingerlings from streams in Central California in an effort to recover near-extirpated stocks and rebuild extinct populations in the Russian River watershed. Stock from Olema Creek were released by CDFG into Walker Creek in January 2004 because it historically contained coho salmon that most likely was genetically related to the Olema Creek population. Subsequently 50-60 coho fingerlings and one coho juvenile were detected.

In the summers of 2001 - 2003, the DFG collected juvenile coho salmon from Olema Creek, a tributary to Lagunitas Creek and Tomales Bay. These three year-classes of juvenile coho were raised to adults at the Warm Springs Hatchery and then released, as adults, into Walker Creek. The adult coho plants into Walker Creek occurred during the winters of 2003/2004 (80 adult coho), 2004/2005 (87 adult coho), and 2005/'06 (40 adult coho). The intent of this planting effort was to reestablish a population of coho salmon in Walker Creek.

Beginning in 2003/'04, MMWD began monitoring surveys in Walker Creek to follow-up on the coho plantings by DFG and to help evaluate the success of the planting effort. Beginning in 2006, this monitoring effort was supported by a CDFG grant to MMWD for the Walker Creek Salmon Monitoring Program. The program is currently underway and includes conducting detailed juvenile and spawner surveys through the 2007/'08 spawning season. According to MMWD, the monitoring effort to date has revealed three main findings:

- There was successful reproduction of coho salmon resulting from the plantings in 2003/'04 and 2004/'05
- Offspring of adults that were planted into Walker Creek have survived and returned as adults in 2006/'07; and
- Walker Creek appears to support a healthy and robust population of steelhead.

The Coho Recovery Strategy presents 7 recommendations for Walker Creek that address: water quality, nutrient loading, sediment source reduction, riparian protection, large woody debris recruitment, restoration of natural channel conditions and limiting factors assessment in Keyes Estero and Tomales Bay. Additionally, the Recovery Strategy recommends assessing the water temperature regime during the summer season for three to five years to determine the role of water temperature as

a limiting factor and continuing to assess the release of water from Soulajule Reservoir to develop the optimum release for coho salmon.

WETLAND AND RIPARIAN HABITATS

WETLANDS

Tomales Bay supports mud flats, salt marshes and freshwater marshes. Large eelgrass beds grow in the northern half of the bay with smaller ones lining the eastern shores (Prunuske Chatham, Inc., April 2004). The largest wetland area in the bay, consisting of salt marsh and mudflats, is located at the southern end of the bay within the Tomales Bay Ecological Reserve, which comprises approximately 500 acres of land that is owned and managed by the State Wildlife Conservation Board. At one time, the wetlands in the area of the reserve covered an additional 500 acres to the south that was diked, drained and converted to agricultural use over the years (Marin County, April 1981).

Other areas of salt marsh in Tomales Bay occur in small scattered patches along the east shore, most notably at the mouths of Walker Creek and Millerton Gulch and on Tom's Point. Areas of freshwater marsh can be found on the upland side of many salt marshes fringing the bay. The largest of these is the Olema Marsh near the junction of Olema and Lagunitas Creeks (Ibid.). Small localized wetland areas are found within the PRNS. Within the Walker Creek watershed, Laguna Lake in Chileno Valley is a shallow natural lake that is considered a vernal pool (Prunuske Chatham, Inc., April 2004). Figure 19 shows wetlands identified as part of the National Wetland Inventory.

Since the early 1900s, construction of levees at the southern end of Tomales Bay for roads and dairy farms have served to hydrologically disconnect Lagunitas Creek and its tributaries from their floodplains. In the early 1900s, several artificial channels were excavated in the Olema Creek watershed, and in the early 1920s, Olema Creek was straightened into a 3-kilometer long canal between the town of Olema and its confluence with Lagunitas Creek. The canal drained the surrounding land for agricultural crop production. Additionally, many of the salt marshes near the mouth of Lagunitas Creek and along the periphery of Tomales Bay were converted into pastureland by the construction of levees during this period. Construction of levees for railroad or agricultural purposes has increased sedimentation rates and resulted in a reduction of bay water volume and tidal exchange, as well as loss of wetland habitat (Tomales Bay Watershed Council, July 2003).

In 2000 the National Park Service acquired the 563-acre Waldo Giacomini Ranch at the mouth of Lagunitas Creek for wetland restoration. Known as the Giacomini Wetland Restoration Project, the project will remove levees and tidegates on a former diked dairy, restoring floodplain and intertidal habitat, as well as serving to improve freshwater flows and water quality in Tomales Bay. The purpose of the project is to restore natural hydrologic processes within a significant portion of the project area, thereby promoting restoration of ecological processes and functions (PRNS, November 2006). Figure 17 shows the location of the project and species that would benefit from wetlands restoration. Infrastructure such as levees, tidegates, and culverts, as well as intensive agricultural management, has degraded the condition of these wetlands and substantially reduced hydrologic and ecological functionality of what was once of the largest integrated tidal marsh complexes in Tomales

Bay. Hydrologically connected, natural wetlands provide many important functions and services for humans and wildlife, including floodwater retention, water quality improvement, wildlife habitat and food supply, recreational opportunities, and support of mariculture and fisheries industries. As two-thirds of Tomales Bay's freshwater inflow passes through the Project Area, these wetlands probably once played an integral role in maintaining health of Tomales Bay, which has deteriorated over the last century because of excessive sedimentation, water and sediment quality problems, non-native species invasions, and other issues (National Park Service, 2007).

The Giacomini Wetland Restoration Project also includes a water quality monitoring program (see discussion in Chapter 9 for further discussion). The ability of the restoration area to attenuate delivery of pathogens, sediment and nutrients to the bay is extensive and would be monitored and quantified as part of a long-term restoration monitoring effort (Tomales Bay Watershed Council Foundation, February 2006).

The USNPS completed a Draft Environmental Impact Statement/Report in 2006, and completed a Final Environmental Impact Statement/Report in 2007. Alternative D, the agency Preferred and environmentally preferred alternative, includes extensive restoration of the Giacomini Ranch east pasture, full restoration of the west pasture, and restoration of Olema Marsh with limited public access (National Park Service, 2007). The North Marin Water District's Coast Guard wells could be adversely affected due to some increase in salinity levels, i.e. concentration, during spring or high tide conditions as a result of the planned restoration project (National Park Service, November 2006). The NMWD has worked cooperatively with the USNPS and its consultants to assess the potential impacts this plan will have on the area's water supply from the Coast Guard Wells near Lagunitas Creek. The USNPS has expressed support of NMWD's efforts in pursuing grant money to develop its Gallagher Well Project.

RIPARIAN HABITAT

Riparian habitat is found throughout the Lagunitas Creek watershed in remnants. There are significant riparian stands along Lagunitas Creek upstream of the Samuel P. Taylor Park and in the San Geronimo Valley. Deciduous trees (e.g., willow, alder) were the most common vegetation type observed in all reaches of Lagunitas Creek (Marin Municipal Water District, January 2006). Canopy cover in Lagunitas Creek varied from 31% downstream of Nicasio Creek to 55% between Devil's Gulch and Shafter Bridge (Ibid.). Several tributaries, such as Devils Gulch, have excellent examples of mature riparian forest with a rich diversity of plants.

Mainstem Walker Creek contains areas of thick riparian forest, some of which are contiguous to upland forest. Other areas, particularly in the Chileno and Keyes Creek watersheds have little remaining mature riparian habitat, although efforts have been underway to re-establish native riparian vegetation (Prunuske Chatham, Inc., April 2004).

Riparian habitat restoration improves water quality and habitat for salmonids and other aquatic and terrestrial wildlife species. Restored riparian corridors in Chileno Valley attract a variety of neotropical songbirds species, including warblers, vireos, flycatchers, and thrushes (Prunuske Chatham, Inc., April 2004).

ASBS AND MARINE HABITATS

The continental shelf extends far from the coast, beyond the Farallone Islands. The offshore marine waters, upwelled over the broad shelf between the Farrallone Islands and Point Reyes, offer a shallow, highly productive habitat for seabirds, fish and marine mammals. In addition, PRNS is located between two marine provinces, Californian and Oregonian. This overlap leads to a wide diversity of terrestrial and aquatic habitats.

Duxbury ASBS contains a variety of habitats and marine species. Duxbury Reef contains an extensive system of tide pools lined with seaweed and beds of mussels and at low tide a wide variety of invertebrates are exposed within the pools. The reef contains a variety of habitats and marine species, including a rich intertidal biota including sea slugs, clams and worms, a rare burrowing anemone and unique acorn worm. (Center for Watershed Protection, March 2004). PRNS monitors rocky-intertidal habitats and has targeted seastars, barnacles, and algae at fixed stations since 1996. PRNS has an existing monitoring program for plovers and pinnepeds. Seabirds do not nest at Duxbury Reef because no major off-shore rocks exist along the reef (National Park Service, 2006). Duxbury Reef is an important haul out site for Harbor seals.

Large areas of kelp are located in the nearshore marine environment of Duxbury Reef. Kelp is one of the most productive marine plants and provides substrate for numerous benthic invertebrates, as well as food and shelter for many fishes, seabirds and marine mammals. Complex communities created by kelp forests are located along the southern portion of Point Reyes from Drakes Bay to Bolinas. Sea otters existed historically along the park's shoreline, though today they do not exist in significant numbers.

Photo by Greg Filbrandt

The Point Reyes Headlands ASBS contains a variety of habitats and marine species. There is extensive use of beaches along the Point Reyes ASBS by northern elephant seal and sea lions. Since the first elephant seal birth was recorded in 1981, the colony has increased steadily, fueled by immigration of mature animals from nearby breeding colonies at Año Nuevo and the Southeast Farallones Islands. Monitoring data is available from 1997-2002. Currently, elephant seals breed on beaches in three main colonies and at several smaller sites, Gus' Cove, Dead Seal Beach, and Mendoza and Nunez' Ranches (National Park Service, 2006). The 1980 ASBS study notes other marine mammal breeding (Sea Lion Cove), seabirds (Lighthouse Point), and largest population of red abalone in Marin County (Split Rock Cove) (State Water Resources Control Board, 1980).

At Double Point ASBS, a solitary rock at North Point, Stormy Rock, is one of the major bird feeding and breeding sites in Marin County with summer use by cormorants, murres, pelicans, and grebes. A smaller summer rookery exists at South point. Below these rookeries is a lush reef with kelp and

invertebrates. Abalones are now sparse; kelp beds south of Double Point have a remnant population large enough to support a sport fishing activity. Harbor seals permanently reside on Bolsa Beach and form one of the largest populations in the world. (State Water Resources Control Board,May 1979).

Major species that are supported in the Bird Rock ASBS are harbor seals and California sea lions, the former of which appear to use the site year-round. Four species of marine birds breed on the island. The marine habitat contains one of the most diverse invertebrate populations north of Monterey County, which includes an abalone nursery population. The marine environment is basically undisturbed and is characterized by relatively stable assemblages of invertebrates and marine plants. White sharks frequently visit the area with seven recorded shark attacks in 1980 (State Water Resources Control Board, April 1980).

A number of studies and programs are underway or have been completed documenting marine resources in the ASBS areas and are summarized in Appendix K. These studies generally include: a coastal inventory of intertidal resources through contract (2006) between USNPS and UCSC Partnership for the Interdisciplinary Study of Coastal Oceans (PICSO); an intertidal restoration program at Duxbury Reef by the Gulf of the Farallones National Marine Sanctuary (GFNMS); preparation of high resolution maps detailing marine habitat throughout the Point Reyes Headlands ASBS; and various summer seabird and marine mammal surveys.

2-9 SOCIAL AND CULTURAL ATTRIBUTES

The Tomales Bay region is characterized as a rural area with low human population density. The residential population is largely consolidated in twelve unincorporated communities. Most of these towns originated as fishing and agricultural villages and summer vacation destinations.

Outside of these communities, agriculture, recreational and fishing enterprises characterize the cultural fabric of the watershed. Agriculture has clearly played a significant role in both the human and environmental history of the Tomales Bay watershed. Cattle ranching for hides and tallow was some of the earliest agricultural production in Marin County (which included production on the Point Reyes Peninsula and other areas beyond the Tomales Bay watershed). Sheep became an important commodity in the late 1850s, and, Marin County was among the leading cattle production counties in the state between 1850 and 1880 (Tomales Bay Watershed Council, July 2003).

Many families that are ranching and farming today in the watershed are fourth and fifth generation descendants of the original European farmers and ranchers, and have been working to improve their practices for the last three decades with the assistance of the NRCS, MRCD, PRNS and the UCCE. Today many dairy producers and ranchers are taking steps to address water quality and habitat concerns. In the past these producers have installed waste management systems, with federal, state, and county assistance to collect and store manure according to the guidelines established by the RWQCB's 1970s "Minimum Guidelines for Protection of Water Quality from Animal Wastes." In addition, MRCD and NRCS continue to provide landowners with both technical and programmatic support for stream restoration, streambank protection, upland erosion control, rangeland management and habitat improvement (Tomales Bay Watershed Council, July 2003).

West Marin has been and continues to be a leader in farmland and open space conservation. Major development and growth plans in the 1950s and 1960s were halted over the years. Farmland protection efforts received an additional boost in 1980 when the Marin Agricultural Land Trust (MALT) was founded in a collaborative effort by ranchers and environmentalists to preserve farmland. MALT was the first land trust of its kind in the nation and continues to be a model for agricultural land protection across the nation. Today MALT has permanently preserved 58 farms and ranches on 38,000 acres.

West Marin also has been and continues to be a leader in organic farming and ranching. On the shores of Tomales Bay, the Straus Dairy, certified organic in 1993, was the first certified organic dairy west of the Mississippi River. West Marin received national and international attention in 2006 when Prince Charles toured the region to honor its pioneering role in organic farming.

2-10 ECONOMIC CONDITIONS & TRENDS

During the last two centuries, the watershed's rich natural resource base has supported a local agricultural community, mariculture industry, and commercial and recreational fisheries that have provided high quality products both locally and to the San Francisco Bay Area and beyond. Today, the region supports various economic enterprises including sheep and cattle ranching, dairying, farming, commercial fishing, oyster farming, specialty crops and tourism. An increasing amount of the local economy has shifted and is predicated upon the demand for recreation-oriented goods and services ranging from over-night accommodations to kayak rentals to numerous eateries that serve approximately 2.5 million visitors annually.

According to the Marin County Farm Bureau, Marin County's agricultural production value in 2005 was $52 million with milk production representing 60% of this total. Overall fish production value in 2005 as reported by the Farm Bureau was $3.2 million of which approximately $1.5 million is related to mariculture operations in Tomales Bay and approximately $1.5 million related to Pacific herring catches. According to the County of Marin Community Development Agency website, approximately half of the county's land area consists of parks and open space, with significant park land located within the Tomales Bay region (see Figure 8). Visitors to Marin County support a $500 million per year tourism industry.

While Marin County consistently ranks among the wealthiest of any county in the state and the nation, the majority of this wealth is concentrated in a handful of communities in East Marin, except for the tiny West Marin community of Nicasio, which is periodically rated among the 50 or 75 wealthiest in the nation based on home prices. During the "dot.com" boom of the 1990s, many homes that provided housing for West Marin's workforce were bought as weekend retreats. The loss of rentals forced many permanent residents to leave. In Inverness, for example, the year-round population dropped 25 percent between the 1990 and 2000 censuses. The high cost of living makes it a challenge for many long-time residents to remain in West Marin.

2-11 RELATIONSHIP TO OTHER REGIONAL EFFORTS

Existing ICWMP-Related Grants

The MRCD is participating in a State Coastal Conservancy funded Tomales Bay Watershed Enhancement Program (prop 40). The program will implement 21 watershed projects on agricultural lands to improve aquatic, salmonid and riparian habitat in the watershed using the Marin Coastal Watersheds Permit Coordination Program.

Marin Municipal Water District and North Marin Water District are participating in two Integrated Regional Water Management planning efforts that extend beyond the Tomales Bay ICWMP regional boundary. These IRWM planning efforts include the North Bay Watershed Association (NBWA) and the San Francisco Bay Area, which are further reviewed in Chapter 4.

Current Regional Efforts

As previously indicated, water resource and watershed management has been undertaken in the region by a variety of agencies and organizations, often resulting in collaborative partnerships. Some of the key past accomplishments and current efforts are summarized below. The following examples highlight the variety of projects and regional collaboration that have been realized to date and that can be anticipated to continue and expand in the future.

- In 2003, the **Tomales Bay Watershed Council (TBWC)** prepared the *Tomales Bay Watershed Stewardship Plan* to address human activities that affect water quality and habitats in Tomales Bay and its watershed. The Plan's goals seek to ensure that the water quality in Tomales Bay and tributary streams is sufficient to support natural resources and beneficial uses; restore and preserve the integrity of natural habitats and native communities; and develop strategies to implement the Plan and to protect the watershed. The TBWC was recently awarded a grant in conjunction with the Giacomini Wetland Restoration Project to coordinate water quality monitoring efforts.
- The **Point Reyes National Seashore (PRNS)** has a long-term interest in the health of Tomales Bay, and to guide its actions and promote coordination with other agencies, developed the *Tomales Bay: Guidelines for Protection and Use (2001)*. In addition, PRNS has secured funding for riparian protection fencing along Olema Creek, established a water quality monitoring program, and developed an education and camping permit system for users of this important estuary. To enhance coho salmon and steelhead trout populations, PRNS has conducted several projects to remove fish passage barriers on Olema Creek and its tributaries. PRNS is currently planning a $5.5M restoration of the Giacomini Ranch at the confluence of Lagunitas Creek and Olema Creek with Tomales Bay. Restoration of natural hydrologic process to this 563 acre area will improve connectivity and function of tidal and floodplain habitats and result in direct improvements to water quality within the Bay. PRNS, through USNPS and CDFG support, has maintained a long-term salmonid monitoring program in coastal Marin streams. In addition, the PRNS has received funding through the Clean Water Act 319 (h) program for rangeland BMP implementation in the Tomales Bay Watershed, as well as

planning monies for restoration and enhancement of fish passage and salmonid habitat within the Bear Valley Creek watershed. A long-term salmonid monitoring program in coastal streams has been maintained at the PRNS through NPS and CDFG support.

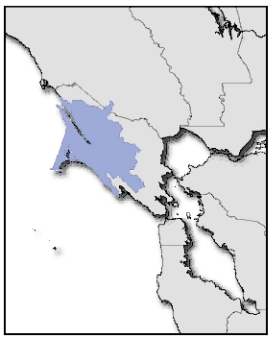
- The San Francisco Bay **Regional Water Quality Control Board (SFBRWQCB)** facilitates the *Tomales Bay Shellfish Technical Advisory Committee* (TBSTAC), composed of agencies and local stakeholders. The RWQCB has been the driving force behind remediation and monitoring of mercury in the bay and tributaries, and has completed a pathogen Total Maximum Daily Load (TMDL) report. The RWQCB has managed projects to improve water quality, funded by the SWRCB, ranging from erosion control to septic improvements. Millions of dollars worth of projects have been funded in Tomales Bay, Walker Creek, and Lagunitas watersheds over the past 10-15 years, including federal pass through funds from CWA 319(h), planning funds from 205(j), and State bond funds Prop. 13 and 50.
- The **Marin Municipal Water District (MMWD)** has been implementing a comprehensive, long-term plan to reduce sediment entering the stream network and to enhance in-stream habitat through: sediment source/erosion control projects throughout Lagunitas Creek; placement of instream woody debris structures in the creek to form deeper pools in the channel and improve habitat; riparian revegetation at several sites; annual monitoring of streambed conditions; annual monitoring of the populations of juvenile coho and steelhead, coho spawners, and California freshwater shrimp; project site monitoring for northern spotted owls and California red-legged frogs; instream habitat typing surveys at least every 5 years; water quality monitoring; annual reporting; and coordination with other agencies and organizations. MMWD also has adopted policies for protection of water quality on its watershed lands within the region.
- The **Marin Resource Conservation District (MRCD)** has worked with agricultural producers, local, state and federal resource agencies and local nonprofits in completing many conservation projects throughout the watershed, including: gully repairs, streambank stabilization, and headcut repairs; road repair; manure management projects; and installation of riparian vegetation, livestock fencing, water troughs, livestock crossings, grade control structures, , and sediment retention ponds. Ranchers in the Walker Creek subwatershed have completed a watershed plan and 6 contiguous miles of stream restoration. Restoration projects most often include participation of the Bay Institute's Student and Teachers Restoring a Watershed program. MRCD has also completed watershed-wide assessment such as a limiting factors analysis for salmonids, and erosion, vegetation and geomorphic studies. Additionally, the MRCD's "Marin Coastal Watersheds Permit Coordination Program" provides coordinated regulatory review for project implementation. Through this program, regulatory agencies issue permits to the MRCD/NRCS that cover projects on private lands provided landowners work under the supervision and Sponsorship of the MRCD/NRCS.
- During the last three decades, the **County of Marin** has revised land use densities and habitat policies that provide increasing protection for riparian areas and fisheries. In Spring 2005, the County Board of Supervisors established a County Fisheries Restoration Program aimed at restoring fish passage through county culverts on salmon streams in West Marin. The County has also created a training program for county road maintenance, and a program to address fish barriers. In partnership with the East Shore Planning Group, the County has received

funding for water quality studies and related research to improve wastewater treatment and failing septic systems. The County has provided financial support to the RCD and TBWC.

- The **Salmon Protection and Watershed Network (SPAWN),** in partnership with RWQCB and SWRCB, is currently assessing water quality in the Lagunitas Creek Watershed as part of an effort to determine TMDLs for pollutants. SPAWN leads a spawner monitoring program on tributaries to San Geronimo Creek (where 25% of coho spawn); monitors smolt outmigration on San Geronimo Creek and its tributaries; leads riparian restoration and sediment reduction projects on private lands throughout the San Geronimo Valley; leads education and community outreach programs, in particular a private landowner consultation program; and works to strengthen Streamside Conservation Area protections.
- **FishNet 4C**, formed in 1998, is a County-based salmon protection and restoration program that brings together the Central Coast Counties, focuses on implementing restoration projects, employing best management practices during maintenance activities, and incorporating aquatic habitat protections into land use regulations and policies. Projects include elimination of fish passage barriers at culverts; completing road restoration projects to reduce sedimentation; and using bioengineered streambank restoration techniques in lieu of traditional rip rap.
- The **California Department of Parks and Recreation (CDPR)** developed a General Plan that addresses Tomales Bay water quality, resource management, and land acquisition; and implements water quality monitoring; erosion control projects; and facility maintenance at Samuel P. Taylor, Tomales and Millerton State Parks.
- The **California Department of Fish and Game's (CDFG)** Fisheries Restoration Grant Program has contributed funding towards planning, assessment, and restoration projects within the Tomales Bay watershed during the last five years. This funding produced the *Walker Creek Watershed Plan* and subsequent riparian fencing, revegetation, alternative water source and erosion control implementation projects in partnership with the MCRCD; sediment source reduction in the Lagunitas Creek watershed in partnership with the Marin County Open Space and Marin Municipal Water Districts; riparian fencing in Lagunitas Creek watershed in partnership with the Tomales Bay Association and National Park Service (USNPS); riparian enhancement in Lagunitas Creek watershed in partnership with MMWD; and salmon and steelhead trout monitoring in Lagunitas Creek watershed in partnership with the USNPS. Most recently, CDFG has funded the Tomales Bay Watershed Council to continue its outreach, education, and watershed planning and assessment efforts.
- The **California State Coastal Conservancy** (Conservancy) has been actively participating in conservation and restoration efforts in Tomales Bay for over 25 years. Working with partners such as Marin Agricultural Land Trust (MALT), the MRCD, USNPS and Marin County, the Conservancy continues to fund projects to restore and enhance the agricultural and natural resource values of West Marin. The Conservancy has been an active participant in watershed planning in Tomales Bay since the early eighties, and was one of the contributors in funding the TBWC's Stewardship Plan. Other Conservancy projects have included acquisitions of agricultural and conservation easements throughout the watershed, erosion control, livestock fencing and stream revegetation projects, an assessment of fish passage barriers in Marin County, and an assessment of on-site septic systems and their impact on coastal waters.

- **Gulf of the Farallones National Marine Sanctuary (GFNMS)** enforces regulations that prohibit discharges and habitat damage in the waters of Tomales Bay up to the mean high tide; coordinates a Technical Advisory Committee on Tomales Bay Vessel-related Management; provides funding for riparian restoration projects; and assisted with the removal of the Giacomini Dam in 1990.
- **The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS)** has provided technical and financial assistance through the Environmental Quality Incentives Program (EQIP) to 18 agricultural property owners in the watershed to implement water quality and other BMPs. The agricultural producers agreed to pay an in-kind contribution of more than $200,000 for the EQIP money awarded. Practices included: riparian fencing, livestock crossings, and off-stream water development for riparian area protection; manure holding ponds and fresh water diversions were constructed for improved dairy manure management; and cross-fencing and livestock water facilities were installed for improving livestock grazing management.
- **Audubon Canyon Ranch (ACR)** has implemented wetland restoration and management projects at Livermore Marsh and Olema Marsh, restored coastal prairie vegetation along the east shore of Tomales Bay and, in several areas surrounding the bay, removed and controlled invasive pest plants, including non-native ice plant (*Carpobrotus edulis*), *Spartina densiflora*, European dune grass (*Ammophila arenaria*), and other pest plant species.
- The **Tomales Bay Agriculture Group (TBAG)**, in collaboration with the MRCD and NRCS, are working to protect and restore riparian and stream resources on ranches and dairies. In cooperation with the University of California Tomales Bay Water Quality Project, TBAG implements water quality improvement practices and to monitor their effectiveness. Water quality data is being collected from loading units that represent land use practices within these facilities. This project is identifying and prioritizing areas and practices that can reduce bacteria, nutrient, and sediment loading from Bay tributary watersheds. Recently four of the study cooperators received letters of recognition from the SFBRWQCB for their efforts to improve water quality.
- The **Tomales Bay Association (TBA)** has conducted a salmonid monitoring and restoration program since 1986 on Olema Creek; installed livestock exclusion fencing and planted riparian vegetation; assisted the USNPS with other fencing projects on Cheda and Devil's Gulch streams; and has published numerous educational documents.
- The **University of California Cooperative Extension (UCCE)** Sea Grant has initiated a pilot program to restore native oysters in Tomales Bay that is being conducted in cooperation with researchers at UC Davis and San Francisco State University (SFSU) in collaboration with NOAA Fisheries. The UCCE also has been actively involved in water quality monitoring efforts and specifically looking at the effects of grazing management measures to improve water quality.
- **Trout Unlimited (TU)** started working in the Lagunitas watershed in the 1980s, calling attention to the adverse impacts of dam construction on the coho and steelhead runs. To preserve the populations in the face of declining water flows, TU member-volunteers captured salmon in tributaries, spawned them, and raised the young in hatcheries until they were big enough to survive in the creek. Among other projects in the watershed, TU members have also worked to install exclusionary fencing along Devil's Gulch to reduce sedimentation in the creek.

- **West Marin Mosquito Control Coordination Council**, a body of representatives from West Marin organizations, governmental agencies, special districts and stakeholders from unincorporated residential areas, continues to work in partnership with the Marin/Sonoma Mosquito and Vector Control District. The Council's purpose is to implement a formal agreement based on precautionary protocols to be used in areas of West Marin to control mosquito populations, with the goal of minimizing adverse environmental impacts associated with the potential widespread use of pesticides in the area. In summary, this agreement states that in communities in West Marin, we will work in partnership to: educate about mosquito prevention and control; to provide information and support for physical prevention methods; to assist these communities with drainage and other standing water issues; and to use only the chemicals *Bacillus thuringiensis var. israelensis* or *Bacillus sphaericus* (Vectobac and Vectolex, the product names), as a last resort. Currently, negotiations are underway to extend the agreement of 2006, recognizing the importance of balancing human safety with the commitment of West Marin communities to long-term solutions that utilize non-toxic means of prevention when possible. The success of this effort is a testament to the effectiveness of solution-based collaboration that is often used to address local issues and policies in West Marin.



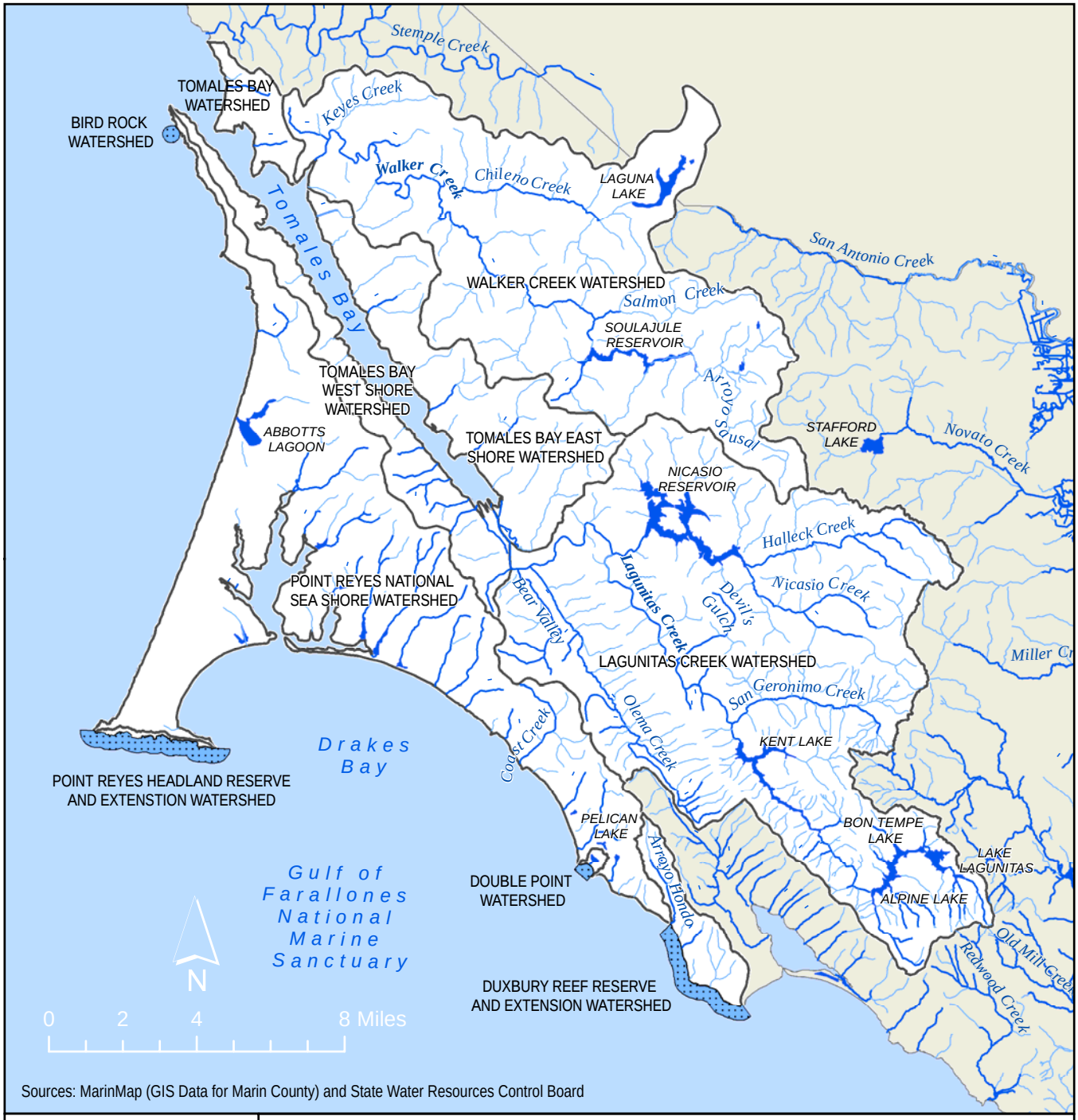
Legend

- Study Area Boundary
- Critical Coastal Area
- Areas of Special Biological Significance
- Coastal Zone

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 4. Critical Coastal Areas



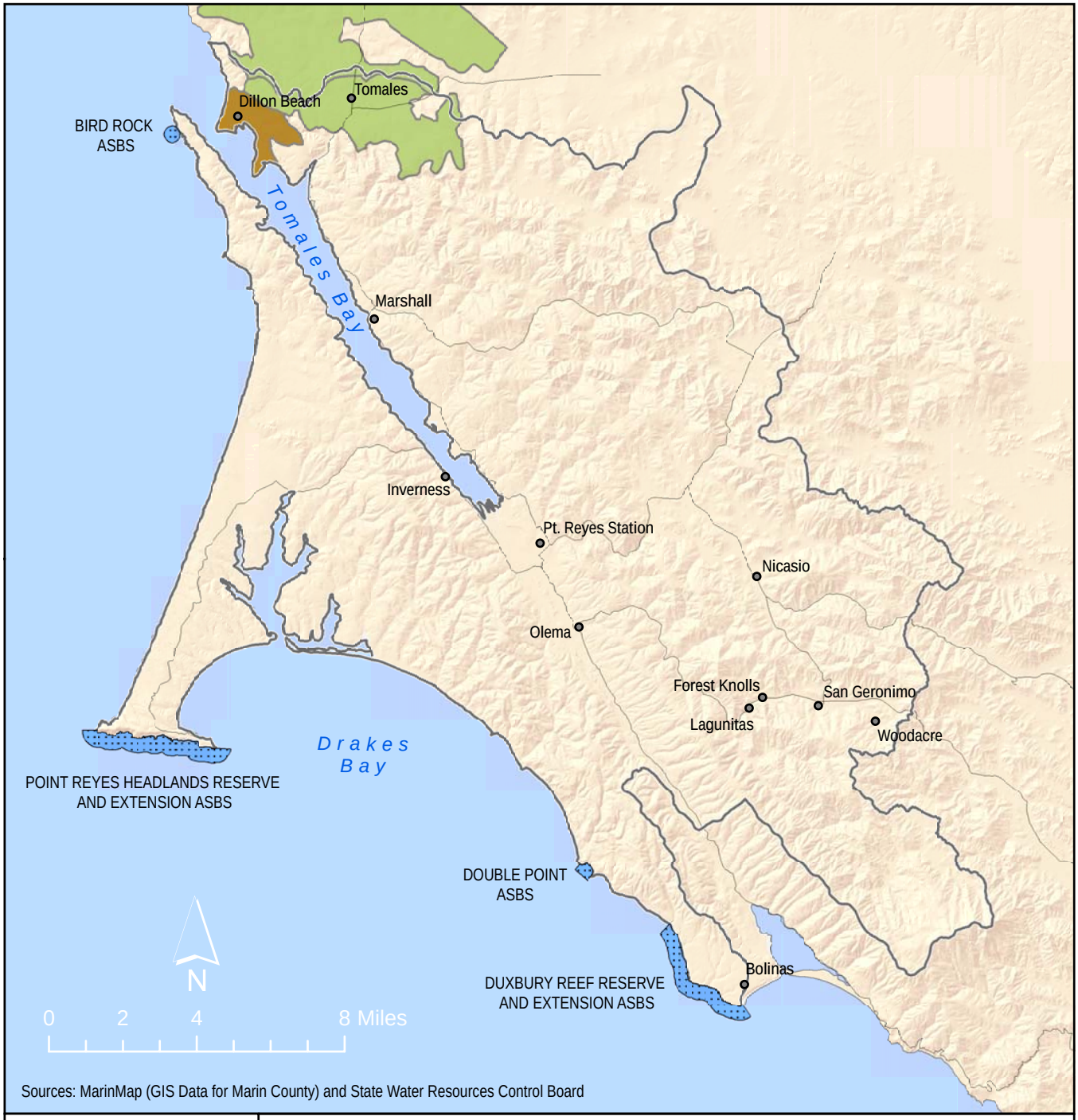
Legend

- Ephemeral and Intermittent Streams
- Perennial Streams
- Subwatershed Boundary
- Areas of Special Biological Significance
- Reservoir, Lake or Lagoon

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 5. Streams, Watersheds and Hydrological Features

TOMALES BAY Watershed Council



Legend

- Study Area Boundary
- Sand Point Area
- Wilson Grove Formation

TOMALES BAY
Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 6. Groundwater Basins

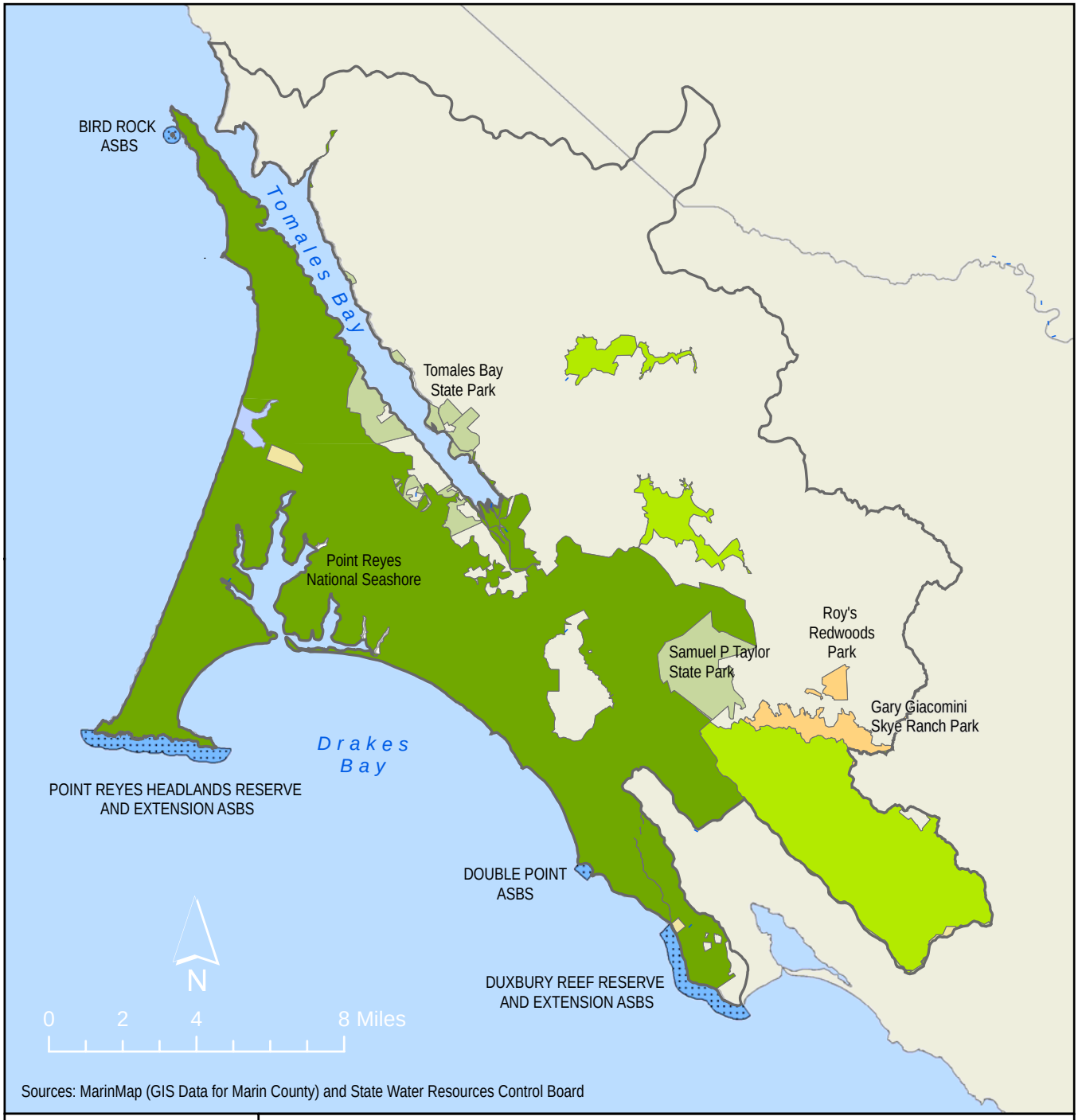
Legend

- Study Area Boundary
- Developed Land Use
- Agriculture/Grazing Land Use
- Parks and Open Space Land Use

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 7. Existing Land Use



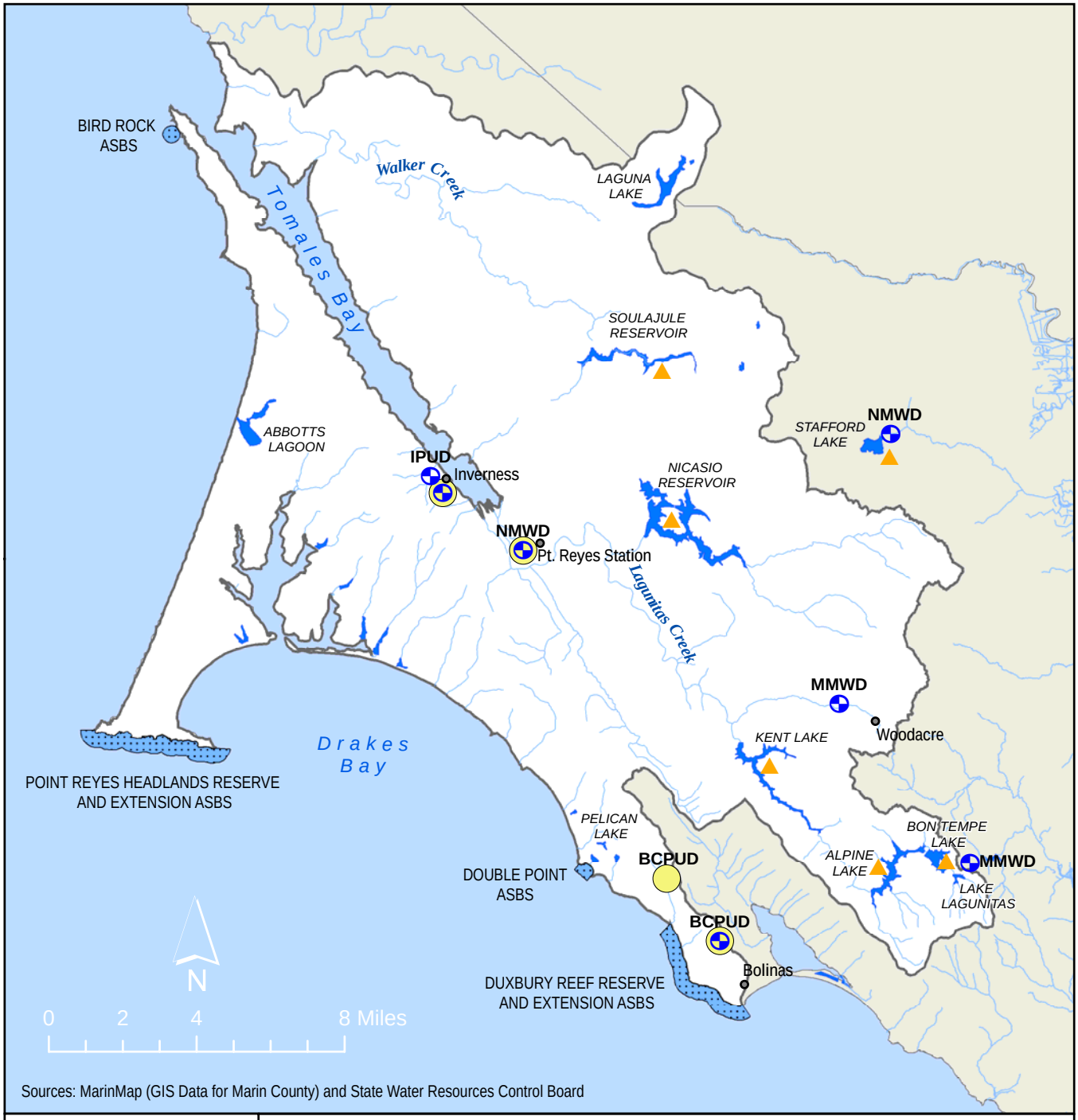
Legend

- Study Area Boundary
- National Park Service
- Marin Municipal Water District
- CA Dept of Parks and Recreation
- Department of Defense
- Marin County

TOMALES BAY
Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 8. Publicly Owned Lands



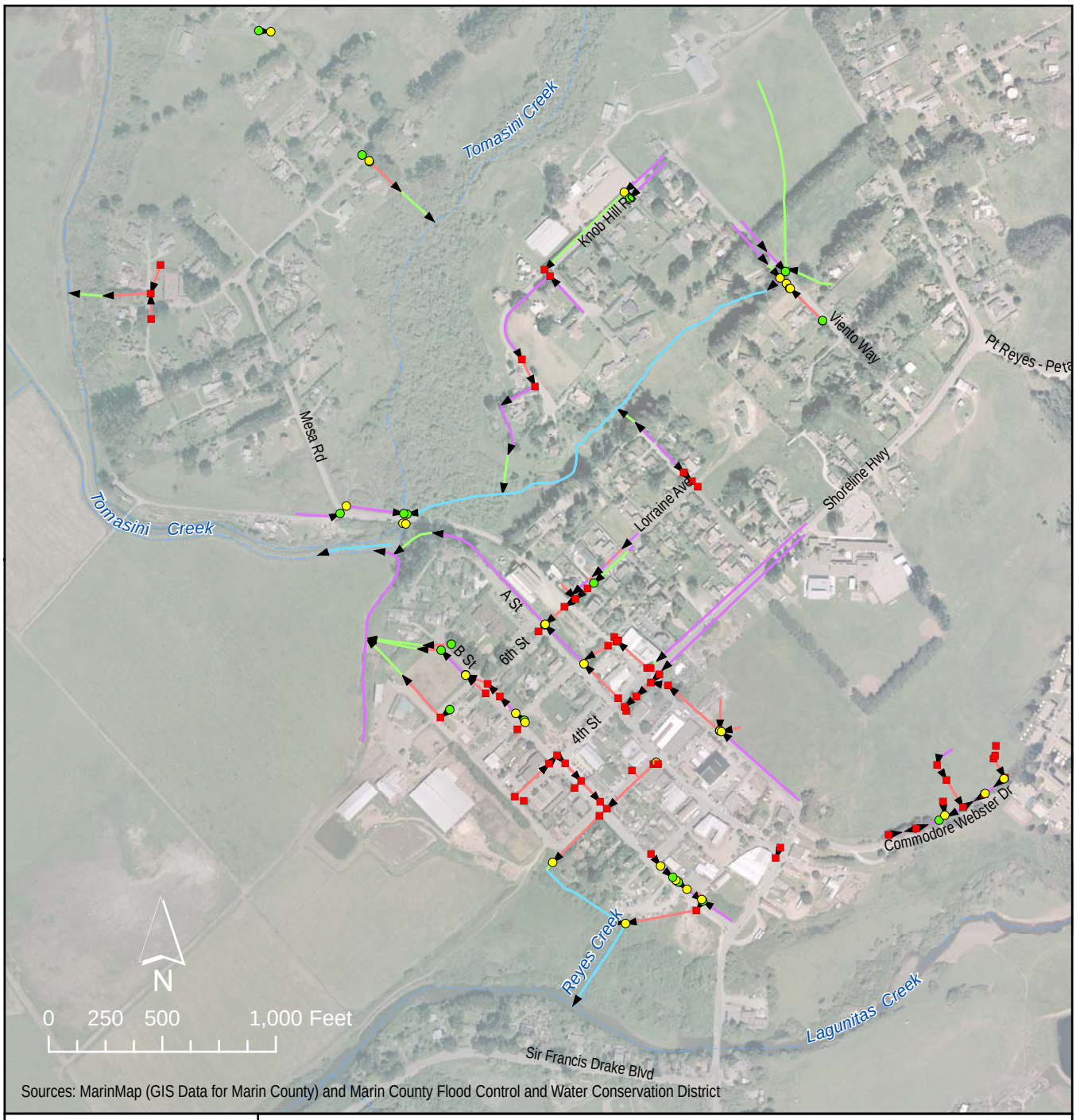
Legend

- Water Treatment Plant
- Water Supply Source
- Water Supply Reservoir or Lake
- Perennial Streams
- Reservoir, Lake or Lagoon

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 9. Major Drinking Water Facilities and Infrastructure



Legend

- Culvert Inlet
- Culvert Outlet
- Catch Basin
- Manhole
- Culvert Flow Direction
- Ditch Flow Direction
- Surface Flow Direction
- Natural Channel Flow Direction

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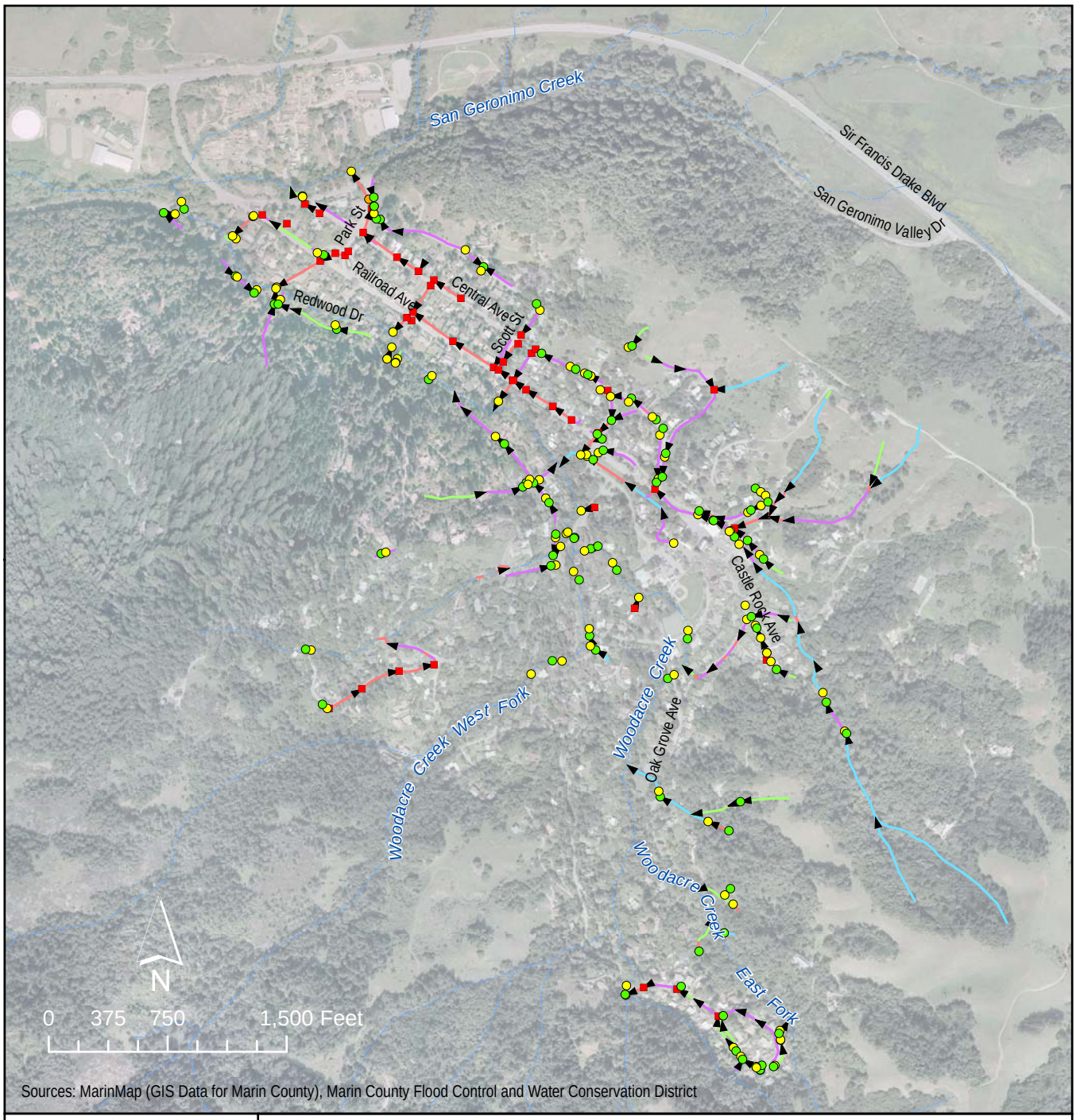
TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 10. Point Reyes Station Storm Drainage Conditions



Legend

- Culvert Inlet
- Culvert Outlet
- Catch Basin
- Manhole
- Culvert Flow Direction
- Ditch Flow Direction
- Surface Flow Direction
- Natural Channel Flow Direction

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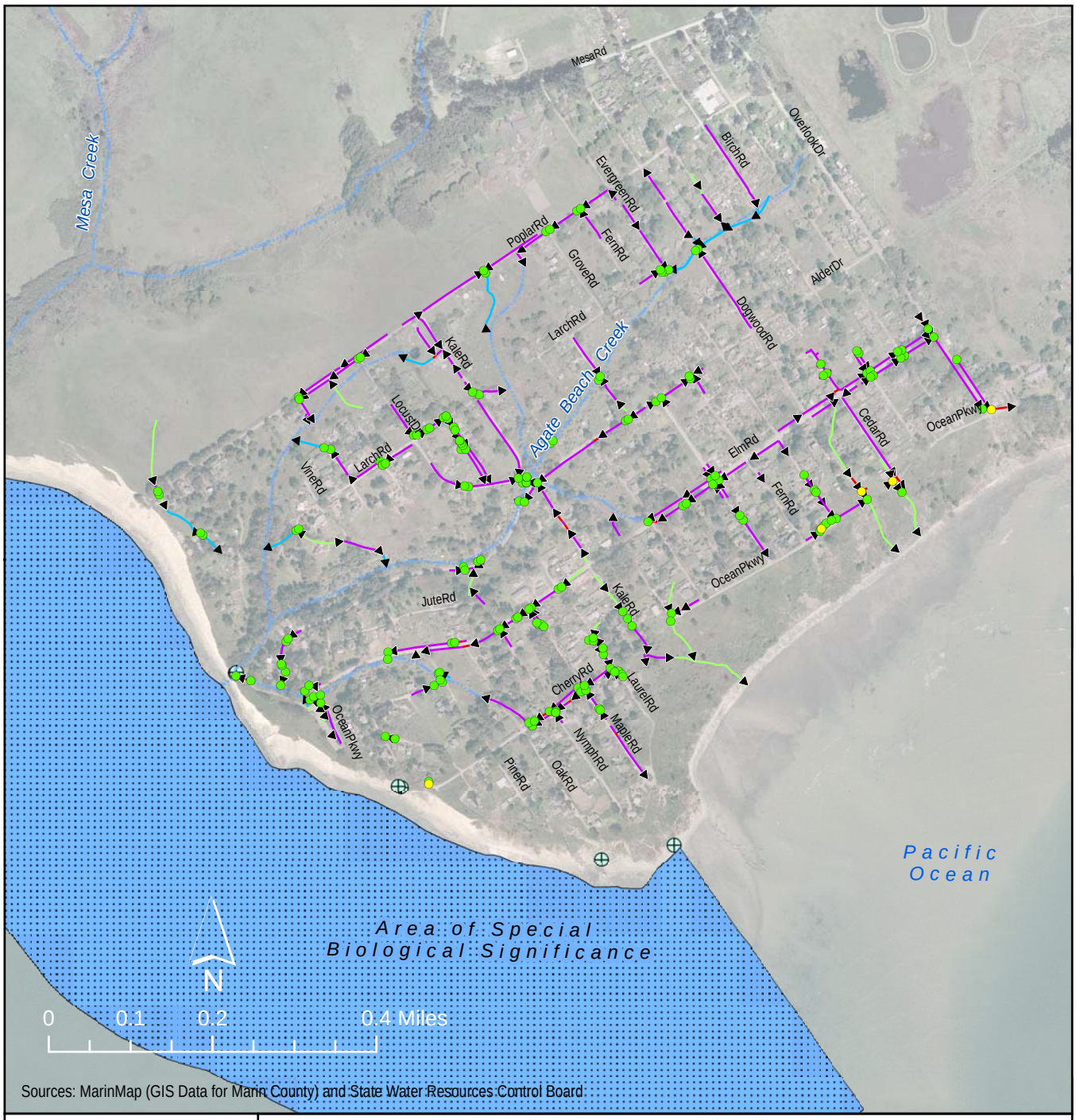
TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 11. Woodacre Storm Drainage Conditions



Legend

- Culvert
- Storm Drain Outlet
- Discharge Outfall
- Culvert Flow Direction
- Ditch Flow Direction
- Surface Flow Direction
- Natural Channel Flow Direction

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TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 12. Bolinas Storm Drainage Conditions

Legend

- Study Area Boundary
- County Flood Zone
- FEMA Floodplain

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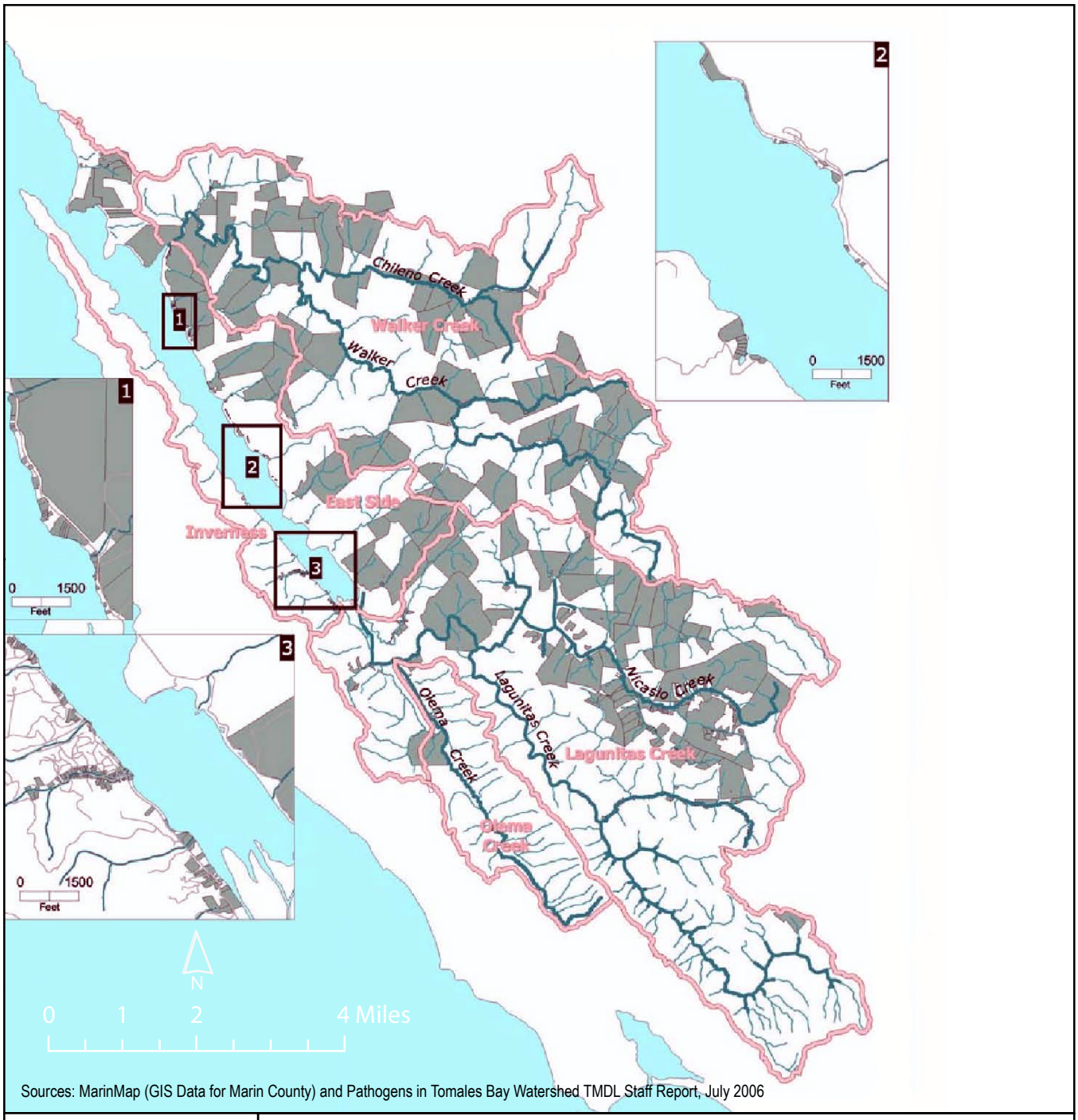
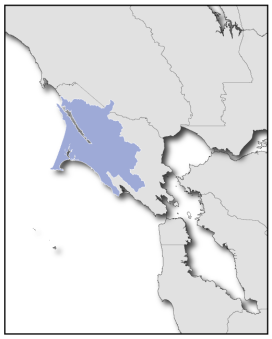
TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 13. Floodplains and Flood Zones



Sources: MarinMap (GIS Data for Marin County) and Pathogens in Tomales Bay Watershed TMDL Staff Report, July 2006



Legend

- Parcel with Septic System*
- Water
- Sub-watershed
- Stream (tributary)
- Road

** Parcel within 150 feet of stream or bay.*

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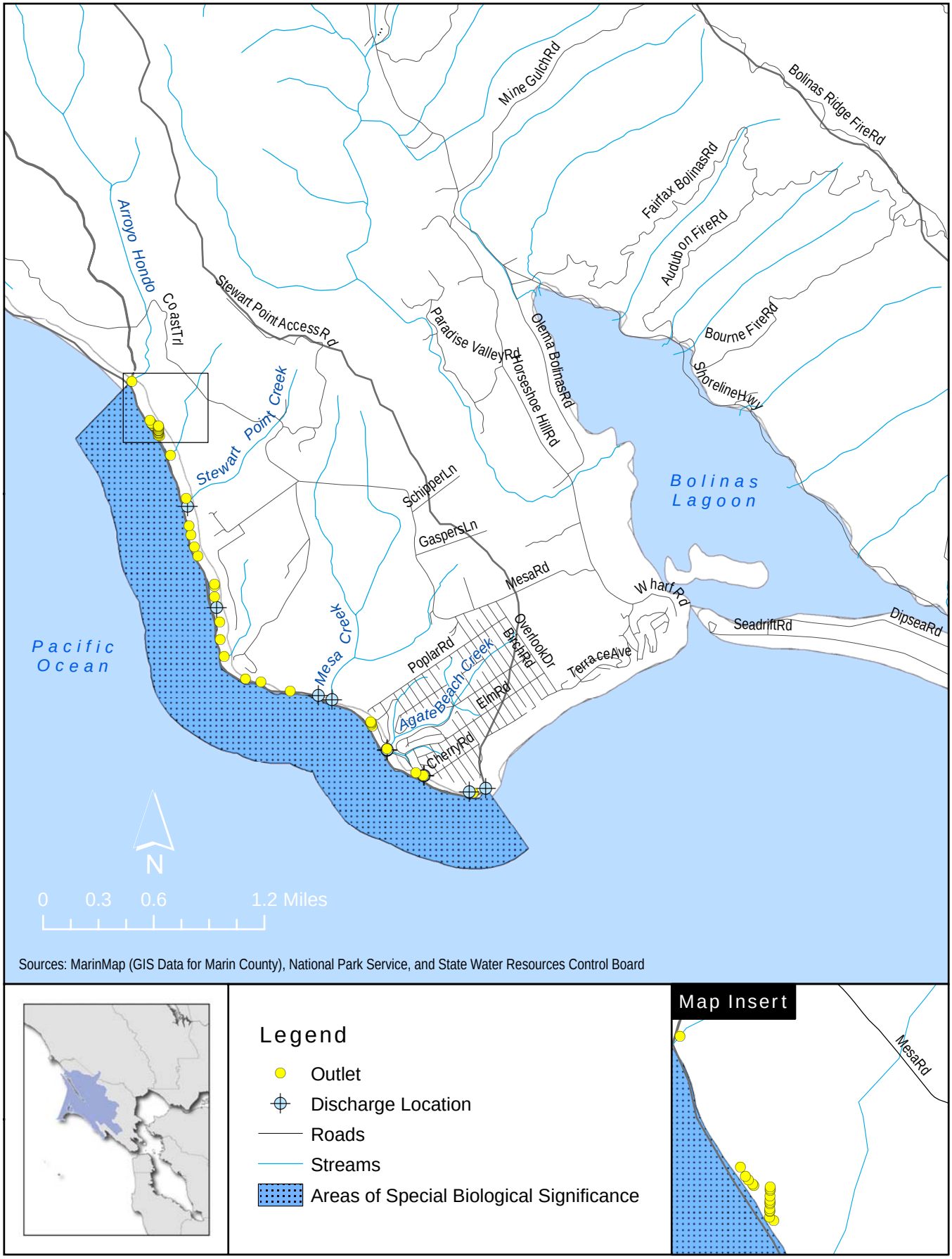
TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 14. Septic Parcels Near Water Bodies



TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 15. Location of Discharges into Duxbury Reef ASBS

Sources: MarinMap (GIS Data for Marin County), National Park Service, and State Water Resources Control Board

Legend

- Outlet
- Discharge Location
- Road
- ASBS Area

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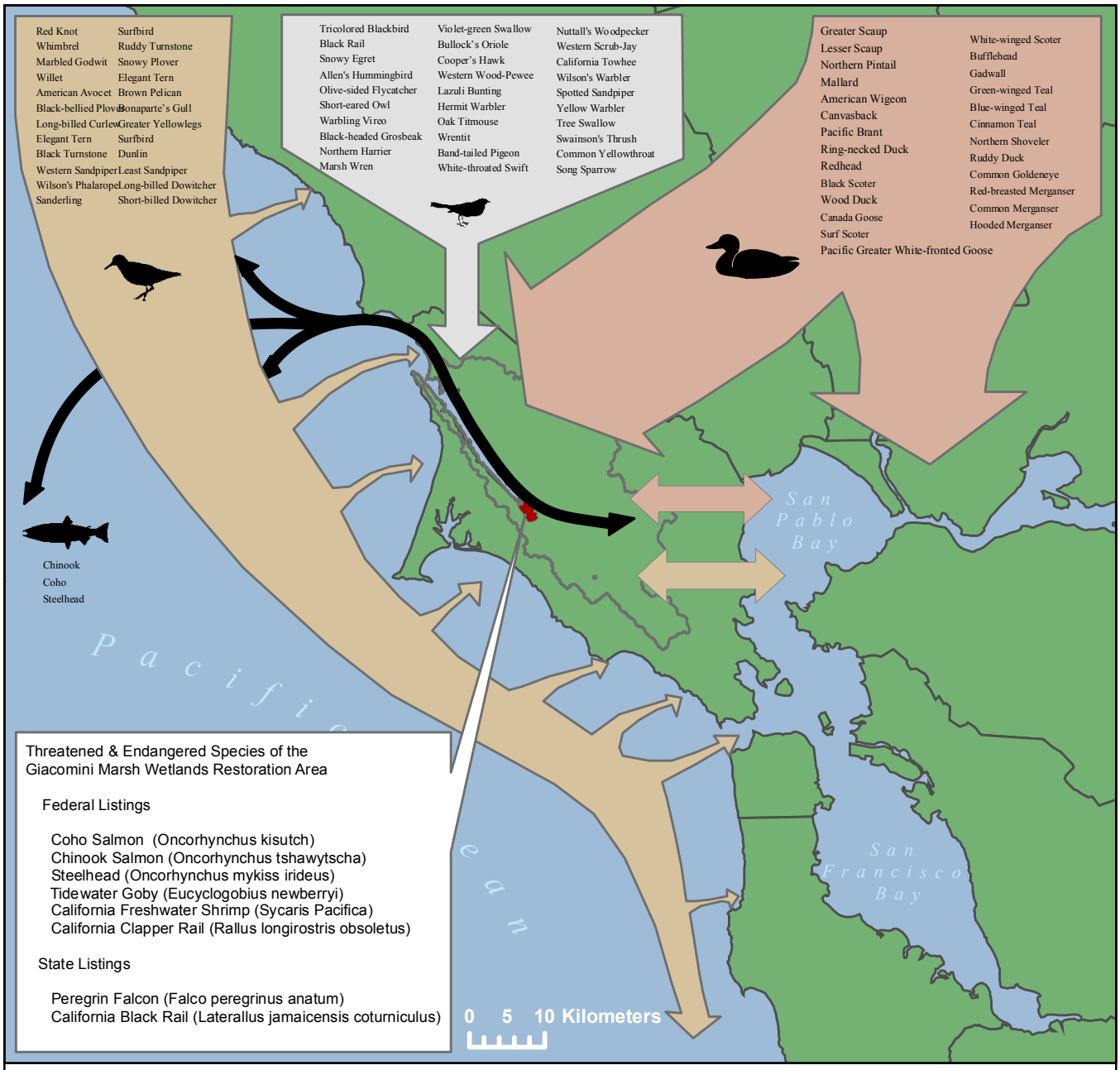
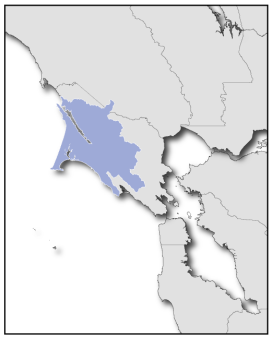
TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 16. Location of Discharges into Point Reyes Headlands ASBS



Sources: Joseph Kinyon, Pacific Coast Science & Learning Center, June 4, 2006



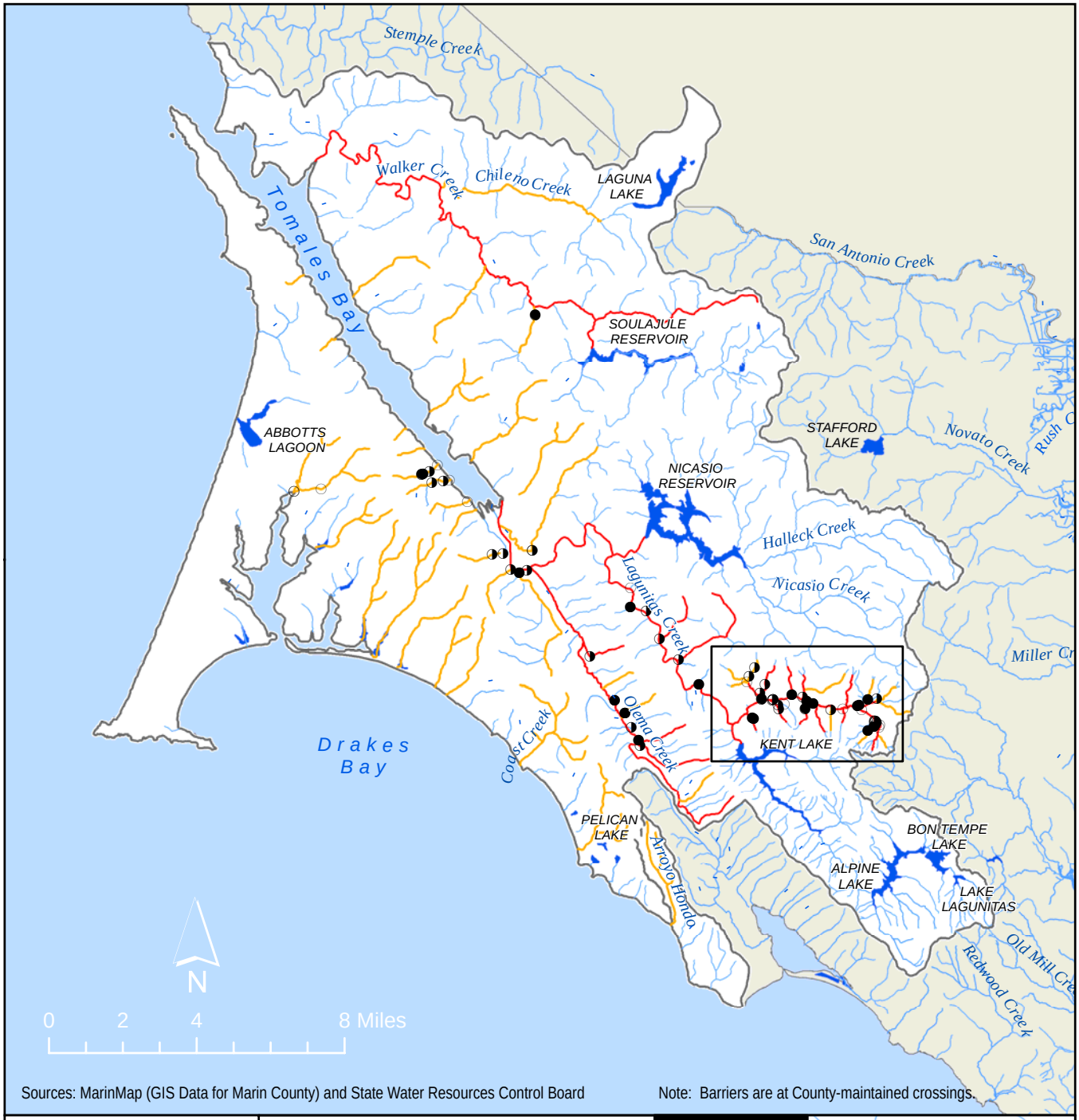
Legend

- Salmonid Spawning
- Waterfowl Migration Pacific Flyway
- Shorebird & Seaduck Migrations to Coastal Wetlands
- Wetland Associated Birds
- Giacomini Marsh Wetlands Restoration Area

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 17. Resident & Migratory Species Benefitting From Wetland Restoration



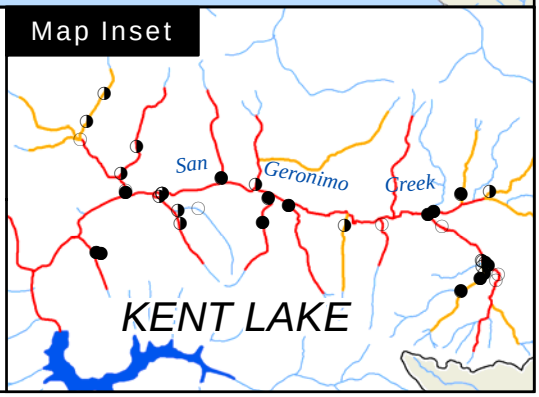
Sources: MarinMap (GIS Data for Marin County) and State Water Resources Control Board

Note: Barriers are at County-maintained crossings.

Legend

- No Barrier
- Partial Barrier
- Complete Barrier
- Coho and Steelhead
- Steelhead
- Reservoir, Lake or Lagoon

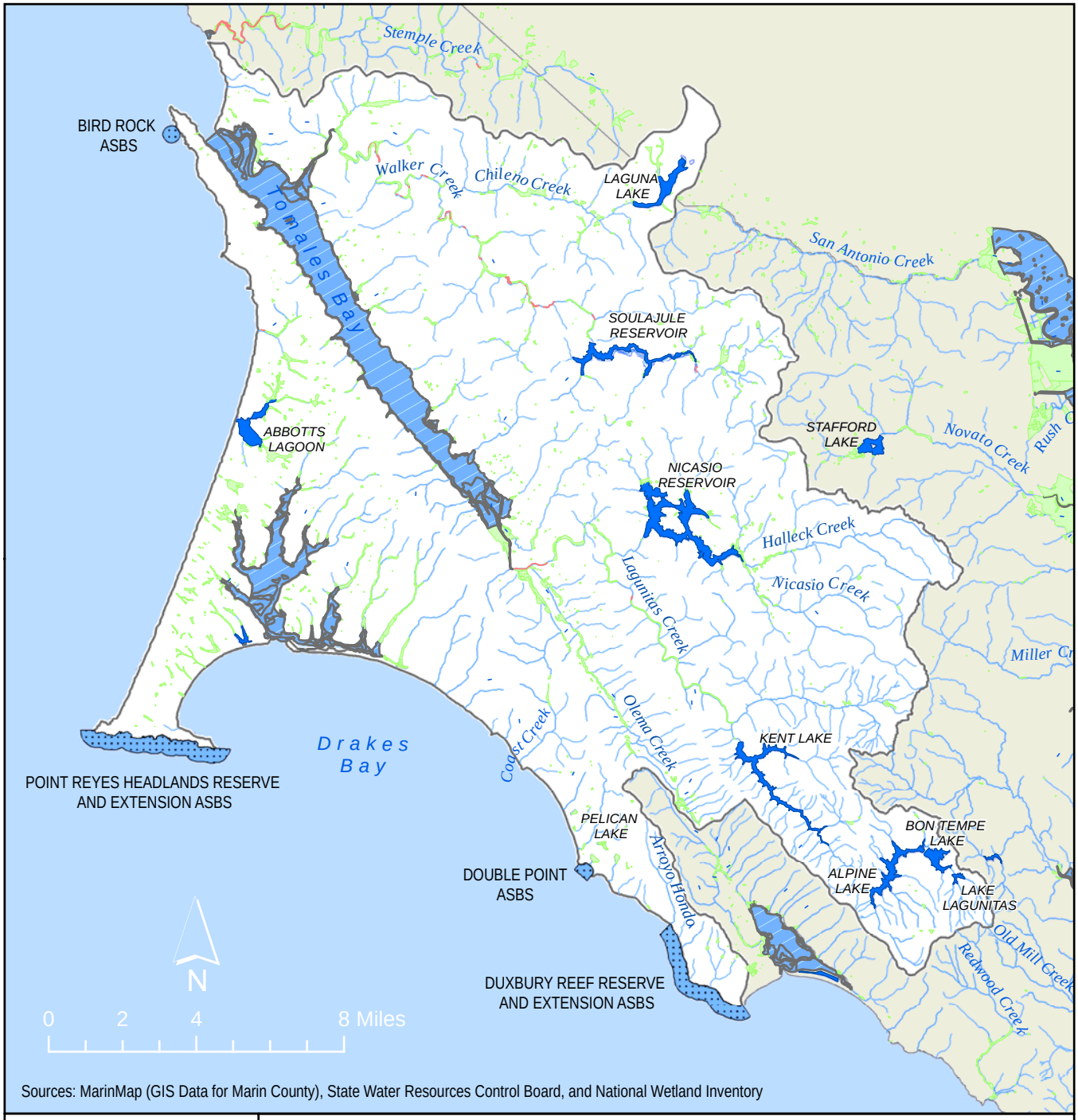
Map Inset



TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 18. Sensitive Fish Habitats



Legend

- Streams
- Estuarine Wetlands
- Lacustrine Wetlands
- Palustrine Wetlands
- Riverine Wetlands
- Areas of Special Biological Significance

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 19. Wetlands

3

ICWM Plan Objectives

Photo by Kathleen Goodwin

3. ICWM PLAN OBJECTIVES

STATE IRWM REQUIREMENTS: C. Objectives. Identify IRWM Plan objectives and the manner in which they were determined. The Plan must address major water-related objectives and conflicts within the region, including, at a minimum, water supply, groundwater management, ecosystem restoration, and water quality.

3-1 PROCESS FOR DETERMINING OBJECTIVES

The development of the Tomales Bay ICWMP objectives was a result of a collaborative review with the TAC of existing plans, studies and recommendations in the region. All existing plans, reports and technical studies were reviewed and summarized to identify key management issues that led to the development of ICWMP objectives. The TBWC's *Tomales Bay Watershed Stewardship Plan* provided the foundation from which plan objectives were identified, expanded, and/or refined. The issues and objectives were reviewed by the TAC and TBWC, and the objectives were prioritized as part of the review of regional and project priorities (see Chapter 5).

Section 3-2 provides a summary of the key findings and management issues that helped define the ICWMP objectives. Section 3-3 presents the ICWMP objectives. As part of this process, five issues were raised which, according to TAC, require additional discussion, review, and/or evaluation as the plan is updated in the future or as new data becomes available. These topics are further discussed in section 3-4 at the end of this chapter.

3-2 SUMMARY OF KEY FINDINGS & MANAGEMENT ISSUES

This section summarizes the key conditions and issues within the Tomales Bay critical coastal areas, based on the review and summary of existing data presented in Chapter 2.

WATER SUPPLY

1. **Water Supply Availability / Reliability:** Availability of water for the many uses that exist within the watershed is a critical issue. All participating water agencies have constrained water supplies under existing and/or long-term (20±-year) conditions due to supply limitations, reliability issues, and/or infrastructure constraints (i.e., treatment plant,

distribution pipeline, and/or treated storage capacity). Water supplies are subject to periods of interruption due to flooding, drought and seismic events, and some facilities are vulnerable to landslides. Landscaping water demand results in constrained supplies in some areas.

2. **Balancing Needs for Water:** Efforts that can provide solutions for balancing instream flow requirements with the needs of domestic, commercial, and agricultural water users, as well as wildlife habitat needs, will contribute to habitat protection and restoration and the continuation of economic and cultural values in the region. MMWD indicates that water supply management operations are currently geared toward the balance between water supply management and fisheries habitat protection and improvement (i.e., through implementation of State Water Resource Control Board mandates).

3. **Water Quality / Safe Drinking Water:** Safe drinking water is a concern for all water districts in the planning area. This is a concern in North Marin Water District (NMWD), especially during the summer and periods of high tides and saltwater intrusion. IPUD and BCPUD are concerned about the treatment of disinfection byproducts in their treated water and are endeavoring to eliminate periodic chlorine disinfection byproducts exceedences from treated drinking water (based on maximum contaminant Levels established by federal and state law).

4. **Agricultural Water Supply Reliability:** A secure water supply for agricultural users is a key concern to the economic well-being of the region. There is lack of data regarding the extent of existing agricultural water sources.

5. **Global Climate Change:** Most studies have not fully accounted for changes in global climate change and variability, which could significantly affect water availability. Potential water resource impacts and consequences of global climate change include: changes in the timing, intensity and amount of precipitation; sea level rise; increased flooding and higher surges; increased water temperatures; changes in urban and agricultural water demand; and disruption to wetlands and habitat areas.

GROUNDWATER MANAGEMENT

6. **Groundwater Conditions:** In general, groundwater conditions in Marin County have not been well documented, but the bulk of unserved areas are underlain by poorly permeable rock with limited storage capacity. Except for the Pt. Reyes peninsula and Bolinas Point, only small pockets of alluvial valleys (such as the NMWD Pt. Reyes wells) are projected to yield in excess of 10 gpm. Review of wells in the Tomales region as part of the County's Countywide Plan update reveals yields ranging between two and 30 gpm and indicates that the fractured bedrock can provide limited water supply to rural communities.

7. **Groundwater Quality:** PER SWRCB Order WR95-17, water from North Marin's wells in the vicinity of Lagunitas Creek is considered subsurface stream flow. Because of the details of this order, the NMWD groundwater resources (Coast Guard Wells) are now susceptible to

the detrimental effects (for domestic water supply) of marine-based saltwater intrusion in the immediate area.

8. **Groundwater Impacts:** Two concerns related to groundwater were raised during preparation of the ICWMP. One concern is the potential decrease in groundwater levels due to increased impervious surfaces and decreased stormwater infiltration, which may affect water supplies and instream flows. Another potential issue that was raised is the cumulative impact of rural residential groundwater pumping on tributary stream flow. As indicated above, groundwater data is limited, and additional data is needed to better define and address groundwater issues as related to supply and/or effects of pumping on instream flows.

WATER QUALITY

9. **Impaired Water Quality:** Tomales Bay and its primary tributaries are identified by the SFBRWQCB as impaired for: pathogens (Tomales Bay, Lagunitas Creek and its tributaries); sediment (Tomales Bay, Lagunitas and Walker Creeks and tributaries); nutrients (Tomales Bay, Lagunitas and Walker Creeks and tributaries); and mercury (Tomales Bay, Walker Creek). Pollution sources include: agricultural runoff; contamination related to septic systems; stormwater runoff; heavy metal pollutants from past mining activities; erosion from stream banks, roads, trails and landslides; and recreational activities.

10. **Impacts to Beneficial Uses:** Beneficial uses are impacted or potentially impacted by water quality impairments as specified in the SFBRWQCB "Water Quality Control Plan (Basin Plan)" related to municipal, domestic and agricultural water supply; fishing and shellfish harvesting; preservation of rare and endangered species; fish migration and spawning; wildlife habitat; and recreational uses. (See full list in Chapter 2 of this Plan.)

11. **Pathogens:** Pathogen contamination in Tomales Bay, primarily *E. coli* sources from Lagunitas and Walker Creeks, impacts the Tomales Bay shellfish industry due to harvesting prohibitions when water quality exceeds standards, resulting in a direct economic impact. Pathogens also pose potential health risks to recreational users and shellfish consumers. Agricultural runoff (dairy farms, cattle/sheep grazing lands, horse facilities), faulty onsite sewage disposal systems, boat wastes, and residential runoff (e.g., pet waste) are considered to be significant sources of pathogens to Tomales Bay. The TMDL Report identifies the lower Walker Creek subwatershed and lower and upper San Geronimo Creek subwatersheds as the highest fecal coliform contributors. Sampling in certain areas of San Geronimo Valley, including Woodacre, detected high levels of fecal coliforms and nitrates. If detected, pathogens due to human activity would be a concern in ASBS areas and the Bolinas area.

12. **Mercury:** Mercury adversely affects aquatic and wildlife species. Walker Creek and Soulajule Reservoir are listed as impaired for mercury. Walker Creek is impaired because mercury adversely affects beneficial uses, including wildlife habitat and all uses supporting aquatic life. Mercury concentrations in Walker Creek exceed the mercury freshwater aquatic life acute toxicity objective established to protect aquatic organisms. Terrestrial

species that primarily or exclusively eat fish are at risk from exposure to mercury due to its tendency to bioaccumulate in the food web. Soulajule Reservoir is impaired due to mercury levels that may pose health risks upon frequent consumption of fish from the reservoir. Although the largest mercury source, the Gambonini mine (downstream of Soulajule), has been stabilized, the mercury remains in sediment that moves through the stream system and into Tomales Bay. High mercury levels were also found in fish collected from Tomales Bay. Mercury is also a water quality indicator in Tomales Bay due to advisory for seven commercial and recreational fish species.

13. **Sedimentation:** The effects of sedimentation include the infilling of Tomales Bay, loss of wetland habitat and eelgrass beds, and impacts to salmonids habitat. Sedimentation (particularly inputs of fine sediment) in Lagunitas, Olema, San Geronimo and Walker Creeks also adversely affects salmonids. Major sediment sources include streambank erosion; the network of unpaved roads and trails; landslides; and livestock-related erosion.

14. **Nutrients:** Tomales Bay, as well as Lagunitas and Walker Creeks, are listed as impaired due to elevated nutrient levels in the tributary streams. The SFBRWQCB expects to initiate development of a Tomales Bay Nutrient TMDL in the near future. While a large number of scientific papers address various monitoring results, hydrological models, and geochemical reconstruction, only limited data exists regarding eutrophication or the extent of nutrient loading from the watershed to Tomales Bay. The TMDL development process will include further assessment of nutrient loading.

15. **Onsite Sewage Disposal Systems:** Tomales Bay communities and residential areas primarily utilize onsite sewage disposal systems (OSDS) for wastewater treatment and disposal. Despite studies and efforts to date, there is insufficient knowledge of baseline conditions and effects of these systems on surface and ground water quality due to an incomplete inventory of existing onsite systems, inadequate tracking of these systems, unknown number of systems failing, and sporadic water quality monitoring. There also is a lack of comprehensive management program(s)—i.e., routine inspections, education and outreach to owners/users, and technical and financial assistance for repair/upgrades.

16. **ASBS:** There is very limited water quality data for ASBS discharges, marine water quality, and discharge compliance history. Currently, there is insufficient data regarding potential water quality effects of discharges into ASBS areas. Additional data is needed to identify appropriate measures to comply with the California Ocean Plan water quality objectives and discharge prohibitions into Duxbury and Point Reyes ASBS areas. Except for one unnamed drainage culvert discharge in Duxbury Reef, ASBS discharges are primarily related to non-point sources in stormwater runoff and erosion. Analysis of one water quality sample taken at Alder Creek at Duxbury Reef found that the analyzed constituents did not exceed the *California Ocean Plan* standards.

STORMWATER AND FLOOD MANAGEMENT

17. **Municipal Stormwater Management:** Stormwater management within unincorporated communities is accomplished primarily through ditches and limited storm drains, without any inlet management or treatment, except for occasional sediment removal. Until recently, the stormwater drainage system in West Marin had not been mapped, and stormwater impacts on water quality have not been known. However, recent mapping and monitoring was undertaken as part of the ICWMP process. The Marin County Roads Division performs routine maintenance on County-owned stormwater facilities throughout West Marin as time and budgets allow.

18. **Effects of Increased Runoff:** Increases in impervious surfaces related to development, road construction, and stream crossings results in increases in runoff and peak storm hydrographs, and may have contributed to increased flooding and bank erosion within the Tomales Bay watershed.

19. **Flood Management:** FEMA-designated floodplains are limited in the Tomales Bay region. The primary flood-prone area is Inverness; however, other areas in the region (including Woodacre and Bolinas) have been subject to periodic, localized flooding. Culverts and stream channels are not functioning adequately in transporting flood flows for many reasons, including: increases in peak flows from development, improperly sized culverts (too small), increased sources of sedimentation causing culvert blockage, and disconnection of stream channels from their floodplain. This is exacerbated by infrequent maintenance due to budget and permit constraints. Disruption of floodplains has contributed to geomorphological and ecologic impacts.

20. Water supply systems are subject to interruption during flood periods (NMWD and IPUD).

ECOSYSTEMS AND HABITAT

21. **Tomales Bay** is one of the major estuaries on the Pacific Coast of California, supports abundant wildlife and is one of four commercial oyster-growing areas in the State. Marin County has the second largest mariculture industry in the state, which consists primarily of Tomales Bay and Drakes Estero. Pacific herring runs in Tomales Bay support a small commercial fishery as well as recreational activities associated with the national and state parks in the area. Beneficial uses within the bay are impacted by water quality impairments as discussed above. Additionally, past and present human uses and activities within the region have impacted habitats and special status species in Tomales Bay and its tributaries.

22. **Habitat and Special Status Species Protection:** The Tomales Bay region supports at least 26 known special status species, including significant populations of wild coho salmon, steelhead, and California freshwater shrimp, all within Lagunitas Creek. Habitat loss, species decline and invasive, exotic species are significant concerns in the Tomales Bay watershed. Habitat protection and restoration are key to maintaining diverse and well-

functioning habitats. Control of invasive exotic plants and animals is an important component of habitat protection.

23. **Freshwater Flows:** Approximately 67% of freshwater inflow to Tomales Bay comes from the Lagunitas Creek watershed and about 25% from the Walker Creek watershed (Fisher et. al. 1996). Much of the stream flow in mainstem Lagunitas Creek is regulated by dams and collected into various reservoirs upstream of the San Geronimo confluence, with Olema and San Geronimo Creeks being the largest uncontrolled tributaries. Over the last 10 years, MMWD's diversions (and evaporation) have totaled about 27,400 acre-feet per year from Lagunitas and Walker Creeks and from reservoir surfaces. It is estimated that MMWD operations lower Lagunitas Creek flow to Tomales Bay by about 27% and decrease total freshwater flow (including Walker Creek diversions) to the bay by about 14%. Irrigation systems, small dams and domestic water supply systems also reduce flow. Freshwater is important in the bay for diluting pollutants, moderating salinity levels, and maintaining the bay's natural circulation patterns.

24. **Coho Salmon and Steelhead Recovery:** According to SWRCB Order WR95-17, construction of dams and other development within the Lagunitas Creek watershed have significantly depleted fishery resources, and the Order establishes instream flow requirements based on its review of water flow requirements for various salmonid life stages. Activities that facilitate coho recovery, especially in Lagunitas Creek watershed, are of high priority in the region. The Lagunitas Creek watershed now supports a significant population of wild coho salmon, estimated as 10% of the population for the Central California Coast Evolutionarily Significant Unit (ESU), and the largest and most stable population south of the Noyo River.

    Factors that affect fishery habitat include stream flow, sedimentation, instream habitat conditions (i.e., large woody debris (LWD), refuge areas, especially winter refuge areas, and stream bed conditions), barriers to fish passage, water temperature, and removal of or alteration to riparian vegetation adjacent to creeks Managing sediment delivery, maintaining stream flows through water releases from Kent Lake, enhancing stream and riparian habitats, protecting riparian habitat and water quality, and improving fish passage are ongoing enhancement efforts.

    The salmonid fishery within the Walker Creek watershed has been degraded over the last century, although it does support a steelhead population. Coho sightings have been very rare in the last fifteen years. Coho stock from Olema Creek were released by CDFG into Walker Creek in 2004 because it historically contained coho salmon that most likely was genetically related to the Olema Creek. Historic studies indicated that sedimentation and high temperatures, caused in part by removal of riparian vegetation, were limiting salmonid populations in the Walker Creek watershed. Other concerns are degraded channel and riparian habitats.

    - **Fishery Spawning and Sedimentation:** A significant portion of the coho and steelhead populations that use Lagunitas Creek use San Geronimo Creek, Devil's Gulch and

other tributaries for spawning and rearing (in addition to Lagunitas Creek). Olema Creek also has been identified as being important to coho recovery. The San Geronimo Creek watershed is a major source of sediment deposition below Peters Dam; this sediment deposition has impaired Lagunitas Creek habitat. Significant habitat impairment has been caused by excessive coarse sand and fine gravel deposition in the Lagunitas channel bed in the reach below Peters Dam and below the outlet of San Geronimo Creek due to excess sediment yield from the San Geronimo Creek watershed. Additional sediment sources may be significant below the confluence with Devil's Gulch, but have not been quantified. According to SWRCB Order WR95-17, dams have reduced the size and frequency of winter flushing flows which transport sediments downstream, resulting in loss of fishery habitat, and MMWD was ordered to prepare a comprehensive sediment management plan. That plan, completed in 1997, is a 10-year plan that expired at the end of June 2007. However, the MMWD has indicated that it will continue its fisheries restoration and enhancement efforts into the future, most likely through the development of a new plan.

25. **Wetlands:** Protection and restoration of aquatic habitat and functions are critical to achieving stewardship goals for the region. Since the early 1900s, construction of levees at the southern end of Tomales Bay for roads and development of dairy farms has converted wetlands and served to hydrologically disconnect Lagunitas Creek and its tributaries from their floodplains. Sedimentation into Tomales Bay has also resulted in loss of wetlands. The diking, drainage and agricultural use of the headwaters of Tomales Bay affect both the immediate critical habitat values (for coho salmon and freshwater shrimp), as well as the broader watershed values of wetland filtration and floodplain integrity. Of particular importance is the role wetlands play in improving water quality and retaining floodwaters.

26. **Riparian Habitat:** Management of riparian resources in the Lagunitas and Walker Creek watersheds is a concern. Riparian habitat is found along Lagunitas Creek with high quality habitat found upstream of Samuel P. Taylor State Park and mainstem Walker Creek and in San Geronimo Valley. Other areas, particularly in the Chileno and Keyes Creek watersheds, have little remaining mature riparian habitat, although efforts have been underway to re-establish native riparian vegetation. Lack of high quality habitat, degraded habitat and presence of invasive species (such as vinca and cape ivy) are concerns. Riparian habitat restoration improves water quality and habitat for salmonids and many other aquatic and terrestrial wildlife species.

27. **Invasive, Exotic Species:** Spread of exotic, invasive species in the Tomales Bay watershed can have adverse effects on both aquatic and plant species. The spread of these plants results in loss of native species and coastal grassland terraces. Invasive species include, but are not limited to, the introduction and spread of European green crabs, which has led to major declines of several key invertebrate species. Non-native, invasive plants include thistles, gorse, giant reed, cape ivy, saltwater cordgrass, periwinkle and non-native perennial grasses (see list in Appendix N). The extent of invasive species threats requires further review as well as development of management measures to address the containment or elimination of those species.

WATERSHED MANAGEMENT

28. **Water Quality Monitoring:** There is a need for ongoing and coordinated comprehensive water quality monitoring for Tomales Bay and tributary streams to document baseline conditions, identify trends for pollutants of concern, and better assess the overall success of projects to reduce non-point sources of pollution.

29. **Fishery Monitoring:** There has been extensive and coordinated monitoring in the Lagunitas watershed which should be continued, although some monitoring and sampling methods vary among monitoring entities. This monitoring has documented baseline conditions as well as trends in the fisheries populations and habitat. There has also been some effort to assess the overall success of projects to enhance habitat, but these analyses have proven to be more difficult. Recently some monitoring work has been conducted in Walker Creek. Review of monitoring methods is needed to develop additional coordination and consistency among the several monitoring programs being undertaken in the region.

30. **Land Use Practices:** Review, monitoring and evaluation of land use practices and other human influences on tributaries to the bay, uplands, riparian corridors, wetlands and along the bay shores would increase the effectiveness of actions taken to improve water quality and floodplain management. Private land uses and development is regulated by the County of Marin. The Countywide Plan is being updated and addresses wetland and riparian habitat protection and restoration, streamside conservation areas, and agricultural protection through draft policies and programs.

31. **Regulatory Requirements:** All agencies are subject to compliance with environmental regulations related to water quality protection, wildlife habitat needs (including endangered species protection), and public health. All projects implemented will be subject to applicable environmental review and permitting requirements, thus achieving sound project design and implementation while minimizing and/or avoiding adverse environmental impacts.

32. **Partnerships:** The community has been successfully organizing to address key watershed issues, and numerous agencies and organizations have been involved. Continued and expanded partnerships are not only desired, but necessary, to address issues in the Tomales Bay region.

33. **Additional Data Needs:** Additional surveys, studies, monitoring and/or reviews have been recommended or data gaps identified during preparation of the ICWMP, include the following general topics (see Chapter 9 and Appendix H for further details).

    - Water quality studies identified in the *Tomales Bay Watershed Stewardship Plan* (see list in Chapter 9), and coordinated water quality sampling among the various entities conducting monitoring, which will in part be facilitated by a recent grant to the TBWC in which this coordination will be initiated.

- Water quality sampling and monitoring for ASBS areas.
- Data on baseline conditions and effects of on-site wastewater systems on surface and ground waters with water quality monitoring.
- Groundwater studies.
- Fishery salmonid population and habitat data and studies identified in the Limiting Factors Analysis and developing standard monitoring methods among monitoring agencies and entities.
- Sediment budgets and transport studies, i.e. those identified in the *Tomales Bay Watershed Stewardship Plan*.
- Additional species and habitat surveys, including Tomales Bay east and west shore mapping; other aquatic and terrestrial species assessments; assessments; Pacific flyway; "Species of Local Interest" (SOLI); mapping of quantity and quality of riparian habitat; monitoring of other special status species; and extent of invasive species.
- Effects of global climate change have not been taken into account in water supply or watershed management studies.

Photo by Greg Filbrandt

3-3 ICWMP OBJECTIVES

GUIDING MANAGEMENT APPROACH AND PRINCIPLES

As part of the development of the ICWMP and the selection of objectives, the TAC reviewed, consolidated and ranked the plan's objectives. As a result of this process, the following guiding management approach and principles were developed that reflect sound resource and watershed management approaches.

GUIDING APPROACH
SOUND RESOURCE AND WATERSHED MANAGEMENT

Contribute to the promotion of economic, social, recreational and environmental values and goals. Develop strategies to implement the ICWM Plan and to protect the watershed.

- Maintain and promote sound water resource management practices. Promote efforts that can provide solutions for balancing instream flow requirements with the needs of domestic, agriculture, and commercial water users, as well as fish and wildlife habitat needs, and that contribute to habitat protection and restoration and the continuation of economic and cultural values in the region.
- Balance water needs for all beneficial uses of water as set forth in the Basin Plan: municipal, domestic and agricultural water supply, aquatic life, wildlife habitat, and recreational uses.
- Support new technologies and management practices through feasibility studies and demonstration projects.
- Address environmental justice issues as they relate to disadvantaged communities, drinking water quality and public health.
- Acknowledge potential effects of global climate changes and support incorporation of further studies into future watershed planning and modeling efforts.
- Incorporate monitoring into restoration, management, and implementation programs. Develop a scientific peer review group to review technical studies.
- Support the Tomales Bay Watershed Council in the role of facilitating and coordinating with other agencies and organizations to ensure implementation and achievement of Plan goals and objectives.
- Increase community outreach and education, and involve and educate the public to become watershed stewards.

ICWMP OBJECTIVES

The objectives developed by the TAC and TBWC were prioritized to aid the process of reviewing, evaluating and prioritizing projects (see Chapter 5). It was determined that of the five key issue areas for the Tomales Bay region, three objective elements would receive equal weight and ranking: Water Quality, Ecosystem Restoration and Habitat Improvement, and Water Supply Reliability. These are followed by Stormwater and Flood Management and Groundwater Management. The specific objectives are outlined below.

WATER QUALITY

GOAL: ***Ensure water quality in Tomales Bay and tributary streams is sufficient to support natural resources and sustain beneficial uses.***

1. Improve water quality in critical coastal areas (CCAs); i.e., improve water quality in Tomales Bay and tributary streams through reductions in sediment, pathogens, mercury, and nutrient loading, with the specific objectives of protecting all beneficial uses, and of removing Tomales Bay from the 303(d) list of impaired water bodies by attaining state and federal water quality standards; or reducing the potential for other contaminants in Tomales Bay; or minimizing point and non-point source pollution and sources areas for pollutants of concern in the CCAs.

2. Develop and implement an ongoing and coordinated comprehensive water quality monitoring program for CCAs (i.e., in Tomales Bay and tributary streams) to document baseline conditions, identify trends for pollutants of concern, and better assess the overall success of projects to reduce non-point sources of pollution.

3. Restore and maintain adequate high quality freshwater flow to maintain geomorphologic form and function in CCAs to protect viable populations of special status species and commercial aquatic species.

ENVIRONMENTAL RESTORATION & HABITAT IMPROVEMENT

GOAL: ***Restore and preserve the integrity of natural habitats and native communities.***

4. Protect, restore and/or rehabilitate the hydrologic and ecological integrity of the CCAs—i.e., restore wetlands, streams and riparian areas for native aquatic and terrestrial species.

5. Restore, protect and maintain viable populations and habitats of special status species in the CCAs—i.e., implement projects and programs that contribute to recovery of coho salmon,

including placement of large woody debris projects and assessment and reduction of stream temperatures, etc.)

6. Remove and/or control invasive non-native species in the CCAs.

WATER SUPPLY & RELIABILITY

GOAL: ***Support adequate and improved water supplies to meet community needs and to improve reliability, consistent with ecosystem management and state and federal regulations, including aquatic ecosystems and stream geomorphology. Maintain and promote sound water resource management practices. Promote efforts that can provide solutions for balancing instream flow requirements with the needs of domestic, agriculture, and commercial water users, as well as fish and wildlife habitat needs, and that contribute to habitat protection and restoration and the continuation of economic and cultural values in the region.***

7. Support water supplier provision of reliable, high quality water supplies to meet future and dry year demands and to sustain water supplies in drought, for domestic water supply, adequate fire flow, and during emergency periods, with sensitive management of natural resources, including potential effects of global climate change.

8. Maintain and improve drinking water quality by continuing to meet or exceed existing and anticipated federal and state drinking water standards.

9. Support reliable water supply and improved technologies for agricultural uses consistent with ecosystem management goals.

10. Maximize water use efficiency, conservation, and/or increased opportunities for recycled water consistent with health and safety.

11. Minimize vulnerability of water supply system and infrastructure to natural disasters.

STORMWATER & FLOOD MANAGEMENT

GOAL: ***Promote sound and environmentally sensitive stormwater and flood management programs and measures.***

12. Support and continue to implement environmentally sensitive flood management programs, practices and associated future planning, including floodplain restoration. Maintain and improve performance of flood protection and stormwater facilities to prevent flooding of communities and important water infrastructure.

13. Evaluate and implement stormwater pollution prevention methods to minimize non-point stormwater discharges in CCAs (i.e., reduce or eliminate all stormwater discharges to ASBS areas area).
14. Support development and implementation of best management practices and alternative technologies to promote stormwater detention that can help reduce stormwater runoff and improve stormwater infiltration and treatment.

GROUNDWATER MANAGEMENT

GOAL: ***Protect groundwater quality and supplies.***

15. Assess groundwater supplies and conditions, including effects of impervious surfaces and increased groundwater pumping on creeks, and assess and reduce groundwater contamination resulting from onsite wastewater disposal systems.
16. Improve agricultural range practices to promote groundwater infiltration.
17. Assess impacts of salinity on groundwater resources in Lagunitas Creek, especially at the Coast Guard Wells.

3-4 ISSUES & QUESTIONS FOR FUTURE CONSIDERATION

During preparation of the ICWMP, five issues and/or questions were raised that the TAC felt needed ongoing discussion, review, and/or evaluation as the plan is updated in the future or as new data becomes available. The water and resource management issues within the Tomales Bay region have generally been addressed through collaboration between the stakeholders. However, some issues or concerns in the planning area are more complex due to pre-existing regulatory requirements and differences of opinion regarding past decisions (i.e., the SWRCB Order WR95-17). Though not considered conflicts at this time, these potential issues have been identified, and it is the intent of the stakeholders to have ongoing policy discussions as part of implementation of the ICWMP and as data may become available.

These topics include the following, which are further addressed below.

- Reservoir Management
- Stream Water Temperature
- Water Diversions
- Agricultural Water Security
- Floodplain Connectivity

RESERVOIR MANAGEMENT & STREAM WATER TEMPERATURE

During preparation of the ICWMP, some TBWC Technical Advisory Committee members expressed concern as to whether reservoirs are managed in a manner that adequately balances drinking water needs and fisheries/ecosystem needs. Concerns were raised regarding: 1) potential negative impacts

of reservoir management on the ecosystem, broadly, and on fisheries, in particular; and 2) whether existing data is adequate to inform current and future decisions about reservoir management. It was acknowledged that MMWD operates reservoirs under the provisions of the SWRCB Order WR95-17 as summarized in Chapter 2, and that coho salmon became a listed species after this Order was put in place. The MMWD has been conducting monitoring for over 10 years and intends to prepare a summary study of findings in the next few years.

The unanswered questions that were raised relate generally to whether the water supply facilities are being operated in the most environmentally sound fashion relative to water quality, large woody debris, in-stream flows, and water temperature. It was expressed that there is insufficient current data to determine whether management of Nicasio and Soulajule Reservoirs impacts fisheries and natural systems. Specific concerns/questions about water quality and migration issues were identified regarding the stream reach below Nicasio Dam. Questions were also raised regarding Kent Lake discharges to Lagunitas Creek and whether flows are maintained at the minimum level required for fish species success in the watershed, including temperature and what information is available on geomorphic issues, sediment flushing and large woody debris (LWD). It was noted that there are known temperature exceedances—e.g., Lagunitas and Walker Creeks (see discussion below), as well as other water quality concerns (e.g., algal blooms in Nicasio Reservoir and mercury in Soulajule Reservoir). It was also noted that while MMWD has undertaken fish habitat projects involving large woody debris, there is a need for more LWD projects.

It is MMWD's position the District is operating and maintaining instream flows as required by State Water Board Order WR95-17, which set flows in perpetuity (unless the Order is revised). Releases from Kent Lake are in accordance with the State Order, and thus, flows are being maintained at the minimum level required for fish success. There has been no information indicating that this flow regime is anything but beneficial to salmon. The District does not intend to pursue a modification of the minimum base flow requirements (which range between 8 and 25 cfs during normal years) and hence does not plan to modify the operations of Kent Lake. Although the State Order was issued before coho salmon were listed, the Order is entirely focused on fishery habitat issue. The years of study and hearings regarding instream flow requirements were specifically to establish a flow regime that would be beneficial to coho, steelhead and California freshwater shrimp. Kent Lake discharges are being maintained at the minimum level required for fish species success. MMWD also notes that the watershed is being managed for LWD.

Related to the reservoir management questions above is another set of questions related to whether and/or how stream water temperature affect coho and steelhead in the Tomales Bay watershed. Water temperature is one part of the larger issue of the long-term goal of sustainable coho and steelhead populations. There is some data about temperatures from some sources, but some of this is not current, has not been consistently monitored, and thresholds differ. The MMWD is required by State Order WR95-17 to maintain specified water temperatures for mainstem Lagunitas Creek, but reportedly, there have been instances in the past when these temperatures have been exceeded. There is no specified temperature regime for Walker Creek. There is insufficient data on Lagunitas, Walker and Olema Creeks regarding temperatures and effects on fish.

It is unclear whether reservoir operations are adversely impacting beneficial uses of the watershed. There is a general question as to whether the coho and steelhead populations of the Tomales Bay watersheds are sustainable and a specific question as to whether long-term temperature trends will be an issue for these species. Additional data would be necessary to further inform this discussion, but it was noted by the TAC that the suggestion for further review was not a suggestion that reservoir operations necessarily be modified. Should future studies be completed that address these questions, the results will be integrated in the ICWMP as appropriate when they become available.

WATER DIVERSIONS

There are many small, in-stream dams on tributary creeks within the region), and the cumulative impact of these small dams on the Tomales Bay watershed is not known. Unanswered questions that were raised included how sizing affects natural processes, which dams/diversions have legal diversion rights, storage rights, and riparian rights. It also is not known how these diversions or certain others may affect the hydrologic connectivity between groundwater and surface water (e.g., how new private wells near streams may affect stream flows and fishery habitat). At this time, the issue of water diversions is of unknown consequence, scope and significance. It is also recognized as an issue of potential sensitivity.

AGRICULTURAL WATER SECURITY

The need for a reliable and secure agricultural water supply was an issue raised by some members of the TAC during preparation of the ICWMP. Two primary concerns were discussed:

- Agricultural water security related to implementation of restoration practices; and
- Agricultural water security related to diversification of agriculture.

Photo by Greg Filbrandt

Agricultural water supply as it relates to restoration efforts is currently an issue. Implementation of grazing and agricultural Best Management Practices (BMPs) to improve/protect water quality, such as fencing off creeks, often requires that an alternative water source be developed—e.g., well, pipeline, tank. This can be an expensive effort; e.g., recently a farmer had to drill five times to find alternative water supply. In consideration of this issue, it was noted that agricultural uses comprise about two-thirds of the Tomales Bay watershed, and farmers are custodians of much of the watershed's open space and riparian land. Generally, it was agreed that the issue involves changing the way the water is accessed; in effect, there is no net change in the amount of water used. There was agreement on the desire and need to support ranchers and farmers who are

implementing restora-tion measures that help Tomales Bay, which is now reflected in this chapter of the ICWMP in both the management issues (#4) and Plan objectives (#9) sections.

The Tomales Bay area has supported sustainable agriculture for 40 years, and expects to continue to support it. However, as agriculture in the region diversifies, increasing numbers of organic and other operations require more water. This is likely to become a major issue as demand for these products continues to increase. Agricultural water security related to changing agricultural practices directly relates to potential increased water demands, how demands can be met and effects of increased demand. With two-thirds of the watershed in agricultural use, it is important to assess trends and potential impacts of agricultural diversification, including further identification and review of opportunities and concerns if water demands were to increase in the future. After discussion, it was agreed that this is an "issue of the future" that calls for ongoing policy discussions, and data to inform those discussions.

FLOODPLAIN CONNECTIVITY

As part of the preparation of the ICWMP, concerns were raised related to increases in impervious surfaces in the watershed, increases in flooding, and potential reconnectivity of floodplains. Questions that were raised included how flooding relates to floodplain connectivity. The discussion included the potential for floodway planning in developed areas, to route floodwaters and encourage conditions that reduce peak hydrograph and reduce flooding. Further study in San Geronimo Valley, where flooding has occurred, was suggested to determine causes and whether elevations in Lagunitas Creek are affecting water elevations in San Geronimo Creek. This could help assess whether a County flood zone should be considered for the area. Floods also can cause loss of large woody debris that is important to fishery habitat and result in bank erosion, bank alterations and downcutting. It was also noted that there needs to be a greater understanding of the value of floodplains as ecosystems with better management and planning. After discussion, it was agreed that this is an "issue of the future" that calls for ongoing discussions, and data to inform those discussions. In particular, a watershed-level hydrologic / geomorphic study may be warranted.

4

Water Management Strategies & Integration

Photo by Greg Filbrandt

4. MANAGEMENT STRATEGIES & INTEGRATION

STATE IRWM REQUIREMENTS:

D. Management Strategies. Document the range of water management strategies considered to meet the objectives. Strategies to be considered may include but are not limited to: Ecosystem Restoration*, Environmental and habitat protection and improvement*, Water Supply Reliability*, Flood management*, Groundwater management*, Recreation and public access*, Storm water capture and management*, Water conservation*, Water quality protection and improvement*, Water recycling*, Wetlands enhancement and creation*, Conjunctive use, Desalination, Imported water, Land use planning, NPS pollution control, Surface storage, Watershed planning, Water and wastewater treatment, and Water transfers.

* *Pursuant to CWC §§ 79562.5 and 79564, these water management strategies must be considered to meet the minimum IRWM Plan Standards.*

E. Integration - Present the mix of water management strategies selected for inclusion in the Plan and discuss how these strategies work together to provide reliable water supply, protect or improve water quality, and achieve other objectives. Include a discussion of the added benefits of integration of multiple water management strategies.

This chapter discusses the management strategies identified for the Tomales Bay ICWMP, introduces the projects submitted by participating agencies and stakeholders to implement these strategies, and discusses how the strategies are integrated and work together to meet ICWMP objectives and to provide reliable water supplies, protect or improve water quality, and achieve other ICWMP objectives, including ecosystem restora-tion and habitat protection and improvement, for the Tomales Bay region. This chapter combines subsections "D" and "E" of the State Integrated Regional Water Management (IRWM) Grant Program Guidelines.

4-1 SELECTED MANAGEMENT STRATEGIES

A comprehensive range of water management strategies was considered in order to achieve the vision, goals and objectives identified in the Tomales Bay ICWMP. The water management strategies required to be considered in the ICWMP are generally already being implemented at some level within the Tomales Bay region. Many of the management strategies, in conjunction with supporting projects and programs, have been identified in plans and technical studies prepared to date in the region or through regional planning efforts that have been conducted. Many of these strategies have been found to be necessary and/or cost-effective in addressing the local water supply, water quality, ecosystem and watershed issues. The community in West Marin has a history of working collaboratively, and of applying this history to water quality and quantity issues. The management strategies from all four water supply agencies, the TBWC, the Marin County Stormwater Pollution Prevention Program, the National Park Service, and other entities will be integrated by this process. All agencies have agreed and are eager to integrate and coordinate efforts to minimize impacts on critical coastal areas (CCA) and the four ASBS areas.

Once key management issues and objectives were defined, the Technical Advisory Committee embarked on a process of reviewing project and program recommendations made in other planning and technical studies, and solicited project recommendations to address the management issues and objectives that had been identified. The strategies specified in the IRWM Guidelines were reviewed in this context of the Tomales Bay region's identified issues and objectives.

Of the 20 management strategies identified in the State IRWM Grant Guidelines, the Tomales Bay ICWMP incorporates all of the 11 strategies required to be considered, as well as seven other strategies. Only two management strategies (conjunctive use and imported water) were found not to be applicable to the Tomales Bay region. The selected management strategies have been determined appropriate for the Tomales Bay ICWMP and will help achieve the objectives identified in Chapter 3, as further discussed in this chapter. The management strategies were categorized into the six key management issue areas that have been identified for the Tomales Bay region:

- Water Supply Reliability,
- Groundwater Management,
- Water Quality,
- Stormwater and Flood Management,
- Ecosystem Restoration and Habitat Improvement, and
- Watershed Management.

WATER SUPPLY & RELIABILITY

Water Supply Reliability

As indicated in Chapter 3, availability of water for the many uses that exist within the Tomales Bay watershed region is a critical issue. All participating water agencies have constrained water supplies under existing and/or long-term (20±-year) conditions due to supply limitations, water quality or reliability issues, and/or infrastructure constraints (i.e., treatment plant, distribution pipeline, and/or

treated storage capacity). Water supplies are subject to periods of interruption due to flooding, drought and seismic events, and some facilities are vulnerable to landslides.

Plans and studies previously prepared for each of the water districts (see list in Chapter 12) outline a number of needed or potential projects to ensure water supply reliability. These include, but are not limited to: expanded supply capacity to accommodate buildout and/or peak demands (MMWD) or due to water quality issues (NMWD); improved treated water capacity and/or storage facilities (BCPUD, IPUD, MMWD, NMWD); and infrastructure improvements to improve supply reliability, especially during peak demand periods and during periods when operations may be interrupted due to flooding or other natural disasters (BCPUD, IPUD, NMWD). Infrastructure requirements for improving water supply delivery and reliability include treatment plant improvements and water distribution line improvements (NMWD, BCPUD, IPUD).

The NMWD proposal for a supplemental water source would help reduce temporary plant shutdowns during times of high tides (and saltwater intrusion) and flooding MMWD's supplemental water sources are of a more regional nature and physically located outside of the Tomales Bay region. The key options—desalination and recycling—are addressed below. Within the Tomales Bay watershed, MMWD has completed the first phase of a Groundwater Recovery Feasibility Study that is exploring the potential of recapturing long-term infiltration loss from MMWD's reservoirs in the watershed, which would provide an additional water supply of approximately 1,000-2,000 acre-feet. In addition, MMWD completed a "Vulnerability Assessment" of its entire water supply and distribution system in 2003 that recommended specific upgrades for prioritized areas. A joint project currently under consideration between MMWD and NMWD would pump water from MMWD's Soulajule Reservoir to NMWD's new Stafford Lake water treatment plant for treatment for overall increased reliability and more efficient operations.

Water and Wastewater Treatment

Water and wastewater treatment play important roles in protecting public health and environmental resources within the region. Regulatory requirements for treated drinking water quality are becoming more and more stringent, and agencies and water districts throughout the state are looking to innovative treatment technologies to help maintain regulatory compliance and protect the health of users. The water treatment facilities for both NMWD and BCPUD require treatment upgrades to assure reliable provision of domestic water supplies that meet federal and state water quality standards. The BCPUD and IPUD have been working collaboratively to identify enhanced filtration or other acceptable treatment methods appropriate to their respective facilities to reduce certain chlorine disinfection treatment byproducts .

There are limited public sewer facilities in the region. The BCPUD operates a community wastewater treatment facility serving its downtown area. The Tomales Village Community Services District has proposed a tertiary treated water project to provide recycled water in the northern portion of the watershed, as discussed under the "Water Recycling" management strategy. Most properties within the region are on septic systems, and there are about a dozen permitted community sewage treatment systems. Wastewater treatment via onsite septic systems most directly affects water quality, specifically pathogens in nonpoint stormwater runoff sources. Tomales Bay and its tributaries' water

quality are listed as impaired for pathogens. This is discussed further below in the Water Quality subsection.

Water Conservation

In general, the water suppliers in the Tomales Bay region have effectively used conservation (water demand management) to reduce and delay water augmentation projects (Nichols Berman, January 2007). MMWD's conservation programs have shown substantial success. Following the drought of the 1970s, water conservation programs were expanded, and by 1987 MMWD water demand had returned to pre-drought levels. Despite increased population and water service connections since 1970, water use in 2004 was essentially the same as use in 1970. MMWD is committed to exploring water conservation potential as fully as possible, and is currently engaged in development of a revitalized and aggressive demand management program. MMWD also implements a Water Entitlement and Water Budget Program which assigns and maintains the water entitlement and water budgets assigned to all non-residential accounts. At the end of each calendar year, staff reviews the water use of all non-residential accounts to determine which accounts exceed their annual water entitlement, and works with those accounts to help reduce their annual consumption.

While numerous efforts have been effectively implemented over the years, some additional conservation opportunities have been identified. The MMWD has expressed interest in researching the potential technologies and application for rainfall capture to reduce use of potable water for irrigation, and use of satellite imagery to help better identify and investigate large landscaped areas with the goal to provide public outreach and reduce irrigation water demand. IPUD has indicated that it may be able to reduce demand through water conservation measures such as: residential and water surveys; system water audits, public information programs, school education programs; and conservation pricing. If grant funds become available, IPUD would institute a residential plumbing retrofit program, a program for large landscapes, and rebates for washing machines and ultra-low flow toilets. The BCPUD recently raised its metered water delivery charges to, among other things, encourage increased water conservation and the district takes regular measures to educate its customers about the benefits of water conservation strategies and technologies.

Water Recycling

Recycled water is considered a near drought-proof water supply in that it is available regardless of hydrologic conditions. The use of non-potable water for irrigation decreases the need for potable water used for irrigation and relieves some of the demand on potable water supplies as the urban demand increases.

There are no currently operating water recycling projects within the Tomales Bay watershed region, although both MMWD and NMWD utilize or will soon be utilizing recycled water as part of those district's regional water supplies. Currently, the MMWD operates a tertiary filtration plant in cooperation with the Las Gallinas Sanitary District (see discussion in Chapter 2, subsection 2-5). On a broader regional level, MMWD has identified another potential user for its Las Gallinas recycled water – the Peacock Gap Golf Course, located outside of the Tomales Bay. Supply to this user would require an increase in production/delivery of recycled water capacity. The NMWD is working with

the Novato Sanitary District on a joint recycled project to serve the Novato area, which will be in operation in 2007.

For the Tomales Bay region, several recycling projects have been considered by various agencies and entities in the region. The Tomales Village Community Services District has proposed a tertiary treated water project to provide recycled water in the northern portion of the watershed for irrigation purposes. The NMWD hopes to develop planned treatment plant improvements that will be able to recover backwash water. The BCPUD has received a $500,000 grant to construct and operate a water reclamation plant in conjunction with its wastewater treatment facility in order to irrigate nearby athletic fields.

Surface Storage

Surface water storage in the Tomales Bay watershed includes a series of constructed surface reservoirs on both Lagunitas Creek (five) and Walker Creek (one). As previously indicated, the development and expansion of these facilities has resulted in significant adverse impacts to coho salmon and other resources. There has been no proposal by MMWD to expand surface storage.

The BCPUD has reviewed expansion of surface storage at its Woodrat #2 reservoir. The expansion of the reservoir to 127 acre-feet was evaluated in a 1991 feasibility study. The expansion would increase storage capacity and result in additional water reserves and water supply reliability. Existing water rights from the unnamed stream that feeds the reservoir would remain unchanged.

Desalination

Desalination is not a direct management strategy for the Tomales Bay area. However, on a broader regional level, desalination is actively being considered by the MMWD as a supplemental water source. A pilot project and testing have been completed. Construction of a 10-15 mgd facility is proposed, and environmental review is nearing completion.

Water Transfers

Water transfers allow suppliers with excess water supplies to sell their water to those agencies in need. Water transfers provide reduced vulnerability to water shortages resulting from drought, catastrophic events and system security breaches. NMWD and IPUD have an emergency intertie to improve supply reliability in the event of acute problems such as pipe line or treatment plant failure, source of supply contamination, or interruption caused by natural disaster or an extraordinary fire emergency." No other water transfers between water districts are planned, proposed or envisioned in the Tomales Bay watershed region. As indicated above, a joint project between MMWD and NMWD is under consideration, which would pump water from MMWD's Soulajule Reservoir to NMWD's new Stafford Lake water treatment plant for treatment for overall increased reliability and more efficient operations.

GROUNDWATER MANAGEMENT

Although some of the IPUD's water supply is from groundwater, and NMWD has an existing well system in place (which is considered surface flow), groundwater management has not been a key management strategy within the ICWMP as related to major water district supplies. Groundwater is used for rural domestic and agricultural supplies. Generally, groundwater resources within the Tomales Bay watershed region are limited and constrained to serve additional development. However, further review of groundwater resources has been recommended in Marin County's *Countywide Plan Update*, which may provide a better understanding of potential supplies for agricultural water demand.

WATER QUALITY

Water Quality Protection and Improvement

Protecting source water quality through watershed protection and improving municipal water quality through treatment upgrades are important elements of the Tomales Bay ICWMP's overall management approach. Water quality must be protected throughout all stages of its use cycle. Ensuring adequate quality during the distribution process also is important. For the Tomales Bay region, water treatment plant upgrades have been proposed by BCPUD, IPUD and NMWD as described above under "Water and Wastewater Treatment."

In addition to domestic water quality protection, water quality improvement of critical coastal areas is a key concern in the Tomales Bay region for the bay itself, as well as for Lagunitas and Walker Creeks and the four ASBS areas. Improving impaired critical coastal area waters and ASBS water quality is directly related to nonpoint source (NPS) pollution control, which is addressed below.

NPS Pollution Control

Concern about the water quality of Tomales Bay surfaced in the early 1960s when studies showed high fecal coliform counts in the winter months, and later studies confirmed that fecal coliform levels rose following heavy rains. These studies concluded that nonpoint source pollution from stormwater runoff from rural development and grazing areas was the most likely source of high bacterial counts in the bay (Prunuske Chatham, April 2004). Since then, numerous water quality monitoring efforts have been undertaken, and recommendations made, to improve water quality in the area. (See Chapter 9 and Appendix E regarding historical water quality monitoring efforts.)

Over the years, many regulatory programs were developed in California and across the nation to address ground and surface water quality concerns from point sources and to control discharges to surface waters from wastewater treatment plants, industries and other specific sources. The recent focus described in the San Francisco Bay Watershed Management Initiative 2004 is to identify, understand and address nonpoint sources. Surface runoff from grazing areas and developed areas collects and transports pollutants, pathogens and organic materials into Tomales Bay and its tributaries. Stormwater runoff carries suspended metals, sediments, algae-promoting nutrients

(nitrogen and phosphorus), floatable trash, automotive oils, pesticides and other toxic contaminants into the bay, streams and potentially into ASBS areas. For the Tomales Bay region, potential nonpoint source pollution includes runoff related to grazing and agricultural uses, deficient or failing septic systems, municipal stormwater, unpaved roads and trails, and boat discharges.

Considerable effort has been made to understand and improve water quality in Tomales Bay and its tributary streams. The Watershed Management Initiative 2004 identifies top priorities related to municipal stormwater/urban runoff management, TMDLs, wetlands and stream protection, rural nonpoint source controls, watershed management, watershed monitoring and assessment, groundwater protection and toxics cleanup, NPDES surface water protection, and planning activities. Tomales Bay, Lagunitas Creek and Walker Creek are identified as priorities for the State, given their current impaired water quality listing. TMDLs or pathogens and mercury have been adopted by the SFBRWQCB for the Tomales Bay region f. In addition to actions identified in the Watershed Initiative, TMDL reports and local plans—particularly the TBWC *Tomales Bay Watershed Stewardship Plans*—also have identified projects, programs and activities to address water quality improvement.

Photo by Greg Filbrandt

Grazing management programs have been undertaken by several agencies to reduce grazing-related runoff from private and public lands. Rangeland management to control pollutant discharges associated with livestock grazing within the PRNS and GGNRA is a priority for funding, as the SFBRWQCB believes that significant reductions in total loads of pathogens, nutrients and sediment could be achieved (San Francisco Bay Regional Water Quality Control Board, October 2004). It would present an excellent opportunity for building partnerships with ranchers operating on private lands elsewhere in the Lagunitas Creek and Walker Creek watersheds (Ibid.). Rancher outreach efforts and programs to implement BMPs on grazing lands continue to be proposed by the USNPS and MRCD. The Tomales Bay Agriculture Group (TBAG), with support from the UC Cooperative Extension (UCCE) and other groups, has been working with agricultural interests in the watershed to implement best management practices to protect water quality and reduce the discharge of pathogens from grazing and confined animal facilities. One program includes assisting several landowners with water quality monitoring on participating dairies, and implementation of measures to reduce targeted pollutants. The MRCD has offered outreach and financial assistance programs to the landowners in the Tomales Bay watershed. Most recently (in 2006) the MRCD received funding from the State to work with ranchers in the watershed to implement conservation practices to improve and protect water quality. The NRCS continues to provide complimentary technical assistance and cost-share programs derived from the Farm Bill that encourage landowners to implement best management practices. UCCE also offers ongoing range management education, performs monitoring and

ecosystem studies, and provides advice to ranchers in the watershed regarding manure management measures. (See also section 2-7 in Chapter 2.)

Unpaved road and trail management has been ongoing with a number of agencies. A Memoranda of Understanding (MOU) was initiated by MMWD and signed by MMWD, County of Marin, Marin County Open Space District, California Department of Parks and Recreation (CDPR), USNPS, and MRCD. The MOU provides uniform standards for the maintenance and management of unpaved roads in the Lagunitas Creek watershed to help reduce sedimentation.

As discussed in Chapter 2, the Marin County Environmental Health Services (EHS), in conjunction with the County's On-Site Septic Policy and Technical Advisory Committee (SepTAC), has implemented and continues to implement a number of programs and projects targeted at improving the management of onsite wastewater disposal systems in Marin County. Currently, EHS is developing a program that will provide a comprehensive inventory that will include location, type of system, and an evaluation of system function and associated environmental risks. The County of Marin developed a Wastewater Improvement Plan for approximately 96 residences and businesses located along the East Shore of Tomales Bay; the Plan calls for repair or replacement of marginal or failing septic systems with a management and financing program, and ongoing inspection, monitoring and management oversight for all existing developed properties. The project has completed several phases of work, and can serve as a model for other communities in the Tomales Bay region that may need to undertake similar wastewater planning and management strategies in the future.

The TBWC Chicken Ranch Beach Committee, with support from the Marin County EHS, has conducted beach monitoring and identified failing septic systems in the vicinity of the public beach area. Efforts by the Committee have assisted residents in repairing septic problems and have improved water quality in the beach area. In collaboration with TBWC, EHS also implements a beach water quality monitoring program at 23 popular swimming areas around the County, and numerous exceedances have been detected for contact recreation. Continued future funding for this monitoring is uncertain.

Ongoing efforts by Marin County, through its Stormwater Pollution Prevention Program (MCSTOPPP), include water quality monitoring and best management practices to reduce pollutants in stormwater runoff. A number of other efforts are underway to reduce pathogen contaminants in Tomales Bay and Lagunitas Creek through grazing management and septic system management. BCPUD and neighborhood groups are implementing drainage improvements in the Mesa area of the community in efforts to create positive drainage and to reduce rainwater ponding and perched groundwater conditions that may be impacting some residential septic systems in the area. The USNPS has reviewed, monitored and implemented BMPs for grazing activities on PRNS lands.

As part of the ICWMP preparation, watershed assessments for each of the region's four ASBS watersheds were prepared. The assessments include field surveys, review of existing data, identified discharges, water quality (where known), pollutant sources, management issues and data gaps. A series of project recommendations was made for each ASBS area to address primarily nonpoint sources in runoff. This work built on the SWRCB Discharge Report completed in 2003. A full

description of the watershed assessment methodologies and findings are included in Appendix K. Key findings related to discharges, water quality and management issues are presented in Chapter 2.

Specific projects have been identified through the ICWMP process by MMWD, MRCD, USNPS, BCPUD, SPAWN, CDPR, Marin County, TBWC, and Trout Unlimited that address all key water quality issues: pathogens, sediment, nutrients, mercury and ASBS discharges. Additionally, as part of the ICWMP preparation, community outreach was targeted to Inverness and Woodacre to review and discuss septic system solutions, which resulted in preparation and distribution of an educational brochure in Inverness and continued discussion of potential septic solutions in Woodacre.

In general the proposed management strategies to address water quality include:

- Pathogens and nutrient reduction (continued repair/replacement of failing septic systems as part of the East Shore project, replacement of other septic/leachfield components at campground and public areas near the bay, rancher outreach, continued grazing BMP implementation, and boat vessel removal/management in Tomales Bay);
- Sediment reduction (unpaved road and trail improvement, rancher outreach, stream bank repairs, removal of fish passage barriers created by culverts whose removal can also aid sediment reduction efforts);
- Mercury reduction (monitoring program to better determine mercury levels in Soulajule Reservoir and downstream areas); and
- Elimination of ASBS discharges (drainage and trail improvements in Duxbury Reef and Point Reyes Headlands ASBS areas). Measures to improve drainage facilities in the Bolinas Mesa and Point Reyes Headlands would contribute to improved water quality in the adjacent ASBS areas.

Recreation and Public Access

Maintenance of trails and other public recreational facilities adjacent to the bay, streams, ASBS areas and/or within the watershed can help address and improve water quality. Projects that target unimproved trails and creek crossings can help reduce sediment and better protect habitat areas. In addition, continued and expanded focused education and outreach to kayakers, boaters and campers that use the shore of Tomales Bay is important to minimize the cumulative impacts of hundreds of water-based recreationalists in the area.

Photo by Greg Filbrandt

Improvement of onsite wastewater disposal systems at public recreational facilities can help reduce pathogens in stormwater runoff. A number of

proposals have been offered, including trail improvements, replacement of campground and public septic systems, leachfields, and replacement or improvement of toilet facilities.

STORMWATER AND FLOOD MANAGEMENT

Storm Water Capture and Management

The Marin County Stormwater Pollution Prevention Program (MCSTOPPP), administered by the Marin County Public Works Department, is the primary municipal stormwater management program in Marin County. MCSTOPP is responsible for implementation or oversight of stormwater management plans for the National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II program in municipal areas within the Tomales Bay watershed region, including ASBS and other critical coastal areas. MCSTOPPP has applied to the SFBRWQCB for and received coverage under the NPDES Phase II General Permit, which requires identification of best management practices (BMPs) for each of the six minimum control measures.

Stormwater capture can be used for irrigation, thus reducing potable water demand, and also may aid in areas of localized flooding. MMWD has expressed interest in researching the potential technologies for rainfall capture and application to reduce use of potable water for irrigation. This also could include other stormwater treatments. The BCPUD is planning a citizen outreach program to educate and encourage community members about the benefits of capturing stormwater runoff (i.e., water tanks installed to collect rainwater from roofs) to store and use during dry summer months for landscape irrigation. SPAWN also has proposed a demonstration project that would investigate, design and install model stormwater systems for use in the San Geronimo Valley area.

Flood Management

Flood management is not one of the major concerns throughout the Tomales Bay planning area, but where flooding has occurred in localized areas it is a major concern, especially in Inverness and the San Geronimo Valley. The ICWMP generally supports reconnectivity of streams and creeks with floodplains, where feasible, to reduce flood damage in populated areas. SPAWN has proposed a stormwater capture demonstration project for the San Geronimo Valley area, primarily to address localized flooding. The County Public Works Department has proposed development of conceptual plans to restore the outlet of Silver Hills Creek to Olema Marsh, which would include a sediment detention basin.

ECOSYSTEM RESTORATION AND HABITAT IMPROVEMENT

Ecosystem and Wetland Restoration and Enhancement

Tidal wetlands along Tomales Bay and smaller freshwater wetlands in the region provide both habitat and water quality benefits. Wetlands are among the most productive wildlife habitats (most notably Tomales Bay itself), and provide significant water quality benefits through settling and filtration of

contaminants from runoff. Ecosystem restoration and wetland enhancement are key management strategies in the Tomales Bay region due to loss of wetlands over the last century. As discussed in Chapter 2, the Giacomini Ranch Restoration Project being undertaken by the USNPS will result in a significant wetland restoration effort for the area that includes improvement of habitat and water quality, and reconnectivity of hydrological features. Other restoration efforts under consideration include the Silver Hills Creek project proposed by Marin County Public Works Department as discussed above, which would restore hydrologic connectivity to Olema Creek and eliminate habitat disturbance. The Audubon Canyon Ranch also has implemented wetland restoration and management projects at Livermore Marsh and Olema Marsh. Additionally, The TBWC Foundation has been developing a proposal for wetland restoration at Chicken Ranch Beach that likely would include riparian stream habitat, a terraced floodplain, seasonal/perennial freshwater marsh and possible tidal/saltwater marsh in significantly degraded areas. Additionally, riparian revegetation and restoration has been ongoing in the Walker Creek watershed.

Environmental / Habitat Protection and Improvement

Photo by Greg Filbrandt

Environmental and habitat protection and improvement can address: stream and riparian habitats; freshwater wetlands seeps and springs; lakes and reservoirs; tidal and bay habitats; and adjacent uplands. For the Tomales Bay region, strategies to aid recovery of coho salmon, as well as riparian and wetland restoration, are key to improving overall watershed health. Projects to protect and improve habitats include primarily fishery habitat improvement projects, but also removal of non-native, invasive species as part of riparian and other native habitat restoration efforts. Fishery habitat improvement projects include erosion control sediment reduction projects, removal of fish barriers, planting of riparian vegetation, and placement of woody debris in stream channels for fish refuge. Removal of degraded culverts, biotechnical bank stabilization and riparian revegetation can decrease erosion and stream sedimentation, improve fish passage, increase native vegetation and/or provide stream shading for fish.

Trout Unlimited and the San Geronimo Valley Planning Group, in conjunction with the MRCD, have proposed review of San Geronimo Creek to better understand fishery habitat values, sedimentation impacts, and the feasibility of addressing removal of an existing fish passage barrier (an old weir). Stream remediation and opportunities for erosion control and habitat enhancement projects (such as woody debris installation or riparian planting projects) would be identified for this segment of San Geronimo Creek as a result of this effort. Should the feasibility study determine that the watershed is of high value and opportunities are meaningful, the study would lay the groundwork for identification of specific BMPs and remediation designs for the existing weir. Additionally, removal of culverts and other fish barriers has been identified as a key habitat improvement strategy that has

been proposed by the County of Marin. Continued fish monitoring by SPAWN and MMWD also is proposed.

WATERSHED MANAGEMENT

Watershed Planning

Watershed planning that involves all stakeholders has been a key element in the Tomales Bay watershed region. The TBWC's *Tomales Bay Watershed Stewardship Plan* sets the framework for coordinated actions, programs and projects with a key objective of improving water quality. Comprehensive watershed planning has included the County of Marin's draft countywide *Watershed Management Plan* (2004) and the *Walker Creek Watershed Enhancement Plan* (2001) that was prepared for the MRCD. Similarly, MMWD also continues watershed planning for the 17,000 acres it owns and manages for municipal water supplies. Major MMWD plans that have identified problems, issues and programs/projects for the watershed area include the *Lagunitas Creek Sediment and Riparian Management Plan* (1997, the *Mt. Tamalpais Road and Trail Management Plan* and the *Mt. Tamalpais Area Vegetation Management Plan and Update.* The watershed planning and management strategy also includes coordination with fishery habitat improvement, coho salmon recovery, and ongoing and coordinated water quality and coho salmon monitoring. More recently, unfolding concerns related to global climate change have resulted in proposals to further investigate the potential effects upon the region's water supplies, and habitat areas, as well as flooding effects.

Land Use Planning

The identification and implementation of land use practices that contribute to the stewardship of natural resources are priority issues to achieve identified stewardship goals in the TBWC *Watershed Stewardship Plan*. This applies to both agriculture and mariculture, with the aim of protecting open space through best management practice and acquisition programs that maintain single operation and regional economic viability and ecological sustainability. Land use planning is key to addressing human pressures on the natural systems and to achieving many watershed objectives, including priority objectives related to water quality, water supply, and ecosystem and habitat protection and restoration.

Private land use projects and development are regulated by the County of Marin. The Countywide Plan, which is in the process of being updated, establishes or reaffirms policies that protect natural resources on and adjacent to public lands. For instance, the Wetlands Conservation Area and Streamside Conservation Area policies all strive to limit impacts on sensitive sites and, by extension, public lands adjacent to them. TBWC and stakeholder input into this process would be desirable to ensure that the region's issues and concerns are reflected in comprehensive county-wide planning efforts.

4-2 MANAGEMENT STRATEGIES THAT ARE NOT APPLICABLE

CONJUNCTIVE USE

Conjunctive use is the combined use of groundwater and surface water supplies that may be utilized by water agencies to meet regional water demand. The benefits of conjunctive use include: optimization of groundwater and surface water resources; protection of groundwater from overdraft and subsidence; prevention of saltwater intrusion; enhancement of natural recharge of groundwater basins; and provision for emergency storage. Conjunctive use improves overall water supply reliability while at the same time providing for sustainable use of groundwater and minimizing impacts to riparian and aquatic habitats from surface water withdrawals. This strategy is not applicable in the Tomales Bay region, as water suppliers in the watershed mostly obtain water supplies from surface sources and do not rely heavily on groundwater. Given the limitations of groundwater resources in west Marin County, neither of the two major regional suppliers (MMWD and NMWD) utilize groundwater sources as part of their water supply.

IMPORTED WATER

Both MMWD and NMWD obtain a portion of their water supplies via imported Russian River water from the Sonoma County Water Agency. This source is used to serve customers outside of the Tomales Bay watershed region. Imported water to the Tomales region has not been identified as necessary or as an option in any of the water district plans and studies.

4-3 INTEGRATION OF STRATEGIES

The water management strategies reviewed and identified have largely been or are becoming integrated as a result of the collaborative efforts that have occurred in the region. Multiple management strategies have been identified to address the key management issues for the Tomales Bay watershed region: water supply and reliability, water quality, ecosystem restoration and habitat protection; stormwater and flood management; and watershed management. Additionally, many of the management strategies that address a particular issue—such as water supply reliability or water quality—also are integrated with other management strategies, such as ecosystem restoration or stormwater management. Table 4-1 summarizes how the selected management strategies are integrated and linked, and a summary of management strategy integration is provided below.

WATER SUPPLY & RELIABILITY

To assure water supply reliability, the ICWMP combines several management strategies: water supply reliability, water treatment, conservation, and larger regional strategies of recycling and desalination. Some of these management strategies directly combine with other water quality, ecosystem or wetland restoration, and/or habitat protection strategies. The NMWD proposal for a supplemental water source would help reduce temporary plant shutdowns during times of high tides (and saltwater intrusion) and flooding. The NMWD project not only would provide an alternative source of water

for the West Marin communities during periods of high tides (thus avoiding salt water intrusion into the existing primary supply wells) but also would provide an alternative source of water during flood events when the existing primary supply wells are under flood waters in Lagunitas Creek and cannot be used as a source of water until the flood waters recede. The project also could help NMWD reduce off-tide pumping during dry year periods of lower instream flows in Lagunitas Creek, thus having potential secondary habitat benefits.

The proposed water treatment plant upgrades (BCPUD, IPUD, NMWD), while mostly a program of the water treatment management strategy, also would serve to protect domestic water quality and ensure water supply reliability. The joint project between MMWD and NMWD that would pump water from MMWD's Soulajule Reservoir to NMWD's new Stafford Lake water treatment plant for increased system reliability, also would allow more efficient operations in droughts and would provide some redundancy in the event of major problems with MMWD's San Geronimo Treatment plant raw water supply.

Although water suppliers in the Tomales Bay region have effectively used conservation to reduce and delay water augmentation projects, some additional efforts and potential measures have been identified. Conservation efforts can further reduce demand on limited water supply systems, thus directly linking to the water supply reliability strategy. Additionally, some potential projects—such as MMWD's stormwater capture project to reduce use of potable water for irrigation—directly integrates with stormwater management strategies. Additionally, SPAWN has proposed a stormwater capture project that also could reduce potable water demand for irrigation purposes.

Recycled water can supplement other water supply reliability management strategies and provide a more secure long-term water supply. Expansion of recycled water users of MMWD's Las Gallinas recycling operation not only would reduce use of potable water for irrigation purposes, but on a regional level would benefit MMWD, NMWD and Sonoma County Water Agency by replacing water that would have been diverted from the Russian River and Lagunitas Creek with recycled water. This would leave more water in those sources for other beneficial uses, including endangered species protection projects. Additionally, on a local level, the Tomales Village Community Services District's proposed tertiary treated water project (to provide recycled water in the northern portion of the Tomales Bay watershed) also could reduce groundwater demand and improve water quality. NMWD also hopes to develop treatment plant improvements that will be able to recover backwash water.

Desalination is not a direct management strategy for the Tomales Bay area; but on a broader regional level, desalination offers potential benefits, including provision of a new source of potable water supply, especially during drought periods; provision of a local supply under local control; and reduced dependence on imported supplies. This would supplement the "Water Supply Reliability" management strategy for MMWD and could have other regional benefits in the Tomales Bay watershed.

TABLE 4-1
INTEGRATION OF MANAGEMENT STRATEGIES

Selected Management Strategy	Integration with Other Management Strategies
WATER SUPPLY RELIABILITY	
✓ Water Supply Reliability*	→ Water Treatment; Water Quality Protection & Improvement; Habitat Protection & Improvement; Desalination
✓ Water Treatment	→ Water Quality Protection and Improvement; Water Supply Reliability
✓ Water Conservation*	→ Water Supply Reliability; Storm Water Capture and Management; Ecosystem Restoration and Habitat Protection
✓ Water Recycling*	→ Water Supply Reliability; Habitat Protection & Improvement; Groundwater Management; Wastewater Treatment
✓ Desalination	→ Water Supply Reliability;
GROUNDWATER MANAGEMENT	
✓ Groundwater Management	→ Water Supply Reliability
WATER QUALITY	
✓ Water Quality Protection & Improvement*	→ Water and Wastewater Treatment; Water Supply Reliability; NPS Pollution Control
✓ NPS Pollution Control	→ Water Quality Projection & Improvement; Wastewater Treatment; Storm Water Capture and Management; Wetland Enhancement; Habitat Protection & Improvement
✓ Recreation and Public Access*	→ Water Quality Protection & Improvement; NPS Pollution Control; Habitat Protection
STORMWATER & FLOOD MANAGEMENT	
✓ Storm water Capture & Management*	→ Flood Management; Water Supply Reliability; Water Quality Protection & Improvement; Habitat Protection & Improvement
✓ Flood Management*	→ Stormwater Capture & Management; Water Quality Protection & Improvement; NPS Reduction; Habitat Protection & Improvement
ECOSYSTEM RESTORATION AND HABITAT PROTECTION	
✓ Ecosystem Restoration*	→ Flood Management; Water Quality Protection & Improvement; NPS Pollution Control; Habitat Protection & Improvement
✓ Wetlands Enhancement & Creation*	→ Flood Management; Water Quality Protection & Improvement; NPS Pollution Control; Habitat Protection & Improvement
✓ Environmental & Habitat Protection & Improvement*	→ Water Quality Protection & Improvement; NPS Pollution Control
WATERSHED MANAGEMENT	
✓ Watershed Planning	→ Flood Management; Water Quality Protection & Improvement; NPS Pollution Control; Wetland Enhancement; Habitat Protection & Improvement
✓ Land Use Planning	→ Water Quality Protection & Improvement; NPS Pollution Control; Stormwater Management; Habitat Protection & Improvement

* Management Strategies required to be considered by State IRWMP Guidelines.

GROUNDWATER MANAGEMENT

Although groundwater management has not been a key management strategy within the ICWMP as related to major water district supplies, future review and management of the region's groundwater sources may provide supplemental water supply options for agricultural users, which would help ensure adequate agricultural water supplies in support of the key economic feature in the region. This review also could provide a better understanding of groundwater issues, including the potential interaction of groundwater and surface water, and groundwater recharge concerns.

WATER QUALITY

To protect and improve water quality (both drinking water quality and impaired water bodies), the ICWMP combines several management strategies: Water Quality and Protection, NPS Pollution Control, and Recreation and Public Access. The NMWD's supplemental well system is proposed in large part to address water quality issues. Water supply and water treatment plant upgrades have been proposed by BCPUD, IPUD and NMWD to protect domestic water quality and enhance public health, and are directly linked to the Water Supply Reliability management strategy. Onsite wastewater treatment system projects and programs serve to reduce nonpoint source pollution in runoff.

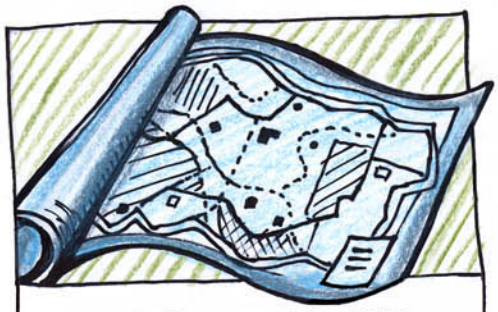
Water quality strategies to improve water quality in impaired water bodies and ASBS areas are a combination of Water Quality Protection & Improvement and NPS Pollution Control strategies. NPS pollution control programs generally strive to protect and restore water resources by reducing the pollutant deliveries to those resources. NPS pollution control programs and projects provide source reduction benefits and improve water quality for all beneficial uses, including municipal water supply, habitat and fishery resources, recreation, and the bay's shellfish industry. NPS reduction also links to wetland enhancement and environmental habitat protection, and provides public health and safety benefits. Wetland restoration projects have been designed to include areas to filter pollutants prior to water entering impaired water bodies. Projects that reduce the amount of sediment and mercury that enter Tomales Bay and its tributaries aid improvement of coho salmon habitat. Projects that improve public access trails and public facilities (i.e., restrooms) also can help reduce sediment and pathogen loadings, as well as better protect habitat areas, including ASBS areas.

STORMWATER AND FLOOD MANAGEMENT

Stormwater capture and management can be useful in preventing or reducing localized flooding, and captured stormwater can be used for irrigation, reducing potable water demand. Detention and filtration of stormwater and runoff through riparian zones and wetlands can significantly improve surface water quality and watershed health, as well as protect salmonid streams from erosion as a result of runoff. Thus, this management strategy is integrated with four other significant management strategies identified in the ICWMP: Flood Management, Water Supply Reliability, NPS Pollution Control, and Habitat Protection and Improvement.

TOMALES BAY WATERSHED MANAGEMENT STRATEGIES

WATERSHED MANAGEMENT



- WATERSHED PLANNING
- LAND USE PLANNING

WATER SUPPLY RELIABILITY

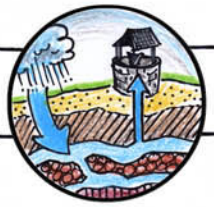
- RELIABILITY ✳
- TREATMENT
- CONSERVATION ✳
- RECYCLING ✳
- DESALINATION

WATER QUALITY

- WATER QUALITY PROTECTION & IMPROVEMENT ✳
- NPS POLLUTION CONTROL
- RECREATION & PUBLIC ACCESS ✳

ECOSYSTEM RESTORATION & HABITAT IMPROVEMENT

- ECOSYSTEM RESTORATION ✳
- WETLANDS ENHANCEMENT & CREATION ✳
- ENVIRONMENTAL & HABITAT PROTECTION & IMPROVEMEN ✳



GROUNDWATER MANAGEMENT

- GROUNDWATER MANAGEMENT ✳

STORMWATER & FLOOD MANAGEMENT

- STORMWATER CAPTURE & MANAGEMENT ✳
- FLOOD MANAGEMENT ✳

✳ Consideration of these strategies is a minimum IRWM Plan Standards requirement

The ICWMP generally supports reconnectivity of streams and creeks within floodplains, where feasible, to reduce flood damage in populated areas. SPAWN has proposed a stormwater capture demonstration project for the San Geronimo Valley area. The County Public Works Department has proposed development of conceptual plans to restore the outlet of Silver Hills creek to Olema Marsh, which would include a sediment detention basin. The project would reduce NPS sediment and local flooding frequency, and would have additional ecosystem benefits by restoring hydrologic connectivity of a significant drainage to Olema Creek and eliminating habitat disturbance that existing stormwater infrastructure maintenance necessitates.

ECOSYSTEM RESTORATION AND HABITAT IMPROVEMENT

Tidal wetlands along Tomales Bay and smaller freshwater wetlands in the region provide both habitat and water quality benefits. Wetlands provide significant water quality benefits through settling and filtration of contaminants from runoff. Both freshwater and tidal wetlands can contribute to improvement of impaired water bodies. By restoring natural hydrologic process and habitat connectivity to the bay's largest estuarine wetland, improved salmonid rearing and smolting habitat, greater and higher quality forage for migratory and overwintering shorebirds and waterfowl, expansion of riparian breeding habitats for neotropical songbirds, and enhanced conditions for shellfish and fish in Tomales Bay are anticipated. The Silver Hills Creek project proposed by Marin County Public Works Department would restore hydrologic connectivity to Olema Creek and eliminate habitat disturbance. The proposed removal of fish passage barriers created by culverts can also aid erosion control and sediment reduction efforts. The TBWC Foundation has been developing a proposal for wetland restoration at Chicken Ranch Beach that likely would include riparian stream habitat, a terraced floodplain, seasonal/perennial freshwater marsh and possible tidal/saltwater marsh in significantly degraded areas. The project not only would restore valuable habitat, but also would aid in the reduction of sediments and pathogens to Tomales Bay.

For the Tomales Bay watershed region, strategies to aid recovery of coho salmon and strategies to restore riparian and wetland are closely linked. Habitat protection and improvement also are linked to water quality improvement and NPS pollution control. Projects include fishery habitat improvement through sediment reduction, removal of fish barriers, planting of riparian vegetation, and placement of woody debris for fish refuge. Removal of degraded culverts, biotechnical bank stabilization and revegetation can decrease erosion and stream sedimentation, improve fish passage, increase native vegetation, and provide stream shading.

WATERSHED MANAGEMENT

The watershed planning and management strategy also includes ongoing and coordinated water quality and fish monitoring, and is linked to other key management issues: Flood Management, Water Quality Protection & Improvement, NPS Pollution Control, Wetland Enhancement, and Habitat Protection & Improvement. Similarly, the identification and implementation of land use practices that result in continued implementation of BMPs contribute to the stewardship of natural resources and are also linked to Water Quality, NPS Pollution Control, Stormwater Management, and Habitat Protection strategies.

4-4 RELATIONSHIP OF STRATEGIES TO ICWMP OBJECTIVES

Table 4-2 shows which management strategies will help achieve ICWMP identified objectives. In many cases, strategies and projects targeted at one plan objective also will support other plan objectives. Strategies and projects that address multiple objectives are typically the most cost-effective and resource-efficient. The ICWMP projects integrate regional strategies as shown on Table 4-3.

4-5 BENEFITS OF MULTIPLE MANAGEMENT STRATEGIES

Combining multiple water management strategies to achieve multiple objectives allows for a diversified approach to problem solving, and indeed has often been the approach taken in the Tomales Bay region: a combination of multi-disciplinary approaches with well coordinated stakeholder input. Each water management strategy considered in the ICWMP will address specific objectives. Additionally, as shown on Table 4-3, many of the proposed projects include one or more management strategies. As a result, the integration of multiple water management strategies results in addressing all ICWMP objectives.

The water management strategies considered as part of the Tomales Bay ICWMP combine effectively to address the regional water resources and management issues and objectives established in Chapter 3. By implementing water management strategies that complement one another, the participating agencies and stakeholders can help ensure that each issue is addressed. Combining multiple management strategies establishes a comprehensive, multi-faceted program that reflects the issues and partnerships within the Tomales Bay region. By integrating water management strategies, multiple objectives can be achieved.

Projects/programs that meet multiple objectives generally are considered to be of higher benefit and priority. Integration of multiple water strategies within a single project or group of projects often achieves greater benefits at less expense, than by implementing individual strategies. Projects that meet the objectives of the Tomales Bay ICWMP, address key management issues, integrate management strategies, provide multiple benefits and/or linkages with other projects, and provide opportunities for partnerships will contribute to ensuring a balanced approach to addressing competing needs of beneficial uses within the region.

4-6 RELATIONSHIP TO OTHER INTEGRATED WATER MANAGEMENT PLANS

There are other Integrated Regional Water Management planning efforts occurring in the Bay area, two of which include portions of Marin County. The North Bay Watershed Association (NBWA) has developed and adopted an IRWM Plan for the geographical area encompassed by NBWA, which includes watersheds that drain to San Francisco Bay. The San Francisco Bay Area IRWMP has been completed and adopted by entities throughout the San Francisco Bay area. The process for developing the plan divided water resource management into four "functional areas": Water Supply/Water

Quality, Wastewater/Recycling, Storm Water/Flood Control, and Watershed/Ecosystem. Each of these functional areas developed preliminary plans which were then merged and used as a foundation for the overarching SF Bay Area IRWMP. Although the geographic scope of the SF Bay Area IRWMP includes the coastal areas of west Marin encompassed by this ICWMP, the SF Bay Area IRWMP does not thoroughly address watershed and water resource management issues in the Tomales Bay area.

The Tomales Bay Watershed Council's ICWM planning effort could provide an opportunity to integrate with the San Francisco Bay Area Plan. The Tomales Bay watershed is located within the Department of Water (DWR) Resources San Francisco Bay Funding Area. As a result, future funding opportunities that derive from DWR will be contingent upon the TBWC cooperating with this region. This cooperation will take a variety of forms:

- Formal contacts between the TBWC and SF IRWMP managers,
- Regular meetings with the SFB IRWMP committees and subcommittees,
- Collaborations between stakeholders in both regions (facilitated by the governing boards of both entities,
- Joint workshops and working groups,
- Regular presentations by each entity before the respective board, and other similar activities.

TBWC has already initiated contact with the SF IRWMP mangers. This contact will lead to the establishment of a regular protocol for communication, a schedule for joint work efforts, formal recognition of the relationship between the groups, ongoing revisions of the TBWC ICWMP, as well as the SF IRWMP, and development of a project evaluation process for the TBWC projects that includes consideration of the SF bay watershed's regional priorities.

Additionally, the WRCB convened a meeting of five ICWMP staff and representatives in March of 2007. This meeting served as a catalyst for the creation of a network that has been meeting since to provide collaboration and coordination between the various ICWMP efforts. The following text was developed by the group and presented to the WRCB at a public meeting in April:

> *Throughout California, citizens, marine researchers, and local governments are joining forces to improve water quality in the most sensitive coastal habitats, the SWRCB-designated Areas of Special Biological Significance. The California Ocean Plan and the SWRCB recognize that serious ocean water quality impacts arise from polluted runoff from California's urban and rural watersheds. Proposition 50 provided funding for the creation of Integrated Coastal Watershed Management Plans to holistically address these challenges.*
>
> *As these groups complete plans for improving ocean water quality within the ASBSs, the SWRCB has stepped forward with an opportunity to implement these plans. By dedicating Prop 50, Chapter 8 funds to protection of ASBS areas, the SWRCB will receive a spectrum of benefits including: (1) addressing the Ocean Protection Council's Goals and Objectives, (2) improved ocean water quality, (3) cutting edge monitoring approaches, (4) TMDL implementation, (5) furthering watershed partnerships, and (6) reducing human health risks from bacterial exposure.*
>
> *Groups throughout the state working on these ICWM Plans are establishing a collaborative relationship to share technical information, implementation approaches, and to coordinate dissemination of these approaches to other communities statewide. The ICWM planning efforts have established leading-edge monitoring approaches, such as the use of marine*

invertebrates for in-situ biological monitoring of water quality stressors, and the use of new approaches for measuring sewage pollution in stormwater runoff. The ICWM project proponents are committed to preparing a manual on ASBS water quality protection as a joint deliverable of their future Prop 50 implementation grants. With successes in a diversity of rural and urban contexts, these projects lead the way for addressing bacterial contamination and water quality issues in ASBS areas statewide. Once completed, ICWM project proponents will provide coast-wide quantifiable benefits on these projects. Our efforts will be monitored by the state's leading ASBS authorities including the SWRCB, Professor Steve Murray (Cal-State Fullerton, Professor Richard Ambrose (UCLA), Professor Pete Ramadi (UC-Santa Cruz) and others.

This program represents a major opportunity to conduct projects to improve ocean water quality in highly sensitive habitat areas and marine ecosystems using holistic/integrated watershed management principles, consistent with Ocean Protection Council's goals and objectives. Each ICWM project addresses the water quality of an entire coastal watershed region, therefore connecting the impacts of land activities to waters underground, in rivers and at sea. The overall benefits of these projects will be the improvement of the quality in waters in land, near beaches and in the ocean, thus benefiting human lives as well as marine lives.

TABLE 4-2
RELATIONSHIP OF MANAGEMENT STRATEGIES TO ICWMP OBJECTIVES

MANAGEMENT STRATEGY	GOALS & OGJECTIVES				
	Water Quality	Ecosystem Restoration, Wetlands & Habitat Protection	Water Supply	Stormwater & Flood Management	Groundwater
Ecosystem Restoration*	✓	✓			
Environmental & Habitat Protection & Improvement*	✓	✓	✓		
Water Supply Reliability*	✓	✓	✓	✓	✓
Flood Management*	✓	✓		✓	
Groundwater Management*			✓		✓
Recreation & Public Access*	✓	✓			
Stormwater Capture & Management*	✓	✓	✓	✓	
Water Conservation*			✓		
Water Quality Protection & Improvement*	✓	✓	✓	✓	
Water Recycling*		✓	✓		
Wetlands Enhancement & Creation*	✓	✓		✓	
Desalination			✓		
Land Use Planning	✓	✓		✓	
NPS Pollution Control	✓	✓			
Surface Storage			✓		
Watershed Planning		✓	✓		
Water and Wastewater Treatment	✓		✓		

* Must be addressed by State IRWM Guidelines.

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
1	NMWD-Gallagher Wells & Pipeline	X	X			X			X		X	X			
2	NMWD-Pt. Reyes Water Treatment Improvements	X		X	X	X									X
3	MMWD-Desalination Plant	X									X				
4	MMWD-Mt. Tamalpais Roads & Trails Management					X		X		X	X				
5	MMWD-Peacock Gap Recycled Water Extension	X			X										X
6	MMWD-Watershed Assessment Program					X				X	X		X	X	
7	MMWD-Mercury Monitoring Program					X									
8	MMWD-Groundwater Recovery Feasibility Study-Phase 2	X	X												
9	MMWD-Lagunitas Creek Riparian Vegetation Work										X		X		
10	MMWD-Water Conservation: Rainwater Capture & Stormwater Use Project			X				X							
11	MMED-Lagunitas Creek Roads MOU Implementation Sediment Reduction					X	X	X			X				

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
12	MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory					X	X	X			X				
13	MMWD-Water System Security and Emergency Preparedness	X													
14	MMWD-Soulajule Reservoir Supply to Stafford Lake WTP	X													
15	MMWD-Water Conservation: Sustainable Wildland-Urban Interface Landscape			X										X	
16	MMWD-Water Conservation: Marin County Satellite Imagery Project			X											
17	MMWD-Pipeline and Tank Access Road Stormwater Improvements	X				X	X	X		X					
18	MMWD-Fencing Around MMWD Water Supply Reservoirs					X									
19	MMWD-Inkwells/Shafter Bridge Crossing Project: Planning									X					
20	MMWD-Inkwells/Shafter Bridge Crossing Project: Construction									X		X			

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
21	MMWD-Invasive Aquatic Weed Management Program	X				X						X			
22	RCD-Rancher Outreach Program					X	X				X		X	X	
23	TU-Dickson Weir & Equestrian Facility Study					X	X				X				
24	MCPW-Arroyo Creek Fish Passage Restoration					X	X				X		X	X	
25	MCPW-East Fork Woodacre #2 Fish Passage Restoration					X	X				X		X	X	
26	MCPW-San Geronimo Creek Fish Passage Restoration					X	X				X		X	X	
27	MCPW- Woodacre Creek #3 Fish Passage Restoration					X	X				X		X	X	
28	MCPW-Kent Canyon Creek Fish Passage Restoration					X					X		X		
29	MCPW-Marin County Watershed Management Plan					X	X	X	X		X		X		
30	MCPW-Silver Hills Creek Restoration Project					X	X	X	X				X		
31	MCPW, BCPUD, USNPS-Duxbury Reef Reserve Restoration					X	X			X				X	
32	USNPS-Pt. Reyes Headlands Reserve Restoration					X	X			X					

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
33	USNPS-Tomales Bay Boat Removal					X	X				X				
34	USNPS-Tomales Bay Vessel Management Plan Implementation					X	X				X				
35	USNPS-Olema Valley Trail Reroute & Stream Crossing Replacement					X	X			X					
36	USNPS-Stewart Horse Camp Septic Replacement					X				X					X
37	USNPS-Devil's Gulch Road/Trail Sediment Control					X	X				X				
38	USNPS-Tomales Bay Beach Campground Access and Restroom Improvements					X	X			X					X
39	CPR-Hearts Desire Beach Restroom Leach Line Replacement			X		X	X			X					X
40	TBWC-Chicken Ranch Beach Restoration					X	X	X	X	X	X		X		
41	IPUD-Climate Change Assessment	X													
42	RWQCB-Nicasio & Soulajoule Reservoir Management					X					X				
43	RWQCB-Stormwater, Flood Management & Instream Flow Enhancement		X	X		X	X	X	X		X		X		

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
44	RWQCB-Lagunitas Creek Watershed Sediment Reduction & Habitat Enhancement					X	X				X				
45	RWQCB-Riparian Zone & Large Woody Debris Enhancement					X	X				X	X	X	X	
46	SPAWN-Lagunitas Creek Watershed Restoration Program					X	X				X			X	
47	SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs					X	X	X			X			X	
48	SPAWN-Salmonid Monitoring					X	X	X			X		X	X	
49	SPAWN-Lagunitas Creek Stormwater Initiative	X		X		X	X	X			X			X	
50	BCPUD-Treatment Microfiltration Unit	X				X									X
51	BCPUD-Olema-Bolinas Road Water Main Upgrade	X													
52	BCPUD-Disinfection Byproduct Treatment Facility	X				X									X
53	BCPUD-Water Storage Capacity Expansion	X		X											
54	BCPUD-Invasive Reed Removal	X													
55	BCPUD-Distribution Pipeline Replacement	X		X											

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
56	BCPUD-Surfer's Overlook Water Main Relocation	X													
57	TVCSD-Tertiary Treatment & Recycling Planning Study	X	X	X	X	X								X	X
58	TVCSD-Tertiary Treatment & Recycling Project	X	X	X	X	X								X	X
59	East Shore Group - Wastewater Upgrade				X	X	X						X		X
60	NMWD-Emergency Pipeline Across SA Fault	X													
61	RCD-Habitat Improvement Project Implementation					X	X				X	X	X	X	
62	RCD-Ag Land Renewal Energy Proposal					X	X				X			X	
63	RCD-Coastal Prairie Improvement										X	X		X	
64	USNPS-Grazing BMPs					X	X								
65	IPUD-Treatment Disinfection Byproducts					X									X
66	IPUD-Distribution Pipeline Replacement	X		X		X									
67	IPUD-Asset Management Plan	X													
68	IPUD-Conservation Program	X		X		X					X				
69	IPUD-Treated Water Storage Expansion	X				X									

TABLE 4-3
MANAGEMENT STRATEGIES IMPLEMENTED BY ICWMP PROJECTS

ID #	PROJECT	Water Supply Reliability	GW Manage-ment	Water Conserve	Water Re-cycling	Water Quality	NPS Pollution	SW Mngmt	Flood Mngmt	Recrea-tion & Access	Eco-System	Habitat	Wetlands	LU & Water-shed Plnng	Treat-ment
70	MCOSD- San Geronimo Road/Trail Sediment Reduction					X	X	X	X	X	X	X	X		
71	MCPW- Duxbury Reef Stormwater Quality ASBS					X	X	X		X					X
72	MALT-Ag Land Conservation Esmt Acquisition			X		X	X				X		X	X	
73	MMWD-Invasive Weed Management										X				
74	USNPS-Riparian Restoration					X	X		X		X				X

Regional Priorities

Photo by Richard Blair

5. REGIONAL PRIORITIES

STATE IRWM REQUIREMENTS: F. Regional Priorities. Include short-term and long-term priorities for implementation of the Plan. Discuss the process for modifying priorities in response to regional changes.

5-1 REGIONAL PRIORITIES

As previously discussed, the Tomales Bay region is an extraordinarily unique area with unsurpassed environmental diversity. Tomales Bay is one of the major estuaries on the California coast that has gained state, regional and international recognition as a major wetland, which supports abundant aquatic and terrestrial wildlife. The other six critical coastal areas in the region (Lagunitas and Walker Creeks and the ASBS areas) also provide significant habitat values. The region and its resources support significant maricultural and agricultural industries, and millions of visitors come to this highly renowned area each year. Past and present human uses and activities within the region have resulted in impaired water quality and habitat conditions, including impacts to endangered species. Water quality impairment has resulted in the posting of human health advisories for Tomales Bay and its tributaries for water contact and the consumption of seven species of sport fish regularly caught in the bay, as well as periodic closure of shellfish harvesting.

The Tomales Bay region has multiple values that have been established through past agency and organization collaborative efforts. At the inception of the Tomales Bay Watershed Council, members agreed on the following common interests: to protect the Tomales Bay ecosystem; to maintain the rural nature and quality of life within the watershed; to use a collaborative approach to sustain agriculture, mariculture, homeowners, recreation and natural resources; and to strike the appropriate balance between voluntary and regulatory efforts. In this spirit, the ICWMP process also recognizes that there are two underlying issues facing the future of the bay and the watersheds of the critical coastal areas: the effective and economical management of all the sources of pollution that may impact the bay ecosystem, and the growing human pressures on this ecosystem.

The ICWMP process has further integrated the region's water suppliers and ASBS areas in an effort to ensure that all water management concerns and stakeholders are included. The partners and

stakeholders involved addressed regional priorities beyond the individual sets of priorities that exist within agencies and other stakeholder groups throughout the preparation of the ICWMP.

The region's multiple values helped in establishing ICWMP objectives to meet the goals of the area, from which priorities were established. The project objectives outlined in Chapter 3 were developed, reviewed and prioritized by the TAC and TBWC, resulting in three equally shared priorities for the region, as outlined below.

TOMALES BAY ICWMP REGIONAL PRIORITIES

- Water Quality Improvement
- Ecosystem Restoration and Habitat Improvement
- Water Supply Reliability

- **Water Quality Improvement:** This regional priority seeks to ensure that water quality in Tomales Bay, tributary streams and ASBS areas is sufficient to support natural resources and sustain beneficial uses. Water quality improvement is expected through reductions in sediment, pathogens, mercury and nutrient loading, with a goal of removing Tomales Bay from the 303(d) list of impaired water bodies list or reducing the potential for other nonpoint source pollution sources areas in the CCAs and to maintain high quality freshwater flows to these areas. Implementation of an ongoing and coordinated comprehensive water quality monitoring program for the critical coastal areas is essential to document baseline conditions, identify trends for pollutants of concern, and better assess the overall success of projects to reduce nonpoint sources of pollution.

- **Environmental Restoration and Habitat Improvement:** This regional priority seeks to restore and preserve the integrity of natural habitats and native communities. This includes restoration of wetlands, streams and riparian areas for native aquatic and terrestrial species throughout the region, in ways that protect, restore and/or rehabilitate the hydrologic and ecological integrity of the CCAs; maintenance of viable populations and habitats of listed special status species, including implementation of projects and programs that contribute to recovery of coho salmon; and improvement of habitat through the removal and/or control of non-native, invasive species throughout the region.

- **Water Supply & Reliability:** This regional priority seeks to ensure provision of adequate and improved water supplies to meet community needs and to improve reliability, consistent with sound ecosystem management. This includes providing adequate supplies during drought conditions, improving drinking water quality, supporting reliable water supplies for agricultural users, maximizing water use efficiencies among all users, minimizing vulnerability of water supply and infrastructure systems to natural disasters, and taking into account effects of global climate change in future water supply and watershed planning.

Promoted within this key priority are solutions for balancing instream flow requirements with the needs of domestic, agriculture, and commercial water users, as well as fish and wildlife habitat needs that contribute to habitat protection, improvement or enhancement, and restoration and the continuation of economic and cultural values in the region..

5-2 PROJECT IDENTIFICATION & PRIORITIZATION PROCESSS

PROJECT IDENTIFICATION

Previous planning efforts and other regional activities have recommended numerous projects and programs to address the management strategies for Tomales Bay (see Chapter 4). The Tomales Bay Watershed Council solicited specific project recommendations from the stakeholder groups involved. In response to this effort, a total of 74 project forms were received from proponents throughout the watershed. Table 5-1 lists the project recommendations that were received. The call for projects has been kept open to encourage ongoing development of projects in response to the creation of new partnerships or the evolution of issues within the watershed. However, the Prop 50-specific project call was closed in March of 2007 to enable the group to begin the project evaluation process.

The project recommendation forms were received from a total of 16 proponents, including (in alphabetical order):

Bolinas Community Public Utilities District (BCPUD)
California Department of Parks and Recreation (CDPR)
County of Marin – Department of Public Works (MCDPW)
County of Marin – Open Space District (MCOSD)
East Shore Planning Group (ESPG)
Inverness Public Utilities District (IPUD)
Marin Agricultural Land Trust (MALT)
Marin Municipal Water District (MMWD)
Marin Resources Conservation District (MRCD)
North Marin Water District (NMWD)
Point Reyes National Seashore (NPS)
Regional Water Quality Control Board, San Francisco Bay Region (SFBRWQCB)
Salmon Protection and Watershed Network (SPAWN)
Tomales Valley Community Service District (TVCSD)
Tomales Bay Watershed Council (TBWC)
Trout Unlimited (TU)

PROJECT EVALUATION

The Technical Advisory Committee (TAC) appointed a seven-person subcommittee to develop criteria for project evaluation and ranking, and to provide preliminary recommendations regarding project priorities. The subcommittee met six times between January and May 2007 to develop project evaluation, ranking and prioritization criteria. The subcommittee was set up with a deliberate intent

and desire to establish an objective review process. In doing so, the subcommittee reviewed the State's IRWMP requirements and other potential criteria (i.e., local plan recommendations) for screening and/or ranking and prioritizing projects. Criteria considerations included project eligibility, project readiness to proceed, and projects or groups of projects that could provide multiple benefits. A project was deemed ready to proceed if all the details about schedule, permitting and costs were outlined, and the project could be fully implemented by the Prop 50 year 2010 deadline, including all environmental review and permitting. A project was deemed eligible if it met one or more of the water management elements as specified in California Water Code section 79561, which is part of the criteria that the SWRCB would use in evaluation of grant proposals.

In reviewing potential project screening and ranking criteria, the subcommittee reiterated the need to develop an objective, "transparent" process. After discussion of various review criteria and scoring/ranking options, the subcommittee, working with the TAC, determined that projects would be evaluated and scored based on their ability to meet ICWMP objectives. The TAC prioritized and ranked ICWMP objectives (see Chapter 3). A weighted scoring value was developed for each of the five management categories and objectives within each category. The Water Quality, Ecosystem Restoration and Habitat Improvement, and Water Supply Reliability categories each received equal weight, followed by stormwater management and groundwater management (see Appendix F for methodology).

It was initially decided that only projects that were deemed eligible and ready to proceed would be evaluated and ranked. However, ultimately it was decided to score all submitted projects, regardless of Prop 50 criteria. This would allow the TBWC to quickly amend the Plan for use in other grant proposals and to readily identify projects of high priority for single-project applications or joint-agency applications in the future. Each of the 74 projects was scored by subcommittee members individually, and these scores were averaged to provide the ultimate score. Appendix F includes the final project scores, which are summarized on Table 5-2. Subcommittee members abstained from voting on their own agencies' projects during the project scoring process.

From this process, the subcommittee considered how to be responsive to the legislated priorities of the Prop 50 effort without artificially narrowing the range of projects contemplated under the Plan. The subcommittee was aware that some projects of potentially high merit would score low in this process because the projects were conceptual, did not have a specific budget, had not yet received approval of the proponent's board, and/or did not have a clear proponent, and that these projects would be reconsidered during the annual review and update.

In its deliberation of short-term project priorities, the subcommittee conducted a pre-screening process to identify three project groups:

1. Projects that are eligible under Prop 50 and ready to proceed;
2. Projects that are eligible, but readiness is uncertain or not determined; and
3. All other projects.

Following the objective scoring of projects, and as a result of extensive subcommittee discussions, the following additional criteria were added to the evaluation:

- Geographic distribution – to ensure that the project benefits are spread throughout the watershed
- Projects which achieve multiple benefits – to assure that projects which achieve a variety of positive outcomes are represented
- Projects which impact diverse categories – to ensure that the final list of projects benefits a variety of management issues and is not clustered in one area of benefit

Based on this review, short-term priorities were identified as set forth in section 5-3, with the remainder of the projects being included in the plan as long-term priorities.

5-3 IMPLEMENTATION PRIORITIES

Photo by Greg Filbrandt

The ranking of projects reflect the overall regional priorities and responsiveness to the State's Prop 50 Guidelines. However, the project ranking does not indicate project priority for implementation. In particular, projects that could provide multiple benefits and be integrated with other projects were considered to be of high importance. The TAC and TBWC sought a balance between a pragmatic response to the Prop 50 guidelines and the direction of SWRCB staff and local desires that the document should also be a holistic and complete watershed management plan. It was the clear desire of the group to have a document that could be used by all authorizing members to manage both their own project prioritization and their ability to collaborate in future funding efforts.

SHORT-TERM PRIORITIES

The project evaluation and ranking process was completed to help prioritize short-term project priorities, consistent with ICWMP objectives and State Prop 50 grant funding guidelines. It was determined that the short-term priorities are those projects grouped into Tier 1, that would generally be completed within two to three years (by 2010). These projects are summarized in Table 5-3, and are illustrated in Figure 20. Projects to be considered for Prop 50 Round 2, Step 1 Grant funding would be taken from the short-term priority list.

LONG-TERM PRIORITIES

The remaining submitted projects are considered long-term priorities. The remaining projects will be equally reviewed as other funding processes come up and/or regional changes occur. The proposals

include a diversity of project types (see Table 5-4). The process envisioned for future project prioritization is described in section 5-4 below.

5-4 PROCESS FOR PRIORITY MODIFICATION

The Tomales Bay ICWMP's projects and programs were developed based on analysis of regional needs and benefits, and in accordance with State requirements. As implementation proceeds, regional needs may change and actual project benefits and outcomes may vary from expectations. As outlined in Chapter 6, the ICWMP will be reviewed in the future, and project priorities would be revisited at each ICWMP revision or amendment.

There were a number of projects that are conceptual or need additional work by the proponents to make the projects suitable for ranking and prioritization. The level of additional work varies considerably across the submitted projects. A meeting for project proponents will be held to assist the various entities in refining their project descriptions. The projects that are strictly conceptual or which do not have a clear proponent will need special attention. The project list developed for the ICWMP will be modified and updated as new projects are identified, current projects are merged or refined, and/or projects are withdrawn. (See Chapter 6 for discussion of other known project concepts, recommendations, and/or future issues.)

The partners will employ a process of adaptive management to enable a flexible decision-making process that can account for these variables and provide future updates to the ICWMP. Adaptive management involves a system of monitoring, assessment and response in order to ensure that future decisions are informed by actual experience gained from project implementation and changing conditions and priorities. Following implementation of each project, impacts and benefits will be assessed and compared with what was initially expected. (See Chapter 7 regarding Plan performance evaluation criteria and measures.)

As priorities shift and objectives are progressively refined, other projects will be considered as new information develops. Project priorities and plan objectives may be revised as new data and plan/project evaluation data are presented.

TBWC intends to review the ICWMP on an annual basis. Each year, in October (beginning in October 2007), the ICWMP will be reevaluated by a standing subcommittee—the Plan Amendment Subcommittee (PAS). As part of their ongoing responsibilities, the PAS will work with the Project Review Subcommittee to solicit, review, rank and prioritize the projects included in the plan. These activities will include working with project proponents to refine and re-submit projects, identifying potential proponents or teams of proponents, then convening discussions concerning both project identification and project proposals; they also will work with the Council as a whole to determine when the plan objectives, management issues or overall priorities need to be revised.

The review will focus on the following:

1. Identify current status of active projects in implementation phase to measure progress in meeting both project and plan goals and objectives.

2. Assess projects that are suitable for funding, but not yet funded, to ensure aggressive recruitment of funds for project implementation.

3. Evaluate projects which were previously insufficiently defined , without a specific proponent, or which were not yet ready to proceed, to ensure that they move forward into the implementation program.

4. Continue to seek options to address geo-specific or issue-specific priorities within the plan and foster continued existing and new partnerships among the stakeholders.

5. Review of new data or monitoring/performance results. For example, the TBWC habitat committee, as well as other committees, are working on other studies that in the future may provide input on substantive planning issues that are underway, but which currently are outside the auspices of this plan. These projects will be developed and integrated into the plan as more data becomes available. The TBWC Science Committee and all other committees will also work external to the Council with other stakeholders both inside and outside region to assist with modifying priorities over time.

The proposed process for prioritizing future projects will proceed as follows:

1. Evaluate the results of any ongoing studies, monitoring efforts and data collection activities.
    a. Ensure that new or updated data is entered into the appropriate databases.
    b. Refine area maps which reflect resource inventories, if needed.

2. Review and, if necessary, revise objectives and management priorities to ensure that the evolution of knowledge about conditions in the watershed (or derived from external factors such as global warming) are reflected.

3. Review projects developed by watershed stakeholders and coordinate with the Project Review Subcommittee to re-rank the overall project list as necessary.

4. Identify and facilitate the coordination of multi-stakeholder and multi-objective projects for the coming year, in coordination with the Project Review Subcommittee.

5. Revise the Plan document as necessary to respond to evolving conditions within the watershed, emerging consensus topics and requirements of new funding opportunities.

TABLE 5-1
SUBMITTED PROJECTS

ID #	PROJECT	AGENCY
1	NMWD-Gallagher Wells & Pipeline	NMWD
2	NMWD-Pt. Reyes Water Treatment Improvements	NMWD
3	MMWD-Desalination Plant	MMWD
4	MMWD-Mt. Tamalpais Roads & Trails Management	MMWD
5	MMWD-Peacock Gap Recycled Water Extension	MMWD
6	MMWD-Watershed Assessment Program	MMWD
7	MMWD-Mercury Monitoring Program	MMWD
8	MMWD-Groundwater Recovery Feasibility Study-Phase 2	MMWD
9	MMWD-Lagunitas Creek Riparian Vegetation Work	MMWD
10	MMWD-Water Conservation: Rainwater Capture & Stormwater Use Project	MMWD
11	MMWD-Lagunitas Creek Roads MOU Implementation Sediment Reduction	MMWD
12	MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory	MMWD
13	MMWD-Water System Security and Emergency Preparedness	MMWD
14	MMWD-Soulajule Reservoir Supply to Stafford Lake WTP	MMWD
15	MMWD-Water Conservation: Sustainable Wildland-Urban Interface Landscape	MMWD
16	MMWD-Water Conservation: Marin County Satellite Imagery Project	MMWD
17	MMWD-Pipeline and Tank Access Road Stormwater Improvements	MMWD
18	MMWD-Fencing Around MMWD Water Supply Reservoirs	MMWD
19	MMWD-Inkwells/Shafter Bridge Crossing Project: Planning	MMWD
20	MMWD-Inkwells/Shafter Bridge Crossing Project: Construction	MMWD
21	MMWD-Invasive Aquatic Weed Management Program	MMWD
22	RCD-Rancher Outreach Program	MRCD
23	TU-Dickson Weir & Equestrian Facility Study	TU
24	MCPW-Arroyo Creek Fish Passage Restoration	MCPW
25	MCPW-East Fork Woodacre #2 Fish Passage Restoration	MCPW
26	MCPW-San Geronimo Creek Fish Passage Restoration	MCPW
27	MCPW- Woodacre Creek #3 Fish Passage Restoration	MCPW
28	MCPW-Kent Canyon Creek Fish Passage Restoration	MCPW
29	MCPW-Marin County Watershed Management Plan	MCPW
30	MCPW-Silver Hills Creek Restoration Project	MCPW
31	NPS-Duxbury Reef Reserve Restoration	MCPW, BCPUD, USNPS
32	NPS-Pt. Reyes Headlands Reserve Restoration	USNPS
33	NPS-Tomales Bay Boat Removal	USNPS
34	NPS-Tomales Bay Vessel Management Plan Implementation	USNPS
35	NPS-Olema Valley Trail Reroute & Stream Crossing Replacement	USNPS
36	NPS-Stewart Horse Camp Septic Replacement	USNPS
37	NPS-Devil's Gulch Road/Trail Sediment Control	USNPS
38	NPS-Tomas Bay Beach Campground Access and Restroom Improvements	USNPS

TABLE 5-1
SUBMITTED PROJECTS

ID #	PROJECT	AGENCY
39	CPR-Hearts Desire Beach Restroom Leach Line Replacement	CDPR
40	TBWC-Chicken Ranch Beach Restoration	TBWC
41	IPUD-Climate Change Assessment	IPUD
42	RWQCB-Nicasio & Soulajule Reservoir Management	RWQCB
43	RWQCB-Stormwater, Flood Management & Instream Flow Enhancement	RWQCB
44	RWQCB-Lagunitas Creek Watershed Sediment Reduction & Habitat Enhancement	RWQCB
45	RWQCB-Riparian Zone & Large Woody Debris Enhancement	RWQCB
46	SPAWN-Lagunitas Creek Watershed Restoration Program for Private Lands, Bioengineered Bank Repairs	SPAWN
47	SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs	SPAWN
48	SPAWN-Salmonid Monitoring	SPAWN
49	SPAWN-Lagunitas Creek Stormwater Initiative	SPAWN
50	BCPUD-Treatment Microfiltration Unit	BCPUD
51	BCPUD-Olema-Bolinas Road Water Main Upgrade	BCPUD
52	BCPUD-Disinfection Byproduct Treatment Facility	BCPUD
53	BCPUD-Water Storage Capacity Expansion	BCPUD
54	BCPUD-Invasive Reed Removal	BCPUD
55	BCPUD-Distribution Pipeline Replacement	BCPUD
56	BCPUD-Surfer's Overlook Water Main Relocation	BCPUD
57	TVCSD-Tertiary Treatment & Recycling Planning Study	TVCSD
58	TVCSD-Tertiary Treatment & Recycling Project	TVCSD
59	East Shore Group - Wastewater Upgrade	County/East Shore Group
60	NMWD-Emergency Pipeline Across SA Fault	NMWD
61	RCD-Habitat Improvement Project Implementation	MRCD
62	RCD-Ag Land Renewal Energy Proposal	MRCD
63	RCD-Coastal Prairie Improvement	MRCD
64	NPS-Grazing BMPs	USNPS
65	IPUD-Treatment Disinfection Byproducts	IPUD
66	IPUD-Distribution Pipeline Replacement	IPUD
67	IPUD-Asset Management Plan	IPUD
68	IPUD-Conservation Program	IPUD
69	IPUD-Treated Water Storage Expansion	IPUD
70	MCOSD- San Geronimo Road/Trail Sediment Reduction	MCOSD
71	Combined with #31	
72	MALT-Ag Land Conservation Easement Acquisition	MALT
73	MMWD-Invasive Weed Management	NMWD
74	NPS-Riparian Restoration	USNPS

TABLE 5-2
RANKING OF SUBMITTED PROJECTS

ID #	Agency	Project Title	Average Score	Rank
61	RCD	Watershed BMP Implementation	46.96	1.00
30	MCPW	Silver Hills Creek Restoration	44.67	2.00
31	NPS	Duxbury Reef ASBS Restoration Activities	40.12	3.00
40	TBWC	Chicken Ranch Beach Restoration	39.26	4.00
46	SPAWN	Lagunitas Creek Watershed Restoration-Bank Repairs	38.48	5.00
43	RWQCB	Stormwater, Floood, Instream Flow Management	36.20	6.00
1	NMWD	Gallagher Well & Pipeline	35.76	7.00
22	RCD	Rancher Outreach Program	35.64	8.00
37	NPS	Devils Gulch Road/Trail Sediment Control	34.98	9.00
45	RWQCB	Riparian Zone and Large Woody Debris Enhancement	33.87	10.00
47	SPAWN	Lagunitas Creek Watershed Restoration-Road Repairs	33.59	11.00
70	MCOSD	San Geronimo Road & Trail Sediment Reduction	33.13	12.00
49	SPAWN	Lagunitas Creek Watershed Stormwater Initiative	33.07	13.00
24	MCPW	Arroyo Creek Fish Passage Restoration	32.08	14.00
26	MCPW	San Geronimo Creek Fish Passage Restoration	32.02	15.00
59	MCEHS	East Shore Wastewater Upgrade	31.67	16.00
23	TU	Dickson Weir & Equestrian Facility Feasibility Study	31.38	17.00
44	RWQCB	Lagunitas Creek Sediment Reduction	30.57	18.00
42	RWQCB	Nicasio & Soulajule Reservoir Water Quality Improvement	29.97	19.00
74	NPS	Remove Structure-Restore Riparian Habitat	29.60	20.00
25	MCPW	East Fork Woodacre Fish Passage	29.55	21.00
12	MMWD	Lagunitas Creek Roads MOU Implementation	29.23	22.00
11	MMWD	Lagunitas Creek Roads MOU Implementation - Sediment Reduction Projects	28.10	23.00
27	MCPW	Woodacre Creek #3 Fish Passage Restoration	28.03	24.00
36	NPS	Stewart Camp Septic Replacement	27.00	25.00
6	MMWD	Watershed Assessment and Planning Program	25.83	26.00
33	NPS	Tomales Bay Derelict Boat Removal	25.78	27.00
72	MALT	Ag Land Conservation Easement Acquisition	25.73	28.00
34	NPS	Vessel Management Program	25.70	29.00
39	CDPR	Tomales Bay State Park Leach Line Replacement	24.30	30.00
32	NPS	Point Reyes ASBS Restoration	23.82	31.00
17	MMWD	Pipeline and Tank Access Road Stormwater Improvements	23.72	32.00
2	NMWD	Point Reyes Treatment Plant Improvements	23.20	33.00
58	TVCSD	Tertiary Treatment & Recycling Study 2	23.13	34.00
7	MMWD	Mercury Monitoring Project	21.88	35.00

TABLE 5-2
RANKING OF SUBMITTED PROJECTS

ID #	Agency	Project Title	Average Score	Rank
38	NPS	Tomales Beach Campground Improvements	21.78	36.00
5	MMWD	Peacock Gap Recycled Water Extension	21.40	37.00
35	NPS	Olema Trail Reroute and Stream Crossing Replacement	21.23	38.00
48	SPAWN	San Geronimo Salmonid Monitoring	20.68	39.00
10	MMWD	Water Conservation: Rainwater Capture and Stormwater Use Project	20.18	40.00
4	MMWD	Mount Tamalpais Roads and Trails Management Plan	19.43	41.00
41	IPUD	Climate Change Study	19.35	42.00
56	BCPUD	Surfers Overlook Water Main Replacement	17.42	43.00
55	BCPUD	Distribution Pipeline Replacement	16.27	44.00
57	TVCSD	Tertiary Treatment & Recycling Study	16.18	45.00
65	IPUD	Disinfection Byproduct Treatment Facility	15.80	46.00
8	MMWD	Groundwater Recovery Feasibility Study - Phase 2	15.77	47.00
50	BCPUD	Treatment Facility Microfiltration Unit	15.72	48.00
68	IPUD	Water Conservation Program	15.57	49.00
73	MMWD	Invasive Weed Management	15.37	50.00
66	IPUD	Distribution Pipeline Replacement	15.15	51.00
52	BCPUD	Disinfection Byproduct Treatment Facility	14.92	52.00
69	IPUD	Treated Water Storage Expansion	14.75	53.00
14	MMWD	Soulajule Reservoir Supply to Stafford Lake WTP	14.58	54.00
62	RCD	Ag Land Renewable Energy Program	14.42	55.00
63	RCD	Coastal Prairie Improvement Project	13.45	56.00
51	BCPUD	Olema-Bolinas Road Water Main Replacement	13.20	57.00
19	MMWD	Inkwells/Shafter Bridge Crossing Project: Planning	13.18	58.00
53	BCPUD	Water Storage Expansion	12.85	59.00
18	MMWD	Fencing Around Water Supply Reservoirs	12.25	60.00
9	MMWD	Lagunitas Creek Riparian Vegetation Work	12.07	61.00
60	NMWD	Emergency Pipeline Provisions Across SA Fault	12.06	62.00
21	MMWD	Invasive Aquatic Weed Management Program	11.95	63.00
20	MMWD	Inkwells/Shafter Bridge Crossing Project	11.80	64.00
54	BCPUD	Reed Removal from Reservoirs	11.62	65.00
15	MMWD	Water Conservation: Sustainable Wildland-Urban Interface Landscape	10.98	66.00
13	MMWD	Water System Security and Emergency Preparedness	9.48	67.00
67	IPUD	Asset Management Plan	8.82	68.00
16	MMWD	Water Conservation: Marin County Satellite Imagery Project	8.62	69.00

See Appendix F for scoring summary.

TABLE 5-3
SHORT-TERM PRIORITIES

WATER QUALITY IMPROVEMENT		
61	RCD	Watershed Outreach and BMP Implementation
31	BCPUD/MCPW/NPS	Duxbury Reef ASBS Restoration Activities
59	MCEHS	East Shore Wastewater Upgrade
39	CDPR	Tomales Bay State Park Leach Line Replacement
12	MMWD	Lagunitas Creek Roads MOU Implementation
37	NPS	Devil's Gulch Road/Trail Sediment Control
46	SPAWN	Lagunitas Creek Watershed Restoration-Bank Repairs
47	SPAWN	Lagunitas Creek Watershed Restoration-Road Repairs
70	MCOSD	San Geronimo Road & Trail Sediment Reduction
33	NPS	Tomales Bay Derelict Boat Removal
32	NPS	Point Reyes ASBS Restoration
38	NPS	Tomales Beach Campground Improvements
ECOSYSTEM RESTORATION AND HABITAT IMPROVEMENT		
26	MCPW	San Geronimo Creek Fish Passage Restoration and Dickson Weir & Equestrian Facility Feasibility Study
40	TBWC	Chicken Ranch Beach Restoration
24	MCPW	Arroyo Creek Fish Passage Restoration
74	NPS	Remove Structure-Restore Riparian Habitat
WATER SUPPLY RELIABILITY		
1	NMWD	Gallagher Well & Pipeline
57	TVCSD	Tertiary Treatment & Recycling Study
65	IPUD	Disinfection Byproduct Treatment Facility
52	BCPUD	Disinfection Byproduct Treatment Facility
STORMWATER AND FLOOD MANAGEMENT		
30	MCPW	Silver Hills Creek Restoration
49	SPAWN	Lagunitas Creek Watershed Stormwater Initiative

There is no ranking implied for short-term priorities.

TABLE 5-4: PROJECT SUMMARY BY PROJECT TYPE

	Agency	Project Title	PROJECT TYPE							
			Plan-ning	Restora-tion	Facility Construc-tion	Educa-tion	Monitor--ing	BMPs	Demonstra-tion-Pilot Project	Other
	WATER SUPPLY / RELIABILITY / SAFE DRINKING WATER									
1	NMWD	Gallagher Well & Pipeline			X					
2	NMWD	Point Reyes Treatment Plant Improvements			X					
3	MMWD	MMWD Bay Water Desalination Plant			X					
5	MMWD	Peacock Gap Recycled Water Extension			X					
8	MMWD	Groundwater Recovery Feasibility Study - Phase 2								X
13	MMWD	Water System Security and Emergency Preparedness			X					X
14	MMWD	Soulajule Reservoir Supply to Stafford Lake WTP								
16	MMWD	Water Conservation: Marin County Satellite Imagery Project	X							
18	MMWD	Fencing Around Water Supply Reservoirs	X		X					
50	BCPUD	Treatment Facility Microfiltration Unit			X					
51	BCPUD	Olemas-Bolina Road Water Main Replacement			X					
52	BCPUD	Disinfection Byproduct Treatment Facility			X					
53	BCPUD	Water Storage Expansion			X					
54	BCPUD	Reed Removal from Reservoirs		X						
55	BCPUD	Distribution Pipeline Replacement			X					
56	BCPUD	Surfers Overlook Water Main Replacement			X					
57	TVCSD	Tertiary Treatment & Recycling Study	X							
58	TVCSD	Tertiary Treatment & Recycling Study 2			X					
60	NMWD	Emergency Pipeline Provisions Across SA Fault			X					

TABLE 5-4: PROJECT SUMMARY BY PROJECT TYPE

	Agency	Project Title	PROJECT TYPE							
			Plan-ning	Restora-tion	Facility Construc-tion	Educa-tion	Monitor--ing	BMPs	Demonstra-tion-Pilot Project	Other
65	IPUD	Disinfection Byproduct Treatment Facility								
66	IPUD	Distribution Pipeline Replacement								
67	IPUD	Asset Management Plan	X		X					
68	IPUD	Water Conservation Program	X		X	X		X		
69	IPUD	Treated Water Storage Expansion			X					
	WATER QUALITY IMPROVEMENT									
4	MMWD	Mount Tamalpais Roads and Trails Management Plan		X				X		
7	MMWD	Mercury Monitoring Project					X			
11	MMWD	Lagunitas Creek Roads MOU Implementation - Sediment Reduction Projects		X				X		X
12	MMWD	Lagunitas Creek Roads MOU Implementation	X					X		
17	MMWD	Pipeline and Tank Access Road Stormwater Improvements	X					X		X
22	RCD	Rancher Outreach Program				X	X			
31	MCPW	Duxbury Reef ASBS Restoration Activities						X		
32	NPS	Point Reyes ASBS Restoration						X		X
33	NPS	Tomales Bay Derelict Boat Removal							X	
34	NPS	Vessel Management Program				X			X	
35	NPS	Olema Trail Reroute and Stream Crossing Replacement			X					
36	NPS	Stewart Camp Septic Replacement [LOCATION NOT KNOWN]			X					
37	NPS	Devil's Gulch Road/Trail Sediment Control			X			X		
38	NPS	Tomales Beach Campground Improvements			X					
39	CDPR	Tomales Bay State Park Leach Line Replacement			X					

TABLE 5-4: PROJECT SUMMARY BY PROJECT TYPE

	Agency	Project Title	PROJECT TYPE							
			Plan-ning	Restora-tion	Facility Construc-tion	Educa-tion	Monitor-ing	BMPs	Demonstra-tion-Pilot Project	Other
42	RWQCB	Nicasio & Soulajoule Reservoir Water Quality Improvement	X					X		
44	RWQCB	Lagunitas Creek Sediment Reduction	X					X		
46	SPAWN	Lagunitas Creek Restoration - Bank Repairs	X	X		X	X		X	
47	SPAWN	Lagunitas Creek Restoration - Road Repairs	X	X		X	X			
59	MCEHS	East Shore Wastewater Upgrade			X					
61	RCD	Watershed BMP Implementation	X	X			X	X		
64	NPS	Grazing BMPs						X		
70	MCOSD	San Geronimo Road & Trail Sediment Reduction		X				X		X
	ECOSYTEMS RESTORATION & HABITAT IMPROVEMENT									
9	MMWD	Lagunitas Creek Riparian Vegetation Work						X		
21	MMWD	Invasive Aquatic Weed Management Program								X
23	TU	Dickson Weir & Equestrian Facility Feasibility Study	X							
24	MCPW	Arroyo Creek Fish Passage Restoration		X						
25	MCPW	East Fork Woodacre Fish Passage		X						
26	MCPW	San Geronimo Creek Fish Passage Restoration		X						
27	MCPW	Woodacre Creek #3 Fish Passage Restoration		X						
28	MCPW	Kent Canyon Creek Fish Passage Restoration		X						
30	MCPW	Silver Hills Creek Restoration	X	X				X	X	
40	TBWC	Chicken Ranch Beach Restoration	X							
45	RWQCB	Riparian Zone and Large Woody Debris Enhancement		X				X	X	

TABLE 5-4: PROJECT SUMMARY BY PROJECT TYPE

	Agency	Project Title	PROJECT TYPE							
			Plan-ning	Restora-tion	Facility Construc-tion	Educa-tion	Monitor-ing	BMPs	Demonstra-tion-Pilot Project	Other
48	SPAWN	San Geronimo Salmonid Monitoring	X	X		X				
63	RCD	Coastal Prairie Improvement Project	X	X		X	X	X	X	
73	MMWD	Invasive Weed Management		X						
	STORMWATER / FLOOD MANAGEMENT									
10	MMWD	Water Conservation: Rainwater Capture and Stormwater Use Project						X		
17	MMWD	Pipeline and Tank Access Road Stormwater Improvements	X					X		X
43	RWQCB	Stormwater, Flood, Instream Flow Management	X			X				
49	SPAWN	Lagunitas Creek Watershed Stormwater Initiative	X	X		X		X	X	
	RECREATION / PUBLIC ACCESS									
19	MMWD	Inkwells/Shafter Bridge Crossing Project: Planning	X							
20	MMWD	Inkwells/Shafter Bridge Crossing Project			X					
	WATERSHED ASSESSMENT / MANAGEMENT									
6	MMWD	Watershed Assessment and Planning Program	X							
15	MMWD	Water Conservation: Sustainable Wildland-Urban Interface Landscape	X			X				
29	MCPW	Marin County Watershed Management Plan	X			X		X		
41	IPUD	Climate Change Study	X							
	OTHERS									
62	RCD	Ag Land Renewable Energy Program	X		X	X	X	X		
72	MALT	Ag Land Conservation Easement Acquisition								X

Legend

- Study Area Boundary
- 33 — Short-Term Project Priorities (see ICWMP text for details)
- Areas of Special Biological Significance

Note: Locations are general. Project 61 includes activities throughout the Tomales Bay Watershed and is not mapped.

TOMALES BAY Watershed Council

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 20. ICWMP Priority Project Locations

Implementation

Photo by Greg Filbrandt

6. IMPLEMENTATION

STATE IRWM REQUIREMENTS: G. Implementation. Identify specific actions, projects and studies, ongoing or planned, by which the Plan will be implemented. Identify the agency(ies) responsible for project implementation and clearly identify linkages or interdependence between projects. Demonstrate economic and technical feasibility on a programmatic level. Identify the current status of each element of the Plan, such as existing infrastructure, feasibility, pilot or demonstration project, design completed, etc. Include timelines for all active or planned projects and identify the institutional structure that will ensure Plan implementation.

6-1 IMPLEMENTATION PROJECTS & ACTIONS

PROJECT SUMMARIES AND STATUS

As indicated in Chapter 5, 74 project recommendations were reviewed and evaluated. These projects represent a range of project types (i.e., restoration, implementation of BMPs, facility construction), as summarized in Table 5-3 in Chapter 5. Table 6-1 of this chapter summarizes the specific type of projects that are proposed to achieve the ICWMP's stated objectives related to water quality, ecosystem restoration and habitat improvement, water supply reliability, and stormwater and flood management. Table 6-2 at the end of this chapter provides a brief project summary and identifies the implementing agency, project status, and timeline. The full project summaries are included in Appendix G.

OTHER PLANS, RECOMMENDATIONS & ONGOING PROGRAMS

Over the course of plan preparation, the TBWC has solicited project descriptions from its members and other stakeholders in the region. The solicitation process for projects suitable for Prop 50 funding was closed in March of 2007, to enable the projects to be ranked for the purposes of plan finalization and public review. However, the plan process has caused numerous stakeholders to reevaluate the method and process by which they identify possible implementation projects.

A collaborative and joint planning approach has gained momentum within the Tomales Bay region among the agencies and organizations concerned with resource and watershed management. This is reflected in the fact that projects continue to be submitted to the Council. Additionally, as a result of the ongoing ICWMP project review and subcommittee activities, a number of stakeholders and project proponents have begun the process of developing multi-stakeholder and/or multi-objective projects in addition to those already proposed in greater detail. Some of these projects are extremely conceptual in nature, don't have a clear proponent, or require completion of studies already underway before they can be finalized into a project proposal.

To accommodate this new energy and to ensure that conceptual, emerging or "fledgling" projects do not fall by the wayside, the TBWC has instituted a process for receiving, processing and tracking new projects developed with an eye toward comprehensive plan implementation. The Council has developed two forms for use in identifying projects within the watershed. The first is a "long form" application that provides a variety of details about the project and assumes that a project is generally ready to proceed. In this context, "ready to proceed" means that the project has an identified proponent/applicant, has been approved by its Board, has a detailed budget and implementation schedule, has initiated permit approval, has an identified match or funding source, and is ready for implementation with a minimum of delay.

The second is a "short form" that has been developed to enable project concepts, preliminary designs or evolving partnerships to be brought forward for inclusion in the plan. The intent of this short form process is to ensure that the full Council and all stakeholders have a constantly updated understanding of not only the emerging technical issues, but also the emerging partnerships and collaborations within the region. The assumption is that many of these projects will develop over time into formal projects that can be ranked and prioritized. Tracking these less defined projects allows for watershed stakeholders to merge projects, refine ongoing projects to accommodate additional data reporting functions and generally ensure holistic thinking throughout the region. The multi-stakeholder, multi-objective projects that are the stated priority of the group will be facilitated by the "early warning" on emerging project concepts and ideas.

The initial group of short-form projects is included in Appendix H. These "Proposed Project Concepts" could be developed in greater detail in the future—especially in response to, or to complement, the measured outcomes of the implemented projects. The ICWMP includes these concepts in order to comprehensively encompass all the previous planning efforts for all of the critical coastal areas, and to provide guidance for future modification of recommendations and project proposals. These projects will enable the Project Review Subcommittee and the Plan Amendment Subcommittee to initiate and test their process for project development.

In addition to the projects identified in the ICWMP and other potential future projects noted above, there are other known project and/or program recommendations that have been included in other regional plans, but have not been submitted as projects under this process. These recommendations also are included in Appendix H. Appendix H also includes a list of known/previously identified data gaps that could serve as future project concepts, as well as those issues/concerns identified in Chapter 3 for further review in the future.

TABLE 6-1
SUMMARY OF SUBMITTED PROJECT DESCRIPTIONS

Project Type	Project #
WATER SUPPLY / RELIABILITY	
▪ Water Supply Projects	1, 3, 8, 14
▪ Recycled Water Projects	5, 57, 58
▪ Water Treatment Plant Upgrades	2, 50, 52, 51, 65
▪ Water Storage & Infrastructure Improvements	51, 53, 54, 55, 56, 66, 69
▪ Water System Security	13, 18, 60
▪ Water Conservation and Planning	16, 67, 68
WATER QUALITY IMPROVEMENT	
▪ Road and Trail Improvement & Management Projects	4, 11, 12, 17, 35, 37, 70
▪ Bank Repairs & Erosion Control	46, 47
▪ Ag Land BMPs	22, 42, 44, 61
▪ Onsite Wastewater Disposal System Replacement or Upgrades	36, 38, 39, 59
▪ Boat Vessel Management	33, 34
▪ Grazing BMPs	64
▪ Mercury Monitoring Project	7
▪ ASBS - Multiple Measures	31,32
ECOSYSTEM RESTORATION / HABITAT IMPROVEMENT	
▪ Wetland Restoration	30, 40
▪ Stream Bank / Channel Enhancement	23, 46
▪ Fish Passage Barrier Removal	24, 25, 26, 27
▪ Salmonid Monitoring	48
▪ Riparian Revegetation	9, 45, 46
▪ Invasive Species Removal	21, 73
▪ Coastal Prairie Improvement Project	62
STORMWATER / FLOOD MANAGEMENT	
▪ Stormwater Capture	10, 49
▪ Stormwater/Flood Management	43
OTHERS	
▪ Recreational Access Improvements Near Creeks	19, 20
▪ Watershed Planning	15, 29, 41
▪ Ag Land Renewable Energy Project	62
▪ Ag Land Conservation Easement Acquisition	72

6-2 IMPLEMENTING AGENCIES AND RESPONSIBILITIES

The Tomales Bay Watershed Council (including the member water supply agencies) will coordinate the implementation of the ICWMP. If this changes in the future, the ICWMP would be amended to reflect this change. Although the TBWC will coordinate implementation of the Plan, all adopting agencies will be part of the Plan implementation process. Decisions such as selection of projects for inclusion in funding applications, Plan updates/modifications, etc., will be a collaborative effort of the agencies and organizations through a clearly defined process.

The TBWC, now 7 years old, has successfully developed the Stewardship Plan, and has been actively involved in the implementation of regional projects. Through the ICWMP process, water supply has been added, and the planning area has expanded in response to the region's concerns. All water agencies providing water service in the Tomales Bay region were on the TBWC. The Tomales Bay region has successfully implemented projects with diverse stakeholders. There is a history of project implementation by a number of stakeholders in the region that preceded the formation of the TBWC. The TBWC brought agencies and organizations together to promote collaboration, which would continue to meet quarterly.

Each project proponent will be responsible for implementation of individual projects and successfully meeting all environmental permitting and compliance requirements (see Table 6-2 for the list of agencies responsible for project implementation). All agencies, organizations and stakeholders are moving forward with their own missions and objectives, and that will continue. While the TBWC is the entity responsible for coordination of ICWMP implementation and working with agencies to review how plan objectives are being met, the TBWC would not necessarily be the administrator of specific grants. However, the TBWC is the focal point for sharing information and project progress and assisting with development of new projects as a result of outcome of ongoing project and plan review and assessment. The TBWC would actively pursue project proposals, and continue to be a forum for coordination, including coordinating joint proposals.

The TBWC will establish a subcommittee that will meet periodically (i.e., quarterly or as needed) to assess the status of project implementation and work with proponent project teams to ensure timely project implementation. The subcommittee will include representatives from each of the Plan's adopting entities. As described in Chapter 8, project performance data will be brought to the TWBC and subcommittee for review to determine the level of contribution toward achieving ICWMP objectives and overall plan implementation progress. The TAC and subcommittee will work with the TBWC during an annual ICWMP status review to ensure that specific projects ready for implementation are being identified and prioritized.

The TBWC has developed a phased approach to Plan implementation that includes regular updates of the Plan through 2010, with semi-annual updates thereafter. Each year, in October (beginning with October 2007), the Plan will be reevaluated by a standing subcommittee – the Plan Amendment Subcommittee (PAS). The PAS will follow the following procedure:

1. Evaluate the results of any ongoing studies, monitoring efforts and data collection activities.
    a. Ensure that new or updated data is entered into the appropriate databases.
    b. Refine area maps which reflect resource inventories, if needed.

2. Review and, if necessary, revise objectives and management priorities to ensure that the evolution of knowledge about conditions in the watershed (or derived from external factors such as global warming) are reflected.
3. Review projects developed by watershed stakeholders and coordinate with the Project Review Subcommittee to re-rank the overall project list as necessary.
4. Identify and facilitate the coordination of multi-stakeholder and multi-objective projects for the coming year, in coordination with the Project Review Subcommittee.
5. Revise the Plan document as necessary to respond to evolving conditions within the watershed, emerging consensus topics and requirements of new funding opportunities.

6-3 LINKAGES BETWEEN PROJECTS

Within the Tomales Bay planning areas are a diversity of local, state and federal agencies, as well as non-governmental organizations. An attempt was made to ensure that the diverse missions of these organizations were reflected in the project mix; more important, an attempt was made to develop purposeful and intentional partnerships across these agencies and organizations to ensure that conceptual and design linkage opportunities were identified as early in the process as possible.

The TAC explored the concept of linkages from a variety of perspectives. There are several ways in which the ICWMP projects are interconnected or linked:

- Projects that address the same objective,
- Projects that contribute to improvements in a specific geographic location (i.e., the same tributary), and
- Projects whose combined implementation results in addressing multiple objectives.

Projects that address the same objective category are summarized in Table 6-1. Projects that seek to reduce pathogen pollutant sources into Tomales Bay (#36, 38, 39, 59) are linked in the sense that they would all be contributing to achievement of the Pathogen TMDL adopted for the area, and at least one project (#7) would be implementing monitoring recommendations of the Mercury TMDL.

Photo by Greg Filbrandt

Table 6-1 also shows the linkages between similar types of projects. One example of project linkage between similar projects is a group of five projects that address implementation of agricultural / grazing BMPs (#22, 42, 44, 61, 64). These projects complement each other and collectively expand the area of watershed coverage in which these projects could be implemented. Another example is the linkage between the BCPUD (Project #52) and the IPUD (Project #65), as they are working collaboratively to identify the most appropriate water treatment technology to reduce chlorine disinfection byproducts from their similar treatment systems.

Projects that are geographically linked are those projects that will directly benefit an individual tributary or specific area, and cumulatively result in a net measurable improvement in the targeted place. Additionally, the idea of maximizing benefits in multiple tributaries to generate a measurable benefit to the larger system also was considered. Within this context, specific geographical linkages between projects were identified that would result in water quality and fish habitat improvement as summarized below.

- Lagunitas Creek: Two road/trail sediment reduction projects (#11, 12) and one riparian revegetation / fish enhancement project (#9) are proposed on Lagunitas Creek. There are seven additional sediment reduction projects on tributaries to Lagunitas Creek: on Devil's Creek (#37), Olema Creek (#17, 35), and San Geronimo Creek (#44, 46,47, 70). Taken together, these projects are linked, in that all of them address water quality improvement via reduction of sediment. This in turns helps improve fishery habitat. These projects also are linked to several fish barrier removal projects on San Geronimo Creek, which are described below.

- San Geronimo Creek: A number of projects proposed to reduce sediment and improve water quality in San Geronimo Creek (#44, 46, 47, 70) are linked to three other projects that would result in removal of barriers for fish migration and other stream improvements to enhance habitat (#23, 24, 26). The value of these improvements is linked to another ongoing project (#48) that monitors salmonid spawning trends and smolt outmigration in San Geronimo Creek as well as other tributaries in the Lagunitas Creek watershed.

  One of the fish barrier removal projects (#26) is directly linked with other similar projects on Woodacre Creek, as it is located at the confluence San Geronimo and Woodacre Creeks, a high priority site as both are important tributaries for spawning and rearing of coho salmon. The project will restore migratory access through an existing barrier, providing access to critical habitat for spawning and rearing coho salmon and steelhead. The project is linked to a project that would remove an upstream barrier (#23), and is thus integrated with the County of Marin Fish Passage Program. The project also will stabilize a severely eroding streambank, which will decrease sedimentation into San Geronimo and Lagunitas Creeks (listed as impaired under 303(d) for sediment).

- Woodacre Creek: Two fish barrier removal projects (#25, 27) would link to provide greater benefits for habitat improvement. Additional projects on Woodacre Creek include:

    - SPAWN outmigration monitoring (48)
    - Develop sediment reduction budgets and projects (44)
    - Bank stabilization to reduce sediments (46)
    - Road improvements to reduce sediment on MCOSD roads (70)
    - Dickson weir project (23)

- Olema Creek: Two projects propose trail improvements (#35) and access road improvements (#17) within the same area which will provide added benefits related to sediment reduction in this area.

- Tomales Bay: Four projects to improve onsite wastewater disposal systems (#36, 38, 39. 59) would be linked as projects serving to reduce pathogens into Tomales Bay. Additionally, two proposed wetland restoration projects (#30, 40) would be linked to the planned Giacomini Wetlands Restoration Project and would expand a wildlife refuge corridor. The Silver Hills Restoration project would restore a creek outlet to Olema Marsh (#30) and would be geographically linked to the planned Giacomini Wetlands Restoration Project.

Table 6-3 summarizes how the short-term priority projects contribute to ICWMP objectives and management strategies. It further illustrates the multiple benefits of combined projects. Not only do the individual projects meet multiple objectives, but collectively, the short-term projects contribute to fourteen selected management strategies and to each of the ICWMP's key goals. Although the short-term projects represent a range of project types, they are collectively linked in that each project contributes to water quality and ecosystem/habitat improvement, two of the ICWMP's key goal and objective categories.

6-4 ECONOMIC AND TECHNICAL FEASIBILITY

The Tomales Bay ICWMP consists of projects, programs and planning activities that have been delivered by the stakeholder proponents. The costs and economic feasibility have been taken into consideration by these agencies and organizations as part of their project recommendation process. Each project proponent was required to determine the technical feasibility of their project prior to submittal. All of the proponents have worked with similar projects and/or project-specific feasibility and design studies which have identified costs and economic feasibility. Economic feasibility of individual projects was determined on a variety of factors including internal agency cost estimates, development of individual project budgets, agency and stakeholder master plans and background documentation and evaluation of projected costs by the project review committee. Individually the projects have demonstrated economic feasibility in that they have identified costs and budget, and are feasible to implement if funds are available. On a program level, economic feasibility focused on projections contained in agency planning documents, availability of selected technologies in the marketplace, cost estimates and budgets contained in individual project proposals and other similar factors.

A majority of the proposed projects and programs within the ICWMP are related to improvements to existing facilities and improvement or restoration of habitat areas. Except for major facilities, such as the MMWD desalination project (a regional project undergoing its own analyses), none of the projects within the ICWMP represent new or unusual technologies that would be deemed infeasible or cost-prohibitive or are designed as pilot and demonstration efforts to test feasibility and cost effectiveness of techniques that could be applied region wide.

The projects identified in the ICWMP have a total cost of $40,712,100; the short-term priorities identified in Chapter 5 represent approximately $9,500,000 of this total amount. The ICWMP reflects the long-term projects currently known throughout the region. However, at this time it is acknowledged that there are more projects proposed than can be implemented with currently available funding. Not all identified projects proposed have been proposed for funding at this time. While there is a likelihood that projects included in the Plan are or will be economically feasible, it

may take time for government agencies and non-governmental agencies to seek and receive funding for project implementation. In this regard and from the regional perspective, the ICWMP may be economically difficult to implement in its entirety, which is why a prioritization process and phased approach has been developed by project proponents and TBWC.

From a regional perspective, the total amount and magnitude of costs challenges the region in funding all projects. The ICWMP can assist in ongoing refinement of the overall economic need of the region to implement projects, and project proponents will try to fund projects that directly address regional priorities and seek funding of highest priority projects with greatest potential for benefits. Reprioritization of projects will bring new projects forward in response. The region has a history of receiving public and private grants to implement a variety of projects similar to those included in the ICWMP. Additional funding sources will continue to be sought regardless of whether a project is being funded by state agencies.

The planning process to date has been a collaborative effort, and in the future, given the nature of partnerships that currently exist, further streamlining, collaboration and focus efforts will occur that could reduce total project costs. For example, a greater economy of scale may be achieved by grouping projects. Project proponents may be working together with more collaborating and strategizing about how projects can be organized.

6-5 TIMELINE FOR IMPLEMENTATION

It is the intent that the Tomales Bay ICWMP be a "living document" with annual updates to coordinate planning in the Tomales Bay region over the next 20 years; however, regular agency updates or new studies or information—i.e., new County General Plan information or TMDL studies—could change the life of the plan and require substantive update and reevaluation. Short-term priority projects identified in Chapter 5 will be considered initially. As other projects are developed, priorities will be revisited. Table 6-2 summarizes specific project timelines as they are currently known, although some have not been fully developed at this time.

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
	WATER SUPPLY / RELIABILITY / SAFE DRINKING WATER					
1	**NMWD**	Gallagher Well & Pipeline	Develop additional wells near existing emergency well and construct pipeline to connect to existing treatment plant.	Preliminary design report complete.	Within one year of funding.	
2	**NMWD**	Point Reyes Treatment Plant Improvements	Water treatment plant upgrades and filter replacement.	Design study complete.	Within one year of funding.	
3	**MMWD**	MMWD Bay Water Desalination Plant	Construction of desalination plant.	EIR in progress.		2010-2012
5	**MMWD**	Peacock Gap Recycled Water Extension	Increase production at existing plant and construct new pipeline to produce and deliver recycled water to a new user (Peacock Gap Golf Course).	Staff studies have been prepared, and costs and specs for several designs have been developed.	To Be Determined	
8	**MMWD**	Groundwater Recovery Feasibility Study - Phase 2	Feasibility study to explore potential for recapturing long-term infiltration loss from reservoirs to increase available water supply.	Phase 1 study complete.	To Be Determined	
13	**MMWD**	Water System Security and Emergency Preparedness	Implementation of identified measures at prioritized locations for added security at MMWD facilities.	Vulnerability Assessment complete.	To Be Determined	
14	**MMWD**	Soulajule Reservoir Supply to Stafford Lake WTP	Construction of pipeline from Soulajule Reservoir to NMWD's Stafford Lake water treatment plant to allow water from the reservoir to be pumped to the treatment plant.	Engineering report needs to be updated.	To Be Determined	
15	**MMWD**	Water Conservation: Sustainable Wildland-Urban Landscape Interface	Development of public outreach components to promote conversion to native vegetation.		To Be Determined	
16	**MMWD**	Water Conservation: Marin County Satellite Imagery Project	Study to target landscape areas that can be converted to water-conserving landscaping and project outreach component to implement.		To Be Determined	
18	**MMWD**	Fencing Around Water Supply Reservoirs	Construction fencing at identified areas at Soulajule and Nicasio Reservoirs to prevent cattle from entering.		To Be Determined	
50	**BCPUD**	Treatment Facility Microfiltration Unit	Installation of microfiltration filter unit within existing water treatment facility.		As Soon As Possible	
51	**BCPUD**	Olemas-Bolina Road Water Main Replacement	Replacement of water main.		As Soon As Possible	
52	**BCPUD**	Disinfection Byproduct Treatment Facility	Construction of filtration unit to reduce chlorine disinfection byproducts.		As Soon As Possible	

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
53	BCPUD	Water Storage Expansion	Expand water storage capacity.	Feasibility study completed.		2009
54	BCPUD	Reed Removal from Reservoirs	Removal of invasive reeds from reservoirs to restore storage capacity.			2009
55	BCPUD	Distribution Pipeline Replacement	Replace aging water distribution system pipeline.		As Soon As Possible	
56	BCPUD	Surfers Overlook Water Main Replacement	Replace and relocate existing water line threatened by coastal bluff erosion.		As Soon As Possible	
57	TVCSD	Tertiary Treatment & Recycling Study	Feasibility study and development of plans for construction of system to produce tertiary treated water for irrigation use.			September 2008
58	TVCSD	Tertiary Treatment & Recycling Study 2	Construction of a filtering and disinfecting system to produce recycled water based on findings of the above feasibility/design study.			September 2009
60	NMWD	Emergency Pipeline Provisions Across San Andreas Fault	Install fire hydrants and purchase high pressure hose to provide emergency water supply to customers in event of an earthquake.		Within one year of Funding	
65	IPUD	Disinfection Byproduct Treatment Facility	Construction of filtration unit to reduce chlorine disinfection byproducts.			Fall 2008
66	IPUD	Distribution Pipeline Replacement	Remove and replace a portion of the aging water distribution system pipeline.			December 2009
67	IPUD	Asset Management Plan	Develop a comprehensive asset management program to provide long-term planning through a systematic analysis of maintenance data and infrastructure condition.			January 2010
68	IPUD	Water Conservation Program	Develop water conservation program to include public education, provision of rebates for retrofits, and consideration of rate restructuring to encourage water conservation.	Water use statistics have been compiled.		March 2010
69	IPUD	Treated Water Storage Expansion	Replace four aging treated water storage tanks and expand storage capacity.			March 2010
	WATER QUALITY IMPROVEMENT					
4	MMWD	Mount Tamalpais Roads and Trails Management Plan	Treat identified erosion sites to reduce sediment.	Sites identified in Mt. Tamalpais Road and Trail Management Plan	To Be Determined	
7	MMWD	Mercury Monitoring Project	Implementation of monitoring program for mercury in Soulajule Reservoir and downstream water releases per TMDL.		To Be Determined	

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
11	MMWD	Lagunitas Creek Roads MOU Implementation - Sediment Reduction Projects	Implement highest priority sediment reduction projects associated with multi-agency MOU for maintenance and management of unpaved roads in the Lagunitas Creek watershed.	GIS mapping is completed.	To Be Determined	
12	MMWD	Lagunitas Creek Roads MOU Implementation – Assessment	Assess and identify specific sediment reduction projects to be implemented with development of database for project management and tracking.	GIS mapping completed.		
17	MMWD	Pipeline and Tank Access Road Stormwater Improvements	Road-related improvements such as outsloping, rolling dips, culvert replacements to better manage stormwater and reduce erosion.		To Be Determined	
22	RCD	Rancher Outreach Program	Develop rancher outreach tools to more effectively implement BMPs and monitoring studies (currently funded) on grazing lands.	SWRCB grant has been awarded for "Conserving Our Watersheds" program, but does not include outreach funding.		
31	MCPW, BCPUD, USNPS	Duxbury Reef ASBS Restoration Activities	Implement recommendations to improve facilities and discharge locations.	Coastal watershed assessment and recommendations complete.		Fall 2009
32	USNPS	Point Reyes ASBS Restoration	Implement recommendations to improve facilities and discharge locations.	Coastal watershed assessment and recommendations complete.		
33	USNPS	Tomales Bay Derelict Boat Removal	Remove identified derelict boats from Tomales Bay.	Boats identified in TB Vessel Management Plan	As Soon As Possible	
34	USNPS	Vessel Management Program	Implement recommended mooring management strategies.	Boats identified in TB Vessel Management Plan	As Soon As Possible	
35	USNPS	Olema Trail Reroute and Stream Crossing Replacement	Trail rehabilitation to include bridge replacement, culvert removal, and installation of weirs adjacent to Olema Valley Creek and wetlands.			
36	USNPS	Stewart Camp Septic Replacement	Replace existing aging septic system and locate further from existing stream.			
37	USNPS	Devils Gulch Road/Trail Sediment Control	Rehabilitation and stabilization activities along unpaved road used for recreational and limited vehicle access; and installation of fencing to exclude cattle from riparian corridor.			
38	USNPS	Tomales Beach Campground Improvements	Replace portable toilets with permanent pit toilets.			

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
39	STATE PARKS	Tomales Bay State Park Leach Line Replacement	Replace one septic system and upgrade another that serve public restrooms in state park.	Project identified in Tomales Bay State Park General Plan		Fall 2008
42	RWQCB	Nicasio & Soulajule Reservoir Water Quality Improvement	Develop and implement watershed management strategy for Nicasio and Soulajule Reservoir to reduce sediment and nutrient loads and assess reservoir operations for measures to improve downstream water quality.			
44	RWQCB	Lagunitas Creek Sediment Reduction	Study to determine roads and sediment budgets to develop prioritized list of sediment reduction projects in San Geronimo and Lagunitas Creek watersheds.			
46	SPAWN	Lagunitas Creek Watershed Restoration - Bank Repairs	Work with landowners to design and implement 12 biotechnical bank/stabilization repair projects to reduce sediments into San Geronimo Creek.	CEQA compliance and securing permits in progress.		2009 / 2010
47	SPAWN	Lagunitas Creek Watershed Restoration - Road Repairs	Repair, re-contour and rehabilitate 2 miles of high-priority unpaved, non-County maintained roads in the San Geronimo Creek watershed.	CEQA compliance and permit acquisition in process.		2010
59	MCEHS	East Shore Wastewater Upgrade	Continuation of East Shore Wastewater Upgrade program that provides financial support to landowners to repair or replace leaking or failing septic tanks.	Phase 1 permit application and CEQA compliance nearing completion		2010
61	RCD	Conserving Our Watersheds, Phase II	Implement Phase II of existing funded program to develop and implement projects and best management practices to improve water quality and habitat and improve habitat.	Phase I in progress.	1-5 years depending on funding	
64	USNPS	Grazing BMPs	Implement BMPs at 10 priority locations on actively ranched lands, primarily including headcut stabilization and repair, wetland and riparian protection, and seasonal pasture development.	Field assessment and identification of priority sites complete.		Spring 2008
70	MCOSD	San Geronimo Road & Trail Sediment Reduction	Implement highest priority sediment reduction projects on Marin County Open Space District roads and trails.	Studies that identify priorities are complete.		October 2009
	ECOSYSTEM RESTORATION & HABITAT IMPROVEMENT					
9	MMWD	Lagunitas Creek Riparian Vegetation Work	Riparian revegetation, biotechnical bank stabilization, invasive weed control at sites along Lagunitas Creek.		To Be Determined	

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
21	MMWD	Invasive Aquatic Weed Management Program	Implementation of recommended aquatic weed management measures.	Aquatic Weed Assessment complete.		
23	TU	Dickson Weir & Equestrian Facility Feasibility Study	Prepare study for North Fork of San Geronimo Creek regarding fishery habitat value, impact of sediment, and feasibility of instream restoration.		Nine months from funding	
24	MCPW	Arroyo Creek Fish Passage Restoration	Remove fish passage barrier (culvert), replace with natural arch.	Multiple studies support this specific project. Design to be completed in spring 2007; permit applications submitted in June 2007; and CEQA completed in September 2007.	April 2007	October 2009
25	MCPW	East Fork Woodacre Fish Passage	Remove fish passage barrier (culvert), replace with natural arch.	Multiple studies support this specific project. Design to be completed in spring 2007; permit applications submitted in June 2007; and CEQA completed in September 2007.	April 2007	October 2009
26	MCPW	San Geronimo Creek Fish Passage Restoration	Construct roughened ramp and series of weirs below an existing box culvert identified as severe fish passage barrier.	Multiple studies support this specific project. Design to be completed in spring 2007; permit applications submitted in June 2007; and CEQA completed in September 2007.	April 2007	October 2009
27	MCPW	Woodacre Creek #3 Fish Passage Restoration	Remove fish passage barrier (culvert), and replace with natural arch.	Multiple studies support this specific project. Design to be completed in spring 2007; permit applications submitted in June 2007; and CEQA completed in September 2007.	April 2007	October 2009
28	MCWP	Kent Canyon Creek Fish Passage Restoration	Remove fish passage barrier (culvert), and replace with natural arch.	Multiple studies support this specific project. Design to be completed in spring 2007; permit applications submitted in June 2007; and CEQA completed in September 2007.	April 2007	October 2009

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
45	RWQCB	Riparian Zone and Large Woody Debris Enhancement	Implement public outreach and work with agencies and landowners to remove invasive plants, implement riparian revegetation, install fencing to exclude cattle from creeks, prepare LWD budget, and monitoring in Lagunitas and San Geronimo Creeks.		2007	2010
48	SPAWN	San Geronimo Salmonid Monitoring	Extend existing monitoring of smolt outmigration in San Geronimo tributaries.	Second year of monitoring is complete; NMFS & CDFG permits secured through 2011	2007	Spring 2011
63	RCD	Coastal Prairie Improvement Project	Study to assess rangeland health and weed infestations; provide alternatives for weed eradication; implement demonstration projects; and provide public education.		2-6 years	
73	MMWD	Invasive Weed Management	Implement recommended strategies for managing and eradicating invasive plant species.	Assessment of known methods currently is being conducted		
	WETLANDS RESTORATION					
30	MCPW	Silver Hills creek Restoration	Conduct engineering analysis and prepare conceptual plans to restore the outlet of Silver Hills Creek to Olema Marsh and remove culverts.	Phase 1 hydraulic and geomorphic investigations and engineering design for part of area complete	January 2009	October 2009
40	TBWC	Chicken Ranch Beach Restoration	Design, engineer and initiate a restoration project to improve the hydrologic functionality of the lower elevations of the Chicken Ranch Beach subwatershed, to include a mix of wetland habitat types.	Preliminary and conceptual designs and investigations complete	June 2008	March 2010
	STORMWATER / FLOOD MANAGEMENT					
10	MMWD	Water Conservation: Rainwater Capture and Stormwater Use Project	Research approaches for rainfall capture and develop public outreach component with possible financial incentive for implementation of measures.	In development		
43	RWQCB	Stormwater, Flood, Instream Flow Management	Identify areas where floodplains and streams can be reconnected and implement small-scale stormwater catchment projects and water conservation measures.			

TABLE 6-2: SUBMITTED PROJECT DESCRIPTION & STATUS SUMMARY

	Implement-ing Agency	Project	Description	Status	Schedule	
					Start	Complete
49	SPAWN	Lagunitas Creek Watershed Stormwater Initiative	Implement stormwater catchment designs at 30 residential sites in the Lagunitas Creek watershed,—i.e., San Geronimo Valley.		Two years	
	RECREATION / PUBLIC ACCESS					
19	MMWD	Inkwells/Shafter Bridge Crossing Project: Planning	Study to determine improvements to facilitate equestrian and bicyclist crossing over Lagunitas Creek without impacting stream banks or habitat.		To Be Determined	
20	MMWD	Inkwells/Shafter Bridge Crossing Project	Construction / implementation of identified solution at Shafter Bridge/Inkwells Bridge to allow better crossing.		To Be Determined	
	WATERSHED ASSESSMENT / MANAGEMENT					
6	MMWD	Watershed Assessment and Planning Program	Program to develop studies and management plans to address vegetation and wildlife management needs for MMWD's watershed lands.	Program elements are being developed	To Be Determined	
29	MCPW	Marin County Watershed Management Plan	Update 2004 Marin County Watershed Management Plan.		October 2007	October 2008
41	IPUD	Climate Change Study	Develop computer-based model to assess effect of climate change on water-related resources over the next 50 years.	Planning has begun.		June 2008
	OTHERS					
62	RCD	Ag Land Renewable Energy Program	Implement renewable energy alternatives for agricultural operations.	One successful project completed with installation of methane digestion system.	3-5 years	
72	MALT	Ag Land Conservation Easement Acquisition	Implementation of eight agricultural conservation easement projects.	Project development is underway.		December 2008

TABLE 6-3
MANAGEMENT STRATEGIES IMPLEMENTED BY SHORT-TERM PRIORITY PROJECTS

ID #	PROJECT	WATER SUPPLY RELIABILITY			WATER QUALITY			ECOSYSTEM RESTORATION & HABITAT IMPROVEMENT					STORWMATER & FLOOD MANAGEMENT		GROUNDWATER MANAGEMENT
		Water Supply Reliability	Water Conserve	Water Re-cycling	Water Treat-ment	NPS Pollu-tion	Water Quality	Eco-System	Habitat	Wet-lands	Recrea-tion & Access	LU & Water-shed Plnng	SW Mngmt	Flood Mngmt	GW Management
1	NMWD-Gallagher Wells & Pipeline	X					X	X	X					X	X
12	MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory					X	X	X					X		
24	MCPW-Arroyo Creek Fish Passage Restoration					X	X	X		X		X			
26	MCPW-San Geronimo Creek Fish Passage Restoration					X	X	X		X		X			
30	MCPW-Silver Hills Creek Restoration Project					X	X			X			X	X	
31	MCPW, BCPUD, USNPS-Duxbury Reef Reserve Restoration					X	X				X	X			
32	USNPS-Pt. Reyes Headlands Reserve Restoration					X	X				X				
33	USNPS-Tomales Bay Boat Removal					X	X	X							
37	USNPS-Devil's Gulch Road/Trail Sediment Control					X	X	X							
38	USNPS-Tomales Bay Beach Campground Access and Restroom Improvements				X	X	X				X				

ID #	PROJECT	WATER SUPPLY RELIABILITY			WATER QUALITY			ECOSYSTEM RESTORATION & HABITAT IMPROVEMENT					STORMWATER & FLOOD MANAGEMENT		GROUNDWATER MANAGEMENT
		Water Supply Reliability	Water Conserve	Water Re-cycling	Water Treat-ment	NPS Pollu-tion	Water Quality	Eco-System	Habitat	Wet-lands	Recrea-tion & Access	LU & Water-shed Plnng	SW Mngmt	Flood Mngmt	GW Management
39	CPR-Hearts Desire Beach Restroom Leach Line Replacement		X		X	X	X				X				
40	TBWC-Chicken Ranch Beach Restoration					X	X	X		X	X		X	X	
46	SPAWN-Lagunitas Creek Watershed Restoration Program					X	X	X				X			
47	SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs					X	X	X				X	X		
49	SPAWN-Lagunitas Creek Stormwater Initiative	X	X			X	X	X				X	X		
52	BCPUD-Disinfection Byproduct Treatment Facility	X			X		X								
57	TVCSD-Tertiary Treatment & Recycling Planning Study	X	X	X	X		X					X			X
59	East Shore Group - Wastewater Upgrade			X	X	X	X			X					
61	RCD-Habitat Improvement Project Implementation					X	X	X	X	X		X			
65	IPUD-Treatment Disinfection Byproducts				X		X								
70	MCOSD- San Geronimo Road/Trail Sediment Reduction					X	X	X	X	X	X		X	X	
74	USNPS-Riparian Restoration				X	X	X	X						X	

Impacts and Benefits

Photo by Greg Filbrandt

7. IMPACTS & BENEFITS

STATE IRWM REQUIREMENTS: H. Impacts and Benefits. Discuss at a screening level the impact and benefits from Plan implementation. Include an evaluation of potential impacts within the region and in adjacent areas from Plan implementation. Identify the advantages of the regional plan, including a discussion of the added benefits of the regional plan as opposed to individual local efforts. Identify which objectives necessitate a regional solution. Identify interregional benefits and impacts. Describe the impacts and benefits to environmental justice or disadvantaged communities. Include an evaluation of impacts/benefits to other resources, such as air quality or energy.

7-1 POTENTIAL BENEFITS AND IMPACTS

BENEFITS FROM IMPLEMENTATION

If the ICWMP achieves full funding and all projects currently identified (including tiered projects) are fully implemented, water quality of the seven critical coastal areas would improve. Stream and habitat improvements would help improve aquatic habitats, increase native vegetation and help restore degraded wetlands. This, in turn, could result in benefits to endangered coho populations as well as other endangered species. Wetland restoration would help restore hydrologic connectivity and also provide additional water quality benefits by serving to filter runoff. Water quality and habitat improvements also could benefit the mariculture industries in Tomales Bay.

If projects proposed by participating water agencies are fully implemented, reliability of water supply will be improved with provision of supplemental sources, improved water quality, and less vulnerability to disasters. Water supply system projects, in conjunction with other proposals such as the Tomales Village Community Service District's recycled water project and several projects to capture stormwater runoff, also would contribute to increased water conservation and/or reduced water demand. Plan implementation also satisfies the overall Proposition 50 Grant Program goals of encouraging "integrated regional strategies for management of water resources" and "protection of

communities from drought, protection and improvement of water quality, and improvement of local water security." These are further summarized below.

Additional consideration was given to: a) the net measurable impact of project implementation related to contribution to specific ICWMP objectives and/or to a specific geographical area or the larger region; b) whether beneficial impacts would outweigh adverse impacts related to construction and operation; and c) the degree to which the project addressed multiple objectives.

Improved Water Supply Reliability and Water Conservation

The 24 water supply/reliability projects included in the ICWMP provide enhanced water supply reliability for domestic users through upgraded and/or augmented supplies, improved treated water quality, increased water conservation, and upgraded infrastructure and facilities to reduce vulnerability to flooding, landsliding and other hazards that affect raw water supplies and/or infrastructure. The NMWD Gallagher Well project provides an alternative source of water for the West Marin communities of Point Reyes Station, Inverness Park, Paradise Ranch Estates, Bear Valley (including Point Reyes National Seashore), and Olema upstream of the high tide water influences of Tomales Bay. This water source would provide water during periods of high tides, avoiding salt water intrusion into the existing primary supply wells.

NMWD, IPUD and BCPUD all have proposals for their water treatment plants that collectively will improve drinking water quality in the West Marin area. Two of these projects (IPUD and BCPUD) seek to construct additional filtration units to further reduce chlorine disinfection byproducts in treated water to levels below maximum containment levels established by state and federal law. The other water system infrastructure proposals will result in replacement of older pipelines and provide increased protection against service disruption in the event of damage to facilities during flooding, earthquakes and other disasters.

The ICWMP, with its combination of projects, also increases water conservation among the water districts. IPUD proposes development of a water conservation program that could improve water use efficiency and increase commitment for conservation funding. By reducing demand through conservation, the district can optimize use of existing supplies and conserve available water in streams. MMWD proposes two projects to increase water conservation through optimal landscaping measures. One project would work with property owners to convert landscaped areas at the rural/urban interface with native vegetation that would reduce water demand and also support efforts for removal of non-native grasslands. Another proposal would utilize satellite imagery of MMWD's service area to target areas where less water-intensive landscaping could be installed.

The Tomales Village Community Service District's proposed recycling project also would reduce water demand and potential effects on groundwater.

Improved Water Quality

As discussed in Chapter 11 (Statewide Priorities), there are numerous projects that would contribute to 1) reducing sediments, nutrients and pathogens within impaired water bodies; and 2) meeting

TDML standards for pathogens and mercury. Taken together, these projects would improve water quality for beneficial uses identified in the San Francisco Bay RWQCB's *Basin Plan*, including: Shellfish Harvesting, Fish Spawning, Commercial Fishing, Cold Freshwater Habitat, Freshwater Replenishment, Fish Migration, Rare And Endangered Species, Warm Freshwater Habitat, Wildlife Habitat, Marine Habitat, Water Contact Recreation, and Water Non-Contact Recreation. These efforts would result in secondary public health benefits if measurable reductions in pathogens result in fewer closures during the shellfish harvesting season. Many of the sediment reduction projects relate to improvement of roads and trails, with secondary benefits to recreational users and public access. Stream remediation, bank stabilization, and erosion control projects all contribute to reducing the transport of sediments into waterways, and thus also serve to improve aquatic habitat.

Two key projects would address ocean nonpoint source discharges into Duxbury Reef ASBS and Point Reyes Headlands ASBS. Upgrading facilities will eliminate possible threats to water quality at Duxbury Reef and ensure that the County is in compliance with recommendations of the SWRCB ASBS discharge report. At Duxbury Reef, improvements to facilities and discharge locations (parking lots, roads) identified by the State Water Resources Control Board ASBS Discharge report (2003) would be implemented.

Habitat Enhancement and Restoration

The Tomales Bay watershed supports a biodiverse community of fish and wildlife, and is a recognized Wetland of International Importance. By restoring natural hydrologic process and habitat connectivity to the bay's largest estuarine wetland, improved salmonid rearing and smolting habitat, greater and higher quality forage for migratory and overwintering shorebirds and waterfowl, expansion of riparian breeding habitats for neotropical songbirds, and enhanced conditions for shellfish and fish in Tomales Bay are anticipated. The projects in the ICWMP will support efforts to improve the connectivity and health of riparian corridors. Robust, native invertebrate and plant communities will be the foundation of habitats benefiting spawning salmonids and other wildlife. Projects that reduce erosion and sedimentation into streams have the added benefit of improving salmonid habitat. Additionally, the NMWD Gallagher well project has the potential to increase stream flows that could result in beneficial habitat impacts.

Implementation of wetland restoration and stream habitat projects may result in both direct and indirect benefits related to the protection and enhancement of physical and biological processes. Rehabilitation of wetlands and riparian ecosystems provides critical habitat to local species and allows natural physical processes, such as creek migration or floodplain recruitment, to occur. Such improvements also may reduce the occurrence of localized flooding, and improve water quality. Expansion of riparian or wetlands habitats can slow or delay peak flood flows, thereby indirectly providing public health and safety benefits.

The replacement of culverts on Levee and Bear Valley Roads in the Olema Marsh would improve hydraulic connectivity between upstream portions of Silver Hills Creek, Olema Marsh and Lagunitas Creek; reduce sedimentation to Lagunitas Creek; reduce and eliminate habitat disturbance associated with dredging of channels and riparian habitat; reduce flooding frequency along Sir Francis Drake Boulevard; and restore hydrologic connectivity of Silver Hills Creek to Olema Marsh. Projects that

include removal of invasive plant species and replanting with riparian vegetation also would have direct benefits to overall habitat improvement and enhancement.

Five projects would remove culverts and other barriers to fish passage on important fish tributaries within the San Geronimo Creek area. Access to important upstream habitat will be made available for migrating and spawning salmon and steelhead trout. The high priority Arroyo Creek barrier removal project is located on Arroyo Creek, an important tributary to San Geronimo and Lagunitas Creeks for spawning and rearing coho salmon and steelhead trout. The projects will replaced removed culverts with natural treatments to improve both adult and juvenile salmonids access to upstream spawning and rearing habitat. The Arroyo Creek barrier removal project targets improving conditions for juvenile rearing, a "limiting factor" for salmonids in the Lagunitas system (Stillwater Sciences, 2006).

The fish barrier removal projects on Woodacre Creek are located at important tributaries for spawning and rearing of coho salmon. These projects will restore migratory access through an existing barrier, providing access to critical habitat for spawning and rearing coho salmon and steelhead. Juvenile salmon will be able to move freely through the stream system during summer rearing and low flow times of the year. At one site, the removal of the culvert also will provide transport for sediment and wood that currently builds up behind the inlet of the culvert. Access to upstream spawning and rearing habitat will be made available for migrating salmon and steelhead trout. Juvenile salmon will be able to move freely downstream through the stream system during low-flow summer rearing months. Sediment and large woody debris transport through the new crossing will be facilitated.

The fish barrier removal projects also will eliminate severe bank erosion problems and/or stabilize eroding stream banks, thus decreasing chronic sedimentation into the Lagunitas Basin, which is considered "impaired for sedimentation" by the SFBRWQCB. Thus these habitat enhancement projects also would contribute to control of nonpoint source pollution in Lagunitas Creek. Additionally, large woody debris transport will be facilitated. Sediment will be eliminated from the creek using erosion control and streambank stabilization methods.

Photo by Greg Filbrandt

The Lagunitas Creek and San Geronimo Creek watersheds are critical spawning habitat for coho and steelhead salmon on the Northern California coast. These creeks are tributary to Tomales Bay and the Gulf of the Farallones National Marine Sanctuary, and are currently the focus of diverse restoration, education and volunteer activities by a multitude of agencies and organizations. Water quality and habitat restoration projects over the past decade have seen gradual increases in spawning success.

A number of projects also would benefit the Walker Creek watershed; these include mercury monitoring, MRCD's implementation of grazing BMPs, and other stream management projects to improve and benefit coho salmon.

Stormwater and Flood Management

The Silver Hills Creek Restoration Project would restore a constructed channel outlet to Olema Marsh. At some point during the last 50 years, the creek was diverted into a roadside ditch that currently is maintained by the Marin County Public Works Department. Silver Hills Creek is one of the larger drainages flowing into Olema Marsh and supports a small run of steelhead despite the fact that its lower reach has been diverted and channelized. Currently Silver Hills Creek flows into Lagunitas Creek via several hundred feet of ditch and constructed channel at White House Pool. This outfall and channel are chronically filled with decomposed granite sediment, requiring routine maintenance by the County to maintain conveyance, and the overflow from this undersized channel contributes to frequent flooding of Sir Francis Drake Boulevard in this area. The proposed project would re-direct the Silver Hills drainage to Olema Marsh. The sediment would be captured via a sediment basin located in the road right-of-way that would reduce the habitat disturbance associated with frequent dredging of the channel and associated riparian habitat. Overall, the project would reduce flooding frequency along Sir Francis Drake Boulevard and restore hydrologic connectivity of Silver Hills Creek to Olema Marsh.

The two stormwater capture projects seek to reduce stormwater runoff that can result in multiple benefits, including reduced water demand, if these small systems are utilized for residential landscape irrigation. In addition, these projects can contribute to reduction of nonpoint pollutant sources in stormwater runoff into Lagunitas Creek and Tomales Bay.

Stakeholder Coordination

In addition to environmental improvements and physical improvement of district water supply systems and infrastructure, the ICWMP facilitates increased and expanded collaboration among agencies, jurisdictions and non-governmental agencies. The Plan has resulted in the development of a process whereby area stakeholders can reliably expect that their project and programmatic concepts can be presented, reviewed, considered and integrated into a regional plan, thereby facilitating potential funding opportunities as well as deepening relationships within the planning area. In particular, the ICWMP has expanded the scope of issues and stakeholder involvement beyond that initiated in the Tomales Bay Stewardship Plan by including the region's water agencies and water supply issues. The benefits of regional collaboration are further exemplified by the region's proven ability to develop and implement projects like those being proposed.

Protection of the Public Trust

Collectively, implementation of the ICWMP would lead to the overall improvement of the common public trust lands that are protected and managed in the area, some of which are visited by 2.5 million people annually due to the unique resources that are present in the area. By protecting resources, the

financial investment that has been made over the years to improve public trust lands also will be protected. Benefits also would extend to the shellfish growers in the bay.

IMPACTS FROM IMPLEMENTATION

Aside from the beneficial impacts of Plan implementation as discussed above, the primary potentially adverse impacts of Plan implementation are related to potential physical environmental impacts of project construction and development. The projects submitted for inclusion in the plan are in varying stages of development. Some of the projects are fully ready to proceed, while others are conceptual in nature. The Plan specifically accommodates and supports the ongoing development and integration of projects. An important aspect of projects inclusion is the plan is the specific and articulated assumption that all projects which would result in disturbance to the landscape, or have construction-related activities associated with implementation, will undergo CEQA and, if necessary, NEPA evaluation. Presence of a project on the plan list does not exempt projects from this environmental review and regulatory compliance. In fact, presence of a project on the list in no way exempts the responsible agency from undertaking formal environmental review for any submitted project.

Some projects will result in construction or restoration activities which result in physical disturbance. Individual projects will be required to comply with applicable regulatory and environmental review (CEQA) requirements. As shown in Appendix G, the project proponents have identified the status of regulatory and CEQA compliance; in many cases projects such as feasibility studies, public education and outreach, and/or BMP implementation would not result in direct physical environmental impacts. Additionally, small habitat restoration projects (under five acres with some provisions) are exempt from CEQA review.

Construction and project development would result in environmental impacts that would be largely localized and/or temporary—i.e., construction-related impacts. The types of physical improvements and development that would occur with ICWMP implementation include: construction of new water supply facilities (only a few) and other minor facilities (i.e., public restrooms); limited minor water facility improvements (i.e., treatment plant upgrades or pipeline replacement); improvement of unpaved roads and trails to reduce sediment; and work in stream channels for placement of woody debris, stream bank stabilization or pedestrian bridge construction.

Approximately 35% of the Plan projects (approximately 25) involve facility construction (i.e., water and/or wastewater facilities). Another 25% involve restoration or other physical improvements or maintenance (i.e., trail improvement or removal of fish passage barriers). Except for the two larger regional water supply projects proposed by MMWD, the impacts from most facilities and development would be localized, likely without significant long-term adverse environmental impacts. Potential adverse impacts resulting from implementation of stream habitat improvement and wetland restoration projects are largely temporary, generally occurring during construction phases (i.e., temporary increases in noise, dust, air, etc.). These impacts would be avoided or minimized with implementation of standard BMPs for control erosion and siting and operation of construction equipment, staging areas, etc., in order to minimize noise and to protect air quality, existing habitat and special status species. However, all submitted projects included in the ICWMP would be

required to complete environmental review and regulatory requirements, including implementation of appropriate mitigation measures as may be identified through this process.

The ongoing project development process within the TBWC has been designed to ensure that projects that are brought forward for funding through the Plan are fully reviewed by not only the Council but also by the responsible agency and regulatory agencies with additional permitting authority over the project. As part of its annual reevaluation of short-term projects with a high priority for implementation, the Council will assess the readiness of the project to proceed from the perspective of formal environmental review. It is implicit in the Plan's objectives and goals that no project which would generate a significant, unavoidable negative environmental impact would be able to receive funding through the Plan. The sole exception to this could be a situation where the ultimate project benefits are so overwhelmingly positive that the trade offs associated with implementation are deemed acceptable. However, a situation such as this would require not only the CEQA/NEPA process to be completed, but also for the implementing agency to make regulatory findings to that effect. At that point, the Council would be able to evaluate whether the project was consistent with the plan and whether it is suitable for funding through the plan.

7-2 ADVANTAGES OF AN INTEGRATED REGIONAL PLAN

The ICWMP provides at a screening level a vehicle for local entities not only to collaborate and develop joint projects of multiple benefits, but also to identify and problem-solve for issues and areas for which no projects are currently proposed. The ICWMP enables stakeholders to be better informed and to collaboratively review the outcomes of both a project and its overall plan implementation to address changing or emerging project needs. This allows for a more comprehensive overview of the cumulative magnitude and benefit of projects that can be implemented or developed in the future and linked together. This can provide for a greater economy of scale, in that projects can be developed collaboratively to affect a larger area or contribute more substantially to ICWMP objectives than multiple projects with less coordination.

Given its relatively isolated geographic location, the regional approach provides an additional advantage in that stakeholders are working within the Tomales Bay watershed or ASBS areas that collectively are the critical coastal areas for the region. Thus, the ICWMP objectives that relate to the regional water quality and to ecosystem restoration and habitat improvement are better served by coordinating local efforts into a regional approach. An integrated regional approach results in an enhanced array of implementation projects that collectively can address multiple objectives and "Statewide" Priorities in a more substantial manner than individual projects.

The benefits of regional collaboration are further demonstrated by the proven ability of the project proponents to develop and implement projects like those being proposed. Benefits of an integrated plan include the ability to identify and pursue data gaps, and the plan becomes a forum which allows issues to be addressed using a holistic, multi-disciplinary approach, and which fosters improved opportunities for multiple-benefit projects. The TBWC is commited to continue using this approach in the future. There is also a benefit in bringing water supply issues and agencies into a mix of groups so that they can be integrated in meaningful way that hasn't been done before.

7-3 INTERREGIONAL BENEFITS AND IMPACTS

A unique attribute of the plan is that the planning area is geographically distinct. The ICWMP planning area includes all the adjacent areas that are hydrologically and/or geographically connected with the seven critical coastal areas within the plan boundaries. Therefore, most projects within the planning area have little to no secondary impact in adjacent regions outside the plan area.

All agencies have agreed and are eager to integrate and coordinate efforts to minimize impacts on critical coastal areas (CCA) and the four ASBS areas. Because three of the water districts all drain to the same CCAs, coordination is essential to address threats. Furthermore, the small nature of BCPUD (a portion of which drains to Duxbury Reef ASBS) will benefit from participation in a larger coalition of problem solvers.

A couple of the regional water supply projects both within and outside the Tomales Bay planning region would have interregional benefits. One example is a joint project between MMWD and NMWD to allow water from MMWD's Soulajule Reservoir to be pumped to and treated at North Marin's new Stafford Lake water treatment plant. This project would allow more efficient operations during droughts and would provide some redundancy in the event of major problems with MMWD's San Geronimo Treatment Plant's raw water supply. Similarly, proposed improvements to NMWD's Point Reyes Station water system could be of further benefit to IPUD in times of emergency.

The proposed MMWD project to provide recycled water to Peacock Gap Golf Course also would benefit North Marin Water District and Sonoma County Water Agency by replacing water that would have been diverted from the Russian River and potentially from Lagunitas Creek with recycled water. This would leave more water in those water sources for other beneficial uses, including endangered species protection projects. It also could benefit the San Francisco Bay by reducing sanitary plant discharges.

On a regional level, the MMWD desalination and recycling projects would provide supplemental water sources to its service area and may result in other secondary interregional benefits. It is unclear but hoped that a desalination plant servicing their area could lead to releasing additional water from Lagunitas Creek.

The physical benefits of implementation of the ICWMP extend not just to the water quality and habitat improvements within the Tomales Bay planning area, but possibly to the offshore marine habitat. This includes the Gulf of Farallones National Marine Sanctuary and the marine life zones that are being established under the Marine Life Protection Act Initiative. Projects and programs proposed and underway result in significant benefits to the bay, and in natural habitats that support resident and migratory habitat (i.e., nursery, rearing and migratory habitats). The regional enhancements envisioned and proposed in the ICWMP go beyond the region because of migratory species in the area.

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7-4 ENVIRONMENTAL JUSTICE BENEFITS

The issue of environmental justice within the Tomales Bay region is being addressed through a diversity of social and educational outreach programs. The TAC initiated an outreach program aimed specifically at the relatively large and vibrant Latino community in west Marin. The outreach program was designed by members of that community with the goal of providing direct education on environmental issues with an emphasis on watershed concerns. As a result of the program, educational and outreach efforts were accomplished through community religious institutions, social organizations, and area schools. The overall benefits of the plan with regard to water supply reliability and health and safety benefits from water quality improvement would also benefit this community. Further discussion is provided in Chapter 13.

8

Technical Analysis & Plan Performance

Photo by Greg Filbrandt

8. TECHNICAL ANALYSIS & PLAN PERFORMANCE

STATE IRWM REQUIREMENTS: I. Technical Analysis & Plan Performance. Include a discussion of data, technical methods, and analyses used in development of the Plan. Include a discussion of measures that will be used to evaluate Project/Plan performance, monitoring systems that will be used to gather performance data, and mechanisms to adapt project operations and Plan implementation based on performance data collected.

8-1 ICWMP DEVELOPMENT

The key goals in development of the Tomales Bay ICWMP are:

- Review and assess water supply and operations demands and needs within the planning area's critical coastal areas, and develop information necessary for integration into an Integrated Coastal Watershed Management Plan.
- Identify mutually agreeable solutions to address issues including water supply, water quality, flood control, and ecosystem and habitat concerns.
- Develop narrative describing the background, existing data, and identification of data gaps/needs for ASBS and CCAs.
- Develop an ICWMP that addresses impacts on ASBS and CCA sites in the region.
- Evaluate municipal stormwater management networks and assess source area and condition of extensive stormwater facilities.
- Implement a septic outreach and education program and include public discussions regarding the development of maintenance and monitoring programs to identify community-based septic management solutions.

A significant amount of existing data and technical analyses already exist for the Tomales Bay watershed and region, much of which has been included the *Tomales Bay Watershed Stewardship Plan*,

which was used as a starting point for development of the ICWMP. The intent of the ICWMP was: (1) to review, synthesize and summarize existing reports, plans and data into one planning document, including incorporation of more information about water supply (which had been addressed only indirectly in the Stewardship Plan); and (2) to use the ICWMP plan development process to facilitate identification of a) data gaps, local resource management concerns, projects and other avenues to address those concerns; and b) opportunities for collaboration for funding and implementation, thus benefiting the long-term health of the Tomales Bay region. It was not the intention to conduct extensive additional data collection or technical analyses as part of ICWM plan development; however, some additional technical data was developed through the ASBS watershed assessments and stormwater monitoring efforts that were conducted as part of this process.

The development of the Tomales Bay ICWMP was initiated with a review of over 100 technical reports , studies, and agency and regional plans prepared to date in the region. A list of all documents and data reviewed is included in Chapter 15. Upon review of existing data, summary papers were provided to the TBWC and TAC that included a summary of findings, known recommendations, key identified management issues, and data gaps for each of the following topical areas:

- Areas of Special Biological Significance,
- Water Supply,
- Ecosystems, Habitat and Biological Resources,
- Water Quality,
- Onsite Wastewater Management, and
- Stormwater Management.

Through a series of meetings, Technical Advisory Committee members used the information provided through this data review to identify key management issues and local objectives for the Tomales Bay watershed and region (see Chapter 3). The existing programs in the area, known recommendations and data gaps also were used in identifying and defining management strategies. The following subsections describe the data review and technical analyses reviewed and/or conducted as part of the ICWMP.

TECHNICAL ANALYSES REVIEWED AS PART OF ICWMP DEVELOPMENT

As indicated above, it was the intent of the ICWMP planning effort to bring together in one document the extensive amount of technical analysis already performed in earlier studies and programs in the planning area. New technical analyses were conducted as part of the ASBS and stormwater assessment. The technical analyses and data reviewed or conducted for the ICWMP are summarized below.

Following are examples of existing technical analyses reviewed and summarized for this ICWMP plan; the full listing of documents reviewed and incorporated into the ICWMP planning process are included in Chapter 15. Chapter 2 includes a summary of the findings of many of these studies as part of the description of the region and planning area.

- **Water Quality.** The State's *Watershed Management Initiative* (2004) identifies top priorities related to municipal stormwater/urban runoff, TMDLs, wetlands and stream protection, rural nonpoint source controls, watershed management, watershed monitoring and assessment, groundwater protection and toxics cleanup, NPDES surface water protection, and planning activities, as further described in Chapter 4. The Pathogen and Mercury TMDL reports (2005 and 2006, respectively) cite and summarize water quality monitoring efforts, data and results for these constituents, which led to the development of specific target TMDL levels for pathogens and mercury. In addition, water quality monitoring data has been collected and reported over the years by various entities, including the SFBRWQCB, DHS, USNPS, SPAWN, the County of Marin, and UCCE, which also were reviewed. (See Appendix E for summary.) The *Tomales Bay Watershed Stewardship Plan* provides a thorough review and compilation of water quality monitoring efforts conducted to 2003. Additionally, a number of technical studies related to alternative sewage disposal and sediment reduction were reviewed. The key technical studies related to water quality that were reviewed as part of the development of the ICWMP include:

    - Pathogens in Tomales Bay Watershed TMDL Report, SFBRWQCB, July 2005.
    - TMDL for Mercury in the Walker Creek Watershed Report. SFBRWQCB, November 2006.
    - WATER QUALITY MONITORING STUDIES: National Park Service (November 2001), "Point Reyes National Seashore Water Quality Monitoring Report, May 1999-May 2001; SPAWN's Lagunitas Creek Watershed Citizen Water Quality Monitoring Program reports for 2004/05 and 2005/06; University of California Tomales Bay Water Quality Project, (December 2004); "Water Quality in the Tomales Bay Watershed: Conflict and Response to On-farm Water Quality Management"; University of California Cooperative Extension studies: "Water Quality in the Tomales Bay Watershed: Conflict and Response to On-farm Water Quality Management" (December 2004) and "Characterizing Freshwater Inflows and Sediment Reservoirs of Fecal Coliforms and E. Coli at Five Estuaries in Northern California" (May 2007);
    - SEDIMENT STUDIES: *Geomorphology of the Walker Creek Watershed* (Prunuske Chatham, Inc., 2005); "Sedimentation from Unpaved Roads in the San-Geronimo sub-Watershed" (SPAWN 2002); *San Geronimo Creek Watershed Sediment Source Sites and Assessment* (Stetson Engineers, 2002); Lagunitas Creek Sediment and Riparian Management Plan (1Marin Municipal Water District, 997)
    - San Geronimo Creek Sediment Assessment. Steston Engineers, March 2002.
    - County of Marin Alternative Sewage Disposal Systems Seventh Annual Performance Review. October 2005
    - Questa Engineering. May 10, 2006. Draft Feasibility Report, East Shore Wastewater Improvement Project (without appendices). Prepared for Marin County community Development Agency Environmental Health Services Division.

- **Water Supply and Groundwater.** Water supply and infrastructure studies were reviewed. SRWCB orders and legal agreements also were reviewed, including SRWCB Order WR95-17 that affects MMWD and NMWD as described in Chapter 2, and historical legal rulings related to BCPUD's imposition of the water moratorium in the early 1970s. Water supply plans included the MMWD's *Urban Water Management Plan* (2006), and supply and facility studies for NMWD and IPUD. Most of the water supply plans included water use and demand projections. These were reviewed and updated as needed, with each of the four water suppliers in the region to develop a 20-year water demand projection to be included in the ICWMP. There is a limited area of State-designated groundwater basins in the Tomales Bay region, and existing information was largely drawn from the California Department of Water

Resources' "California's Groundwater: Bulletin 118. Individual Basin Descriptions" (February 2007).

- **Ecosystem Restoration and Habitat Improvement.** Fishery studies and fish monitoring surveys are among the key technical studies reviewed as part of the ICWMP. The State's 2004 "Recovery Strategy for California Coho Salmon" report sets forth the key management strategies for the Tomales Bay area (see Chapter 2). The "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead" (Stillwater Sciences, February 2007) was prepared in two phases to help fill information gaps related to the physical and biological factors controlling salmonid population dynamics within the watershed, and preparation of this study was one of the recommendations in CDFG's Coho Recovery Strategy. Fish monitoring is and/or has been conducted by MMWD, SPAWN and PRNS. Existing watershed and County plans provided some information on other terrestrial and aquatic habitats. Wetland and riparian habitat information was found in some of the area watershed plans and data developed as part of the National Park Service's Giacomini Wetland Restoration Project. The key technical studies related to ecosystem restoration and habitat improvement that were reviewed as part of the development of the ICWMP include:

  - CDFG Coho Salmon Recovery Plan (February 2004)
  - "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead" (Stillwater Sciences, February 2007 and February 2004)
  - Lagunitas Creek Salmon Surveys and Reports (MMWD and SPAWN)
  - Marin County Stream Crossing Inventory and Fish Passage Report (Ross Taylor and Associates, June 2003)
  - SWRCB Order WR95-17
  - TBWC Compilation of Data on Coho Salmon and Steelhead Trout Between 1994 and 2003 (February 2004)
  - The Klamath Resource Information System (KRIS) database that pulls together maps, data tables, charts, photographs and bibliographic resources relevant to fisheries and water quality for designated watershed, which includes Lagunitas and Walker Creeks.

  General and project-specific recommendations for habitat improvement are included in:
  - CDFG "Recovery Strategy for California Coho Salmon" (2004)
  - TBWC Stewardship Plan (July 2003)
  - Marin County Watershed Management Plan (2004)
  - Walker Creek Watershed Enhancement Plan (2001)
  - Lagunitas Creek Sediment and Riparian Management Plan (1997)
  - Marin Coastal Watersheds Enhancement Project

- **Stormwater and Flood Management.** Technical analyses related to stormwater and flood management are limited. Technical studies related to Flooding and Hydrology that were prepared as part of the Marin Countywide Plan (Clearwater Hydrology and Nichols Berman, November 2005) provided some general background information. The Marin County Stormwater Pollution Prevention Program's (MCSPPP) *Action Plan 2010* and annual reports also were reviewed.

- **Local Plans.** A number of watershed and resource management plans prepared in the last 10 years provided key data regarding watershed and sub-watershed characteristics, including

habitat, water quality and sedimentation data and issues, as well as specific key management and/or specific project recommendations. The key plans include: *Tomales Bay Watershed Stewardship Plan* (2003), *Marin County Watershed Management* (2004), *Lagunitas Creek Sediment and Riparian Management Plan* (1997), *Walker Creek Watershed Enhancement Plan* (1981), *The Marin Countywide Plan, Public Review Draft* (2005), and Marin County area plans for San Geronimo Valley, Bolinas, Inverness, Point Reyes Station and the coastal zone. As part of the Marin County Countywide Plan Update, a number of technical and background studies were prepared, and the hydrology, flooding and biological resource reports were reviewed as part of the ICWMP preparation.

TECHNICAL ANALYSES CONDUCTED AS PART OF ICWMP

The ICWMP planning efforts included additional technical analyses and watershed assessments for the Areas of Special Biological Significance (ASBS) and stormwater quality monitoring and review. The methodologies for each of these data collection efforts are summarized below. The ASBS watershed assessment is included in Appendix K. The stormwater quality monitoring was implemented through the County of Marin Public Works Department, and data management efforts are detailed in Chapter 9. A draft "Stormwater Assessment" that outlines methodologies, results to date and preliminary findings is included in Appendix M.

ASBS Watershed Assessments

The watershed assessments conducted for each of the four ASBS areas included field and "desktop" assessments. The assessments addressed the elements outlined in "California's Critical Coastal Areas NPS Watershed Assessment & Action Plan Outline" (July 23, 2005). Prior to completing the fieldwork, the consultant team reviewed available reports documenting conditions in each of the ASBS watersheds. In addition, available GIS layers were collected to generate field maps and the ASBS watershed boundaries were delineated prior to starting the fieldwork. Available GIS data included aerial photography, land use, parcel data, ASBS discharge locations, and watershed boundaries.

The objectives of the field assessment were to: (1) investigate and document existing conditions, (2) identify potential impairments to water quality and aquatic life and habitat, and (3) identify potential restoration opportunities and projects within each of the four watershed areas. Three field assessment methods were used: the Unified Stream Assessment (USA), Unified Subwatershed and Site Reconnaissance (USSR), and the Stormwater Retrofit Inventory (SRI). These methods have been modified slightly to include conditions likely to be expected within the ASBS watersheds, specifically stream

access by cattle and trails. The Unified Stream Assessment (USA) is a comprehensive stream walk protocol used to systematically evaluate conditions and identify restoration opportunities within the stream corridor of small watersheds (Center for Watershed Protection, March 2004). The Unified Subwatershed and Site Reconnaissance (USSR) is a rapid field survey to evaluate potential pollution sources and restoration opportunities within urban sub-watersheds (Center for Watershed Protection, February 2005). The Stormwater Retrofit Inventory (SRI) is a method for identifying potential storm-water improvements at existing sites. The methods are further described in Appendix K.

The "desktop assessment" consisted of delineation of the ASBS watersheds with GIS software using the following data resources:

- 10- and 5-foot topographic contour data available from County of Marin
- ASBS resource boundaries available from the State Water Resources Control Board
- 2004 Aerial Photography available from County of Marin
- The Point Reyes National Seashore watershed boundary available from County of Marin

Stormwater Quality Monitoring and Analysis

Under the Tomales Bay Pathogen TMDL, municipal runoff is identified as a potential non-point source pollutants to surface waters, contributing pathogens to the bay. In the unincorporated areas within the Tomales Bay planning area, municipal stormwater runoff management is primarily accomplished through ditches and limited storm drains, but little data exists regarding the condition and performance of these underground facilities. As a supplement to the ICWMP effort, the County documented the location of drainage facilities, including ditches and culvert inlets and outlets in the communities of Bolinas, Woodacre, Point Reyes Station, and Tomales. Stormwater quality monitoring was initiated in the winter of 2007 to determine existing baseline conditions and to help determine if and to what extent contaminants are transported through selected West Marin County community stormwater systems.

Stormwater sampling is being conducted through the stormwater systems in the communities of Point Reyes Station, Woodacre and Tomales. (Locations are shown in the Stormwater Assessment in Appendix M.) Sampling storm –event-based with samples collected during three to four storms, spanning the storm season, per subshed and community. One sample per storm event per sampling location are being collected and submitted for analysis. In addition to storm sampling, samples will be collected from each sample location two to three days following storm event sampling. This base flow sampling will be conducting three to four times across the rainfall season at each sample location that has sufficient streamflow for sampling. (Due to the low rainfall winter season in 2006-2007, only limited sampling was obtained during that period. It is expected that sampling will continue in winter 2007-2008 to provide a full season of data.)

The measured parameters were organized into a group that will be run on every sample and a group that will be selectively studied and in particular requested for early season storm samples or based upon hydrologic pathways and their likelihood to be detected in storm flow. The combination of *E. coli*, MBAS, Nitrate, and Ammonia provide a suite of constituents to assess wastewater delivery and transport to stormwater systems. Total suspended solids and turbidity are constituents for which design specifications of management practices are developed and written. Generating these results

will potentially facilitate comparison of pre- and post-remediation conditions, contributing to the determination of practical effectiveness. The suite of metals, oil and grease, and Total Hydrocarbons will provide an initial assessment of the presence and transport of these contaminants through the studied stormwater networks.

Measurement and collection of field parameter values was in accordance with approved protocols, including those in the State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP) and the National Park Service's SFANI&M WQ Program. A Quality Assurance Performance Plan (QAPP) provides the detailed measures to ensure data collection accuracy, precision and repeatability. These are further detailed in Appendix M.

DATA GAPS

As a result of the technical reviews, analyses and data collection, a number of key data gaps were identified in existing reports and studies or were identified during preparation of the ICWMP. Generally, these include the following topics (see Appendix H for further details).

- Water quality studies identified in the *Tomales Bay Watershed Stewardship Plan* (see list in Chapter 9), and coordinated water quality sampling among the various entities conducting monitoring, which will in part be facilitated by a recent grant to the TBWC in which this coordination will be initiated. A key action of the TBWC's Tomales Bay Watershed Stewardship Plan calls for the development of a coordinated and comprehensive water quality monitoring plan for Tomales Bay and tributary streams to document baseline conditions and identify trends for pollutants of concern. Monitoring would provide the information needed to evaluate water quality in the bay and its tributaries, as well as the efficacy of projects to reduce nonpoint sources of pollution, management practices intended to improve water quality, and educational programs. In conjunction with this effort is the need for standard sampling and reporting procedures and a database where data collected by entities can be stored and accessed.
- Water quality sampling and monitoring for ASBS areas.
- Data on baseline conditions and effects of onsite wastewater systems on surface and ground waters with water quality monitoring.
- Groundwater studies.
- Fishery salmonid population and habitat data and studies identified in the Limiting Factors Analysis and development of standard monitoring methods among monitoring agencies and entities.
- Sediment budgets and transport studies, i.e. those identified in the *Tomales Bay Watershed Stewardship Plan*.
- Additional species and habitat surveys, including Tomales Bay east and west shore mapping; other aquatic and terrestrial species assessments; assessments; Pacific flyway;

"Species of Local Interest" (SOLI); mapping of quantity and quality of riparian habitat; monitoring of other special status species; and extent of invasive species.

- Effects of global climate change have not been taken into account in water supply or watershed management studies.

8-2 PERFORMANCE EVALUATION MEASURES

Generally, there are two types of performance measures: measures by which ICWMP implementation will be evaluated, and measures applied to individual projects. Performance evaluation criteria were developed for the ICWMP activities discussed above and will be further developed to assess project activities and progressive Plan performance.

PROJECT PERFORMANCE MEASURES

As described in Chapter 6, Implementation, each project proponent will be responsible for overseeing project implementation, and the TBWC will be responsible for administering the overall program. Each project proponent will be responsible for developing project-specific monitoring systems to evaluate the performance of their projects in terms of meeting the stated project goals and achieving the desired benefits.

In conjunction with the TAC, all project proponents currently are developing project-specific performance measures, and TAC will be reviewing these measures to ensure consistency of approach and methodology for projects. These performance measures will be used in both monitoring project outcomes and progressive refinement of the ICWMP over time. The goal of the effort is to establish a set of performance measures which: 1) are quantifiable wherever possible, 2) allow for ongoing evaluation of the effects of funded projects, 3) enable the development of new projects over time as the successes and problems of implemented projects become known, and 4) allow for the progressive refinement of management strategies and plan objectives.

Results of data developed or collected as part of a specific project will be put into the TBWC's database so that data is available and can be used to refine other future projects. The TAC currently proposes to use the revised DWR SAB framework (see discussion below).

Project performance data will be brought forward to the TBWC or selected subcommittee on a quarterly basis. The Council or selected subcommittee will assess project monitoring and performance data to determine the degree to which any given project's implementation contributes toward achievement of the ICWMP objectives. Additional progress and/or performance oversight committees may be established by the TBWC as necessary for certain projects or for groupings of projects (i.e., water supply, water quality, etc.).

It is envisioned that all unfunded projects and their proponents and sponsors would meet as a committee at least twice a year to discuss project implementation status, as well as the monitored

effects of implemented projects. Where relevant, these discussions would lead to project descriptions being further refined for any projects that have not yet been implemented.

PLAN PERFORMANCE MEASURES

In order to assess effects of plan implementation and the degree to which plan objectives are being met, the TBWC will devise an ongoing performance evaluation process. The TBWC TAC has determined that the development of performance measures will be an interactive process between the stakeholders and the committee, and that performance evaluation will include an annual review that will address both quantitative and qualitative measures.

The TAC has begun the process of identifying possible frameworks to apply to the evaluation of project and plan implementation outcomes. One framework that is under active consideration in the USEPA Ecological Reporting Framework for Monitoring Watershed Health. In 2006, DWR adopted the USEPA Ecological Reporting Framework for Monitoring Watershed Health in California, developed in conjunction with EPA's Science Advisory Board (SAB). This framework relates the goals and objectives of watershed programs and management efforts to ecological conditions. Information from specific measurements is aggregated into indicators which describe the condition of ecosystem characteristics or "Essential Ecological Attributes." These attributes are interdependent and, taken together, describe the condition of an ecosystem. Program goals and objectives can then be evaluated in light of the ecological conditions described by the attributes. From this, specific monitoring measures/benchmarks can be developed for variables requiring field monitoring. This framework provides a scientifically defensible approach for aggregating and assessing a multitude of environmental data, and for evaluating a variety of environmental management goals.

The framework has identified seven Essential Watershed Attributes (or indicators) for use in assessing watershed health and which form the basis for evaluating plan and project performance:

Landscape condition. The extent, composition and pattern or structure of the landscape (an area composed of a mosaic of interacting ecosystems or habitat patches).

Biotic condition. The structure and composition of the biota below the landscape level (i.e., ecosystems or communities, species/populations, individual organisms, and genes).

Chemical and physical characteristics, which include measures of physical parameters and concentrations of chemical substances that are naturally present in the environment.

Ecological processes, defined as the metabolic functions of ecosystems at the ecosystem or landscape level, including energy flow, elemental cycling, and the production, consumption and decomposition of organic matter.

Hydrology/Geomorphology, including characteristics that reflect the dynamic interplay of water flow and landforms.

Natural disturbance regimes, which are discrete and recurrent disturbances that may be physical, chemical, or biological in nature.

Socio-economic condition. A working definition of this seventh attribute and a list of possible indicators have not yet been developed.

Utilizing this framework, specific indicators and measures will be developed to assess ICWMP performance. The overall Plan performance also will be evaluated in terms of achieving or contributing to ICWMP objectives. The evaluation will consider individual projects as well as the cumulative effect of implementation of multiple projects. Some examples of performance criteria and/or indicators (with measurable benchmarks where possible) that will be developed for each local goal and objective are outlined below (see Chapter 3 for complete goals and objectives). It is expected that measurable benchmarks and targets can be developed and utilized in conjunction with existing and future water quality and fish monitoring efforts. The list below is a preliminary outline of the types of criteria that will be used and defined. For each objective, the desired outcome will be defined by indicators or measurable targets, where appropriate, with identification of the methods or monitoring for measurement.

Water Quality Goal: Ensure water quality in Tomales Bay and tributary streams is sufficient to support natural resources and sustain beneficial uses.

- Contribution to reduction of pathogens, sediment, mercury and nutrients to impaired waters.
- Contribution to reduction of nonpoint source pollutants in all critical coastal areas.
- Level of contribution to meeting TMDL stated limits.
- Contribution to coordinated water quality monitoring program.
- Improved water quality measurements—i.e., levels of specified constituents are reduced at target locations.

A key objective of this goal is to improve water quality in Tomales Bay and tributary streams through reductions in sediment, pathogens, mercury and nutrient loading, with the specific objectives of protecting all beneficial uses and removing Tomales Bay from the 303(d) list of impaired waterbodies by attaining state and federal water quality standards. A benchmark for success in reducing pathogen levels will be a reduction in shellfish harvest closures by increasing the rainfall threshold and reducing the minimum duration of shellfish harvest closures. Benchmarks for sediment, nutrients and mercury will be developed as regulatory agencies further develop reduction plans for these pollutants.

Ecosystem Restoration and Habitat Improvement Goal: Restore and preserve the integrity of natural habitats and native communities.

- Number of improved or restored habitat acres.
- Number of acres of improved habitat or linear feet of improved stream habitat.
- Protection of amount and number of listed species.
- Level of contribution to coho recovery.
- Species population levels.
- Number of acres of non-native vegetation removed.

Water Supply and Reliability Goal: Support adequate and improved water supplies to meet community needs and to improve reliability, consistent with ecosystem management and state and federal regulations, including aquatic ecosystems and stream geomorphology. Maintain and promote sound water resource management practices. Promote efforts that can provide solutions for balancing instream flow requirements with the needs of domestic, agriculture, and commercial water users, as well as fish and wildlife habitat needs, and that contribute to habitat protection and restoration and the continuation of economic and cultural values in the region.

- Level of improved treated drinking water.
- Contribution to water use conservation and change in demand.
- Reduction in water supply system vulnerability to natural disasters.

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Stormwater and Flood Management Goal: Promote sound and environmentally sensitive stormwater and flood management programs and measures.

- Contribution to floodplain restoration.
- Level of reduction of stormwater peak flows.

Groundwater Management Goal: Protect groundwater quality and supplies.

- Number of acres of rangeland with improved practices relative to groundwater infiltration.
- Quality and amount of data relative to groundwater resources, e.g., impacts of salinity on groundwater wells, impacts of impervious surfaces and increased groundwater pumping on creeks; reduced groundwater contamination due to onsite wastewater disposal systems.

Water quality and fish monitoring are examples of monitoring efforts that will play a key role in determining progress relative to attaining resource goals and objectives. The TBWC was recently awarded a grant to develop comprehensive water quality data collection and analysis that would include coordination with other ongoing monitoring efforts. In addition, land use practices and other human influences on tributaries to the bay, uplands, riparian corridors, wetlands and along the bay shores will be monitored and evaluated. Voluntary landowner monitoring will provide important information about the effectiveness of projects on private lands. Together, these monitoring activities will provide the framework for adaptive management, which will increase the effectiveness of actions taken to improve water quality.

8-3 ADAPTIVE MANAGEMENT

As project and plan performance evaluations are completed, and additional monitoring information and other data become available, the performance evaluation criteria and processes will be modified to reflect changing conditions and the outcomes of project and ICWMP implementation. This will also help inform the development and selection of future priority projects. In addition, project performance will be assessed periodically with respect to established performance measures.

9

Data Management

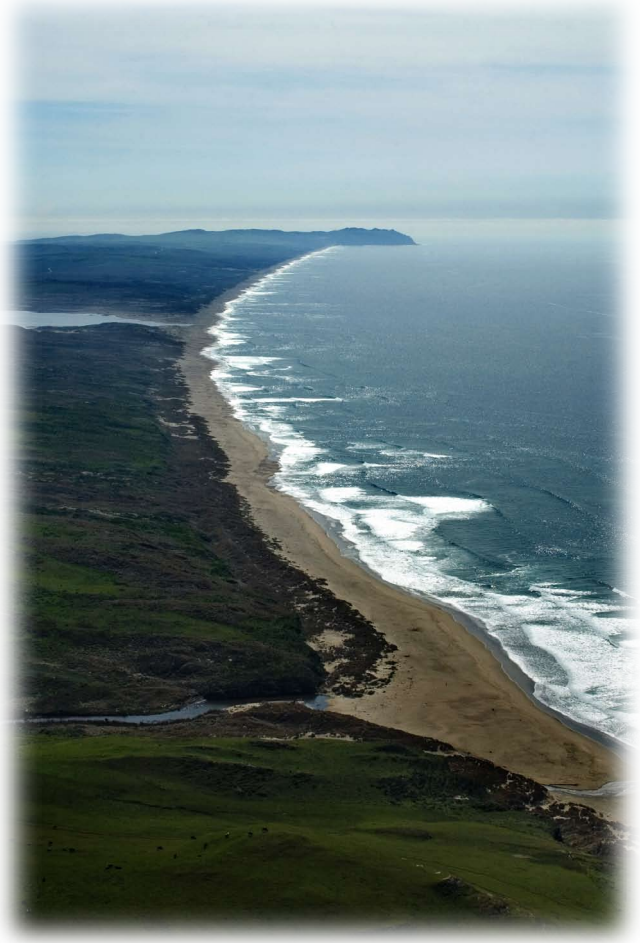


Photo by Greg Filbrandt

9. DATA MANAGEMENT

STATE IRWM REQUIREMENTS: J. Data Management. Include mechanisms by which data will be managed and disseminated to stakeholders and the public, and include discussion of how data collection will support statewide data needs. At a minimum assess the state of existing monitoring efforts for water quantity and water quality, and identify data gaps where additional monitoring is needed. If the Plan includes a water quality component, include a discussion of the integration of data into the SWRCB's Surface Water Ambient Monitoring Program and Groundwater Ambient Monitoring and Assessment Program.

9-1 DATA MANAGEMENT

Data generated and collected during the course of the ICWMP process has been and will continue to be managed to ensure that it will be available to fulfill the needs of stakeholders, the state and the general public. Data management measures are described for data collected during the ICWMP preparation and for data collected during ICWMP implementation.

DATA MANAGEMENT DURING PREPARATION OF ICWMP

All studies and technical data collected and reviewed during preparation of the ICWMP have been inventoried (see Chapter 15) and catalogued in the TBWC library. Technical data collected as part of the preparation of the ICWMP includes stormwater quality monitoring data and field assessments conducted as part of the ASBS watershed assessments. Data management for each of these efforts is summarized below, and the technical methods utilized are described in Chapter 8.

In addition to specific data management efforts described below, copies of the reports developed for these efforts will be maintained as both paper copies and electronic copies at the TBWC offices. All documentation, raw data, data conclusions and interim and summary reports will be archived and used by TBWC partners for future management decisions in the watershed. Results, conclusions and recommendations from the stormwater quality monitoring and ASBS watershed assessment efforts have been presented in the ICWMP. The results will be collated onto a single set of CDs that will also

be retained at the offices of the County of Marin Public Works Department and the National Park Service—Point Reyes National Seashore.

Stormwater Quality Monitoring Data

The work program for the ICWMP work plan calls for the completion of targeted storm water quality monitoring at selected locations within the watershed. Documents that have been or will be produced in support of this data collection effort are included in Appendix M. Data collected as part of this effort will be integrated into existing databases that are compatible with State systems as further described below. Stormwater data will be managed through the Marin County Department of Public Works. The Public Works Department is the primary agency responsible for the management of municipal runoff under the Marin County Stormwater Pollution Prevention Program (MCSTOPP). MCSTOPP is responsible for the implementation or oversight of stormwater management plans for NPDES Stormwater Phase II program in municipal areas within the Integrated Coastal Watershed Assessment Planning Area CCAs.

All QA/QC procedures will be performed pursuant to the State Water Resources Control Board's Quality Assurance Project Plan (QAPP) for the Surface Water Ambient Monitoring Program (SWAMP). These procedures are outlined in the California State Water Resources Control Board, Division of Water Quality's December 2002 *Quality Assurance Management Plan for the State of California's Surface Water Ambient Monitoring Program, 1st Version*. This includes sample collection and handling, as well as sample analysis. The QA/QC plan for implementation of this program is included in the implementation protocol (see Appendix M).

Data collected as part of this effort will be housed at three locations: Marin County Public Works Department, USNPS and TBWC. All records generated by the project will be stored at the TBWC main office in Olema, CA. Copies of all records held by the lab will be provided to TBWC and stored in their files, as well. Copies of the records will be maintained at Analytical Sciences for five years after project completion, then discarded, except for the database, which will be maintained without discarding. TBWC stores paper and electronic files permanently, in support of creating a durable and chronologically coherent data resource. All records will be passed to the State Board Contract Manager at project completion.

ASBS Watershed Assessment Data

The work program for the ICWMP work plan calls for the completion of watershed assessments for the four ASBS areas within the Tomales Bay planning area. Field survey forms (as described in Chapter 8) have been included as part of the ASBS report (see Appendix K).

DATA MANAGEMENT DURING IMPLEMENTATION

As part of the implementation of ICWMP, a project monitoring system will be developed to track components of project implementation progress. A component will be the identification and dissemination of data that is generated by specific projects, including water quality monitoring results

for those projects that have monitoring components. Other data generated to develop and/or support ICWMP projects also will be compiled, maintained and distributed. As discussed in Chapter 6, Implementation, performance criteria will be established to assess project performance. Data collected during plan implementation will be compiled in a database and submitted to stakeholders as part of monthly, quarterly and/or annual reports. Water quality data will be included within regional and State databases as described in this chapter.

9-2 DATA DISSEMINATION

The mechanisms for data dissemination that have been employed to date are described below. It is anticipated that all of these mechanisms will continue into the future.

TBWC MEMBER DISTRIBUTION PROCESS

Copies of data developed for the ICWMP will be distributed to all parties involved with the project, upon request from their TBWC representative. At present the following members have indicated a desire to have the full electronic and paper record of the stormwater monitoring effort: SPAWN, County of Marin, USNPS/Point Reyes National Seashore local office, and the BCPUD. Additional members may ask for this same set of data.

PUBLIC DISSEMINATION OF DATA

At each public meeting held during ICWMP preparation, the public has been notified of the availability and location of the files supporting preparation of the Plan. As public review drafts of the ICWMP are circulated during the public review, a notice within the report will reiterate the TBWC policy of open files, as well as the location and process for accessing both electronic and paper files.

Public notices for the project, beginning in April 2007, will also make note of the availability of data (related to stormwater sampling, background conditions). The results of ongoing data development and collection efforts by TBWC members also will be made available as they are completed.

PUBLIC ACCESS TO DATA

As previously indicated, copies of all data, summaries and reports will be maintained as both paper copies and electronic copies at the TBWC offices. The TBWC offices are, and will continue to be, open to the public, currently on Tuesday and Thursday afternoons and during regular working days by appointment. This will continue to be true in the future. Additionally, copies of all data and background materials developed not only for the stormwater monitoring but for all aspects of ICWMP preparation will be made available to TBWC members and members of the general public upon request. A full set of electronic backup materials will be housed off-site to protect them from loss if there is a fire or other emergency at the TBWC offices. All summary reports, as well as the ICWMP and its supporting appendices, will be provided on CD to each TBWC member for online posting and distribution.

9-3 EXISTING AND NEEDED MONITORING

A number of water quality monitoring efforts are underway or planned for the region that include efforts by the SFBRWQCB, , the National Park Service (USNPS), the County of Marin, SPAWN, and MMWD. Additionally, TBWC recently received funding for a three-year water quality monitoring program that includes coordination of data and creation of a database. The SFBRWQCB completed water quality sampling in 2001 as part of the "Surface Water Ambient Monitoring Program" (SWAMP). SWAMP is a statewide monitoring effort designed to assess conditions of surface waters throughout the state. The SWAMP report that includes the Tomales Bay region is due to be released in the near future. Other historical efforts conducted by other agencies and entities are summarized in Appendix E.

RWQCB – Pathogens TMDL Monitoring

The main objectives of the Monitoring Program of the "Pathogens TMDL Report" (RWQCB, San Francisco Region, July 2005) are to:

- Assess attainment of TMDL targets;
- Evaluate spatial and temporal water quality trends in the bay and its tributaries;
- Further identify significant pathogens source areas;
- Evaluate coliform levels and loadings to the bay at the terminus of major tributaries;
- Collect sufficient data to calibrate and validate the bay hydrodynamic model to observed coliform levels; and
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of implementation actions.

The TMDL Study recommends that water quality sampling be conducted at 30 monitoring stations for the Tomales Bay watershed and the bay itself, as summarized below.

- Lagunitas Watershed: 11 locations on Woodacre, East Fork Woodacre, West Fork Woodacre, San Geronimo, Lagunitas, Arroyo, and Montezuma Creeks;
- Olema Creek: 6 locations;
- Walker Watershed: 4 locations on Walker, Keys, and Upper Chileno Creeks;
- West Shore: 3 locations at Inverness Public Utility District's sampling station;
- East Shore: 2 locations at Millerton Creek and drainage at Milepost 36.17 on Highway 1; and
- Tomales Bay: 4 stations at inner-bay, south end, southeast corner, and northeast corner.

Table 9-1 outlines the locations, constituents, sampling frequency, analytical methods, and the responsible parties for the long-term water quality monitoring program. The SFBRWQCB, in coordination with the responsible parties and interested third parties—such as National Park Service, Department of Health Services, commercial shellfish growers, the Inverness Public Utility District, and Salmon Protection and Watershed Network (SPAWN)—will conduct the proposed long-term water quality monitoring. All water quality monitoring (including Quality Assurance [QA] and Quality

Control [QC] procedures) will be performed pursuant to the State Water Board's Quality Assurance Project Plan for the Surface Water Ambient Monitoring Program.

National Park Service

In addition to the sites sampled by the SFBRWQCB as part of its Pathogen TMDL monitoring, the National Park Service (USNPS) samples three additional sites on a monthly basis: one site on Cheda Creek and two sites on Olema Creek tributaries. In addition to pathogens (total fecal coliform and E. coli), nitrate, ammonia and other core constituents (temperature, pH, dissolved oxygen, salinity) also are sampled. This data is managed as part of the IVPSTORET database. Older past data also is being integrated into this database. The last annual report was in 2001, but annual reporting is planned to be resumed (Ketcham, personal communication, April 2007).

As part of the "Tomales Bay Wetlands Restoration and Monitoring Program" that was recently funded by the SWRCB for restoration of the National Park Service's Giacomini Ranch, a comprehensive ambient water quality plan will be implemented. The data collection and analysis will be consistent with SWAMP and QAPP requirements. The Water Quality Plan, anticipated to be initiated this year, will conduct long-term and source area monitoring for parameters including bacteria, DO, nutrients, pH, conductivity, salinity, temperature, turbidity and suspended sediment levels and duration. Trend monitoring will generate water quality data to assess long-term shifts in water quality within Tomales Bay and tributaries. Source area monitoring will focus on identifying sources and quantities of water pollutants to Tomales Bay and its freshwater tributaries to evaluate and prioritize past and future water quality improvement efforts. The monitoring will include post-restoration sampling to document the physical and ecological response to this significant wetlands restoration project (Tomales Bay Watershed Council, June 2006).

Point Reyes National Seashore currently conducts a source area monitoring program within the boundaries of the Seashore. The intent is to document loading from the various park watersheds, in order to concentrate long-term management and restoration efforts into areas where the watershed will benefit the most. Through this program, the Seashore has identified source areas and management or structural practices intended to reduce pollutant loading to aquatic systems.

SPAWN

The Salmon Protection and Watershed Network (SPAWN), in partnership with the SFBRWQCB and SWRCB, has conducted a citizen-based (volunteer) water quality monitoring program in the Lagunitas Creek watershed since 2003. The focus of the study was to collect data for key pollutants (including sediment, nutrients, and fecal coliform) to determine exceedances of water quality standards and potential source categories as a preliminary step in determining TMDLs for the Tomales Bay region. Several monitoring stations were established to assess nonpoint source pollution impacts attributed to residential and commercial developments in the watershed that have a relatively high density of septic systems and marginal site conditions (i.e., areas of high groundwater). Samples are taken at 7 locations in the summer and 9 locations in the winter on Lagunitas Creek and its tributaries. All sites are sampled according to protocols approved by the SWRCB. The program documents conditions and source areas within the San Geronimo watershed. Constituents sampled include: fecal coliform,

nitrate + nitrate and orthophosphates, as well as dissolved oxygen (DO), pH, and conductivity for both sampling seasons, as well as TDS and temperature during the summer sampling period.

TABLE 9-1
SUMMARY OF RWQCB MONITORING PARAMETERS

Constituent	Location	Frequency	Analytical Method	Sampling Entities
TOMALES BAY				
Fecal Coliform [a]	Four of the 17 designated DHS monitoring stations at shellfish growing lease areas	Weekly for five weeks from January to early February; Monthly from March through December Weekly for five weeks during summer months	U.S. EPA Standard Multiple Tube Fermentation Method; 9221B	DHS, Shellfish Growers
TOMALES BAY WATERSHED				
Fecal coliform Stream Flow	Olema Creek	Weekly for five weeks from January to early February; Monthly from March through December Weekly for five weeks during summer months	U.S. EPA SM 9221B USNPS gauging station	National Park Service
Fecal coliform	West Shore	Same as above	U.S. EPA SM 9221B	Inverness PUD
Fecal coliform	East Shore	Same as above	U.S. EPA SM 9221B	Water Board
Fecal coliform Stream Flow	Lagunitas Creek	Same as above	U.S. EPA SM 9221B USGS gauging station	Water Board, SPAWN
Fecal coliform Stream Flow	Walker Creek	Same as above	U.S. EPA SM 9221B USGS gauging station	Water Board

a. *E. coli* monitoring may be used in the future to assess general water quality trends and exceedances. If E. coli is used instead of fecal coliform to assess general water quality trends and exceedances, samplers also will collect duplicate samples (10% of the total number of samples) to be analyzed for fecal coliform, in order to obtain a Tomales Bay-specific correlation factor between fecal coliform and *E. coli*.

Available stream ambient water quality data in the community of Woodacre has been collected by the Salmon Protection and Watershed Network (SPAWN) through the Lagunitas Watershed Citizen Water Quality Monitoring Program (June 2004–June 2006). This program, funded by the SFBRWQCB, was implemented to conduct physical and biological water quality monitoring in support of efforts to

monitor the creek's run of spawning coho salmon. SPAWN data will be evaluated in the ICWMP, along with the monitoring data collected under the Monitoring Plan, as part of the Tomales Bay Watershed Council ICWMP implementation.

County of Marin

The County of Marin, through the MCSTOPPP, is conducting some ASBS water quality monitoring at Duxbury Reef, and stormwater sampling as initiated with this ICWMP planning grant award, both of which are further described below. Additionally, the County of Marin Environmental Health Division samples at coastal locations (beach discharge points) along the Tomales Bay shoreline. The sampling occurs weekly between April 1 and October 31. The constituents tested for are total coliform, E. coli and enterococcus.

As part of the preparation of this ICWMP, a separate work effort was initiated to set up stormwater monitoring stations and prepare a "Municipal Stormwater Assessment and Recommendations" report, which is contained in Appendix M. The purpose of the ICWMP stormwater quality monitoring effort is to improve management of water resources throughout West Marin County and, in particular, provide direction for improving the quality of stormwater entering area streams from rural community stormwater systems. The overall goals of this work effort are to:

- Determine the types and level of contamination that are present in the stormwater system in the targeted communities.
- Enable an assessment of the effect of stormwater infrastructure on water quality characteristics of the targeted areas.
- Direct development and implementation of site-specific remediation recommendations by the appropriate TBWC partners.

The specific objective of the water quality monitoring effort is to determine whether and to what extent contaminants are transported through selected West Marin County community stormwater systems, including priority contaminants from wastewater and surface water.

A stormwater network mapping effort has been completed for Point Reyes Station, Tomales, and Woodacre, and limited stormwater water quality monitoring has been conducted in Bolinas. MCSTOPPP plans to continue stormwater network mapping and condition assessments in the future.

Data collected during the 2006/2007 season is limited due to a low rainfall year. Once the data has been analyzed and interpreted, it will assist the TBWC and responsible agencies to move forward with site-specific and regional planning efforts to address potential water quality problems identified by the study.

Marin Municipal Water District

MMWD conducts ongoing water quality monitoring at multiple locations in the Lagunitas Creek and Walker Creek watersheds. Monitoring of Soulajule, Nicasio, Kent, Alpine, Bon Tempe and Lagunitas reservoirs is conducted on a quarterly basis for temperature, pH, conductivity, turbidity, alkalinity,

hardness, metals, oxygen, nutrients, Total Coliform, E. Coli, and total dissolved solids. Nicasio and Kent reservoirs are sampled each twice per year for pharmaceuticals, hormones, and estrogen mimicking compounds.

Annual sampling of the above named reservoirs includes, in addition to the parameters mentioned in the quarterly monitoring above, surfactants, pesticides and industrial contaminants. During the summer, Kent, Bon Tempe, and Nicasio reservoirs are also monitored at least once every month for pH, dissolved oxygen, temperature, and conductivity.

Inflow streams to Nicasio Reservoir are monitored five times per year during the winter at 7 different sites, 5 of which are located on Halleck and Nicasio Creeks. Monitoring at these sites includes sampling for temperature, pH, turbidity, conductance, coliform, total organic carbon, nutrients, suspended solids, Total Coliform and E. Coli.

MMWD also conducts monthly sampling at four creek sites in the Lagunitas and Walker Creek watersheds. These sites include: Lagunitas Creek below Kent Reservoir (at Shafter Bridge), San Geronimo Creek, Nicasio Creek below Nicasio Reservoir, and Arroyo Sausal/Walker Creek below Soulajule Reservoir. This water quality monitoring program analyzes samples for nine parameters, including: temperature, pH, turbidity, alkalinity, hardness, copper, total suspended solids, oxygen, and settleable solids.

TBWC Water Quality Monitoring Plan

In December 2003, the Tomales Bay Watershed Council developed a Water Quality Monitoring Plan in response to lack of long-term comprehensive water quality monitoring at a watershed level. Numerous stakeholders and regulatory agencies have conducted comprehensive monitoring for short durations or for a limited focus on water quality parameters or geographic boundaries. Examples of this sort of water quality monitoring would be the National Park Service's continuing monitoring of Olema Creek, and the Shellfish Technical Advisory Committee's two-year pathogen study on Tomales Bay and its tributaries. The recent but now terminated efforts of California Department of Fish and Game to monitor ammonia concentrations in Stemple Creek and Tomales Bay watersheds is a relevant example of the type of effort and intended use of the data to be generated for this program.

The TBWC Water Quality Monitoring Plan provides direction for a water quality monitoring program with an initial 10-year timeframe. It is envisioned, however, that the design will include monitoring parameters and a sampling regime that can be carried out indefinitely. The plan and program objectives are to:

1. Provide the watershed community with the required data and analysis to determine improving, constant or declining trends in bay and tributary water quality;
2. Form and maintain a clearinghouse of water quality data and monitoring activities that facilitates effective and efficient use of limited resources;
3. Serve as source of information that will direct and promote actions to improve water quality; and
4. Provide an understanding of source areas and categories for constituents of concern in the bay and on a sub-watershed and/or tributary scale.

Trend monitoring will be conducted to generate water quality data of sufficient duration and representation to assess long-term shifts in water quality within Tomales Bay and it tributaries. There are numerous stakeholder efforts to manage sources of pollution for which feedback is needed to assess impacts and the effectiveness of restoration efforts. There are also regulatory and statutory needs for long-term trend water quality monitoring; these include the Pathogen TMDL and the Shellfish Lease monitoring by California Department of Health Services. This component of the monitoring program will give the watershed community the needed benchmarks to determine the success of management efforts.

Nine permanent tributary sampling locations will be established and will include one per sub-watershed. These sites will be coordinated with the four existing gauging stations (mainstem Lagunitas, Olema, Walker, and San Geronimo); Chileno Creek; one site on the east shore of Tomales Bay (Millerton Creek); and one site on the west shore. East and west shore sites will include at least one reference stream that flows through subwatersheds with minimal human land use activities. Sampling locations will include four bay sites to represent the tidal conditions and separation of the Bay. These sites will be re-evaluated to ensure that variability within the Bay, from east to west and north to south, is captured. These sites will be coordinated with the existing monitoring sites in the bay that are used by the SFBRWQCB, Department of Health Services, and other agencies.

Water quality samples collected in Tomales Bay and tributary creeks will be analyzed for fecal coliform, turbidity, conductivity/salinity, pH, dissolved oxygen, ammonia, and temperature. In addition to these water quality parameters or "response variables," descriptive or "explanatory variables" will be collected. These will include tidal stage, discharge, cumulative precipitation, and possibly others. Analytical methods will follow accepted procedures. Trend sampling shall be conducted on a weekly basis, and in the future the data will be evaluated to determine if seasonally based monitoring can be used to reduce the sampling frequency.

Source area monitoring efforts will be focused on identifying sources and quantities of water pollutants to Tomales Bay and its freshwater tributaries. The intent of source area monitoring will be to support and prioritize future watershed or sub-watershed water quality improvement efforts, and to document conditions in order to evaluate the effectiveness of efforts to improve water quality on private and public lands. The source area monitoring program will target winter and spring runoff events when nonpoint source pollution loading is most prevalent. Primary sub-watershed and Bay groupings (which will be used to compare data and to focus management efforts) are: Lagunitas Creek, San Geronimo Creek, Olema Creek, West Side Bay Tributaries, East Side Bay Tributaries, Walker Creek, Chileno Creek, and Keyes Creek.

The water quality parameters to be sampled will be coordinated with the long-term monitoring program. In the initial years of this study, the water quality monitoring constituents will include field-collected parameters (e.g., temperature, DO, conductivity, pH, etc.) as well as analytical lab analysis (e.g., fecal coliform, ammonia, etc.). Additional parameters may be added as we learn more about the system and the issues in the Tomales Bay watershed.

Results of the source area sampling program will be used to advise outreach and prioritization of water quality management measures supported by partners that are working on the ground to address water quality issues on public and private lands (e.g., the MRCD, SPAWN, PRNS, NRCS, Marin County, and others).

In March 2006 the TBWC began monitoring efforts at three local swimming locations and source area monitoring in Inverness, Third Valley Creek and at Chicken Ranch Beach.

MONITORING DATA GAPS

Water quality monitoring data gaps identified in TBWC's 2003 *Tomales Bay Stewardship Management Plan* that are still relevant include:

- The SFBRWQCB developed specific recommendations for study and monitoring programs (SWAMP) for Walker Creek and Lagunitas Creek watersheds (RWQCB, 2001):
    1. Develop a monitoring program to study nutrient, pathogens and sediment movement in Keys, Chileno, Arroyo Sausal, Salmon, and Walker Creek to evaluate the effects of grazing.
    2. Develop a monitoring program for pathogens and nutrients at Laguna Lake to determine the input from the headwaters of Chileno Creek.
    3. Develop a monitoring program for pathogens and nutrients below the town of Tomales to evaluate the septic system leaks into Keys Creek.
    4. Develop a monitoring program to evaluate the impact of flow, temperature, dissolved oxygen and sediment on the salmonid fishery below Soulajule Reservoir.
    5. Design a sampling program above Peters Dam to establish reference conditions in a protected upper watershed for flow, temperature, dissolved oxygen, and biological indicators.
    6. Develop a monitoring program to evaluate water quality (DO, temperature and sediment) in Lagunitas Creek below Peters Dam, and in Nicasio Creek below Seeger Dam and San Geronimo and Olema Creeks.
    7. Develop a monitoring program for sediment deposition up and downstream from the confluence of Lagunitas and San Geronimo Creeks to evaluate erosion control programs.
    8. Monitor for pathogens and nutrients from septic tank leaks along San Geronimo Creek.
    9. Conduct nutrient and pesticide testing below the golf courses on Bon Tempe Lake and on San Geronimo Creek.

- The database on bacterial contamination in the bay and watershed is well developed but there are still a number of data gaps that include:
    1. Contributions made by natural background sources (e.g., large, over-wintering and resident bird populations, marine mammals) and the extent of human waste input (e.g., failing septic systems, boat and recreational uses) into the watershed and bay;
    2. Comparative studies of the eastern shoreline sub-watersheds that have low fecal coliform counts with those sub-watersheds that have high fecal coliform levels in order to establish background conditions;

3. Address the concern about increases in summer primary productivity in Tomales Bay by designing studies to determine spatial and temporal dynamics of phytoplankton in the various sections of the bay.

- Evaluation of nutrient levels is far behind monitoring activities related to bacterial contamination. Most of the effort to understand toxic contamination has been centered on mercury released from the Gambonini mine in the Walker Creek watershed. Ongoing and future studies will fill some of the data gaps include:
    1. Continue to monitor the release of mercury from the mine site to determine the success of the remediation program.
    2. Evaluate mercury contaminated sediment transport out of the Walker Creek drainage into Tomales Bay.
    3. Investigate the storage of contaminated sediment in the drainage and estimate possible release times for pulsed levels of sediment reaching the bay.
    4. Continue the investigation of contamination pathways through various biological trophic levels in the bay system.
    5. Investigate the extent of contaminated sediment movement within Tomales Bay.
    6. Investigate the natural levels of mercury entering the bay system from the Lagunitas sub-watershed and other smaller tributaries.
    7. Develop a monitoring plan to examine the bioaccumulation of metals and synthetic organic compounds to establish a long-term baseline in Tomales Bay.

- Sediment studies recommended in the Stewardship Plan appendix include:
    1. Analyze the sediment transport functions in the Lagunitas Creek system with respect to their impact on instream habitat and on sediment delivery to Tomales Bay. In Lagunitas Creek, such analysis will increase understanding of how the sediment transport function influences critical habitat features such as pool riffle complexes and bed material composition. This information is critical to the design of effective restoration projects. This work has been undertaken by the County of Marin and should be nearing completion.
    2. Inventory and prioritize sediment sources in upper Devil's Gulch and mainstem Lagunitas Creek below Tocaloma. Include a road assessment on the areas of the watershed not covered by the current MMWD effort.
    3. Conduct a fluvial geomorphic analysis of the Walker Creek stream system. The analysis will provide a scientific basis for selection, design, implementation and monitoring of future fisheries habitat enhancement and sediment reduction projects. Coordinated with RWQCB monitoring efforts, it will also provide critical information on the movement of mercury-laden sediments through Walker Creek to Tomales Bay.
    4. Develop a, comprehensive, hydrodynamic watershed-wide sediment budget and monitoring program to assess the impacts of enhancement measures both within the watershed and Tomales Bay that includes: 1) water column, 2) bedload, 3) upland sources and 4) habitat monitoring. Evaluate the MMWD sediment monitoring program in Lagunitas Creek and determine what it can contribute to the larger program. Analyze the data collected to date.

Implementation of the TBWC Water Quality Plan will provide a basis for establishing baseline data. The development of a comprehensive water quality monitoring program is only the first step in water-

shed monitoring for Tomales Bay. Along with baseline monitoring (to characterize existing conditions) and effectiveness monitoring (to determine the success of existing or newly implemented projects or management practices), bio-indicators should be identified and monitored.

A coordinated water quality monitoring system is needed in which standard data gathering and reporting measures are used by all agencies and organizations, with the development of a database in which all data from various agencies can be collected and accessed to develop better analyses on water quality conditions and trends. Various agencies would keep their own data, but also combine it and make it available somewhere for all. Items to consider in developing such a database include:

- **TBWC Database As A Model.** Implementation of the TBWC Water Quality Plan will provide a basis for coordinating water quality data collection. The TBWC database, in addition to being a repository for data, will be able to conduct data analyses related to specific sites, aggregate data, and provide water quality graphs and other outputs that are fairly sophisticated. Also, this repository will support inclusion of legacy water quality data, in addition to providing a single comprehensive database for all current and future monitoring efforts .

- **Compatibility and Consistency in Data.** There is a need to review how the various agencies collect and maintain their data such that they can be compatible and/or combinable (e.g., SPAWN, USNPS, TBWC). Currently, there are two sizeable water quality databases— the TBWC and the National Park Service—and they are consistent. Water quality data collected through the TBWC is consistent in format to the USNPS database, and they could be combined.

  Data Sensitivity. There are data sensitivity issues with water quality databases that contain information collected on or about private property, especially if site-specific information is included. There needs to be careful discussion about the types of information that are included in a comprehensive database and who can access the data, prior to data collection and data compilation. The variety, quality and quantity of data collected will vary significantly between projects; however, it is critical to remember that in order to better understand our effectiveness and trends in water quality, we will all benefit when sufficient information is provided to be able to determine if progress is being made or not.

  In some circumstances, is important to pair data collection and monitoring with solution oriented projects that can assist with funding to implement the necessary changes that may be considered as a result of the data collected. Implementation of the ICWMP would include as much information on locations (e.g., GPS) as possible, and will employ the strategy that monitoring and data collection are typically easier and more effective if they are linked to implementation funding.

- **Need Long-term Data Gathering and Monitoring for Each Local Priority.** Monitoring data and review are needed for each of the ICWMP's three regional priorities: water quality, ecosystem restoration and habitat improvement, and water supply. Long-term data collection and monitoring is a key element in monitoring ICWMP performance and integrating watershed

management efforts in the Tomales Bay area. In this regard, the TBWC has been a leader in efforts to expand and coordinate a comprehensive water quality program.

- **Long-Term Project Management.** In addition to development of a database, there is a need to update and manage it. This requires a discussion about who does this management in the longer term. There needs to be further TBWC discussion. The TBWC has been made aware of this need and is discussing their possible role.

Other potential monitoring needs identified by some stakeholders during preparation of the ICWMP include standard salmon monitoring methods and fish growth. Other data gaps and issues/questions raised during the preparation of the ICWMP are summarized in Chapter 3 and included in Appendix H.

9-4 SUPPORT OF STATEWIDE NEEDS

The ASBS watershed assessments build on the SWRCB Discharge Report completed summer 2003, and these assessments were used to develop the ICWMP and project recommendations. It should be noted that equivalent assessments of resources, stressors and watershed issues already have been conducted within the Tomales Bay, Lagunitas Creek, and Walker Creek CCAs under a variety of initiatives. Most of the issues associated with these strategies are synthesized under the Tomales Bay Watershed Stewardship Plan (TBWC 2003), the Tomales Bay Pathogen TMDL Staff Report (RWQCB 2005), and other watershed or parameter-specific assessments. The ASBS assessments document the information identified as essential through the Critical Coastal Areas Program. Data and information developed through this program will contribute to a collaborative, watershed-based management strategy to reduce and prevent impairment of state ASBS and CCAs within coastal Marin County.

The stormwater quality data directly supports the RWQCB Pathogen TMDL monitoring efforts, and will provide additional data to review success in achieving TMDL levels. This data, as well as projects included in the ICWMP, also contribute directly to recommendations included in the State's October 2004. *Watershed Management Initiative Integrated Plan Chapter (*San Francisco Bay Regional Water Quality Control Board). The monitoring data, in conjunction with other monitoring efforts, will be reviewed continually and thus will assist in the ongoing review of the success of various projects, programs and measures in contributing to water quality improvement, especially to achieve identified TMDL objectives and ultimately eliminate the impairment status for listed water bodies. In this way, the data generated during Plan development and through implementation of projects also will contribute to maintaining the desired water quality for "beneficial uses" identified in the *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin.* (San Francisco Bay Regional Water Quality Control Board, November 2004.)

9-5 DATA INTEGRATION INTO SWRCB SURFACE WATER AMBIENT MONITORING PROGRAM

The goal of the SWAMP-funded program in the San Francisco Bay Region is to monitor and assess water quality in all of the watersheds in the region to determine whether beneficial uses are protected. Specific objectives of the monitoring program are to: 1) measure environmental stressors (pollutants or other water quality parameters), biological effects, and ecological indicators to evaluate whether beneficial uses are being protected; 2) use a design that allows for evaluation of spatial and temporal trends in the watersheds of the region; 3) identify minimally disturbed reference conditions; 4) determine whether impacts are associated with specific land uses and/or water management; 5) use standard sampling protocols, QA procedures and the SWAMP database to provide statewide consistency and availability of data; 6) evaluate monitoring tools in watersheds; 7) generate data to develop indices to evaluate ecological indicators; and 8) use a rotating watershed approach to collect data in each hydrologic unit at least once every five years (San Francisco Bay State Water Resources Control Board, October 2004). The SWAMP report that includes the Tomales Bay region is due to be released in the near future.

Stormwater quality measurement and collection of field parameter values will be in accordance with approved protocols including those in the State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP) and the National Park Service's SFANI&M WQ Program. These parameters include: pH, electrical conductivity, dissolved oxygen, temperature, discharge, 24-hour rainfall (from existing gauges within the watershed), annual cumulative rainfall (from existing gauges within the watershed), and salinity.

The stormwater quality data will be submitted to the SWRCB's SWAMP database. The USNPS will work with database managers to develop a template for upload to the state SWAMP database. As a preliminary step, all data will be compiled in a MicroSoft EXCEL spreadsheet as raw data. Currently the TBWC is using a version of USNPS's Storet and will integrate the data from this program into that database. This system was developed by the National Park Service for water quality data management. The program is a Microsoft ACCESS-driven database that has an export template for upload to EPA STORET. This will enable the data to be made available to the public.

10 Financing

Photo by Kathleen Goodwin

10. FINANCING

STATE IRWM REQUIREMENTS: K. Financing. Identify beneficiaries and identify potential funding/financing for Plan implementation. Discuss ongoing support and financing for operation and maintenance of implemented projects.

10-1 IMPLEMENTATION FUNDING

The ICWMP will be implemented through project-specific implementation and overall Plan administration by the TBWC. Project costs and funding matches, where known, are summarized on Table 10-1. These projects (excluding the MMWD's regional water supply projects) total approximately $41,000,000. The short-term project priorities identified in Chapter 5 represent approximately $9,500,000 of this total amount.

Funding for most capital improvement projects includes some reserves by public water agencies and public utility districts. However, full funding has not been assured, and for other projects funding is largely dependent on receipt of government or private grants. Few of the project proponents have the ability to generate revenues of sufficient magnitude to implement identified projects within their resources, especially non-governmental organizations.

At this time (July 2007), the TBWC plans to submit a Proposition 50, Round 2, Step 1 grant application requesting funding for some of this Plan's short-term priorities. In the immediate future other potential funding sources include Proposition 84, which was passed by California voters in 2006. Proposition 84 provides funds for planning and implementation of critical water resource management facilities and programs. Other state, federal and private grant funding sources will be pursued.

Many of the stakeholders in the TBWC have worked effectively in the past to solicit and receive government and grant funding for a variety of key projects. In addition, many of the project proponents have secured some matching funds for the projects identified in the ICWMP. Other

known matching funds include: State Coastal Conservancy funding, California Department of Fish and Game funding, federal Community Development Block Grant, and private grant funds, as well as agency contributions. Public agency project proponents largely have a matching fund component (i.e., County of Marin and National Park Service). MMWD also provides a portion of matching funds to several sediment reduction and watershed projects.

The agencies and organizations in the region have a collective demonstrated ability to obtain grant money and other investment of resources.. Public and private dollars already have been invested in the Tomales Bay region, and this plan further protects investment made to date. In the past 20 years, millions of dollars have been received by stakeholder groups in the region to implement water quality, ecosystem restoration, water supply, and stormwater/flood management projects and programs. There has also been a lot of volunteer support with project implementation that is expected to continue.

Water supply and infrastructure capital improvement matching funds will largely be provided through agency capital improvement funds. For example, the NMWD's Point Reyes Station water supply wells and treatment plant improvements have allocated 50% matching funds to both projects from the District's Capital Improvement Plan. Capital reserve funds also are budgeted for portions of IPUD and TVCSD projects. State grants and loans are funding sources for the smaller water agencies that are often sought to supplement agency revenue and user fees.

10-2 ONGOING O&M SUPPORT AND FINANCING

Ongoing operations and maintenance of constructed capital improvements would be funded through existing agency revenues and user fees. Most of the proposed facility construction (except for MMWD's regional projects) consist of minor additions, replacements, or treatment additions, which would not result in a significant increase in staff or maintenance requirements. Operations and maintenance for these facilities would be within existing agency O&M costs. Most project proponents have conducted these types of projects in the past and are committed to a 10-year maintenance schedule. It is anticipated that costs and requirements for maintenance will be met.

Other ICWMP projects consist of habitat restoration and/or minor land or stream improvements, which would not result in significant ongoing O&M costs. In some cases, projects that remove culverts and fish barriers could remove some future maintenance and associated costs with clearing culverts and/or removal of jammed debris from streams and fish stocking costs.

In some cases, there is maintenance associated with stream projects, which can be subject to flooding and post-storm maintenance. Agricultural BMP implementation requires maintenance and/or monitoring—i.e., when fencing is installed, weed management and fence repair becomes new costs for private landowners.

10-3 BENEFICIARIES

Several groups will benefit from implementation of the ICWMP. The first is clearly the residents of the Tomales Bay area, who would benefit from improvements to water supply and treatment systems, as well as improvements to make these systems less vulnerable to service disruption during natural disasters and emergencies. The second group of beneficiaries would be all the "beneficial uses," including mariculture operators and fish and wildlife resources that would benefit from improved water quality, and habitat improvements in the case of fish and wildlife resources, including over two dozen threatened and endangered species. Third, the public agencies empowered with implementing state plans (i.e., coho recovery, TMDL targets) would benefit from the ongoing implementation, evaluation and assessment of how the ICWMP is contributing to achieving targets or implementing projects outlined in these studies.

Last, beneficiaries of Plan implementation also include current and future generations of residents and visitors, including recreational users in the greater San Francisco Bay region and elsewhere that are part of the approximate 2.5 million visitors to the area annually. The improvement of public trust lands within an area that receives regional, state and international recognition will further protect the investments made to date in the Tomales Bay region.

TABLE 10-1
SUMMARY OF PROJECT FUNDING

ID #	PROJECT	Cost	Funding Match	Matching Funds
1	NMWD-Gallagher Wells & Pipeline	800,000	800,000	50%
2	NMWD-Pt. Reyes Water Treatment Improvements	1,250,000	1,250,000	50%
3	MMWD-Desalination Plant			TBD
4	MMWD-Mt. Tamalpais Roads & Trails Management	4,000,000		
5	MMWD-Peacock Gap Recycled Water Extension			
6	MMWD-Watershed Assessment Program	220,000	75,000	25%
7	MMWD-Mercury Monitoring Program			
8	MMWD-Groundwater Recovery Feasibility Study-Phase 2	180,000		
9	MMWD-Lagunitas Creek Riparian Vegetation Work	200,000		TBD
10	MMWD- Rainwater Capture & Stormwater Use Project			
11	MMED-Lagunitas Creek Roads MOU Implement Sediment Reduction	300,000	50,000	17%
12	MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory	175,000	20,000	10%
13	MMWD-Water System Security and Emergency Preparedness	250,000		TBD
14	MMWD-Soulajule Reservoir Supply to Stafford Lake WTP	5,000,000		
15	MMWD-Water Conservation: Sustainable Wildland Landscape			
16	MMWD-Water Conservation: Marin County Satellite Imagery Project			
17	MMWD-Pipeline and Tank Access Road Stormwater Improvements	200,000	70,000	25%
18	MMWD-Fencing Around MMWD Water Supply Reservoirs	480,000	170,000	25%
19	MMWD-Inkwells/Shafter Bridge Crossing Project: Planning	35,000		
20	MMWD-Inkwells/Shafter Bridge Crossing Project: Construction	350,000		TBD
21	MMWD-Invasive Aquatic Weed Management Program			TBD
22	RCD-Rancher Outreach Program	60,000	45,000	43%
23	TU-Dickson Weir & Equestrian Facility Study	25,000		TBD
24	MCPW-Arroyo Creek Fish Passage Restoration	400,000	50,000	11%
25	MCPW-East Fork Woodacre #2 Fish Passage Restoration	175,000	50,000	50%
26	MCPW-San Geronimo Creek Fish Passage Restoration	250,000	50,000	20%
27	MCPW- Woodacre Creek #3 Fish Passage Restoration	400,000	50,000	12.50%
28	MCPW-Kent Canyon Creek Fish Passage Restoration	400,000	50,000	12.50%
29	MCPW-Marin County Watershed Management Plan	50,000	10,000	20%
30	MCPW-Silver Hills Creek Restoration Project	65,000	10,000	15%
31	NPS-Duxbury Reef Reserve Restoration	575,000	57,500	10%
32	NPS-Pt. Reyes Headlands Reserve Restoration	225,000		TBD
33	NPS-Tomales Bay Boat Removal	150,000		
34	NPS-Tomales Bay Vessel Management Plan Implementation	225,000		
35	NPS-Olema Valley Trail Reroute & Stream Crossing Replacement	300,000		
36	NPS-Stewart Horse Camp Septic Replacement	143,000		
37	NPS-Devils Gulch Road/Trail Sediment Control	334,000		
38	NPS-Tomas Bay Beach Campground Access & Restroom Improvements	152,900		
39	CPR-Hearts Desire Beach Restroom Leach Line Replacement	400,000		TBD

TABLE 10-1
SUMMARY OF PROJECT FUNDING

ID #	PROJECT	Cost	Funding Match	Matching Funds
40	TBWC-Chicken Ranch Beach Restoration	140,000	15.,000	11%
41	IPUD-Climate Change Assessment	40,000		
42	RWQCB-Nicasio & Soulajoule Reservoir Management			
43	RWQCB-Stormwater, Flood Management & Instream Flow Enhancement			
44	RWQCB-Lagunitas Creek Watershed Sediment Reduction & Habitat Enhancement			
45	RWQCB-Riparian Zone & Large Woody Debris Enhancement			
46	SPAWN-Lagunitas Creek Watershed Restoration Program for Private Lands, Bioengineered Bank Repairs	650,000	65,000	10-15%
47	SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs	350,000	70,000	10-20%
48	SPAWN-Salmonid Monitoring	17,400		
49	SPAWN-Lagunitas Creek Stormwater Initiative	120,000	18,000	15%
50	BCPUD-Treatment Microfiltration Unit	275,000		
51	BCPUD-Olema-Bolinas Road Water Main Upgrade	500,000		
52	BCPUD-Disinfection Byproduct Treatment Facility	660,000		
53	BCPUD-Water Storage Capacity Expansion	1,400,000		
54	BCPUD-Invasive Reed Removal	250,000		
55	BCPUD-Distribution Pipeline Replacement	2,500,000		
56	BCPUD-Surfer's Overlook Water Main Relocation	750,000		
57	TVCSD-Tertiary Treatment & Recycling Planning Study	79,800	39,000	50%
58	TVCSD-Tertiary Treatment & Recycling Project	360,000	36,000	10%
59	East Shore Group - Wastewater Upgrade	2,000,000		
60	NMWD-Emergency Pipeline Across SA Fault	150,000		??
61	RCD-Habitat Improvement Project Implementation	500,000	125,000	25%
62	RCD-Ag Land Renewal Energy Proposal	5,000,000	1,250,000	25%
63	RCD-Coastal Prairie Improvement	500,000	125,000	25%
64	NPS-Grazing BMPs	400,000	200,000	50%
65	IPUD-Treatment Disinfection Byproducts	500,000	125,000	25%
66	IPUD-Distribution Pipeline Replacement	40,000	8,000	20%
67	IPUD-Asset Management Plan	10,000	2,000	20%
68	IPUD-Conservation Program	10,000	1,000	10%
69	IPUD-Treated Water Storage Expansion	300,000	150,000	50%
70	MCOSD- San Geronimo Road/Trail Sediment Reduction	700,000	105,000	15%
71	MCPW- Duxbury Reef Stormwater Quality ASBS	150,000	22,500	15%
72	MALT-Ag Land Conservation Easement Acquisition	4,290,000	2,831,400	66%
73	MMWD-Invasive Weed Management	50,000		
74	NPS-Riparian Restoration	250,000	125,000	50%
NOTE: Matching fund determination is underway for those projects with yet unspecified matching fund amounts.				
	TOTAL COSTS	**$ 40,712,100**	**6,871,300**	

Statewide Priorities

Photo by Greg Filbrandt

11. STATEWIDE PRIORITIES

STATE IRWM REQUIREMENTS: L. Statewide Priorities. Identify statewide or State agency priorities that will be met or contributed to by implementation of the Plan, proposal, or specific projects. Describe how the Plan, proposal, or specific projects were developed pursuant to Statewide Priorities.

11-1 OVERVIEW

The Statewide Priorities established by DWR and SWRCB address water supply, water quality and environmental issues are as follows:

- *Reduce conflict between water users or resolve water rights disputes, including interregional water rights issues;*
- *Implementation of Total Maximum Daily Loads that are established or under development;*
- *Implementation of Regional Water Quality Control Board (RWQCB) Watershed Management Initiative Chapters, plans, and policies;*
- *Implementation of the SWRCB's Nonpoint Source (NPS) Pollution Plan;*
- *Assist in meeting Delta Water Quality Objectives;*
- *Implementation of recommendations of the floodplain management task force, desalination task force, recycling task force, or state species recovery plan;*
- *Address environmental justice concerns; and*
- *Assist in achieving one or more goals of the CALFED Bay-Delta Program.*

11-2 ICWMP DEVELOPMENT

As discussed in Chapter 3, Objectives, all existing plans, reports and technical studies were reviewed. Key management issues were identified, which led to the development and ranking of objectives. Some of the key issues identified—water quality, water supply reliability, and ecosystem and habitat issues—relate directly to the Statewide Priorities. In reviewing management strategies and developing a process to identify projects and programs as part of the ICWMP, both the Statewide Priorities and State Preferences were considered. In particular, both Statewide Priorities and State Preferences were included on the Recommended Project form as projects were solicited, and were summarized and

considered during the project review and prioritization process. Last, the process used to review management issues and define objectives (Chapter 3) also led to the distillation of local priorities for the region (see Chapter 5).

11-3 ICWMP CONTRIBUTION TO STATEWIDE PRIORITIES

Of the eight Statewide Priorities, the Tomales Bay ICWMP contributes to five. As previously indicated, the planning area includes the critical coastal areas that include the watersheds of Tomales Bay and ASBS drainages. The planning area is not hydrologically related to the Delta, and the ICWMP would not assist in meeting Delta water quality objectives or achieving the CALFED Bay-Delta Program goals.

Environmental justice means the fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations and policies. While the Tomales Bay region does have "disadvantaged communities," according to the State Prop 50 Guidelines' definition (see discussion in Chapter 13), environmental justice concerns were considered in the preparation of the ICWMP. However, at this time no projects or programs that address environmental justice concerns have been brought forward.

Table 11-2 at the end of this chapter summarizes the 74 project recommendations considered in the ICWMP. The results show that most projects within the Plan contribute to Statewide Priorities. All of the short-term priority projects (shown in boldface type) also contribute to the Statewide Priorities. Further discussion of the ICWMP's contribution to each of the Statewide Priorities is provided below.

In addition to the listed Statewide Priorities, the State Guidelines request identification of other State agency priorities that would be addressed by implementation of the plan. For the Tomales Bay ICWMP, the plan implementation would contribute to reduction of pollutants to seven State-designated "critical coastal areas" within the planning area. This includes four ASBS areas, and thus implementation also would contribute to meeting water quality objectives set forth in the SWRCB's "California Ocean Plan" (2005). The ICWMP specifically includes a project that includes measures to reduce potential nonpoint source pollution into Duxbury Reef ASBS, which is considered a high priority ASBS by the SWRCB (State Water Resources Control Board, August 2006).

Additionally, the California Water Code and implementing legislation specifies that preference will be given to specific project types under the Prop 50 grant funding. These program preferences are reflected in the State's evaluation criteria and will be taken into consideration during the review process. Preference will be given to proposals that, as applicable:

- Include integrated projects with multiple benefits;
- Support and improve local and regional water supply reliability;
- Contribute expeditiously and measurably to the long-term attainment and maintenance of water quality standards;
- Eliminate or significantly reduce pollution in impaired waters and sensitive habitat areas, including areas of special biological significance;

- Include safe drinking water and water quality projects that serve disadvantaged communities; or
- Include groundwater management and recharge projects that are located: 1) in San Bernardino or Riverside counties; 2) outside the service area of the Metropolitan Water District of Southern California; **and** 3) within one mile of established residential and commercial development.

Table 11-3 at the end of this chapter summarizes how the ICWMP projects meet State Program Preferences. As can be seen, the ICWMP projects contribute significantly to the first four Program Preferences.

REDUCE CONFLICT BETWEEN WATER USERS

Reduce conflict between water users or resolve water rights disputes, including interregional water rights issues.

In 1995 the State Water Resources Control Board (SWRCB) issued Order WR95-17, which establishes minimum instream flow requirements and other measures to protect fishery resources in Lagunitas Creek that were impacted as a result of the Marin Municipal Water District (MMWD)'s raising of Peters Dam in 1982, which increased the storage capacity of Kent Lake. Order WR95-17 also required that the historic installation of a seasonal dam on private property (Giacomini) be relocated upstream by 1997. The Order further directed NMWD to find an alternative water supply during the summer months (July through October) of dry years. In response, the NMWD acquired a senior water right from the Giacomini Ranch and agreed to deliver the Giacomini Ranch irrigation water from an upstream raw water source (the Downey Well) and eliminate the installation of the summer dam in an effort to protect anadromous fish passage. An amended water rights license was approved by the SWRCB in May 2007.

Since the NMWD's wells are located within the tidal reach and within the flood zone of Lagunitas Creek, they are subject to tidal saline intrusions (from Tomales Bay) and dissolved contaminants from the creek. This results in occasional increased and excessive chloride and sodium concentrations in drinking water during high tide events of 6 feet or over when flows in Lagunitas Creek are simultaneously low. Until 1997, the impacts of tidal influence were blocked by annual installation of a summer gravel dam downstream on the Giacomini property. Without this construction, the District's wells are susceptible to high tide saltwater intrusion, which detrimentally affects domestic water supplies. NMWD has implemented an off-tide pumping plan that continuously monitors salinity levels and avoids pumping during high tide and low creek flow conditions. If salinity levels increase, the wells are systematically shut off 3 hours before and remain off until three hours after high tide conditions (again with Tomales Bay tides over 6 feet when there are low flows in Lagunitas Creek).

The rate of NMWD intake of water from Lagunitas Creek during dry year periods was also a prime issue of contention between NMWD and local environmental organizations and the California Department of Fish and Game (CDFG). Eventually a flow of 0.67 cfs (300 gallons per minute or 430,000 gallons per 24 hour day) during dry years was agreed upon. The need to flow water from

the wells at higher rates to recapture storage during dry years after a high tide (salinity avoidance pumping) requires a flow of 1.18 cfs (529 gallons per minute) for a limited period of time (within the 430,000 or 300 gallons per minute for 24 hours limitation). This was agreed upon by a stipulation by CDFG that the senior water right quantity of diversion is limited to 148.8 acre-feet of water per year (State Water Resource Control Board, May 2007). This agreement settled the contentions between the local environmental groups. However, the CDFG continued to protest the amended order, and wanted the limitation of 0.67 CFS to be part of the agreement for any intake flows at any time during a dry year. During high tide conditions this would severely limit the District's ability to recapture storage for its system from the Coast Guard Wells. It was in May 2007 that NMWD's petition to the SWRCB Division of Water Rights was approved, which will permit NMWD to increase pumping rates to recapture storage in the Point Reyes system at 529 gallons per minute or 1.18 cfs as long as the dry year limit of 432,000 gallons per day is met.

In 2000 the National Park Service (USNPS) acquired the 563-acre Giacomini Ranch at the mouth of Lagunitas Creek for wetland restoration. As discussed in Chapter 2, a wetland restoration project is proposed on the site, which will remove levees and tidegates on a former diked dairyland, restoring floodplain and intertidal habitat, as well as serving to improve freshwater flows and water quality in Tomales Bay. The USNPS has completed a draft Environmental Impact Statement/Report and has taken public comments on several preferred options. Depending on the option/alternative that is selected, salinity levels in NWMD's wells could be adversely affected due to some increase in salinity levels during spring or high tide conditions as a result of the planned restoration project (National Park Service, November 2006). NMWD has concerns about future potential impacts to its wells as a result of the planned wetland restoration project.

The ICWMP includes the NWMD Gallagher Well and Pipeline project that would construct additional wells near the District's existing Gallagher Ranch emergency well site and pipe that water to the existing Point Reyes treatment plant (2 miles away). The Gallagher Wells are upstream of the high tide influences of Tomales Bay. Thus, potential conflicts between domestic water suppliers and environmental restoration would be minimized, as the new alternative water source would provide water during periods of high tides and low Lagunitas Creek flows at a location further upstream, thus, avoiding salt water intrusion into the existing primary supply Coast Guard wells. The project also would help the District reduce off-tide pumping rates during dry year periods when in-stream flows in Lagunitas Creek are lower. This would eliminate the previous conflict with the California Department of Fish and Game and future potential conflicts as a result of the Giacomini Ranch wetland restoration project. The USNPS has expressed support of NMWD's efforts in pursuing grant money to develop its Gallagher Well project (North Marin Water District, email communication).

There are no other known existing conflicts between water agencies and other users or water rights disputes. However, in the Tomales Bay region, water "users" has a broader meaning than traditional water suppliers and appropriated water rights. In the Tomales Bay region, water users also include agricultural water users and the stream ecosystems that support special status species. In this regard, and as discussed in Chapter 3, several issues were raised during preparation of the ICWMP that the TAC felt needed ongoing discussion, review and/or evaluation as the plan is updated in the future or as new data becomes available. The water and resource management issues within the Tomales Bay generally have been addressed through collaboration between the stakeholders. However, there are

some issues or concerns in the planning area that are more complex due to pre-existing regulatory requirements and differences of opinion regarding these past decisions—i.e., the SWRCB Order WR95-17. The topics identified for further consideration include reservoir management (including stream temperatures for fish), water diversions, and agricultural water security. The effects of global climate change on water supply also may affect domestic and agricultural water use. Though not considered conflicts at this time, these potential issues have been identified, and it is the intent of the stakeholders to have ongoing policy discussions as part of implementation of the ICWMP and as data may become available.

IMPLEMENTATION OF TMDLS

Implementation of Total Maximum Daily Loads that are established or under development.

As discussed in Chapter 2, Tomales Bay, Lagunitas Creek and Walker Creek are on the federal 303(d) list (Clean Water Act) of impaired waterbodies for pathogens (Tomales Bay and Lagunitas Creek), sediment (Tomales Bay, Lagunitas and Walker Creeks), nutrients (Tomales Bay, Lagunitas and Walker Creeks), and mercury (Walker Creek). The San Francisco Bay RWQCB adopted a Pathogens TMDL in 2005, and adoption of a Mercury TMDL is pending.

Twenty-one specific projects have been identified through the ICWMP process by MMWD, MRCD, USNPS, SPAWN, State Parks Department, Marin County and the East Shore Improvement Project that address all key water quality issues: pathogens, sediment, mercury, nutrients and ASBS discharges. The proposed community-based East Shore Planning Group project, USNPS grazing management project, and upgraded bathrooms at parks along the bay are listed specifically as recommended actions in the Pathogens TMDL. The MMWD project to monitor mercury levels in Soulajule Reservoir and downstream areas is consistent with recommendations in the Draft Mercury TMDL staff report.

In general the project proposals outlined in the ICWMP include:

- Pathogens and nutrient reduction (continued repair/replacement of failing septic systems as part of the East Shore project, replacement of other septic/leachfield components at camp-ground and public areas near the bay, rancher outreach and continued BMP implementation to reduce nonpoint sources in runoff, and boat vessel removal/management in Tomales Bay);
- Sediment reduction (unpaved road and trail improvement, rancher outreach, stream bank repairs, removal of fish passage barriers created by culverts that also can aid sediment reduction efforts); and
- Mercury reduction (monitoring program to better determine mercury levels in Soulajule Reservoir and downstream areas).

IMPLEMENTATION OF WATERSHED MANAGEMENT INITIATIVE

Implementation of Regional Water Quality Control Board (RWQCB) Watershed Management Initiative Chapters, plans, and policies.

The SWRCB Watershed Management Initiative (WMI), which is a key component of the SWRCB Strategic Plan, promotes a watershed management approach for water resources protection. The WMI was developed to help State and Regional Boards meet their goal of providing water resource protection, enhancement, and restoration while balancing economic and environmental impacts. The San Francisco Bay Watershed Management Initiative 2004 identifies and addresses nonpoint sources. The Initiative identifies nine water quality priorities, and the ICWMP implementation would contribute to addressing the following five priorities:

- **Total Maximum Daily Loads (TMDLs)** – Priority TMDLs identified in the WMI include: Tomales Bay and Lagunitas Creek for pathogens; Walker Creek for mercury and sediment; and Lagunitas Creek for sediment.

- **Wetlands and Stream Protection** – Priorities include Basin Plan amendments to include a stream protection policy and additional beneficial uses for stream and wetland protection; permitting and technical oversight of several large wetland restoration and enhancement projects in San Francisco Bay and coastal areas; mitigation tracking and monitoring for wetland projects; and outreach and education to municipalities, consultants, and non-profit groups on application of sound stream and river protection principles to hydromodification projects.

- **Rural Nonpoint Sources –** Priorities include permitting and oversight of confined animal facilities (dairies, horse boarding, and other); application of sound management principles to vineyards and other agricultural land conversion activities; and oversight of existing Rural Wastewater and non-Chapter 15 Waste Discharge Requirements (WDRs).

- **Watershed Management –** Priorities include continuing to work with watershed stakeholders in areas including Tomales Bay, and developing capacity building and outreach for grant solicitations.

- **Watershed Monitoring and Assessment** – Priorities include the Surface Water Ambient Monitoring Program, Regional Monitoring Program, and coordination with other federal, State and local monitoring efforts.

Tomales Bay, Lagunitas Creek and Walker Creek all are identified as priorities for the State given their current impaired water quality listing. The WMI also identifies Tomales Bay as a priority for watershed management as related to agriculture. The WMI states that rangeland management to control pollutant discharges associated with livestock grazing on public parklands within Point Reyes National Seashore and Golden Gate National Recreation Area (within the Tomales Bay watershed) is a priority for funding because it is thought that such actions could achieve significant reductions in the

total loads of pathogens, nutrients and sediment being discharged into Lagunitas Creek and Tomales Bay. Furthermore, successful implementation of effective nonpoint source controls on grazed public lands would present an excellent opportunity for building partnerships with ranchers operating on private lands elsewhere in the Lagunitas Creek and Walker Creek watersheds.

Building on the *Tomales Bay Watershed Stewardship Plan*, the ICWMP with its water supply elements is the first step for the region in progressing toward an integrated watershed management approach. The 21 projects that support water quality improvement as discussed above, in addition to 13 wetlands, stream, habitat, and watershed management projects, also support identified Watershed Management Initiative priorities. The USNPS Grazing BMPs directly addresses the WMI priority related to rangeland management on public parklands. This project would implement BMPs at 10 priority locations on active grazing lands to address headcut stabilization, wetland and riparian protection fencing and establishment of seasonal pastures. These actions would contribute to reduction of sediment, pathogens and nutrients in Tomales Bay.

The Watershed Management Initiative also recognizes the significance of Critical Coastal Areas (CCAs), seven of which are within the Tomales Bay ICWMP planning area. One of the major issues noted in the WMI in all of Marin County is the preservation and restoration of the integrity of stream systems, including barrier removal for fisheries.

IMPLEMENTATION OF NONPOINT SOURCE POLLUTION PLAN

Implementation of the SWRCB's Nonpoint Source (NPS) Pollution Plan.

According to the State of California NPS Program Five-Year Implementation Plan for 2003-2008, the vision of the State's NPS Program is to "… reduce and prevent NPS pollution so that the waters of California support a diversity of biological, educational, recreational, and other beneficial uses." The key management measures that were identified in the current NPS Five-Year Implementation plan include the following:

- **Agriculture:** Erosion and Sediment Control, Nutrient Management, Pesticide Management, Grazing Management, Irrigation Water Management, Education/Outreach, and Agricultural Used Oil/Waste Management.
- **Forestry:** Pre-Harvest Planning, Streamside Management Areas, Road Construction/ Reconstruction, Road Management, Timber Harvesting, Site Preparation and Forest Regeneration, Fire Management, Re-vegetation of Disturbed Areas, Forest Chemical Management, Wetlands Forest Management, and Education/Outreach.
- **Urban:** Runoff from Developing Areas, Runoff from Construction Sites, Runoff from Existing Development, Onsite Disposal Systems, Transportation Development (Roads, Highways and Bridges), and Education/Outreach.
- **Marinas and Recreational Boating:** Assessment, Siting and Design, Operation and Maintenance, and Education/Outreach.

- **Hydromodification:** Channelization/Channel Modification, Dams, Streambank and Shoreline Erosion, and Education/Outreach.
- **Wetlands:** Riparian Areas Protection, Riparian Areas Restoration, Vegetated Treatment Systems, and Education/Outreach.
- **Other:** Abandoned Mines, Marine Native Plant Restoration, and Marine Invasive Species Eradication.

Implementation of the ICWMP would address a number of the management measures outlined in the NPS Plan, as summarized in Table 11-1. Measures that reduce sediments and nutrients related to agricultural runoff also address TMDLs. RWQCB activities for the Tomales Bay area include development of a TMDL for sediments and nutrients.

TABLE 11-1: ICWMP PROJECTS THAT IMPLMENT NPS PLAN

NPS Plan Management Measures	ICWMP Project
Agriculture 1A – Erosion & Sediment Control	▪ Devil's Gulch Road/Trail Sediment Control Project (#37) ▪ Devil's Gulch Road/Trail Sediment Control Project (#37) ▪ Nicasio & Soulajule Reservoir Water Quality (#42) ▪ MRCD Conserving Our Watersheds Phase II (#61)
Agriculture 1F – Grazing Management	▪ Duxbury Reef ASBS Integrated Stormwater Quality & Enhancement Project (#31) ▪ NPS Grazed Land BMPs (#64) ▪ Acquisition & Management of Agricultural Conservation Easements (#72) ▪ MRCD Conserving Our Watersheds Phase II (#61) ▪ MRCD Coastal Prairie Improvement (#63)
Agriculture 1G – Education / Outreach	▪ Rancher Outreach Program (#22)
Urban 3.4 – On-site Disposal Systems (OSDS)	▪ Stewart Horse Camp Septic Replacement (#36) ▪ East Shore Wastewater Upgrade (#59)
Urban 35F – Road, Highway and Bridge Runoff Systems	▪ Mt. Tamalpais Roads & Trails Management (#4) ▪ Lagunitas Creek Roads MOU Implementation & Other Road Sediment Reduction (#11, 12, 44, 47) ▪ MMWD Access Road Improvements (#17) ▪ Marin County Watershed Management Plan (#29) ▪ Olema Valley Trail Reroute & Stream Crossing Replacement (#35) ▪ Devil's Gulch Road/Trail Sediment Control Project (#37) ▪ San Geronimo Road & Trail Sediment Reduction (#70)
Hydromodification 5.3 – Streambank & Shoreline Erosion	▪ Lagunitas Creek Bank Stabilization & Riparian Revegetation (#9) ▪ Dickson Weir & Equestrian Facility Study (TU, 23) ▪ Lagunitas Creek Restoration Program (#46) ▪ Arroyo Creek, Woodacre Creek, San Geronimo Creek, & Kent Canyon Creek Fish Passage & Bank Stabilization Projects (#24 through 28) ▪ Lagunitas Creek Watershed Restoration – Bank Repairs & Riparian Revegetation (#46) ▪ RCD Conserving Our Watershed Phase II (#61)
Wetlands 6B – Wetlands-Riparian Restoration	▪ Silver Hills Creek Restoration Project (#30) ▪ Chicken Ranch Beach Restoration (#40) ▪ Riparian Enhancement (#45) ▪ RCD Conserving Our Watersheds Phase II (#61)
Wetlands 6D – Education-Outreach	▪ Marin County Watershed Management Plan (#29) ▪ Lagunitas Creek Watershed Grassroots Restoration Program for Private Lands (#49)

IMPLEMENTATION OF TASK FORCE RECOMMENDATIONS

> Implementation of recommendations of the floodplain management task force, desalination task force, recycling task force, or state species recovery plan.

The State has initiated a number of focused efforts to investigate key water management issues and opportunities, including floodplain management, desalination, water recycling, and species recovery. The ICWMP includes projects that implement or contribute to implementation of these recommendations as further described below.

Floodplain Task Force

Recommendation 16 of the DWR's Floodplain Management Task Force Final Recommendations Report (December 2002) recommends that flood management programs and projects maximize opportunities for agricultural conservation and ecosystem protection and restoration, where feasible. Considerations cited in the recommendation include: promote the recovery and stability of native species populations, and overall biotic community diversity; provide for natural, dynamic hydrologic, and geomorphic processes; increase and improve the quantity, diversity, and connectivity of native habitat.

Two projects would restore floodplain functions. The Silver Hills Creek Restoration Project (#30) would prepare conceptual plans to restore the outlet of Silver Hills creek to Olema Marsh. At some point during the last 50 years, the creek was diverted into a roadside ditch that currently is maintained by the Marin County Public Works Department. Silver Hills creek is one of the larger drainages flowing into Olema Marsh and supports a small run of steelhead despite the fact that its lower reach has been diverted and channelized. The proposed project would re-direct the Silver Hills drainage to Olema Marsh. The sediment would be captured via a sediment basin located in the road right-of-way that would reduce the habitat disturbance associated with frequent dredging of the channel and associated riparian habitat. The replacement of culverts on Levee and Bear Valley Roads in the Olema Marsh would improve hydraulic connectivity between upstream portions of Silver Hills Creek, Olema Marsh and Lagunitas Creek. The Chicken Ranch Beach Restoration project (#40) would result in the design, negotiation, engineering and facilitation of a restoration project that will improve the hydrologic functionality of lower elevations of the Chicken Ranch Beach subwatershed.

Recommendation 17 recommends nonstructural flood management approaches, and restoration and conservation of agriculture and natural lands. In planning new or upgraded floodwater management programs and projects, local and State agencies are encouraged under this recommendation to implement nonstructural approaches and the conservation of the beneficial uses and functions of floodplains. ICWMP projects that contribute to this recommendation include several projects that remove culverts and other drainage facilities to improve fish habitat (Dickson Weir Facility Study [#23] and San Geronimo fish barrier removal projects [#26], which is related to a larger restoration project for the upper San Geronimo Creek watershed). The disconnection of floodplains from the creeks has exacerbated these problems and resulted in severe localized flooding in some areas of the region. Another ICWMP project (#43) would 1) identify areas where floodplains can be reconnected to the streams, and

2) design reconnection to achieve reduction in floodwater elevation, increased groundwater recharge, enhanced summer streamflows, and improved salmonid winter habitat. This project also seeks implementation of small-scale residential and commercial stormwater catchment and re-infiltration projects for irrigation.

Desalination Task Force

The major recommendation of DWR's Desalination Task Force is that desalination projects should be evaluated on a case-by-case basis. Other recommendations seek to include desalination, where economically and environmentally appropriate, as an element of a balanced water supply portfolio, which also includes conservation and water recycling to the maximum extent feasible.

As indicated in Chapter 4, desalination is not a direct management strategy or implementation project for the Tomales Bay area. However, on a broader regional level, the MMWD is actively considering desalination as a supplemental water source. A pilot project and testing have been completed, and construction of a 10- to 15-mgd facility is proposed. Environmental review is nearing completion.

Recyled Water Task Force

Two projects included in the ICWMP would contribute to increasing recycled water statewide. The Tomales Village Community Services District's proposed tertiary treated water project would provide recycled water in the northern portion of the watershed, and also could reduce groundwater demand and improve water quality. On a broader regional level, MMWD has identified another potential user for its Las Gallinas recycled water: the Peacock Gap Golf Course, located outside of Tomales Bay. Supply to this user would require an increase in production/delivery of recycled water capacity.

Coho Salmon Species Recovery Plan

As discussed in Chapter 2, the CDFG prepared the "Recovery Strategy for California Coho Salmon" in 2004. The plan identifies approximately 20 goals and specific recommendations and implementation measures for the Tomales Bay watershed to achieve delisting of the species (see Appendix I). The ICWMP would contribute to implementation of recovery measures to include:

- Projects that contribute to reduction of sediment (# 11, 12, 17, 35, 37, 42, 44, 70).
- Projects that remove fish passage barriers (as identified by the County study by Ross Taylor) and improve stream habitat (#23, 24, 25, 26, 27, 28).
- The Recovery Plan's recommendation for restoration at Olema Creek is specifically addressed by the Silver Hills Creek Restoration Project (#30).
- Bank Stabilization and Riparian Revegetation (#9, 45, 46, 47).

TABLE 11-2: ICWMP CONTRIBUTION TO STATEWIDE PRIORITIES

ID #	PROJECT	Reduce user conflicts	Implement TMDL	Implement RWQCB Watershed int.	Implement SWRCB NPS Plan	Implement Task Force Recs	Address Environ-mental Justice Concerns
Projects in **bold typeface** are Short-Term Priorities – See Chapter 5.							
1	**NMWD-Gallagher Wells & Pipeline**	X					
2	NMWD-Pt. Reyes Water Treatment Improvements						
3	MMWD-Desalination Plant					X	
4	MMWD-Mt. Tamalpais Roads & Trails Management				X		
5	MMWD-Peacock Gap Recycled Water Extension					X	
6	MMWD-Watershed Assessment Program						
7	MMWD-Mercury Monitoring Program		X	X			
8	MMWD-Groundwater Recovery Feasibility Study-Phase 2						
9	MMWD-Lagunitas Creek Riparian Vegetation Work			X	X	X	
10	MMWD-Water Conservation: Rainwater Capture & Stormwater Use Project						
11	MMED-Lagunitas Creek Roads MOU Implementation Sediment Reduction		X	X	X	X	
12	**MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory**		X	X	X	X	
13	MMWD-Water System Security and Emergency Preparedness						
14	MMWD-Soulajule Reservoir Supply to Stafford Lake WTP						
15	MMWD-Water Conservation: Sustainable Wildland-Urban Interface Landscape						
16	MMWD-Water Conservation: Marin County Satellite Imagery Project						
17	MMWD-Pipeline and Tank Access Road Stormwater Improvements		X	X	X	X	
18	MMWD-Fencing Around MMWD Water Supply Reservoirs		X	X			
19	MMWD-Inkwells/Shafter Bridge Crossing Project: Planning						
20	MMWD-Inkwells/Shafter Bridge Crossing Project: Construction						
21	MMWD-Invasive Aquatic Weed Management Program					X	
22	RCD-Rancher Outreach Program		X	X	X	X	
23	TU-Dickson Weir & Equestrian Facility Study				X	X	
24	**MCPW-Arroyo Creek Fish Passage Restoration**		X	X	X	X	

TABLE 11-2: ICWMP CONTRIBUTION TO STATEWIDE PRIORITIES

ID #	PROJECT	Reduce user conflicts	Implement TMDL	Implement RWQCB Watershed int.	Implement SWRCB NPS Plan	Implement Task Force Recs	Address Environ-mental Justice Concerns
25	MCPW-East Fork Woodacre #2 Fish Passage Restoration		X	X	X	X	
26	**MCPW-San Geronimo Creek Fish Passage Restoration**		X	X	X	X	
27	MCPW- Woodacre Creek #3 Fish Passage Restoration		X	X	X	X	
28	MCPW-Kent Canyon Creek Fish Passage Restoration		X	X	X	X	
29	MCPW-Marin County Watershed Management Plan		X	X	X	X	
30	**MCPW-Silver Hills Creek Restoration Project**		X	X	X	X	
31	**BCPUD, MCPW, USNPS-Duxbury Reef Reserve Restoration**				X		
32	**USNPS-Pt. Reyes Headlands Reserve Restoration**				X		
33	**USNPS-Tomales Bay Boat Removal**		X		X		
34	USNPS-Tomales Bay Vessel Management Plan Implementation		X		X		
35	USNPS-Olema Valley Trail Reroute & Stream Crossing Replacement		X	X	X	X	
36	USNPS-Stewart Horse Camp Septic Replacement		X		X		
37	**USNPS-Devils Gulch Road/Trail Sediment Control**		X	X	X	X	
38	**USNPS-Tomales Bay Beach Campground Access and Restroom Improvements**				X		
39	**CPR-Heart's Desire Beach Restroom Leach Line Replacement**		X	X	X		
40	**TBWC-Chicken Ranch Beach Restoration**		X	X	X	X	
41	IPUD-Climate Change Assessment						
42	RWQCB-Nicasio & Soulajule Reservoir Management		X	X	X	X	
43	RWQCB-Stormwater, Flood Management & Instream Flow Enhancement		X	X		X	
44	RWQCB-Lagunitas Creek Watershed Sediment Reduction & Habitat Enhancement		X	X	X	X	
45	RWQCB-Riparian Zone & Large Woody Debris Enhancement		X	X	X	X	
46	**SPAWN-Lagunitas Creek Watershed Restoration Program for Private Lands, Bioengineered Bank Repairs**		X	X	X	X	
47	**SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs**		X	X	X	X	
48	SPAWN-Salmonid Monitoring		X	X		X	
49	**SPAWN-Lagunitas Creek Stormwater Initiative**						
50	BCPUD-Treatment Microfiltration Unit						
51	BCPUD-Olema-Bolinas Road Water Main Upgrade						

TABLE 11-2: ICWMP CONTRIBUTION TO STATEWIDE PRIORITIES

ID #	PROJECT	Reduce user conflicts	Implement TMDL	Implement RWQCB Watershed int.	Implement SWRCB NPS Plan	Implement Task Force Recs	Address Environ-mental Justice Concerns
52	**BCPUD-Disinfection Byproduct Treatment Facility**						
53	BCPUD-Water Storage Capacity Expansion						
54	BCPUD-Invasive Reed Removal						
55	BCPUD-Distribution Pipeline Replacement						
56	BCPUD-Surfer's Overlook Water Main Relocation						
57	**TVCSD-Tertiary Treatment & Recycling Planning Study**						
58	TVCSD-Tertiary Treatment & Recycling Project						
59	**East Shore Group - Wastewater Upgrade**		X	X	X		
60	NMWD-Emergency Pipeline Across SA Fault						
61	**RCD-Conserving Our Watersheds Phase II**		X	X	X	X	
62	RCD-Ag Land Energy Renewal						
63	RCD-Coastal Prairie Improvement				????		
64	USNPS-Grazing BMPs		X	X	X		
65	**IPUD-Treatment Disinfection Byproducts**						
66	IPUD-Distribution Pipeline Replacement						
67	IPUD-Asset Management Plan						
68	IPUD-Conservation Program						
69	IPUD-Treated Water Storage Expansion						
70	**MCOSD- San Geronimo Road/Trail Sediment Reduction**		X	X	X	X	
71	REVISED AND INCORPORATED INTO #31 AS JOINT AGENCY PROJECT						
72	MALT-Ag Land Conservation Esmt Acquisition		X	X	X		
73	MMWD-Invasive Weed Management						
74	**USNPS-Riparian Restoration**					X	

TABLE 11-3: ICWMP CONTRIBUTION TO STATE PREFERENCES

ID #	PROJECT	STATE PREFERENCES				
		Multiple Benefits	Water Supply	Water Quality Standards Attainment	Reduce Pollution in Impaired Waters & ASBS	Safe Drinking Water
1	NMWD-Gallagher Wells & Pipeline		X	X		
2	NMWD-Pt. Reyes Water Treatment Improvements		X	X		
3	MMWD-Desalination Plant		X			
4	MMWD-Mt. Tamalpais Roads & Trails Management			X		
5	MMWD-Peacock Gap Recycled Water Extension		X			
6	MMWD-Watershed Assessment Program					
7	MMWD-Mercury Monitoring Program			X	X	
8	MMWD-Groundwater Recovery Feasibility Study-Phase 2		X			
9	MMWD-Lagunitas Creek Riparian Vegetation Work					
10	MMWD-Water Conservation: Rainwater Capture & Stormwater Use Project		X			
11	MMED-Lagunitas Creek Roads MOU Implementation Sediment Reduction			X	X	
12	MMWD-Lagunitas Creek Roads MOU Implementation Assessment and Inventory			X		
13	MMWD-Water System Security and Emergency Preparedness		X			
14	MMWD-Soulajule Reservoir Supply to Stafford Lake WTP		X			
15	MMWD-Water Conservation: Sustainable Wildland-Urban Interface Landscape	X	X			
16	MMWD-Water Conservation: Marin County Satellite Imagery Project		X			
17	MMWD-Pipeline and Tank Access Road Stormwater Improvements		X			
18	MMWD-Fencing Around MMWD Water Supply Reservoirs			X		
19	MMWD-Inkwells/Shafter Bridge Crossing Project: Planning	X				
20	MMWD-Inkwells/Shafter Bridge Crossing Project: Construction	X				
21	MMWD-Invasive Aquatic Weed Management Program			X		
22	RCD-Rancher Outreach Program	X	X	X	X	
23	TU-Dickson Weir & Equestrian Facility Study	X				
24	MCPW-Arroyo Creek Fish Passage Restoration	X		X	X	
25	MCPW-East Fork Woodacre #2 Fish Passge Restoration	X		X	X	
26	MCPW-San Geronimo Creek Fish Passage Restoration	X		X	X	
27	MCPW- Woodacre Creek #3 Fish Passge Restoration	X		X	X	

TABLE 11-3: ICWMP CONTRIBUTION TO STATE PREFERENCES

ID #	PROJECT	STATE PREFERENCES				
		Multiple Benefits	Water Supply	Water Quality Standards Attainment	Reduce Pollution in Impaired Waters & ASBS	Safe Drinking Water
28	MCPW-Kent Canyon Creek Fish Passage Restoration	X		X	X	
29	MCPW-Marin County Watershed Management Plan	X		X	X	
30	MCPW-Silver Hills Creek Restoration Project	X		X	X	
31	BCPUD, MCPW, USNPS-Duxbury Reef Reserve Restoration			X	X	
32	USNPS-Pt. Reyes Headlands Reserve Restoration			X	X	
33	USNPS-Tomales Bay Boat Removal				X	
34	USNPS-Tomales Bay Vessel Management Plan Implementation				X	
35	USNPS-Olema Valley Trail Reroute & Stream Crossing Replacement			X	X	
36	USNPS-Stewart Horse Camp Septic Replacement			X	X	
37	USNPS-Devil's Gulch Road/Trail Sediment Control			X	X	
38	USNPS-Tomales Bay Beach Campground Access and Restroom Improvements			X	X	
39	CPR-Heart's Desire Beach Restroom Leach Line Replacement	X		X	X	X
40	TBWC-Chicken Ranch Beach Restoration	X		X	X	
41	IPUD-Climate Change Assessment	X	X			
42	RWQCB-Nicasio & Soulajule Reservoir Management		X	X		
43	RWQCB-Stormwater, Flood Management & Instream Flow Enhancement	X	X	X	X	
44	RWQCB-Lagunitas Creek Watershed Sediment Reduction & Habitat Enhancement	X	X	X	X	
45	RWQCB-Riparian Zone & Large Woody Debris Enhancement	X	X	X	X	
46	SPAWN-Lagunitas Creek Watershed Restoration Program for Private Lands, Bioengineered Bank Repairs	X		X	X	
47	SPAWN-Lagunitas Creek Watershed Restoration - Road Repairs	X		X	X	
48	SPAWN-Salmonid Monitoring			X	X	
49	SPAWN-Lagunitas Creek Stormwater Initiative	X	X		X	
50	BCPUD-Treatment Microfiltration Unit		X	X		
51	BCPUD-Olema-Bolinas Road Water Main Upgrade		X			
52	BCPUD-Disinfection Byproduct Treatment Facility		X	X		
53	BCPUD-Water Storage Capacity Expansion		X			
54	BCPUD-Invasive Reed Removal		X	X		
55	BCPUD-Distribution Pipeline Replacement		X			
56	BCPUD-Surfer's Overlook Water Main Relocation		X			
57	TVCSD-Tertiary Treatment & Recycling Planning Study	X	X	X	X	

TABLE 11-3: ICWMP CONTRIBUTION TO STATE PREFERENCES

ID #	PROJECT	STATE PREFERENCES				
		Multiple Benefits	Water Supply	Water Quality Standards Attainment	Reduce Pollution in Impaired Waters & ASBS	Safe Drinking Water
58	TVCSD-Tertiary Treatment & Recycling Project	X	X	X	X	
59	East Shore Group - Wastewater Upgrade			X	X	
60	NMWD-Emergency Pipeline Across SA Fault		X	X		
61	RCD-Habitat Improvement Project Implementation	X		X	X	
62	RCD-Ag Land Renewal Energy Proposal	X		X	X	
63	RCD-Coastal Prairie Improvement	X		X	X	
64	USNPS-Grazing BMPs			X		
65	IPUD-Treatment Disinfection Byproducts		X	X		
66	IPUD-Distribution Pipeline Replacement		X			
67	IPUD-Asset Management Plan		X			
68	IPUD-Conservation Program	X				X
69	IPUD-Treated Water Storage Expansion		X			
70	MCOSD- San Geronimo Road/Trail Sediment Reduction	X	X	X	X	
71	MCPW- Duxbury Reef Stormwater Quality ASBS	X		X		
72	MALT-Ag Land Conservation Easement Acquisition		X	X	X	
73	MMWD-Invasive Weed Management					
74	USNPS-Riparian Restoration			X		

12

Relation to Local Planning

Photo by Kathleen Goodwin

12. RELATIONSHIP TO LOCAL PLANNING

STATE IRWM REQUIREMENTS: M. Relationship to Local Planning. Discuss how the IRWM Plan relates to planning documents and programs established by local agencies. Demonstrate coordination with local land-use planning decision-makers. Discuss how local agency planning documents relate to the IRWM strategies and the dynamics between the two planning documents. Discuss the linkages between the Plan and local planning documents.

12-1 LOCAL PLANS, DOCUMENTS AND PROGRAMS

Existing plans, planning documents and current planning efforts are and will continue to be an integral part of the ICWMP process. As previously described, existing planning documents were reviewed to identify needs and issues in the region and were used in developing goals and objectives. These planning efforts provided background data and information relating to water supplies, water quality, stormwater management ecosystem restoration, habitat protection and improvement, and watershed issues in the Tomales Bay watershed region. The plans also suggest potential solutions for many issues. These documents provided a foundation for developing the ICWMP and an opportunity to link existing plans in a unified framework.

Table 12-1 summarizes the key plans and planning documents utilized for the ICWMP process. This table is not intended to be a comprehensive list of every report reviewed, but does reflect the primary planning documents and efforts within the Tomales Bay watershed region. (See Chapter 15 for a list of all plans, reports and documents reviewed as part of the preparation of this ICWMP.) The Tomales Bay Watershed Council's *Tomales Bay Watershed Stewardship Plan* and the water management and supply plans of the four water districts provided an essential starting point in the development of the ICWMP. Other major plans that have identified problems, issues and programs/projects for the watershed area include the *Marin County Watershed Management Plan* (2004), the *Lagunitas Creek Sediment and Riparian Management Plan* (MMWD, 1997), and the *Walker Creek Watershed Enhancement Plan* (2001). Continued report review will take place as existing and new documents, efforts and

projects are identified. It also should be noted that while these documents address "local" issues, some of the efforts were undertaken by regional, state or federal agencies.

12-2 COORDINATION WITH LOCAL AGENCIES

The local land use planning agencies and decision-makers are included in the ICWMP stakeholders. Representatives from the Marin County Community Development Department and the aide to the Board of Supervisors representative for the area are both members of the TBWC. Additionally, staff representatives from the County Public Works and Environmental Health Department were also on the TBWC and/or TAC. A description of the coordination with all federal, state, regional and local agencies is provided in Chapter 14 of this ICWMP.

12-3 ICWMP RELATIONSHIP TO LOCAL PLANS

The intent of the ICWMP is to combine and build upon the recommendations of local planning documents. The ICWMP has been developed as an extension to local planning efforts. To avoid conflict with local efforts, stakeholder involvement has been and will continue to be an integral part of the ICWMP process as discussed in Chapters 6 and 13.

This ICWMP, and the projects and programs recommended herein, are based upon, and in some cases dependent upon, a number of local or agency/organization-specific planning documents. The Tomales Bay ICWMP seeks to achieve a harmonious balance between local and regional planning activities to maintain consistency and reduce overlap, while respecting the respective roles and processes of local and regional jurisdictions and their planning and regulatory efforts.

The Tomales Bay ICWMP is intended to serve as a unifying document for previous local and regional planning efforts. It is not intended to supersede any of these documents, but to combine them into one overarching regional planning document that can serve as the next increment of coordinated regional planning. As a unifying document with multiple participant and stakeholder involvement, it combines previous planning efforts with new broader objectives and priorities, making the ICWMP consistent with established local and regional plans of the Tomales Bay planning area.

TABLE 12-1 LOCAL PLANS & DOCUMENTS

WATER SUPPLIES AND RELIABILITY	
WATER DISTRICT PLANS & STUDIES	Marin Municipal Water District. January 18, 2006 (Adoption Date). *Marin Municipal Water District Urban Water Management Plan 2005.*
	Marin Municipal Water District. June 2006. "Long Range Capital Program (2006-2015).
	North Marin Water District. July 2005. *Point Reyes Water Treatment Plan Upgrade Study North Marin Water District.* SPH Associates.
	North Marin Water District. October 2001. *West Marin Long Range Plan*. Brelje & Race.
	Bolinas Community Public Utility District. February 2001. "Watershed Sanitary Survey, Arroyo Hondo and Woodrat 1 & 2 Watersheds, Marin County, California."
	Inverness Public Utility District. January 2002. "Report on Watershed Sanitary Survey."
STATE ORDERS	State Water Resources Control Board. October 26, 1995. Order WR 95-17, Lagunitas Creek, Order Amending Water Rights and Requiring Changes in Water diversion Practices to Protect Fishing Resources and to Prevent Unauthorized Diversion and Use of Water.
	State Water Resources Control Board. May 7, 2007. "Change in Place of Use and Purpose of Use for License 4324B (Application 13965B) of North Marin Water District to Appropriate Water From Lagunitas Creek in Marin County."
GROUNDWATER MANAGEMENT	
STATE PLANS & STUDIES	California Department of Water Resources. 2003. "California's Groundwater." Bulletin 118.
	Kulongoski, J.T., Belitz, Kenneth, and Dawson, B.J. 2006. "Groundwater Quality Data in the North San Francisco Bay Hydrologic Provinces, California, 2004: Results from the California Groundwater Ambient Monitoring and Assessment Program." U.S. Geological Survey Data Series Report 167, U.S. Department of the Interior.
LOCAL STUDIES	Clearwater Hydrology and Nichols Berman. November 2005. "Hydrology and Water Quality Technical Report." Prepared for Marin County Community Development Department.
WATER QUALITY	
STATE PLANS	San Francisco Bay Regional Water Quality Control Board. ▪ October 2004. *Watershed Management Initiative Integrated Plan Chapter.* ▪ November 2004. *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin.* San Francisco Bay Regional Water Quality Control Board. ▪ July 8, 2005. "Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL) Staff Report." Prepared by Farhad Ghodrati, Rebecca Tuden. ▪ November 20, 2006. "Total Maximum Daily Load for Mercry in the Walker Creek Watershed, Staff Report." Prepared by Jill Marshall.
LOCAL PLANS	Prunuske Chatham, Inc. February 1997. *Lagunitas Creek Sediment and Riparian Management Plan.* Prepared for Marin Municipal Water District. [ALSO ADDRESSES RIPARIAN ISSUES]
	Pacific Watershed Associates. 2003. "Summary Report, Road and Trail Inventory and Assessment, Erosion Prevent Implementation Plan, Mt. Tamalpais Watershed." Prepared for MMWD.
LOCAL STUDIES	County of Marin Community Development Agency Environmental Health Services. October 2005. *Alternative Sewage Disposal Systems Seventh Annual Performance Review.*
	Marin County Septic Systems Technical Advisory Committee. December 2001. "Final Recommendations for Improving the Management of Onsite Wastewater Systems" (December 2001).
	Questa Engineering. Prepared for Marin County community Development Agency Environmental Health Services Division. ▪ May 10, 2006. *Draft Feasibility Report, East Shore Wastewater Improvement Project.* ▪ October 2005. *Community Coordination Plan East Shore Tomales Wastewater Upgrade Project; Marin County, California.*

TABLE 12-1 LOCAL PLANS & DOCUMENTS

LOCAL STUDIES (continued)	Economic & Planning Systems, Inc. June 19, 2003. Draft Report-*West Marin Septic Management Organizational Options and Feasibility Analysis.* Prepared for Marin County Community Development Agency.
	Prunuske Chatham, Inc. August 2005. *Geomorphology of the Walker Creek Watershed: Prospects for Habitat Enhancement and Sediment Management.* Prunuske Chatahm, Inc. Prepared for Marin Resource Conservation District. [ALSO ADDRESSES HABITAT ISSUES]
	Salmon Protection and Watershed Network. 2002. "Sedimentation from Unpaved Roads in the San-Geronimo sub-Watershed (Sprijng/Sumer 2002).
	Stetson Engineers, Inc. March 31, 2002. *San Geronimo Creek Watershed Sediment Source Sites and Assessment and Evaluation for the San Geronimo Creek Watershed Planning Program.* Prepared for Marin Municipal Water District.
ASBS AREAS	
STATE PLANS	State Water Resources Control Board.2005. Water Quality Control Plan, Ocean Waters of California – *California Ocean Plan*.
	State Water Resources Control Board. August 2006. "Areas of Special Biological Significance Status Report."
	California Ocean Protection Council. September 2006. *A vision for Our Ocean and Coast, Five-Year Strategic Plan*.
STORMWATER AND FLOOD MANAGEMENT	
LOCAL PLANS	May 2005. Marin County Stormwater Pollution Prevention Program. *Action Plan 2010.* Coordinated by Marin County Department of Public Works.
ECOSYSTEMS AND HABITAT	
STATE PLANS	California Department of Fish and Game. February 2004. "Recovery Strategy for California Coho Salmon," Report to the California Fish and Game Commission. Species Recovery Strategy 2004-1.
LOCAL PLANS	Leonard Charles and Associates. 1995. *Mount Tamalpais Vegetation Management Plan*. Prepared for Marin Municipal Water District and Marin County Open Space District.
LOCAL STUDIES	Stillwater Sciences. Prepared for Marin Resource Conservation District. ▪ February 2007. "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead." ▪ September 2004. "Lagunitas Limiting Factors Analysis, Phase 1: Potential Limiting Factors and Draft Study Plan for Phase II."
	Ross Taylor and Associates. June 2003. "Marin County Strem Crossing Inventory and Fish Passage Evaluation, Final Report." Prepared for the County of Marin Department of Public Works.
	Richard R. Harris, Ph.D., UC Berkeley. January 2001. *Effects of County Land Use Policies and Management Practices on Anadromous Salmonids and Their Habitats.* Final Report Prepared for the FishNEt 4C Program of Sonoma, Marin, San Mateo, Santa Cruz and Monterey Counties.
WATERSHED MANAGEMENT & LAND USE	
LOCAL LAND USE PLANS	Marin County Community Development Agency. August 2005. *The Marin Countywide Plan, Public Review Draft.*
	Marin County Planning Department. April 1, 1981 (Certified). *Marin County Local Coastal Program, Unit II.*
	Marin County Board of Supervisors. ▪ 2001. *Point Reyes Station Community Plan.* Marin County. ▪ December 2, 1997 (Adopted). *San Geronimo Valley Community Plan.* ▪ 1997 (Amendment). *The Bolinas Community Plan 1975*. ▪ 1985. *A Plan for the Bolinas Gridded Mesa*. (And approved by the California Coastal Commission.) ▪ 1983. *The Inverness Ridge Communities Plan*.

TABLE 12-1 LOCAL PLANS & DOCUMENTS

LOCAL MANAGE-MENT PLANS	Tomales Bay Watershed Council. July 2003. *Tomales Bay Watershed Stewardship Plan: A Framework for Action.*
	Marin Municipal Water District. 2005. *Mt. Tamalpais Watershed Road and Trail Management Plan.*
	Prunuske Chatham, Inc. April 2004. *Marin County Watershed Management Plan-Administrative Draft.* Marin County Community Development Agency, Planning Division.
	Prunuske Chatham, Inc. April 2001. *Walker Creek Watershed Enhancement Plan.* Prepared for Marin County Resource Conservation District.
FEDERAL PLANS	U.S. Department of commerce, National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program. 2006. *Gulf of Farallones National Marine Sanctuary Draft Management Plan.* http://www.sanctuaries.nos.noaa.gov/jointplan/

12

Stakeholder Involvement

Photo by Richard Blair

13. STAKEHOLDER INVOLVEMENTS

STATE IRWM REQUIREMENTS: N. Stakeholder Involvement - Identify stakeholders included in developing the Plan. Identify how stakeholders were identified, how they participate in planning and implementation efforts, and how they can influence decisions made regarding water management. Include documentation of stakeholder involvement such as inclusion of signatory status or letters of support from non-agency stakeholders, i.e., those who have not "adopted" the Plan. Include a discussion of mechanisms and processes that have been or will be used to facilitate stakeholder involvement and communication during implementation of the Plan. Discuss watershed or other partnerships developed during the planning process. Discuss disadvantaged communities within the region and their involvement in the planning process. Discuss efforts to identify and address environmental justice needs and issues within the region. Identify possible obstacles to Plan implementation.

13-1 STAKEHOLDER IDENTIFICATION

Stakeholder involvement has been essential in many of the projects and programs that have been undertaken in the Tomales Bay region. The area is unique from a statewide perspective in the number and types of public agencies and stakeholders involved in managing, monitoring and overseeing natural resources. The Tomales Bay Watershed Council (TBWC) is an existing stakeholder group which represents these interests from west Marin County and the Marin County critical coastal areas. Thus, the complete integration of natural resource and water agency stakeholders has been included in the process through the participation of the TBWC as manager of the Prop 50 Planning Grant.

The Tomales Bay Watershed Council (TBWC) was formed in January 2000 to develop a plan to improve the water quality of Tomales Bay and tributary streams and to protect and restore the entire watershed in a manner that sustains both human activities and natural resources. The aim of TBWC is to provide an ongoing, collaborative forum to comprehensively manage and protect Tomales Bay, its watershed and the interests of stakeholders. The TBWC is currently the only non-governmental organization considering issues facing the future of the Tomales Bay watershed in which all natural

resource managing entities and water agency stakeholders participate. TBWC has used consensus successfully to make decisions for over 7 years, thereby ensuring the long-term participation of a wide spectrum of stakeholders in watershed stewardship.

The TBWC's 32 members are drawn from local interest groups and agencies affected by or responsible for the watershed and its resources. The TBWC includes representatives from local, state and federal agencies; water districts; environmental organizations; citizen and residential groups; agricultural and shellfish industry interests; and recreational interests. Many of these entities already are involved in efforts to protect and improve the health of the watershed, either individually or through partnerships with others. All partners who manage water resources within the watershed or areas that drain to critical coastal areas (including Tomales Bay and "Areas of Special Biological Significance") are included.

Thus, the public agencies, non-governmental organizations, and other entities that were necessary to address the objectives and water management strategies of the ICWMP were involved in the planning process. The combination of these agencies and groups addresses all key issues identified in the ICWMP planning process: water supply and reliability, water quality, stormwater and flood management, habitat and ecosystem protection and enhancement, and watershed management.

Represented agencies and organizations on the TBWC include:

- Federal Agencies (National Park Service – Point Reyes National Seashore, Gulf of Farallones National Marine Sanctuary, Point Reyes Bird Observatory (PRBO) Conservation Science)
- State Agencies (Regional Water Quality Control Board, Department of Fish and Game, Department of Parks and Recreation, Department of Health Services, UC Cooperative Extension)
- Water Suppliers (BCPUD, IPUD, MMWD, NMWD)
- Local Agencies (Marin County Community Development Agency, County Supervisor for the area)
- Special Districts (Marin Resource Conservation District)
- Non-profit Organizations (Environmental Action Committee of West Marin, Salmon Protection and Watershed Network [SPAWN], Tomales Bay Association, Cypress Grove Research Center—Audubon Canyon Ranch)
- Agricultural & Shellfish Industry Interests (Marin County Farm Bureau, Tomales Bay Agricultural Group, Marin Agricultural Land Trust, Sonoma-Marin Cattlemen's Association, Hog Island Oyster Company)
- Citizens Groups, Associations and Residents (East Shore Planning Group, Inverness Association, Inverness Yacht Club, and local watershed residents)

While all of the organizations and agencies with resource management responsibility/authority for watershed resources are represented on the TBWC, there may be stakeholders who are not represented through Council membership. For instance, a few agencies and business community interests are absent. The business community, which has no statutory or other direct responsibility, is clearly affected by decisions made about resource management. Business, as a constituency, is not well represented on the Council and has been designated as a recruitment priority for the coming year, as will be other agencies and entities that are identified throughout the process.

13-2 STAKEHOLDER PROCESS

STAKEHOLDER PROCESS DURING ICWMP PREPARATION

TBWC and Technical Advisory Committee Meetings

The monthly meetings of the TBWC have included status reports and updates regarding the ICWMP. Additionally, the TBWC reviewed and provided direction on key elements during the preparation of the ICWMP: key management issues, objectives and regional priorities, as well as project prioritization. Thus, all stakeholders have been kept informed and have participated in the ICWMP process.

In February 2006 the Executive Committee for the TBWC identified 16 people/organizations that they felt should participate on a Technical Advisory Committee (TAC) that would guide the development and preparation of the ICWMP. This list was then forwarded to the full TBWC at their meeting in March 2006 for approval. Current TAC members include representatives from:

- Federal Agencies (National Park Service)
- State Agencies (Regional Water Quality Control Board, UC Cooperative Extension)
- Water Suppliers (NMWD with BCPUD, IPUD and/or MMWD as alternate)
- Local Agencies (Marin County Public Works, Marin County Department of Environmental Health)
- Special Districts (Marin Resource Conservation District)
- Non-profit Organizations (Environmental Action Committee of West Marin/Sierra Club)
- Citizens Groups and Associations (East Shore Planning Group and local watershed residents)

The TAC has met monthly or twice a month, sometimes more often, since March 2006 and has reviewed key elements of the ICWMP planning process and plan document and made suggestions. This includes reviews of key management issues within the region, definition of objectives, review and prioritization of projects, and review of ICWMP document sections. Five TAC subcommittees were formed to deal with specific key issues: water supply, ASBS areas, stormwater management, septic solutions, and project review. These subcommittees have met as needed to review pertinent issues and technical study methods for these topics. In addition, a Project Proponents meeting was held by the Project Subcommittee to allow for further presentation of project information, how best to handle excellent project proposals received that do not fit well under Prop 50 guidelines, how to keep updating the projects list, opportunities for collaboration (e.g., on fundraising), and the like. An additional Project Proponents meeting was held in June 2007 to discuss the final project rankings/prioritization and to solicit input from the 16 project proponents as to the best processes for updating both the plan and the project ranking as new projects are identified, or already submitted projects are refined.

Public Outreach, Meetings and Workshops

Public outreach during the course of the ICWMP was a composite of publicly advertised meetings, notices in local newspapers, items in TBWC member newsletters, and reports from TBWC representatives back to their own organizations at board meetings and through internal communication. All TBWC meetings are open to the public. In the interest of full disclosure and transparency the following TBWC meetings were advertised locally as ICWMP meetings and the agendas published in local media to encourage participation: December 19, 2006, and June 19, 2007.

Finally, an important element of the public involvement program was implemented as a result of the Septic Solutions Report (SSR) (See Appendix L). The scope for the SSR included the evaluation of existing management plans to document findings and/or conditions within selected communities, prioritization of "problem" communities and provision of forums for community-based discussions to identify management options, and submittal of the report summarizing project activities to review by the TAC and, ultimately, the Council.

A Subcommittee formed was formed in mid-2006 specifically to implement the SSR component of the ICWMP to evaluate the data gathered during preparation of the ICWMP. The Subcommittee identified four target communities based on this data: Inverness, Woodacre, Bolinas and the San Geronimo Valley. The SSR involved two primary components: outreach to the community of Inverness through the Inverness Association, and outreach to the Woodacre community via the formation of a new citizens group. The communities of Bolinas and the San Geronimo Valley will be approached in the fall of 2007 through already existing groups. The two communities will have the opportunity to organize community efforts (with some support of the TBWC).

The Inverness effort involved seven members of the Inverness Association (IA). The IA is over 75 years old, and over the years has been very active in planning matters, especially in the development of the Community Coastal Plan mandated by the Coastal Act. The IA serves as the contact point for the County in any proposed construction where design review is required, and also serves as a community forum within which neighborhood issues can be discussed. The IA works to mediate various kinds of community issues. The Inverness Planning Area extends north to Sea Haven, a development immediately south of Shell Beach, and south to Fox Drive, that being just under 3 miles from the village of Inverness. The community plan is called the Inverness Ridge Plan and covers that entire area.

The Inverness Association developed a handout about septic system monitoring and maintenance that ultimately was distributed to over 1,000 residents in the Inverness Ridge Planning Area. This brochure also was distributed at the annual meeting of the Inverness Association in July 2007 and was the subject of a segment of the meeting.

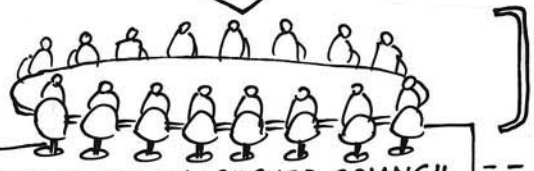
The community of Woodacre did not have an existing citizens group or organization. With the assistance of the ICWMP consulting team, a series of meetings were held in the community to determine whether there was sufficient interest and commitment among members of the community to design and implement a local education program. In the community of Woodacre the public outreach effort began with a targeted mailing to residents, soliciting their participation in a discussion about possible

STAKEHOLDER INVOLVEMENT

LOCAL, STATE & FEDERAL AGENCIES

ALL FOUR LOCAL WATER AGENCIES

LOCAL NON-PROFIT ORGANIZATIONS



PUBLIC MEETINGS

TOMALES BAY WATERSHED COUNCIL

TECHNICAL ADVISORY COMMITTEE

FORMED FOUR SUB-COMMITTEES

SEPTIC SOLUTIONS

INVERNESS

Septic System Monitoring & Maintenance Brochure

400+ Recipients

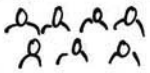
WOODACRE

Woodacre Flats Waste-Water Group (WFWG)

[formed via TBWC outreach]

↓

Community-wide Meeting



50 PEOPLE

↓

Committed to ongoing meetings

SSR

(SEE APPENDIX L)

MUNICIPAL STORMWATER

Monitoring Winter 07

↓

MSARR

Additional Monitoring Winter 07/08

↓

Will be making recommendation for water quality improvement

(SEE APPENDIX M)

ASBS WATERSHED ASSESSMENTS

ASBS Existing Conditions Evaluation

↓

Recommendation:

- Future study
- Improvements

(SEE APPENDIX K)

LATINO OUTREACH

Purpose:

- Education
- Solicit feedback from community

Work Plan Created

↓

Community presentations & video to 50+ Latinos (In English & Spanish)

↓

School Project in Fall 07

↓

Formation of Standing Committee to provide ongoing collaboration & outreach connections

local solutions for ongoing problems with septic tanks in the community. The committee meetings extended over six months and culminated in a community-wide meeting on June 7, 2007. After two meetings and discussion of potential alternatives for onsite wastewater management, it was decided that another community meeting would be held in fall 2007.

STAKEHOLDER PROCESS DURING IMPLEMENTATION

For plan implementation, stakeholders will participate in the same manner as with preparation of the ICWMP. The contracts with project proponents will be coordinated by the TBWC staff to assure that funded projects are completed on schedule and within allocated budgets. The TBWC will require each of the project proponents to submit to the Council monthly progress/status reports detailing the status of project implementation and progress of their funded projects. The TBWC will appoint an Implementation subcommittee that will meet quarterly to review each of the funded projects with regard to status and progress toward completion and will report back to the Council. The Council also will review quarterly reports to assess how well the projects are achieving their stated objectives and to ensure that completed projects contribute to achieving the objectives of the ICWMP.

Photo by Greg Filbrandt

For projects that are funded outside of the Prop 50 context, the TBWC will continue to serve as a focal point for exchange of information regarding project status, ongoing implementation efforts and communication among project proponents. The Council's monthly meetings will also serve as a forum through which new and evolving projects can be added to the plan. Because the council represents all the regional stakeholders, the council is the logical entity to coordinate ongoing implementation of projects seeking funding from other funding sources. The council further serves as a venue for project proponents to develop ideas for new projects as ongoing studies and projects are completed that reveal the need for new strategies to achieve the objectives stated in the plan.

Regular council meetings and subcommittee meetings will provide a forum for stakeholder input into ICWMP implementation. The TBWC has working rules of order that formalize stakeholder input. Additional stakeholders will be identified through the planning efforts, advertisement, and active recruitment throughout west Marin among those individuals and communities potentially affected by the plan. Furthermore, each water agency has a board of directors and local outreach efforts that will be utilized to involve stakeholders in the ICWMP development and implementation.

13-3 PARTNERSHIPS DEVELOPED DURING ICWMP PROCESS

The TBWC is 7 years old, and successfully developed the *Tomales Bay Stewardship Plan* in 2003. Upon initiation of the ICWMP, the Council reassessed its membership to determine whether other participants should be included to ensure that all stakeholders within the planning area were fully represented within the Council. As a result, several water agencies and other environmental stakeholders were recruited into the Council with full membership. Through the ICWMP process, water supply issues and interests were added, the Bolinas Community Public Utility District was brought on the Council, and the planning area has expanded in response to the region's concerns.

Over the course of the preparation of the ICWMP, this expanded Council worked together to identify not only projects for consideration from individual proponents, but also opportunities for proponents to collaborate and form partnerships. These partnerships were sought to develop specific projects or long-term strategies for addressing the objectives identified in the plan in a collaborative way. In particular, following "the call for projects," diverse proponents within the Council met in small groups and in the context of the TAC and project review subcommittee meetings to identify opportunities for short- and long-term partnerships within the watershed.

13-4 DISADVANTAGED COMMUNITIES & ENVIRONMENTAL JUSTICE

A "disadvantaged community" is defined by the State of California as a community with an annual median household income (MHI) that is less than 80% of the statewide MHI (CA Water Code, Section 79505.5[a]). Census data from 2000 were collected and reviewed to identify any disadvantaged communities in the region. The 2000 State MHI was $47,493; therefore, communities with an average MHI of $37,994 are considered disadvantaged communities. Based on the 2000 census data, none of the Tomales Bay communities are considered disadvantaged communities under this definition (see Appendix C).

However, it is estimated that up to 15.9% of families in the Tomales Bay watershed are below U.S. poverty levels (Tomales Bay Watershed Council, June 2006). The majority of these families reside in areas outside of the settled areas of West Marin (see Figure 21-*Percent of Families Below Poverty Line*). Although these communities are not disadvantaged according to the Sate definition, one of the primary goals of the Council is to engage and include these "locally-defined" disadvantaged communities through outreach activities.

In addition, the Tomales Bay ICWMP planning efforts seek to ensure that environmental justice concerns in general are addressed. Pursuant to State law, this involves the "fair treatment of people of all races, cultures, and income with respect to development, adoption and implementation of environmental laws, regulations and policies (Government Code section 650401(c)). The Latino Community is considered a local environmental justice (EJ) focus.

The Latino community is extremely diverse; it is comprised of undocumented immigrants, documented immigrants, naturalized citizens, first-generation immigrants, as well as Latinos whose family settled region prior to the 1800s. According to the 2000 census, Latinos represent about 19 percent of West Marin's total population – 8 percentage points higher than the countywide Latino population. In contrast, Latinos make up 32.4 percent of the state's population. Twenty-eight percent of Marshall's population is Latino – just ahead of Inverness (including the northwestern National Seashore), with Latinos representing 27 percent of the population. Other towns with high Latino populations include Olema (27 percent), Nicasio (13 percent), Tomales (10 percent), and the Point Reyes Station-Inverness Park area (9 percent).

The local Latino community was comprised of Mexican immigrants who earned their living as farm and dairy workers within the watershed, becoming the backbone of the dairy industry in this Marin County. Many of the older generation of Latino residents are less educated than the subsequent generations who have gone through the local school system and have found work outside of the ranches, working in other areas of interest throughout the County and beyond. While Spanish is the dominant language within this demographic group, by no means are all local ethnic Latinos Spanish-speaking. Currently, Latinos' predominant professions are construction, landscaping and service industries, however, they are increasingly found in professional fields, i.e. administrative positions in business and education. Similarly, home ownership among Marin's Latino population is low, but increasing.

Both the disadvantaged and Latino communities of the region experience the same water related issues and needs as the rest of the community. The rural disadvantaged and Latino communities in the region experience water supply problems because they are either outside the service area of local water agencies and, thereby, dependent on wells, or experience water distribution problems due to aging infrastructure. Those residents who rely on wells experience localized water quality issues that result from contamination by bacteria or metals. Statistical documentation of constituency-specific water related needs is unavailable. Virtually all of West Marin is dependent upon onsite wastewater disposal systems (septic systems). The lack of water supply and wastewater treatment infrastructure throughout the rural portions of the county will continue to be an issue.

The goals of the outreach program for both disadvantaged and EJ communities are the same. As previously mentioned, the TBWC made outreach to these communities from the inception of the ICWMP process, during plan development, and have determined to continue such efforts during plan implementation. The initial approach of the TBWC's outreach consisted of four goals: (1) to educate local residents on watershed-related issues and gain insight into projects that would address local concerns; (2) create relationships with constituencies to support ongoing participation in plan development and refinement; (3) recruit participants and members for the TBWC from these communities; and (4) provide opportunities for participation to community members without the time and/or interest to attend TBWC meetings.

In the Tomales Bay plan area, it rapidly became apparent that both the disadvantaged and EJ constituencies were geographically dispersed (and therefore experienced long distances between meeting venues and their residence), did not have formal community representation, lacked staff and/or financial resource to participate in an ongoing process, and were uncertain of how water

management related directly to their constituency concerns. As a consequence, it became difficult for the TBWC to achieve their implementation goals through traditional methods of public involvement (i.e.: public meetings and newsletters).

Therefore, the TBWC adapted its approach and developed an alternative strategy for outreach. In October of 2006, discussions began to determine the best way to involve the Latino community of the Tomales Bay Watershed in the ICWMP process. A strategy was developed and presented to the TAC for consideration. This strategy was developed in part based on conversations with staff of organizations that are external to the ICWMP process, which specialize in diversity consulting (i.e., The Institute for Conservation Leadership in Washington, DC and Visions, Inc. of Arlington, MA). The strategy involves the following components: identification of local representatives, direct personal contact with those representatives, briefings and relationship building activities, and other similar tasks.

The strategy also involves "taking the process to the community" instead of asking the community to come to the process. In other words, rather than design a process and impose it on the local community, the decision was made to ask community leaders within the Latino community to design their own process to involve their community in the ICWMP process. A meeting was convened to solicit input from leaders in the West Marin Latino Community, with a goal to develop the most suitable outreach for the local Latino community on watershed issues. This group determined that education would be an initial requirement prior to community involvement.

The product of this collaboration by the TBWC and local Latino leaders was the Latino Outreach Project. The goals of the project were to:

1. raise awareness of watershed issues among the Spanish-speaking population,
2. determine what future activities might be undertaken to build ownership of the watershed within the Latino community,
3. determine how to communicate the Latino concerns about watershed issues to decision-makers,
4. inform the Latino community about the development of project and implementation priorities within the watershed,
5. provide direct outreach to a constituency that otherwise would be excluded from the local decision-making about watershed management, and
6. raise awareness among the school-age community about just what a watershed is, what their place in the watershed is, how their behaviors can affect the watershed, and what actions they can take to be good citizens of the watershed.

As a result of the coordination meeting, a number of Latino outreach activities were considered and selected including a church-related outreach. The event was advertised on a local Spanish speaking radio show and on flyers at the Church and windows of local businesses. After mass, parishioners were invited outside the church to watch *Madre Tierra Solo Hay Una* (*There is only one Mother Earth*). After the film, TBWC president, Carlos Porrata, led a discussion about water management, avenues

for watershed activism, and the role that individuals can play in water quality. Because of the church-related outreach, several follow-up actions have been planned by Latino community leaders including an educational program for the workers of a Latino businessman's landscape company.

In addition to the church-related outreach, the TBWC identified the importance of developing educational programs. Environmental stewardship is not always the highest priority within disadvantaged communities; however environmental education in local schools has demonstrably affected the stewardship values of school-aged children. Education to help citizens understand the role they can play in water-supply, water quality, and environmental habitat and restoration will continue to be a plan priority. Educational outreach plans include: helping teachers expand school curriculum, school-based art projects, community-wide contests, and library-based outreach.

Working through previously established relationships, the Council will provide stipends to ensure participation and attendance, direct technical assistance to build capacity for participation within targeted communities, informal "at-home" meeting opportunities to facilitate wider participation, distribution of materials at public gathering points and through the mail, and identification of partners with whom to collaborate in project development. On-going outreach will be designed to take these factors into account.

13-5 POTENTIAL OBSTACLES TO PLAN IMPLEMENTATION

Obstacles to implementation of the Plan primarily include availability of funding, durability of consensus and continued stakeholder participation. Most of the TBWC partners do not have the financial resources to implement the projects they have identified as important for the plan area. This situation is unlikely to change in the near future. Thus, the availability of funding will continue to be a limitation to plan implementation.

During the ranking and prioritization of the projects the TBWC members showed themselves to be remarkably altruistic. Many of the project proponents willingly moved their projects out of contention for Prop 50 funding under the assumption that their projects would be eligible or more competitive for funding under Prop 84. They also moved up projects for funding consideration that might have a lesser ability to compete under Prop 84. This focus on the plan as a vehicle for funding may contribute to problems later if high priority projects do not get funded while lower priority projects do get funded. Implementation of the Plan will depend on all stakeholders continuing to pursue project funding regardless of the availability of state bond funds. This competition for funding has already been identified as an obstacle for plan implementation.

Some of the entities in the TBWC are participating directly because of the funding requirements of Prop 50. It is not yet clear whether the Boards of these organizations will want to continue their association with the TBWC after Prop 50 is complete. If these groups were to separate from the Council, the ongoing implementation effort could suffer as regular communication and direct conversation diminish.

Potential conflicts could arise in the future over water supply and/or as a result of global climate change. Potential conflicts between land uses, water supply and environmental protection could arise in the future that may result in conflicts over funding needs, consensus and continued stakeholder participation. Unresolved questions and issues raised during the ICWMP process are addressed in Chapter 3. With regard to septic systems, there has been an underlying significant struggle regarding how to resolve water quality issues without raising growth and development concerns. Additionally, two other significant impedimentsare (1) the lack of available public financial assistance to septic system owners to fund replacement or repair systems and (2) regulatory resistance to and/or prohibition of demonstrated successful alternative technologies as options for property owners to repair/replace existing systems.

Legend

Study Area Boundary

Areas of Special Biological Significance

Percent of Families Below the Poverty Level

- 4.3%
- 5.5%
- 5.6%
- 6.7%
- 12.6% - 15.9%

TOMALES BAY INTEGRATED COASTAL WATERSHED MANAGEMENT PLAN

Figure 21. Percent of Families Below Poverty Line

Agency Coordination

Photo by Kathleen Goodwin

14. AGENCY COORDINATION

STATE IRWM REQUIREMENTS: O. Coordination - Identify State or federal agencies involved with strategies, actions, and projects. Identify areas where a State agency or other agencies may be able to assist in communication, cooperation, or implementation of Plan components or processes, or where State or federal regulatory decisions are required for implementation.

14-1 AGENCY COORDINATION

As discussed in the Stakeholder Involvement section (Chapter 13), federal, state and local agencies have been engaged throughout the ICWMP preparation. These activities have included participation at TBWC, Technical Advisory Committee and subcommittee meetings. Additionally, agency staff have worked with the Council and consultant team to provide studies and other data, and discuss study findings and conclusions. The agencies that further participated on the TAC and TAC subcommittees were also strongly involved in the review of ICWMP draft sections prior to completion of the public review draft ICWMP. Coordination and involvement of these agencies will continue throughout ICWMP implementation efforts. Table 14-1 summarizes the activities of these agencies. The end of Chapter 2 also summarizes current and recent activities and programs of these agencies and other non-governmental groups.

14-2 REGULATORY SUPPORT

Regulatory support and agency involvement is essential to the eventual implementation of projects identified in this plan. In the future, some projects will require permits from different agencies in order to construct facilities, install improvements and/or work within stream channels, or to undertake restoration or habitat enhancement programs. Approximately 35% of the Plan projects (approximately 25) involve facility construction (i.e., water and/or wastewater facilities). Another 25% involve restoration or other physical improvements or maintenance (i.e., trail improvement or removal of fish passage barriers). Except for larger regional water supply projects (such as MMWD's

desalination and recycling projects), typical permits that may be required to implement some of the ICWMP projects include, but are not limited to:

- CALIFORNIA DEPARTMENT OF FISH AND GAME: Streambed alteration agreements for improvements and/or alterations within streams.
- CALIFORNIA DEPARTMENT OF HEALTH SERVICES: Approval of water supply, distribution, treatment facilities and/or improvements.
- SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD: Water Quality 401 Certification and Waste Discharge Requirements and/or waivers to WDRs.
- U.S. ARMY CORPS OF ENGINEERS: Section 404 authorization for work in wetlands or waters of the U.S.
- MARIN COUNTY: Coastal development and/or land use permits for certain types of projects.
- CALIFORNIA COASTAL COMMISSION: Coastal development permits for certain types of projects within coastal zone.
- U.S. FISH AND WILDLIFE SERVICE: Threatened and endangered species protection consultations.

The ongoing involvement of stakeholder agencies in the implementation of the ICWMP will help facilitate and coordinate permit requirements. Some projects requiring permits may be facilitated by the Marin Resource Conservation District (RCD), which acquires funding for and implements soil conservation, water quality improvement, erosion control, erosion prevention, or stream bank stabilization projects. Division 9 of the State Public Resources Code also provides an RCD with the regulatory authority to work, with the consent of affected private property owners, to make improvements or conduct operations that will further water quality improvement and the prevention and control of soil erosion. The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), the RCD's federal partner for the program, provides technical assistance and cost sharing to private landowners ("cooperators") working in partnership with the RCD/NRCS to develop conservation systems uniquely suited to their land (Marin Resource Conservation District, June 2004).

The RCD's "Marin Coastal Watersheds Permit Coordination Program" is one example of coordination among regulatory agencies. The program provides coordinated regulatory review for implementation, under the sponsorship of Marin RCD/NRCS, of 16 specific conservation and restoration practices that are intended to reduce erosion and enhance aquatic and terrestrial habitat in the Marin County coastal watersheds. This program will provide the catalyst for high quality erosion control and habitat restoration throughout the Tomales Bay area (Marin Resource Conservation District, June 2004). The program is based on a model of coordinated, multi-agency regulatory review that ensures the integrity of agency mandates but makes permitting more accessible to farmers and ranchers than the traditional process. Through the program, regulatory agencies issue permits to the RCD/NRCS that cover projects on private lands provided landowners work under the supervision and Sponsorship of the RCD and/or NRCS.

TABLE 14-1: SUMMARY OF AGENCY COORDINATION

AGENCY	JURISDICTION/INTEREST	ICWMP COORDINATION
FEDERAL AGENCIES		
Gulf of Farallones National Marine Sanctuary	Protection of offshore marine sanctuary.	TBWC Member
National Park Service, Point Reyes National Seashore	Own and manage the Point Reyes National Seashore, whose lands are within the watersheds of critical coastal areas.	TBWC Member, TAC Member, subcommittee member (ASBS, Septic, Stormwater, Project Review), and data/information source during preparation of the ICWMP
STATE AGENCIES		
California Department of Fish and Game	Administers mariculture leases in Tomales Bay. CDFG's Fisheries Restoration Grant Program and other programs have funded projects within the Tomales Bay watershed.	TBWC Member
California Department of Health Services	Monitors safety and quality of harvested mariculture products in Tomales Bay.	TBWC Member
California Department of Parks and Recreation	Owns and manages State Park lands and facilities within Tomales Bay watershed.	TBWC Member
San Francisco Bay Regional Water Quality Control Board	Protection and management of surface water and groundwater quality. Facilitates the Tomales Bay Technical Advisory Committee.	TBWC Member, TAC Member, subcommittee member (Septic), and data/information source during preparation of the ICWMP
State Water Resources Control Board	Preserve, enhance and restore the quality of California's water resources and ensure their proper allocation and efficient use.	Regular meetings and contact with staff during preparation of the ICWMP
U.C. Cooperative Extension		TBWC Member, TAC Member, subcommittee member (Project Review, Stormwater), and data/information source during preparation of the ICWMP
LOCAL AGENCIES		
Bolinas Community Public Utility District	Public Utility District that provides domestic water service to, as well as sewage collection and treatment and solid waste disposal for, the community of Bolinas.	TBWC Member, TAC Member, subcommittee member (ASBS, Septic, Stormwater, and alternate to Water Suppliers), and data/information source during preparation of the ICWMP
County of Marin, Board of Supervisors, District 4 (includes Tomales Bay	Serves as the legislative and executive body of Marin County pursuant to State law	TBWC Member, subcommittee member (Septic)

TABLE 14-1: SUMMARY OF AGENCY COORDINATION

AGENCY	JURISDICTION/INTEREST	ICWMP COORDINATION
planning area)		
County of Marin, Community Development Department (includes Department of Environmental Health)	Oversees County land use planning and regulatory programs. Issues septic permits	TBWC Member, TAC Member , subcommittee member (Septic)
County of Marin, Public Works Department	Provides County with a safe environment and enhanced quality of life through improvements to and maintenance of public infrastructure. Oversees County stormwater program.	TAC Member, subcommittee member (ASBS, Septic, Stormwater, Project Review), and data/information source during preparation of the ICWMP
Marin County Farm Bureau		TBWC Member
Inverness Public Utility District	Public Utility District that provides domestic water service, as well as fire protection service, to the community of Inverness in the Tomales Bay watershed.	TBWC Member, TAC Member, subcommittee alternate member (Water Suppliers), and data/information source during preparation of the ICWMP
Marin Municipal Water District	Municipal water district; water supplier for 190,000 Marin County residents; owns and manages 17,000 acres of watershed lands and water supply facilities within the Tomales Bay watershed.	TBWC Member, subcommittee member (Water Suppliers), and data/information source during preparation of the ICWMP
Marin Resource Conservation District	Manages soil conservation, water quality improvement, erosion control, erosion prevention, and streambank stabilization projects	TBWC Member, TAC Member, subcommittee member (Project Review), and data/information source during preparation of the ICWMP
North Marin Water District	Municipal water district; water supplier for 1,800 residents in the Tomales Bay watershed; owns and operates water supply facilities for the West Marin Point Reyes area.	TBWC Member, TAC Member, subcommittee member (Water Suppliers, Project Review, Septic), and data/information source during preparation of the ICWMP

Planning Documents & Technical Studies Used in ICWMP Development

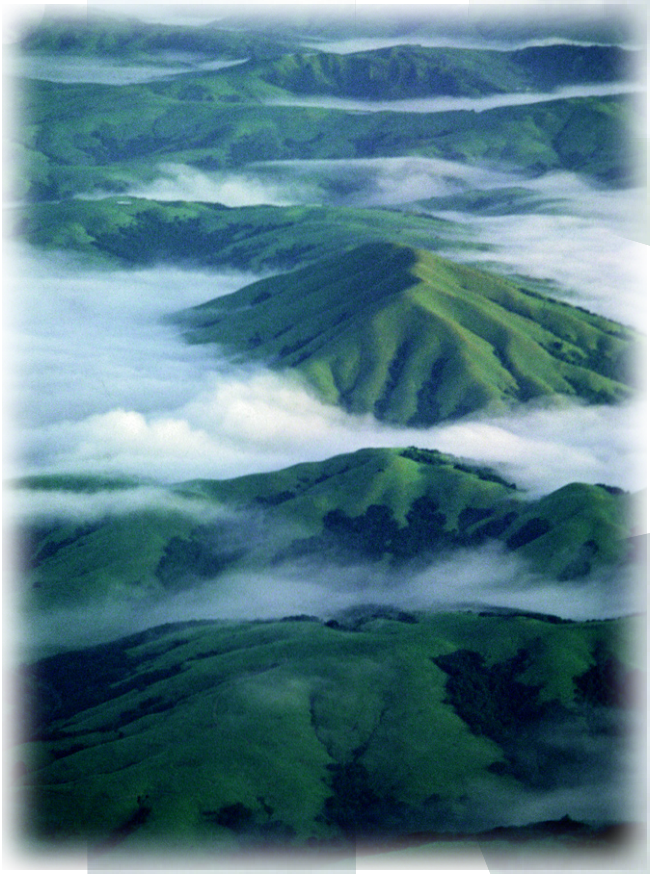


Photo by Kathleen Goodwin

15. PLANNING DOCUMENTS & STUDIES USED IN ICWMP DEVELOPMENT

15-1 PLANS

LOCAL PLANS

Marin County. 1985. *A Plan for the Bolinas Gridded Mesa.* Adopted by the Marin County Board of Supervisors and approved by the California Coastal Commission.

Marin County. 1997 (Amendment). *The Bolinas Community Plan 1975.* Adopted by Marin County Board of Supervisors.

Marin County. 2001. *Point Reyes Station Community Plan.*

Marin County Community Development Agency. August 2005. *The Marin Countywide Plan, Public Review Draft.*

Marin County Board of Supervisors. December 2, 1997 (Adopted). *San Geronimo Valley Community Plan.*

Marin County Planning Department. 1983. *The Inverness Ridge Communities Plan*.

Marin County Planning Department. April 1, 1981 (Certified). *Marin County Local Coastal Program, Unit II*.

Marin Municipal Water District. June 2006. "Long-Range Capital Program (2006-2015)."

Marin Municipal Water District. January 18, 2006 (Adoption Date). *Marin Municipal Water District Urban Water Management Plan 2005.*

Marin Municipal Water District. July 2005. *Mount Tamalpais Watershed Road and Trail Management Plan.*

North Marin Water District, October 2001. *West Marin Long Range Plan*. Brelje & Race.

Prunuske Chatham, Inc. February 1997. *Lagunitas Creek Sediment and Riparian Management Plan.* Prepared for Marin Municipal Water District.

Prunuske Chatham, Inc. April 2004. *Marin County Watershed Management Plan-Administrative Draft.* Prepared for Marin County Community Development Agency, Planning Division.

Prunuske Chatham, Inc. 1981. *Walker Creek Watershed Enhancement Plan.* Prepared for Marin County Resource Conservation District.

Point Reyes National Seashore. 2003. "General Management Plan Update, Concepts Newsletter 2003." http://www.nps.gov/pore/parkmgmt/gmp_2003_conceptsnewsltr.htm

Tomales Bay Watershed Concil. July 2003. *Tomales Bay Watershed Stewardship Plan: A Framework for Action.*

STATE & FEDERAL PLANS

California Coastal Commission. Undated. "California's Critical Coastal Areas, Partnering to Protect Our Coast from Polluted Runoff, Critical Coastal Areas Program Description." http://www.coastal.ca.gov/nps/Web/cca_project.htm

California Department of Fish and Game. February 2004. "Recovery Strategy for California Coho Salmon," Report to the California Fish and Game Commission. Species Recovery Strategy 2004-1. http://www.dfg.ca.gov/nafwb/CohoRecovery/RecoveryStrategy.html

San Francisco Bay Regional Water Quality Control Board. November 2004. *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin.* http://www.waterboards.ca.gov/sanfranciscobay/basinplan.htm#2004basinplan

San Francisco Bay Regional Water Quality Control Board. October 2004. *Watershed Management Initiative Integrated Plan Chapter.*

State Water Resources Control Board. 2005. Water Quality Control Plan, Ocean Waters of California – *California Ocean Plan*.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program. October 2006. *Gulf of the Farallones National Marine Sanctuary Draft Management Plan*.

15-2 TECHNICAL STUDIES AND ASSESSMENTS

WATER QUALITY

California Regional Water Quality Control Board, San Francisco Bay Region. June 30, 2001. "Controlling Pathogens in Tomales Bay, California. Total Maximum Daily Load: Sources and Loadings." Progress Report.

California Regional Water Quality Control Board, San Francisco Bay Region. July 8, 2005. *Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL) Staff Report.* Prepared by Farhad Ghodrati, Rebecca Tuden.

California Regional Water Quality Control Board, San Francisco Bay September 2005. *Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL) – proposed Basin Plan Amendment*. SFRWQCB.

California Regional Water Quality Control Board, San Francisco Bay Region. November 20, 2006. *Total Maximum Daily Load for Mercury in the Walker Creek Watershed, Staff Report*. Prepared by Jill Marshall.

California Regional Water Quality Control Board, San Francisco Bay Region. November 15, 2002. "Total Maximum Daily Load for Pathogens in Tomales Bay." Preliminary Project Report.

Clearwater Hydrology and Nichols Berman. Updated November 2005. "Hydrology and Water Quality Technical Report." Prepared for Marine County Community Development Department.

County of Marin Community Development Agency Environmental Health Services. October 2005. *Alternative Sewage Disposal Systems Seventh Annual Performance Review.*

Economic & Planning Systems, Inc. June 19, 2003. Draft Report-*West Marin Septic Management Organizational Options and Feasibility Analysis.* Prepared for Marin County Community Development Agency.

Marin County Septic Systems Technical Advisory Committee. December 2001. "Final Recommendations for Improving the Management of Onsite Wastewater Systems" (December 2001).

National Park Service. November 2001. "Point Reyes National Seashore Water Quality Monitoring Report, May 1999-May 2001.

Questa Engineering Corporation. October 2005. *Community Coordination Plan East Shore Tomales Wastewater Upgrade Project; Marin County, California.* Prepared for Marin County Community Development Agency Environmental Health Services Division.

Questa Engineering. May 10, 2006. *Draft Feasibility Report, East Shore Wastewater Improvement Project* (without appendices). Prepared for Marin County community Development Agency Environmental Health Services Division.

Prunuske Chatahm, Inc. August 2005. *Geomorphology of the Walker Creek Watershed: Prospects for Habitat Enhancement and Sediment Management.* Prepared for Marine Resource Conservation District.

The Salmon Protection and Watershed Network. June 2006. "Lagunitas Creek Watershed Citizen Water Quality Monitoring Program – The Salmon Protection and Watershed Network's (SPAWN) 2005/06 Water Quality Report."

The Salmon Protection and Watershed Network. 2002. "Sedimentation from Unpaved Roads in the San-Geronimo sub-Waterhsed (Sprijng/Sumer 2002).

The Salmon Protection and Watershed Network. June 2005. "SPAWN/RWQCB Citizen Water Quality Monitoring Program, Winter 2004/05 Report."

San Francisco Bay Regional Water Quality Control Board. August 2001 (Revised August 2002). "Surface Water Ambient Monitoring Program (SWAMP) Final Workplan 2001-2002."

Stetson Engineers, Inc. March 31, 2002. *San Geronimo Creek Watershed Sediment Source Sites and Assessment and Evaluation for the San Geronimo Creek Watershed Planning Program.* Prepared for Marin Municipal Water District.

Tomales Bay Watershed Council. December 2003. "Tomales Bay Water Quality Monitoring Plan."

University of California Cooperative Extension. September 2001. *University of California Tomales Bay Water Quality Project Update.* D. Lewis, M. Lennox, R. Atwill, K. Tate, S. Larson, P Olin and E. Rilla.

University of California Tomales Bay Water Quality Project. December 2004. "Water Quality in the Tomales Bay Watershed: Conflict and Response to On-farm Water Quality Management."

University of California School of Veterinary Medicine and Cooperative Extension in Sonoma and Marin Counties. May 2007. "Characterizing Freshwater Inflows and Sediment Reservoirs of Fecal Coliforms and E. Coli at Five Estuaries in Northern California."

October 29, 2001. "Memorandum of Understanding Among the Marin Municipal Water District, County of Marin, Marin County Open Space District, California Department of Parks and Recreation, National Park Service, and Marin County Resource Conservation District For Maintenance and Management of Unpaved Roads in the Lagunitas Creek Watershed."

WATER SUPPLY

Bolinas Community Public Utility District. February 2001. "Watershed Sanitary Survey, Arroyo Hondo and Woodrat 1 & 2 Watersheds, Marine County, California."

Clearwater Hydrology, Nichols – Berman. August 2000. "Marin Countywide Plan, Hydrology and Water Quality Technical Background Report." Prepared for the Marin County Community Development Agency, Planning Division.

Inverness Public Utility District. January 2002. "Report on Watershed Sanitary Survey." (and other file documents)

Marin Local Agency Formation Commission. May 2007. "Inverness Area Service Review and Sphere of Influence Update."

Marin Municipal Water District. April 6, 2006. "2006 Water Management Report Overview." (Available online at http://www.marinwater.org/)

SPH Associates. North Marin Water District. July 2005. *Point Reyes Water Treatment Plan Upgrade Study North Marin Water District.*

State Water Resources Control Board. May 7, 2007. "Change in Place of Use and Purpose of Use for License 4324B (Application 13965B) of North Marin Water District to Appropriate Water From Lagunitas Creek in Marin County."

The Pacific Legal Foundation versus BCPUD – a historical description of the legal developments following the BCPUD's imposition of the water moratorium. (Available online at www.bcpud.org)

1977. Resolution 173 – Declaration of Continued Water Shortage Emergency Condition. (Available online at www.bcpud.org)

2002. "Settlement Agreement" by and among Tomas Bay Association, Trout Unlimited-North Bay Chapter, Sierra Club, and North Marin Water District.

ECOSYSTEM RESTORATION AND HABITAT ISSUES/PROTECTION

Audubon Canyon Ranch, ACR Technical Report 2004-2-1. 2004. "Point-count Surveys of bird Use in Olema Marsh, Spring and Autumn 2004."

Avocet Research Associates. August 6, 2002. "Draft Giacomini Marsh Restoration Site Special Status Animal Species: Reconnaissance & Compliance." Report to the National Park Service .

California Department of Fish and Game. October 2004. "Coho Salmon Planting and Monitoring Project, Walker Creek Watershed, Marin County."

Clearwater Hydrology and Nichols Berman. Updated November 2005. "Marin Countywide Plan Biological and Wetland Protection Background Report." Prepared for Marine County Community Development Department.

FishNet 4C, MFG, Inc., Prunuske Chatham Inc., Pacific Watershed Associates.December 2004. *Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance.*

Fishnet 4C. Undated. "Marin County Participation in FishNet 4C – Marin County Creates Fish Passage Program." http://fishnet.marin.org/counties_marin.html

Richard R. Harris, Ph.D., UCB Berkeley. January 2001. *Effects of County Land Use Policies and Management Practices on Anadromous Salmonids and Their Habitats.* Final Report Prepared for the FishNEt 4C Program of Sonoma, Marin, San Mateo, Santa Cruz and Monterey Counties.

Richard R. Harris and Susie Kocher, UC Berkeley. January 2001. "Summary of Marin County Policies Relating to Anadromous Fish Habitat Conservation." (Excerpted from FishNet 4C Report).

Marin Municipal Water District. May 2006. "Lagunitas Creek Salmon Spawner Survey Report 2005-2006.

KrisWeb – West Marin-Sonoma. Hypothesis #5: High levels of sediment limit salmonid production in Lagunitas Creek watershed.
http://www.krisweb.com/kris_wms/krisdb/html/krisweb/analysis/hypoth4_wms.htm

Marin Municipal Water District. April 2007. "Juvenile Salmonid Population Monitoring Report, Lagunitas Creek, Marin County, California, Fall 2006."

Marin Municipal Water District. March 2006. "Juvenile Salmonid Population Monitoring Report, Lagunitas Creek, Marin County, California, Fall 2005."

Marin Municipal Water District. January 2006. "Lagunitas Creek Habitat Typing Survey – 2003 Analysis."

Marin Municipal Water District. May 2006. "Lagunitas Creek Salmon Spawner Survey Report 2005-2206."

National Park Service. 2001. "Current Research in Bay Area National Parks." Point Reyes National Seashore Official Website.
http://www.nps.gov/archive/pore/science_current_resmgt.htm

National Park Service. July 2006. "Point Reyes National Seashore Non-Native Deer Management Plan: Protecting the Seashore's Native Ecosystems, Final Environmental Impact Statement.:"
http://www.nps.gov/pore/parkmgmt/planning_nonnativedeermanagementplan.htm

Prunuske Chatahm, Inc. August 2005. *Geomorphology of the Walker Creek Watershed: Prospects for Habitat Enhancement and Sediment Management.* Prepared for Marine Resource Conservation District.
Stillwater Sciences. February 2007. "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead." Prepared for Marin Resource Conservation District.

Salmon Protection and Watershed Network (SPAWN). 2002. "Coho Spawning in 2001-02 in the San Geronimo sub-Watershed with Opportunistic Notes on Steelhead." By Reuven Walder and Todd Steiner,

Salmon Protection and Watershed Network (SPAWN). 2002. "Inventory of Select Migration Barriers in the San Geronimo sub-watershed (Spring 2002). Salmon Protection and Watershed Network (SPAWN).
http://www.spawnusa.org/cgi-files/0/pdfs/1111454327_Migration_Barrier_Report.pdf

Stillwater Sciences. February 2007. "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead." Prepared for Marin Resource Conservation District.

SPAWN. Undated. "Salmon Protection and Watershed Network." http://www.spawnusa.org

SPAWN. January 27, 2006. *2005/2006 Spawning Salmon Updates*. Paola Bouley, SPAWN Watershed Biologist, http://www.spawnusa.org/pages/page-103

State Water Resources Control Board. October 26, 1995. Order WR 95-17, Lagunitas Creek, Order Amending Water Rights and Requiring Changes in Water diversion Practices to Protect Fishing Resources and to Prevent Unauthorized Diversion and Use of Water.

Stillwater Sciences. February 2007. "Lagunitas Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead." Prepared for Marin Resource Conservation District.

Stillwater Sciences September 2004. "Lagunitas Limiting Factors Analysis, Phase 1: Potential Limiting Factors and Draft Study Plan for Phase II." Prepared for Marin Resource Conservation District.

Ross Taylor and Associates. June 2003. "Marin County Strem Crossing Inventory and Fish Passage Evaluation, Final Report." Prepared for the County of Marin Department of Public Works.

Tomales Bay Watershed Council. February 2004. "Compilation of Information on Coho Salmon and Steelhead Trout Collected Between 1994-2003 in the Tomales Bay Watershed with Recommendations for Future Actions." By Neysa King.

University of California Sustainable Agriculture Research and Education Program. Summer 1996. "Marin Coastal Watershed Project: Walker Creek is part of the Marin Coastal Watershed Enhancement Project." *http://www.sarep.ucdavis.edu/NEWSLTR/v8n3/sa-4.htm*

U.S. Department of the Interior, National Park Service, Point Reyes National Seashore & Golden Gate National Recreation area and California State Lands Commission. November 2006. "Draft Giacomini Wetland Restoration Project Environmental Impact Statement / Environmental Impact Report."

Gulf of Farallones National Marine Sanctuary Draft Management Plan.
http://www.sanctuaries.nos.noaa.gov/jointplan/

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

Marin County. May 2006. Report sent to SWRCB from Marin County. *Request for Exception for National Park Service (NPS) Discharges into the Point Reyes Headlands Reserve and Extension Area of Biological Significance (ASBS) and the Duxbury Reef Reserve and Extension ASBS.*

Southern California Coastal Water Research Project. July 2003. "Final report: Discharges into State Water Quality Protection Areas." Final Report to State Water Resources Control Board.

State Water Resources Control Board. June 2003 (Revised). "Areas of Special Biological Significance, California's Marine State Water Quality Protection Areas."

State Water Resources Control Board, Ocean Unit, Division of Water Quality. August 2006. "Status Report, Areas of Special Biological Significance."

State Water Resources Control Board, Water Quality. 2003. "State Water Quality Protection Areas – Areas of Special Biological Significance. http://www.waterboards.ca.gov/plnspols/asbs.htm

April 1980. *California Marine Waters Areas of Special Biological Significance Reconnaissance Survey Report. Point Reyes Headland Reserve and Extension.* Water Quality Monitoring Report No. 80-1. SWRCB, Surveillance and Monitoring Section, Sacramento, CA.

State Water Resources Control Board.April 1980. *California Marine Waters Areas of Special Biological Significance Reconnaissance Survey Report. Bird Rock.* Water Quality Monitoring Report No. 80-2. SWRCB, Surveillance and Monitoring Section, Sacramento, CA.

State Water Resources Control Board. May 1979. *California Marine Waters Areas of Special Biological Significance Reconnaissance Survey Report. Duxberry Reef Reserve and Extension.* Water Quality Monitoring Report No. 79-14. SWRCB, Surveillance and Monitoring Section, Sacramento, CA.

State Water Resources Control Board. May 1979. *California Marine Waters Areas of Special Biological Significance Reconnaissance Survey Report. Double Point.* Water Quality Monitoring Report No. 79-15. SWRCB, Surveillance and Monitoring Section, Sacramento, CA.

Tenera Environmental. April 20 ,2006. "Gulf of the Farallones National Marine Sanctuary Duxbury Reef Rocky Intertidal Restoration Program – Part I, Study Plan." Prepared for Gulf of the Farallones National Marine Sanctuary.

STORMWATER MANAGEMENT

Clearwater Hydrology and Nichols Berman. Updated November 2005. "Marin Countywide Plan Flooding Technical Background Report." Prepared for the Marin County Community Development Agency, Planning Division.

Marin County Department of Public Works. May 2005. Marin County Stormwater Pollution Prevention Program. *Action Plan 2010.*

Marin County Department of Public Works. September 2006. Marin County Stormwater Pollution Prevention Program, *2005-2006 Annual Report, Summary of Activities.*"

Marin County Department of Public Works.August 2005. *Marin County Stormwater Pollution Prevention Program 2004-2005 Annual Report.*

MCSTOPPP Local Program 2005-2006. "Water Quality Sampling and Storm Drain Mapping."

GROUNDWATER

California Department of Water Resources. 2007. "California's Groundwater: Bulletin 118. Individual Basin Descriptions (February 2007)."
http://www.groundwater.water.ca.gov/bulletin118/basin_desc/index.cfm

Kulongoski, J.T., Belitz, Kenneth, and Dawson, B.J. 2006. "Groundwater Quality Data in the North San Francisco Bay Hydrologic Provinces, California, 2004: Results from the California Groundwater Ambient Monitoring and Assessment Program." U.S. Geological Survey Data Series Report 167, U.S. Department of the Interior.

MISCELLANEOUS

California Climate Change Center. July 2006. "Our Changing Climate – Assessing the Risks to California."

California Department of Water Resources. July 2006. "Progress on Incorporating Climate Change into Management of California's Water Resources."

Douglas T. Fischer, Stephen V. Smith, Robert R. Churchill. 1996. "Simulation of a Century of Runoff Across the Tomales Watershed, Marin County, California." Journal of Hydrology, Volume 186, November 15, 1996.

Marin Conservation District, Prunuske Chatham, Inc., and Sustainable Conservation. June 9,m 2004. "Initial Study and Mitigated Negative Declaration for Marin Coastal Watersheds Permit Coordination Program."

Marin County Community Development Agency. October 2006. "Marin County Greenhouse Gas Reduction Plan."

Marin County Flood Control and Water Conservation District web page: http://www.co.marin.ca.us/depts/pw/main/floodcontrol.cfm

Marin County LAFCO. January 2007. "Directory of Marin County Local Governments." http://lafco.marin.org/directory.html

Nichols Berman. January 2007. "Marin Countywide Plan Update Draft Environmental Impact Report."

University of California Cooperative Extension. February 2003. " The Status of Marin County Agriculture: A Profile of Current Practices and Needs."

U.S. EPA Science Advisory Board. July 2002. "A Framework for Assessing and Reporting on Ecological Condition." Terry F. Young an Stephanie Sanzone, Editors.