Watershed Information Center & Conservancy of Napa County

AGENDA

SPECIAL BOARD MEETING

Thursday, December 15, 2005 at 4:00 p.m.
2nd Floor Conference Room, Hall of Justice Building,
1125 Third Street, Napa CA

1. **CALL TO ORDER & ROLL CALL** (Chairman/Staff)

2. **APPROVAL OF ACTION MINUTES**
   Regular meeting of September 22, 2005 (Chairman)

3. **PUBLIC COMMENT**
   In this time period, anyone may comment to the Board regarding any subject over which the Board has jurisdiction, or request consideration to place an item on a future Agenda. No comments will be allowed involving any subject matter that is scheduled for discussion as part of this Agenda. Individuals will be limited to a three-minute presentation. No action will be taken by the Board as a result of any item presented at this time. (Chairman)

4. **ANNOUNCEMENTS** (Board/Staff)

   a. **"Caring for Napa County's Creeks," 2006 watershed awareness calendar** promoted by the Resource Conservation District (RCD) and the County's Watershed Education Program (Staff/RCD)

   b. Others (Board/Staff)

5. **UPDATES/REPORTS:**

   a. Update on current County **General Plan Update process and General Plan Steering Committee activities** (Board/Staff)

   b. Update on the **expansion of the WICC Board's membership** to include an elected official from each of the County's municipalities, providing opportunity and representation of every City and Town in Napa County (Staff)

   c. Update and report on the December 6, 2005 Board of Supervisor's meeting, approving a **comment letter to the Regional Water Quality Control Board** regarding the scope of the environmental review required under CEQA to support the Napa River TMDLs (Staff)

   d. Others (Board/Staff)

6. **PRESENTATION, DISCUSSION AND POSSIBLE DIRECTION TO STAFF ON A DRAFT 2006 MEETING CALENDAR FOR THE WICC BOARD:**

   Presentation, discussion and direction to staff on a **DRAFT 2006 Meeting Calendar** for the WICC Board; establishing the Board's Regular Meeting schedule for the year 2006. Final consideration and approval of the calendar will occur at the Board's January 26, 2006 meeting (Board/Staff)

7. **PRESENTATION, DISCUSSION AND POSSIBLE APPROVAL OF A WATERSHED MONITORING STRATEGY FOR NAPA COUNTY:**

   Presentation, discussion and possible **approval of a Watershed Monitoring Strategy** for Napa County; a first step in the development of a Countywide Watershed Monitoring Program, a priority action item in the Board's 2005 Strategic Plan. The Monitoring Strategy was prepared under contract by a consultant (San Francisco Estuary Institute) and directed by the WICC Board's Technical Advisory Committee (TAC) (Staff)

8. **PRESENTATION AND DISCUSSION ON COMPLETED BASELINE DATA REPORT (BDR) OF NAPA COUNTY:**

   Presentation and discussion on the Napa County Baseline Data Report; including an overview of resource topics, uses of the report, and how the WICC may use the document, data and GIS information to support its Strategic Plan mission (Staff/BDR Consultant)

9. **FUTURE AGENDA ITEMS** (Board/Staff)

   a. **Election of new Chair and Vice-Chair** for year 2006 (per Bylaws§ II.A.)

   b. Discussion and final **adoption of 2006 Meeting Calendar** (per Bylaws§ III.A.)

   c. Others (Board/Staff)

10. **NEXT MEETING:**

    Regular Board Meeting of January 26, 2006 – 4:00 PM
    Hall of Justice Building, 2nd floor Conference Room, 1125 Third Street, Napa

11. **ADJOURNMENT** (Chairman)

Note: If requested, the agenda and documents in the agenda packet shall be made available in appropriate alternative formats to persons with a disability. Please contact Jeff Sharp at 707-259-5936, 1195 Third St., Suite 210, Napa CA 94559) to request alternative formats.

Watershed Information Center & Conservancy OF NAPA COUNTY

Members
Diane Dillon
Mark Luce
Lori Luporini
Mark Van Gorder
David Graves
Jeff Reichel
Phill Blake
Donald Gasser
Kate Dargan
Jeffrey Redding
Robert Steinhauer
Charles Slutzkin
Marc Pandone
Richard Camera

Alternates
Harold Moskowite
Karen Slusser

- MINUTES / ACTION SUMMARY -

REGULAR BOARD MEETING

Thursday, September 22, 2005 at 4:00 p.m.
2nd Floor Conference Room, Hall of Justice Building,
1125 Third Street, Napa CA

Staff Representatives

Patrick Lowe,
Secretary
Deputy Director,
Conservation Div., CDPD

Jeff Sharp,
Watershed Coordinator
Planner III,
Conservation Div., CDPD

Laura Anderson,
Counsel
Attorney IV,
County Counsel's Office

1. **CALL TO ORDER, WELCOMING OF NEW MEMBERS & ROLL CALL** (Chairman/Staff)
New appointments and reappointments were made by the Board of Supervisors on September 13, 2005. Welcome Marc Pandone and Robert Steinhauer!

Members Present: Mark Van Gorder, David Graves, Jeff Reichel, Donald Gasser, Robert Steinhauer, Charles Slutzkin, Carol Kunze (for Marc Pandone, her last meeting), Richard Camera
Members Absent Excused: Diane Dillon, Mark Luce, Phill Blake, Kate Dargan
Members Absent: Lori Luporini, Jeffrey Redding
Staff Present: Patrick Lowe, Jeff Sharp

Robert Steinhauer introduced himself to the Board. Carol Kunze informed the Board that this will be her last meeting and that Marc Pandone (who could not attend) will fulfill the vacancy.

2. **APPROVAL OF ACTION MINUTES**
None at this time

3. **PUBLIC COMMENT**
In this time period, anyone may comment to the Board regarding any subject over which the Board has jurisdiction, or request consideration to place an item on a future Agenda. No comments will be allowed involving any subject matter that is scheduled for discussion as part of this Agenda. Individuals will be limited to a three-minute presentation. No action will be taken by the Board as a result of any item presented at this time. (Chairman)

Outcome: None presented.

4. **ANNOUNCEMENTS** (Board/Staff)

a. Grant **Funding Fair on November 4, 2005** hosted by Division of Financial Assistance, California Water Boards and State Water Resources Control Board (Staff)

Outcome: Informational.

b. Reminder **WICC Board Member biographies and photographs still needed** for WICC WebCenter and outreach materials (Staff/Board)

Outcome: Staff announced not all of the Board Members have provided biographies and photographs for use in on the WICC WebCenter. The information will be used to add a human element to the WICC WebCenter and inform site users and the public of the WICC's Board of Directors and the community representation they embody. A reminder to provide this information will be sent to the Board by staff.

c. New Board Member **orientation of the WICC WebCenter** is available and encouraged (Staff)

Outcome: Staff circulated a contact information sheet and asked that each Board member review the information to ensure it is correct. Staff also offered to orient new Board members to the WICC WebCenter, encouraging anyone interested to call and arrange a time at their convenience.

d. Others (Board/Staff)

Outcome: Staff announced (for Phill Blake who could not attend) that the Natural Resource Conservation Service (NRCS) is offering watershed restoration and management funding for on the ground projects through the Environmental Quality Incentives Program (EQIP) sponsored by the federal government. A flier detailing the program was circulated to the Board.

Staff also announced an upcoming symposium called "City Rivers: The Urban Creek Restored" on November 18th in Sacramento and circulated a flier with containing information about the event.

Staff provided an issue of "Wildland Waters" published by the USDA Forest Service and mentioned that this edition included an interesting discussion on the relationship of fire in forested watersheds and the affects fire has on the health and function of aquatic ecosystems.

Charles Slutzkin announced that WICC staff spoke at the Watershed Forum and that the presentation given was very informative and suggested that other groups interested in the WICC invite staff to speak at their gatherings.

5. **UPDATES/REPORTS:**

a. Update on **General Plan Steering Committee activities and General Plan Update** process (Staff)

Outcome: Staff announced that two meetings were held thus far, one being an extended alternatives charrette. Committee member Carol Kunze found the alternative scenarios a very interesting part of the planning process. Jeff Reichel, also a Committee member, added that water and water use remains a topic at the forefront of many of the Committee's discussions.

b. Update on **Board of Supervisor's consideration to approve WICC's 2005-06 Strategic Plan and expansion of the Board's membership** to include a representative from city and town (Staff)

Outcome: Staff informed the Board that the County Supervisors will consider the matter at their October 18, 2005 meeting. The selection process of elected city representatives will be conducted according to each city's individual nomination practice. Since the WICC functions as an advisory committee to the County Board of Supervisors, final appointment of those nominated will be conducted by County Supervisors.

c. Update and report on **2005-06 grant opportunities** offered through the Regional Water Boards Division of Financial Assistance, the US Environmental Protection Agency and other agencies and meeting with San Francisco Bay Regional Water Board staff on October 5, 2005 (Staff)

Outcome: Staff informed the Board that staff level meetings are planned between WICC staff, Napa County Resource Conservation District (RCD) staff and Regional Water Board staff to assess opportunities, support coordination and address priorities for grant funding offered through various California resource agencies.

d. Update and report on **recent WICC presentations** given to U.C. Berkeley Graduate Studio in Landscape Architecture and community interest leaders at the Watershed Forum (Staff)

Outcome: Informational. Over the past month Staff provided various WICC presentations to the community.

6. **REPORT AND DISCUSSION ON THE HISTORY AND BACKGROUND OF THE LISTING OF THE NAPA RIVER AS WATER QUALITY IMPAIRED:**

Report and discussion on the **history and background of the listing of the Napa River** as water quality impaired under the federal Clean Water Act by California Environmental Protection Agency and the State Water Resources Control Board by authority in the California Water Code and the Porter-Cologne Act (Staff/RCD)

Outcome: Informational. Staff introduced Leigh Sharp of the RCD who presented the Board with an overview of the Clean Water Act, the 303(d) list, the role of the CalEPA, the State Water Board and the Regional Water Quality Control Boards, and the specific pollution concerns of the Napa River. Leigh also outlined the background/history behind the Napa River listing and how the TMDL process developed to address water quality impairment and protection of identified beneficial uses. The Board had many questions and a lengthy discussion on the Napa River's beneficial uses, the pollution impairments identified and the reasons behind the listing of the waterway. There was also interest in delisting the river and understanding the State's delisting process, as well as some of the benefits of being on the 303(d) list.

7. **PRESENTATION, DISCUSSION AND POSSIBLE DIRECTION THAT THE TECHNICAL ADVISORY COMMITTEE (TAC) REVIEW AND RECOMMEND AN INFORMATIVE MEANS OF HOSTING BENTHIC MACRO-INVERIBRATE (BMI) MONITORING DATA ON THE WICC WEBCENTER:**

Presentation, discussion and possible **direction that the WICC's TAC review and recommend an informative means of hosting initial BMI monitoring data on the WICC WebCenter** collected by the Friends of Napa River (FONR) BMI Project. A brief background of the project will be provided, as well as a sample of the information/data and what it can tell us about the health and function of the Napa River system (Staff/FONR)

Outcome: Informational. Staff introduced Bernhard Krevet of Friends of the Napa River. Bernhard presented the Board with an overview of the Benthic Macro Invertebrate (BMI) study. Todd Adams outlined the data collected for the study and explained how that data may be use to evaluate the health and function of a creek system. Graphical samples of the data were reviewed and discussed. The Board directed staff to discuss the data with its Technical Advisory Committee (TAC) and an appropriate means of hosting of the information on the WICC WebCenter.

8. **FUTURE AGENDA ITEMS** (Board/Staff)

Outcome: Update on the TAC's review of the BMI data and recommendation for hosting that information on the WICC WebCenter.

9. **NEXT MEETING – Regular Board Meeting of October 27, 2005 – 4:00 PM**
Hall of Justice Building, 2nd floor Conference Room, 1125 Third Street, Napa

10. **ADJOURNMENT** (Chairman)

If requested, the agenda and documents in the agenda packet shall be made available in appropriate alternative formats to persons with a disability. Please contact Jeff Sharp at 707-259-5936, 1195 Third St., Suite 210, Napa CA 94559) to request alternative formats.

COUNTY of NAPA
OFFICE OF CONSERVATION, DEVELOPMENT & PLANNING

General Plan Update
Steering Committee

October 21, 2005

Notice of Preparation of a Draft Environmental Impact Report regarding the Napa County General Plan

Napa County is undertaking the first comprehensive update of the Napa County General Plan since 1983, and will be the lead agency for preparation of a program-level Environmental Impact Report (EIR) on the General Plan Update.

We need to know your views regarding the scope and content of the environmental information to be included in the EIR. If you work for a public agency, your comments should address the scope and content of environmental information that is germane to the agency's statutory responsibilities, as required by Section 15082(b) of the State Guidelines for the California Environmental Quality Act (CEQA). A summary of the project, alternatives, and potential environmental effects proposed for analysis is provided below.

Written comments can be submitted at any time during the notice period which begins October 21 and ends at 4:45 PM on December 12, 2005. Letters should be directed to:

Napa County General Plan Update
Attn: Patrick Lowe, EIR Task Manager
1195 Third Street
Napa, CA 94559
(or e-mail to info@napacountygeneralplan.com)

In addition, oral comments will be accepted at three public/agency meetings:

- Northern Napa County: 6:30 PM on November 9, 2005 at St. Helena Fire Station, 1500 Main Street, St. Helena

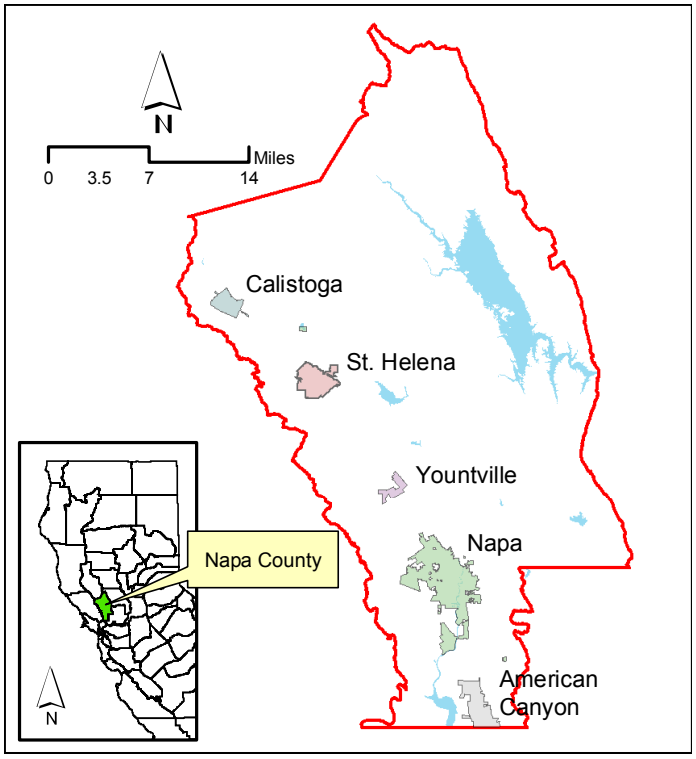
- Daytime Meeting: 1:00 PM on November 10, 2005 Napa City-County Library, 580 Coombs Street, Napa (Targeted for Public Agency Staff)

- Southern Napa County: 6:30 PM on November 10, 2005 at Napa Valley Unified School District (Education Center) Board Room, 2425 Jefferson Street, Napa

It is not necessary to comment more than once. All comments will be considered during preparation of the EIR and the General Plan update. Please call the Napa County Planning Department at (707) 253-4416 if you have questions.

Project Name: Napa County General Plan Update

Project Location: The Napa County General Plan addresses unincorporated areas of Napa County, California.



Project Description:

The proposed project consists of the adoption of an updated General Plan for Napa County. California law requires all local jurisdictions in the State to maintain a current general plan with goals and policies to guide land use and development. The current version of the Napa County General Plan was adopted in 1983, although some sections (known as elements) have been updated since then. (A copy can be found on Napa County's website at www.co.napa.ca.us.)

In 2004, the Napa County Board of Supervisors stated its desire to undertake a comprehensive update of the Plan, and in mid-2005 established a citizen Steering Committee to prepare the Plan and build public support. Concurrently, County staff and consultants have been charged with preparing an EIR.

Since the precise contents of the updated Plan will not be known until the Steering Committee completes its task, the EIR will evaluate a range of possible alternatives designed to bracket the final, proposed plan. Three of the alternatives will be analyzed at equal level of detail, and the remainder will be analyzed qualitatively.

At present, there are seven possible alternatives, as described below; however, the Board of Supervisors is considering eliminating elements of Alternative 1 (Status Quo) and Alternative 7 (Plan Update

w/Additional Hillside Parcels) based on your input in response to this Notice of Preparation. All of the alternatives may be further refined, and no decision has been made regarding which of the alternatives will be analyzed at a higher level of detail. We are interested in your suggestions on this topic.

1. **Alternative 1 (Status Quo)** This alternative would modify the existing General Plan and implementing ordinances to prohibit new parcel splits (probably by increasing minimum parcel sizes) and preserve existing land uses within unincorporated Napa County. Little new development would occur and major infrastructure improvements would not be feasible. There would be no change to the amount of land designated for industrial or agricultural use, although the present Agriculture, Watershed & Open Space (AWOS) district would be split into an AOS district and a WOS district, with the latter including areas where preservation of natural habitats would be prioritized. (This would be subject to a countywide vote under the terms of the County's "Measure J" referendum process.) The minimum parcel size for new wineries would increase from 10 to 40 acres, and additional forest protections would be included in the County's Conservation Regulations. No new sites would be made available for affordable or workforce housing.

2. **Alternative 2 (Extension of Existing Plan)** This alternative would update the existing General Plan without substantive policy changes, except that planned expansions in highway capacity would not occur. Slow housing and employment growth would continue principally w/in existing urban areas, no changes to agricultural or industrial areas would occur, and there would be no change to the amount of land designated for agricultural use. No changes to the Winery Definition Ordinance or the Conservation Regulations would occur, and no new sites would be made available for affordable or workforce housing.

3. **Alternative 3 (Plan Update)** This alternative would modify the existing General Plan and implementing ordinances by re-designating existing industrial lands for residential use (at the Dillingham & Pacific Coast sites) and commercial mixed use (at the Napa Pipe site). Slow housing and employment growth would occur w/in these areas in addition to existing urban areas, with the goal of maintaining a reasonable jobs-housing balance within the County. Incentives would be offered for on-site farmworker housing, and consistent with the City of Napa's General Plan, the County would support increased residential density within downtown Napa and encourage consideration of publicly owned sites within the City for mixed use (including housing).

   Infrastructure improvements would include widening of Jamieson Canyon Road (State Hwy 12), extension of Flosden/Newell to Green Island Road, and provision of recycled water to the Coombsville and Carneros areas. Increased emphasis would be placed on alternative modes of transportation, with potential increases in trails, transit, and paratransit (i.e. van and taxi service). Re-designation of the Hess vineyard north of American Canyon from "Industrial" to "Agriculture, Watershed & Open Space" would increase the amount of land designated for agricultural use and policy changes would expand the "right to farm" to include a "right to process" (i.e. at wineries) and allow food-wine pairing at wineries. Changes to the Conservation Regulations would make erosion control plans (for vineyards) ministerial (i.e. a simpler approval process) with inclusion of effective Best Management Practices (BMPs). Affordable housing would be included as a percentage of new housing developed on industrial and publicly owned sites. No Measure J vote would be required.

4. **Alternative 4 (Plan Update w/Enhanced Affordable Housing & Historic Preservation Focus)** This alternative would include all the same changes as Alternative 3, but would also include General Plan and zoning changes required to re-designate some land adjacent to the cities of Napa and/or American Canyon for housing, as well as incentives for the reuse of historic buildings in agricultural areas such as Pope Valley, and the adjustment of urban boundaries to match zoning and uses in Angwin. (These changes would require a Measure J vote – however there would be no net change to the amount of land designated for agricultural use.) Second units would be permitted in the Agricultural Preserve (AP) zoning district similar to the Agricultural Watershed (AW) zoning district and small wineries (less than 20,000 gallons) would no longer require a use permit if they exclusively process grapes grown on site. Vineyard management companies would be permitted to locate in agricultural areas.

5. **Alternative 5 (Plan Update w/Enhanced Transportation Focus)** This alternative would include all the same changes as Alternative 3, but would also include enhanced transportation improvements including re-designating Hwy 29 around St. Helena and Calistoga (e.g. using Zinfandel Lane and Silverado Trail), extension of

Flosden/Newell to So. Kelly Road, ferry & light rail service between Vallejo and Napa (including Napa Pipe) & potentially between Fairfield and Napa if feasible. Policies would emphasize energy conservation and seek to increase alternative sources of energy.

6. **Alternative 6 (Plan Update w/Enhanced Economic Development Focus)** This alternative would include all the same changes as Alternative 3, but would also include enhanced economic development activities such as policies and zoning to support sustainable commercial "nodes" in Oakville, Rutherford, Pope Valley, Angwin, and Lake Berryessa. (A Measure J vote may be required.) This alternative would also include an emphasis on economic and agricultural diversity (incl. sustainable timber harvest), a growth in service-sector employment, and policies regarding enhanced childcare services. Residential mixed-use could be considered for the Napa Pipe site. Vineyard management companies would be permitted to locate in agricultural areas and all new wineries using grapes grown on site would be exempt from use permit requirements.

7. **Alternative 7 (Plan Update w/Additional Hillside Parcels)** This alternative would modify the existing General Plan and implementing ordinances to preserve the agricultural character of the Napa Valley (including agricultural land within City boundaries) by permitting increased residential development in hillside areas. A Measure J vote would be required. Potential policy changes could include smaller minimum parcel sizes for wineries and residences and expansions of sewer and water infrastructure. Policies would emphasize energy conservation and seek to increase alternative sources of energy, including possible development of a cogeneration facility in the Knoxville area. Vineyards would be permitted on slopes of up to 35% (instead of 30% currently).

All alternatives assume successful completion of the General Plan Update and assume that land use designations for vast sections of the County would remain unchanged. Implementation of all alternatives would require some level of cooperation between the County and other agencies, including the City of Napa, the City of American Canyon, the City of Calistoga, the City of St Helena, the City of Yountville, Caltrans, and others.

Agency representatives, members of the public, and other interested parties are encouraged to provide comments on the range of alternatives described above, and to suggest other ideas or alternatives that should be evaluated.

Potential Environmental Effects:

Any change to the existing Napa County General Plan is likely to have environmental impacts, and the EIR will assess each alternative's potential direct, indirect, and cumulative effects on the following:

- Aesthetics, including Napa County's visual character, scenic views, light and glare;
- Agricultural Resources, including Napa County's agricultural preserve, Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Williamson Act contracts, agricultural uses and zoning;
- Air Quality, including the regional air quality plan, violations of existing air quality standards, air pollutants, and odors;
- Biological Resources, including special status (e.g. rare and endangered) plant and animal species, riparian habitats and other sensitive natural communities, wetlands, wildlife movement and nursery sites, related local policies or ordinances, and adopted plans;
- Cultural Resources, including historic, archaeological and paleontological resources;
- Geology, Soils & Mineral Resources, including potential risks associated with earthquakes and landslides, soil erosion, issues associated with unstable sites, expansive soils, or septic systems, and conflicts with mineral resource recovery;
- Hazards & Hazardous Materials, including potential safety hazards, exposure to hazardous materials, emergency response plans, safety hazards with public or private airports, and risks involving wildland fires;
- Hydrology & Water Quality, including water quality and runoff, waste discharge requirements, groundwater quality/recharge, drainage, flooding and inundation;

- Land Use & Planning, including existing plans and policies in effect within the County's incorporated and unincorporated areas that provide environmental protection measures;
- Noise, including vibration and exposure of people to excessive noise levels;
- Population & Housing, including growth inducement, employment-generated housing demand, affordable and workforce housing, and displacement of existing housing;
- Public Services, including, but not limited to, fire, sheriff, schools, and open space;
- Recreation, including existing and future parks and recreational facilities;
- Transportation, including local, commuter, and tourist traffic, parking, safety and emergency access, alternative modes of transportation (transit, air, water, pedestrian, bicycle); and
- Utilities & Service Systems, including Regional Water Quality Control Board requirements, water, wastewater and reclaimed water, drainage facilities, and solid waste facilities and regulations.

Agency representatives, members of the public, and other interested parties are encouraged to provide comments on these and any other environmental issues that should be explored in the draft EIR. The County may use the EIR to present and adopt thresholds of significance pursuant to State CEQA Guidelines Section 15064.7.

PAMELA A. MILLER
Clerk of the Board

COUNTY of NAPA

BOARD OF SUPERVISORS

1195 Third Street, Suite 310, Napa, CA 94559
Office (707) 253-4386 FAX (707) 253-4176

December 6, 2005

Dyan Whyte
TMDL Section Leader
San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Oakland CA 94612

RE: Scope of required CEQA documents to support the Napa River TMDL process and proposed amendments to the Water Quality Control Plan for the San Francisco Bay Basin

Dear Ms. Whyte:

Thank you for conducting your California Environmental Quality Act (CEQA) Scoping Meeting in the city of Napa on October 7, 2005. Many of our staff attended the meeting and found your presentations on the Sediment and Pathogen Total Maximum Daily Load (TMDL) process very informative. We are looking forward to receiving more specific information regarding your proposed Basin Plan amendment.

While we noted some progress based on the scoping meeting presentations, the County remains concerned with findings offered in the initial TMDL reports and still questions the means used to support them. In particular, we do not support your definition of the impairment problem(s) and the linkages drawn between the causes and the effects (please see our earlier comment letter of September 15, 2005, which is incorporated herein by this reference and made a part of this letter). This raises doubt that the numeric targets are justified and that the suggested implementation measures are the most effective and feasible means of addressing the identified impairments. We hope that more direct and understandable connections will be drawn between the problem statement/source analysis and the numeric targets and implementation measures proposed. An effective TMDL is one that establishes sensible numeric targets and realistic loading allocations that are economically viable for those responsible. If the Regional Water Quality Control Board's (RWQCB) plan does not outline an economically feasible way to meet the TMDL allocations and ultimately de-listing the basin, there will be little community support behind the proposed implementation plans.

It is critical that your CEQA analysis consider the economic feasibility of the suggested implementation measures. Although some of the implementation recommendations sound appropriate, the costs of administering them (a public and private road improvement program, or septic system monitoring and upgrade program for example) to meet the allocation goal is unknown and will likely burden private property owners as well as the County's ability to support future infrastructure improvement programs. If the suggested measures are cost prohibitive, or are so expensive that they divert public funds from other deserving programs, there will be foreseeable impacts to the well being of our community.

The proposed implementation plans suggest a number of possible approaches to achieve the TMDL allocations, but lack project level specificity that is necessary to conduct an adequate CEQA review. It would be helpful if the proposed implementation plans provide more project level detail and setting requirements to effectively and efficiently address the identified sources of pollutant loading and the impairment issues at hand.

It should also be noted that the initial reports spend considerable effort identifying many implementation steps beyond pollution control and reduction that are part of a broader healthy watershed strategy, indicating that the RWQCB is considering a broad context for the river's recovery. If these implementation steps are so imperative to improving the Napa River, then those measures should be explicit in the implementation plans and analyzed in your CEQA review.

As we mentioned in our earlier comment letter, there are many factors that affect the beneficial uses of the Napa River, of which sediment and pathogens are only two in a complex and interrelated system. A holistic watershed analysis and approach is required to efficiently address multiple limiting factors believed to contribute to the river's impairment. At a minimum, the TMDL implementation plans should include a re-evaluation of the numeric targets over time. Your CEQA review should also consider this type of performance review schedule and possible changes to the implementation plans as more is known about our river and its watershed.

Again, we encourage you to bring other municipalities, districts, and the public into the TMDL process. The RWQCB plans should be very open about who is expected to take on the greatest burden and why it is justified.

We look forward to working with you and other Regional Water Quality Control Board (RWQCB) staff throughout the TMDL process, and to future opportunities where we can discuss our concerns collectively and work towards an appropriate and acceptable TMDL solution for the basin. Please don't hesitate to contact Patrick Lowe (707) 259-5937 or Jeff Sharp (707) 259-5936 on our staff if you have any questions regarding these comments.

Very truly yours,

Diane Dillon

Diane Dillon
Chair, Napa County Board of Supervisors

cc: Nancy Watt, County Executive Officer
Hillary Gitelman, Director of Conservation, Development & Planning
Jill Pahl, Acting Director of Environmental Management
Bob Peterson, Director of Public Works
Thomas Mumley, Chief of TMDL and Planning Division, S.F. Bay RWQCB
Mike Napolitano, Environmental Scientist, S.F. Bay RWQCB
Peter Krottje, Environmental Scientist, S.F. Bay RWQCB

Total Maximum Daily Load (TMDL) Program Status Report

February 2005

Overview

Over the next sixteen months we will be asking the Board to consider adopting Basin Plan amendments to formally establish seven Total Management Daily Loads (TMDLs): Tomales Bay Watershed Pathogens, San Francisco Bay Urban Creeks Diazinon and Pesticide-Related Toxicity Water Quality Attainment Strategy and TMDL, San Francisco Bay PCBs, Napa River Pathogens, Sonoma Creek Pathogens, Walker Creek Mercury, and Napa River Sediments. The current schedule for these seven TMDLs in shown in Table One at the end of this document. Our objective is to ensure that TMDL efforts result in tangible water quality improvements in the shortest possible time with the goal of restoring affected waters and maintaining water quality standards in those waters.

These seven projects, combined with the San Francisco Bay Mercury TMDL adopted in 2004 and the delisting of the South Bay as impaired by copper and nickel, address about one-third of the 270 impaired water quality listings in our Region. In addition, nine TMDL projects are scheduled for completion by 2008. These address over 50 listings and include three efforts supported by the Clean Estuary Partnership: San Francisco Bay Legacy Pesticides, San Francisco Bay Diazinon and Pesticide Toxicity, and San Francisco Bay Selenium. Other active projects include sediment TMDLs for Lagunitas Creek, San Francisquito Creek, Sonoma Creek, and Walker Creek; nutrient TMDLs for Sonoma Creek and Napa River; and the Guadalupe River Watershed Mercury TMDL.

The TMDL Development Process

As background, the federal Clean Water Act requires states to identify impaired waters and the pollutants causing those impairments. This list of water bodies is often referred to as the "303(d) list" (referencing the requirement in section 303(d) of the Clean Water Act). The Clean Water Act requires that states establish Total Maximum Daily Loads (TMDLs) for the listed pollutants causing the impairments. TMDLs are essentially cleanup or restoration plans for a water body that target the specific pollutants causing the impairment of the listed water body. Essential components of TMDLs include: numeric target(s) that define the desired condition of the water body; the maximum amount of pollutant(s) or stressor(s) the water body can tolerate while meeting these targets; identification of the sources of the pollutant(s) reaching the water body; and allocations of pollutant loads or load reduction responsibility to these sources.

TMDLs are established via amendments to our Basin Plan, and these amendments must also include plans to implement the TMDLs. Implementation plans describe necessary pollution prevention, control, and restoration actions necessary to restore the water body and/or remove the impairment. They identify responsible parties and schedules for actions, and specify monitoring to track the actions and attainment of water quality standards in the water body. They may also specify studies needed to confirm key assumptions made while developing the TMDL, resolve any uncertainties remaining when the TMDL was adopted, and establish a process for revising the TMDL, as necessary, in the future.

We use a phased approach to develop TMDLs. Early phases involve identifying key issues concerning the cause of the impairment and the information needed to understand how to resolve the impairment, meeting with stakeholders—both those causing and affected by the impairment—and conducting studies and analyses. The timeline and level of effort, which we identify in a project plan, depend on staff and contract resources, available data, and the complexity of the impairment problem.

We next develop a project report that reflects the results of these efforts and describes the water quality problem causing the impairment, sources of the pollutant reaching the impaired water body, and potential actions needed to restore or clean up the water body. A key task during this phase is to meet with stakeholders and solicit input on appropriate regulatory options.

The success of any TMDL is dependent on successful implementation. As such, developing permit options and working with other agencies and divisions within the Water Board to determine the most efficient and effective way to integrate needed corrective actions into existing programs are high priority tasks.

The last step before Board action is the formal public notice and comment phase. We typically schedule two hearings for each TMDL project. The first, a testimony hearing, serves as an opportunity for interested parties to comment on the proposed Basin Plan amendment and associated implementation plan, and for Board members to ask questions of staff and stakeholders. At the second, the adoption hearing, the Board is asked to consider comments and staff responses and establish the TMDL by adopting the proposed Basin Plan amendment. Once adopted by the Board, the TMDL is sent for approval to the State Water Board, the California Office of Administrative Law, and the U.S. Enivronmental Protection Agency (U.S. EPA).

Throughout the process of developing TMDLs, we look for all opportunities to implement appropriate actions that are likely to help address the causes of water body impairments, even before the TMDL is effective. These early actions give us both a head start in restoring listing water bodies and in evaluating whether the selected actions are as effective as anticipated. Examples of such early actions include implementation of pollution prevention efforts targeted at a specific pollutant or the requirement of control measures likely to reduce new discharges of a pollutant to a water body (e.g., the requirement for stormwater programs to implement updated new and redevelopment performance standards).

Stakeholder participation is essential for successful TMDLs. Stakeholder buy-in helps create TMDLs that are real solutions to real problems. Each of our TMDL projects has a stakeholder involvement process tailored to reflect opportunities, challenges, and stakeholders' interests. The Clean Estuary Partnership, a collaborative effort between Board staff and the wastewater and urban runoff management agencies (specifically, the Bay Area Clean Water Agencies and the Bay Area Stormwater Management Agencies Association) is funding critical scientific studies and providing a forum for resolving issues to augment and enhance our San Francisco Bay TMDLs.

Our TMDL Web site (www.waterboards.ca.gov/sanfranciscobay/tmdlmain.htm) contains a list of active TMDL projects, TMDL work products, and forthcoming meetings and workshops.

A Preview of Forthcoming TMDLs

Tomales Bay Watershed Pathogens

The goal of the Tomales Bay Watershed Pathogens TMDL is to minimize human exposure to disease-causing pathogens. Tomales Bay supports one of the few remaining commercial shellfish growing areas on the west coast, and the TMDL focuses on protecting shellfish consumers while balancing the desire to sustain agriculture in the watershed. Early actions are already underway. We are working closely with the County of Marin to improve its septic tank program; inspecting all regulated facilities; working closely with the National Park Service to better manage rangeland, dairies, and recreational uses; implementing our dairy waste management program; and developing a mechanism to track and improve rangeland management.

SF Bay Urban Creeks Diazinon and Pesticide-Related Toxicity

The goal of San Francisco Bay Urban Creeks Diazinon and Pesticide-Related Toxicity Water Quality Attainment Strategy and TMDL is to reduce pesticide-related toxicity and protect aquatic life in all urban creeks. This effort is aimed not only at eliminating existing sources of

such toxicity, but also preventing such toxicity in urban creeks from occurring in the future. We are currently involved in an extensive stakeholder effort to get feedback on draft Basin Plan language. Many of the urban runoff programs are already implementing large portions of the implementation plan. A key challenge is to better coordinate how the California Department of Pesticide Regulation, U.S. EPA, and the Water Board regulate pesticides and water quality.

San Francisco Bay PCBs

The goal of the San Francisco Bay PCBs TMDL is to reduce PCBs in aquatic life so that humans and wildlife can safely consume fish. Sources of concern include in-Bay hotspots and urban runoff. We are fortunate to have both the Regional Monitoring Program and the Clean Estuary Partnership to assist us in developing the scientific basis of the TMDL and evaluating implementation alternatives. We are currently getting input from the various stakeholders as we draft Basin Plan language to establish and implement the TMDL. Two projects, funded by Proposition 13, are underway to determine feasible actions to reduce PCBs in urban runoff.

Napa River and Sonoma Creek Pathogens

The goal of the Napa River and Sonoma Creek Pathogens TMDLs is to minimize human exposure to disease-causing pathogens. These TMDLs focus on protecting recreational water uses (fishing, swimming, boating). We recently confirmed that septic tanks and urban runoff are key pathogen contributors in these watersheds, and livestock and grazing are localized sources. We will meet with stakeholders to discuss our findings and implementation alternatives.

Walker Creek Mercury

The goal of the Walker Creek (Marin County) Mercury TMDL is to reduce mercury in aquatic life so that humans and wildlife can safely consume fish. Early action on this TMDL began in 1998 when the Board, using funds from the state's cleanup and abatement account, partnered with U.S. EPA to cleanup the Gambonini mercury mine. Recent monitoring suggests that mercury loads from the mine site have decreased by 75% as a result of cleanup efforts. The Board and the public will be invited to attend a site tour this spring. A remaining implementation challenge for this TMDL is to address legacy mine wastes downstream of the mine site.

Napa River Sediment

The overall goal of the Napa River Sediment TMDL project is to reduce sediment discharges and enhance and restore native fish populations in the Napa River Watershed. A key challenge in developing sediment TMDLs is distinguishing between naturally occurring and controllable sediment discharges. This project confirmed that sediment discharges in the Napa River Watershed are linked to a decline in steelhead and salmon populations. Sediment discharges are degrading steelhead-spawning gravels in the upper watershed and salmon spawning and juvenile rearing habitat in the lower watershed. Land uses that may increase erosion, such as dirt roads, vineyards, and grazing, and actions that cause the Watershed creek channels to erode their bed and banks are considered controllable and will be addressed by the TMDL. We are setting up meetings to discuss these results and implementation alternatives with stakeholders in the Watershed.

Table 1
San Francisco Bay Region TMDLs Scheduled for Completion by June 2006

TMDL Project	Project Report	Testimony Hearing	Adoption Hearing
Tomales Bay Watershed Pathogens	Completed March 2004	April 2005	June 2005
SF Bay Urban Creeks Diazinon and Pesticide-Related Toxicity	Completed March 2004	August 2005	October 2005
SF Bay PCBs	Completed January 2004	January 2006	March 2006
Napa River Pathogens	May 2005	February 2006	April 2006
Sonoma Creek Pathogens	May 2005	February 2006	April 2006
Walker Creek Mercury	June 2005	March 2006	May 2006
Napa River Sediment	April 2005	April 2006	June 2006

San Francisco Bay Regional Water Quality Control Board
TMDL PROJECT Schedule

Project Name	Project Report Completion Dates	Regional Board Adoption Dates
Guadalupe River Watershed Mercury	September-05	July-06
Lagunitas Creek Sediment	December-06	February-08
Napa River Nutrients	March-06	November-06
Napa River Pathogens	February-06	April-06
Napa River Sediment	April-06	June-06
San Francisco Bay Legacy Pesticides	December-07	December-08
San Francisco Bay Mercury	June-03	September-04
San Francisco Bay (North of the Dumbarton Bridge) Nickel	December-04	August-05
San Francisco Bay PCBs	January-06	March-06
San Francisco Bay Pesticide Toxicity	October-06	August-07
San Francisco Bay Urban Creeks Diazinon	August-05	October-05
San Francisquito Creek Watershed	December-05	December-06
Sonoma Creek Nutrients	March-06	December-06
Sonoma Creek Pathogens	February-06	April-06
Sonoma Creek Sediment	August-06	May-07
Tomales Bay Mercury	August-06	December-07
Tomales Bay Pathogens	April-05	June-05
Tomales Bay Sediment	December-07	December-08
Walker Creek Mercury	March-06	May-06
Walker Creek Sediment	August-06	June-07

Updated 3/31/05

Watershed Information Center & Conservancy of Napa County

Meeting Details

Time:
4:00 to 6:00 PM

Location:
Second Floor Conference Room, Hall of Justice Building, 1125 Third St., Napa CA

All are welcome to attend.

Time and location may change as directed by the Board.

Members:
Diane Dillon
Mark Luce
David Graves
Jeff Reichel
Phill Blake
Donald Gasser
Kate Dargan
Jeffrey Redding
Robert Steinhauer
Charles Slutzkin
Mark Van Gorder
Lori Luporini
Marc Pandone
Richard Camera

Alternates:
Harold Moskowite
Karen Slusser

Staff:
Patrick Lowe,
Secretary
Deputy Director, CDPD

Jeff Sharp,
Watershed Coordinator
Planner III, CDPD

Laura Anderson,
Legal Counsel
County Counsel's Office

Draft
2006 Meeting Calendar

"To guide and support community efforts to maintain and improve the health of Napa County's watershed lands"

January

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	(26)	27	28
29	30	31				

February

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	(23)	24	25
26	27	28				

March

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	(23)	24	25
26	27	28	29	30	31	

April

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	(27)	28	29
30						

May

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	(25)	26	27
28	29	30	31			

June

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	(22)	23	24
25	26	27	28	29	30	

July

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	(27)	28	29
30	31					

August

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	(24)	25	26
27	28	29	30	31		

September

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	(28)	29	30

October

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	(26)	27	28
29	30	31				

November

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	(23)	24	25
26	27	28	29	30		

December

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	(28)	29	30
31						

( ) - Meeting date

( ) - Tentative date due to holiday

A Watershed Monitoring Strategy for Napa County

FINAL DRAFT

Prepared for

Watershed Information Center & Conservancy (WICC) Board

Prepared by

Jennifer Hayworth, Assistant Environmental Scientist, and Rainer Hoenicke, Senior Scientist
San Francisco Estuary Institute

December 2005

Table of Contents

Acknowledgments

Production of this document was possible through support and funding from the following: the Napa County Board of Supervisors, the Napa County Watershed Information Center & Conservancy (WICC) Board, and members of the WICC Technical Advisory Committee (TAC) including WICC Board Monitoring Sub-Committee members Phillip Blake (NRCS), Jeff Reichel (Land Trust of Napa County), Richard Camera (Hess Collection), Don Gasser and Kate Dargan (Assistant State Fire Marshall), and Patrick Lowe (Deputy Director, Napa County Conservation, Development, and Planning Department). In particular, we would like to thank Jeff Sharp (Watershed Coordinator, Napa County Conservation, Development, and Planning Department) for his coordination efforts, technical guidance and editorial review. We thank Linda Wanczyk (San Francisco Estuary Institute) for graphic design work on the document.

This plan draws on elements from other on-going efforts to develop sound watershed and monitoring implementation plans, and we gratefully acknowledge those resources including the USEPA and the California State Water Resources Control Board.

Executive Summary

MONITORING STRATEGY PURPOSE

The Napa County Watershed Information Center & Conservancy (WICC) updated its Strategic Plan in the summer of 2005. A key goal of the Plan is to *improve watershed health throughout Napa County by supporting community efforts to protect and enhance watershed lands and natural processes with an emphasis on riparian corridors and native species and their habitats.* A key strategy towards achieving this goal is to identify, conduct and coordinate watershed studies and monitoring that will prioritize watershed areas for restoration, enhancement and/or permanent protection. Development of a watershed monitoring strategy is a necessary first step toward this goal. Within the context of the WICC Strategic Plan, monitoring is a key management action for tracking success of natural resource protection and restoration efforts and assessing and reporting on the long-term environmental health and socio-economic well being of Napa County's watershed lands. Where public expenditures are used for watershed management activities, good information based on monitoring data is a requirement for gaining and maintaining public confidence. Because ecosystems are complex, monitoring information is also a key component needed for adaptive watershed management, a systematic process of continually improving watershed management policies and practices by learning from their outcomes.. As monitoring data are being used to inform management practices and policies, the monitoring program itself will also be adjusted on a regular basis as part of the adaptive management feedback loop.

ESSENTIAL ELEMENTS

Development and implementation of a monitoring program follow a logical progression, and contain ten essential elements:

1. Clear management goals and monitoring objectives,
2. Assessment questions formulated directly from goals,
3. Monitoring program design,
4. Indicator selection,
5. Quality assurance,
6. Data management,
7. Data analysis and assessment,
8. Program reporting,
9. Programmatic evaluation, and
10. General support and infrastructure planning.

1. Management Goals and Monitoring Objectives

The WICC has begun to identify conservation and planning goals based on community needs and interests for the county's watersheds, including broad goals established for the Napa River watershed and the watersheds of upper Putah and Suisun Creeks. The San Francisco Bay Regional Water Quality Control Board (RWQCB) is proposing pollution allocations for the

Napa River watershed in the form of Total Maximum Daily Loads (TMDLs) for sediment, pathogens (nutrients have also been proposed or are being developed) to meet State water quality attainment guidelines. Each TMDL implementation plan is based on adaptive and performance-based management principles, and monitoring information provides the basis for selecting the most flexible and the most cost-effective implementation measures for achieving allocation targets. In consideration of proposed TMDL target allocations and the community's current concerns for watershed health and management, the WICC proposed a fundamental set of candidate watershed goals that were derived from a broader assortment watershed objectives. Those fundamental watershed goals include:

- Protection and enhancement of watershed lands and natural processes,
- Achievement of improved watershed health,
- Protection and restoration of water quality and beneficial uses, and
- Continuous application of new information and lessons learned from management action or inaction to adjust future next-steps.

A broader set of watershed monitoring objectives specific to support the above goals are also proposed:

- Characterize watershed conditions and trends using appropriate indicators of "healthy" watershed processes and valued ecosystem components,
- Improve the condition of the county's water bodies recognized as having beneficial use impairment problems,
- Prevent degradation of intact water bodies throughout Napa County,
- Prioritize beneficial use protection and restoration activities, and
- Insure monitoring information is used in decision-making.

2. Assessment Questions

The next step in implementing a county-wide monitoring program is to derive assessment questions related to each goal and objective that are designed to provide answers relevant to the specific needs of Napa County watershed protection. These assessment questions can be developed on several scales and arranged in hierarchical order into an increasingly specific set of questions that range from the very general to very explicit. Appropriate assessment questions help guide the design of the monitoring program and can focus monitoring expenditures commensurate with the level of community interest, management uncertainty, potential implementation costs, and risks of inaction.

3. Monitoring Program Design

A carefully planned monitoring program saves management time and money. An effective monitoring program design must consider many factors, including available resources (budget, personnel resources, current and past data gathering efforts), design adaptability, data quality issues, (such as comparability and scientific robustness) and suitable design approaches that can yield data for all levels of assessment questions posed by the community. The program design should allow for monitoring at various spatial and temporal scales utilizing multiple indicators, as this provides greater weight of evidence for decision-making. An integrative design approach is recommended to accomplish this; one that incorporates three principal levels:

1) inventory of watershed resources (e.g., habitat types, water body types),
2) rapid assessment of conditions using appropriate indicators, and
3) more detailed or intensive monitoring and assessment of relationships between watershed management actions and watershed health indicators.

This three-level framework would ensure that local monitoring is comparable on a regional and statewide level. This type of framework was recently incorporated into a California monitoring strategy for surface waters under the State Water Resource Control Board's Surface Water Monitoring and Assessment Program (SWAMP). The methodology is currently applied to wetlands and riparian habitat under the California Wetlands Inventory Program and the California Rapid Assessment Methodology.

Local prioritization of data collection efforts will need to be governed by the community's prioritization of the assessment questions through use of the WICC and its Technical Advisory Committee (TAC). Given recent efforts by the RWQCB to develop TMDLs for the Napa River watershed, there may be particular interest in addressing the protection and prevention of healthy intact water bodies, as well as defining the potential progress toward delisting impaired water bodies in the county.

4. Watershed Indicator Selection

An important element of monitoring implementation is to identify watershed health indicators that correspond with prioritized assessment questions, and are chosen to balance cost and achievable/effective results. A list of preliminary watershed indicators specific to Napa County should be chosen so that they reflect representative geographic areas, ecosystem functions and their component parts.

5. Quality Assurance

A watershed monitoring program will include the development of data quality objectives for chosen watershed indicators/parameters, data verification, as well as validation and audit procedures for laboratory testing and field sampling.

6. Data Management

A WICC goal is to make credible watershed monitoring data and information available to all stakeholders in the community in a timely and accessible manner. The WICC WebCenter (**www.napawatersheds.org**) will be the foundation for a cooperative information management system to capture geospatial data for every indicator sample collected throughout the county.. Several key elements must be considered in the data management process, including developing guidelines to maintain data quality and comparability, data verification and validation, and development of and training on data tools for effective information sharing and use in decision making.

7. Data Analysis and Assessment

An effective watershed monitoring program achieves the goal of providing a consistent, defensible framework for the evaluation of monitoring data relative to state and countywide standards and supplies a methodology for assessing watershed conditions relative to various benchmarks and guidelines. The methodology must incorporate key elements that identify the available data and procedures used to collect it, document requirements relating to data quality issues, include or reference procedures for evaluating the quality of datasets, and explain data

reduction procedures that are appropriate for comparing data to applicable water quality standards and land use goals. Data from different sources need to be in a consistent format and of known quality .

8. Program Reporting and Communication

The WICC WebCenter (www.napawatersheds.org) provides one tool for a variety of users to access data for reporting purposes and general assessment. However, continual summary reports and condition assessments require considerable long-term resources to maintain and additional tools that may not be available at the local level. Monitoring implementation also requires thought on the frequency of reporting required for timely management intervention for critical parameters or for policy refinement, as well as appropriate reporting media and venues.

9. Programmatic Evaluation

A successful watershed monitoring should incorporate periodic external scientific and administrative reviews to obtain feedback on the program's validity and the effectiveness of its implementation to meet the community's needs. Approximately five years of data collection and interpretation are required to effectively evaluate lessons learned, to determine the degree of which questions have been answered that formed the rationale for the monitoring program, and to propose effectual adjustments to improve the monitoring effort.

10. General Support and Infrastructure Planning

Several key infrastructure and planning elements must be considered to sustain a watershed monitoring program and foster institutional collaborations and coordination. Some of the most important structural/operational needs include: staff personnel and training to run and oversee the monitoring program, scientific laboratory needs, necessary funding and potential funding mechanisms to support the program and carry-out various required forms of grant writing and other locally based funding activities. A successful program will likely be implemented with support from a wide variety of funding sources, examples of which may range from federal, state, and private foundation grants to voluntary contributions, General Fund allocations, impact fees on products or activities that diminish watershed health, or fines imposed on violators of land use regulations. However varied the funding arrangement, a minimum level of locally based long-term and reliable funding is required to maintain a basic trend record and understanding of changes in core watershed health indicators.

Introduction

Background

The Watershed Information Center & Conservancy (WICC) Board was convened in 2002 by the Napa County Board of Supervisors. The WICC is governed by a 14-member Board of Directors representing a broad range of stakeholder interests. The mission of the WICC is to educate and support the community in its efforts to maintain and improve the health of Napa County's watershed lands. The WICC supports and promotes activities of watershed restoration and enhancement by: facilitating and coordinating partnerships among the individuals, agencies, and organizations involved in improving watershed health; supporting watershed research activities; and providing watershed information and education.

In 2005 the WICC Board adopted an updated strategic plan that included five thematic goal categories: (1) Watershed Conservation and Management; (2) Watershed Information Center and Conservancy Website; (3) Communication, Coordination, and Partnerships; (4) Education; and (5) Organizational Structure and Funding (PMC Conservation and Resource Planning Group, 2005). One of the specific goals in the first category is to: *Coordinate and facilitate watershed planning, research, and monitoring efforts among Napa County organizations, agencies, landowners, and citizens*. The development of a monitoring strategy is a necessary first step towards this goal.

Monitoring in the most general sense is the periodic or continuous collection of data (measured parameters) using consistent methods. Within the context of the WICC Strategic Plan, monitoring is a key management action for tracking success of natural resource protection and restoration efforts and assessing and reporting on the long-term environmental health and socio-economic well being of the Napa County's watershed lands. Where public expenditures are used for watershed management activities, good information based on monitoring data is also a requirement for gaining and maintaining public confidence. Because ecosystems are complex, monitoring information is needed for adaptive watershed management.

Adaptive Management

Adaptive management is a process that employs research and monitoring to allow certain projects and activities to proceed despite some uncertainties and risks regarding their success or consequences. Adaptive management approaches decision-making as a structured process to reduce the costs of management experiments/activities with increasing opportunities for social learning. Adaptive management increases understanding why certain actions work and others do not. Expressed differently, adaptive management is the opposite of the usual trial and error approach, where decisions are made without the required information to evaluate risks of failure (wasted expenditures) or risks of inaction (and the possibility of continued declines in quality of life issues and/or watershed health). The informative feedback concepts embedded in the adaptive management approach should be used to help reduce the inherent uncertainty and continually revise and update the goals and methods associated with watershed enhancement and protection activities.

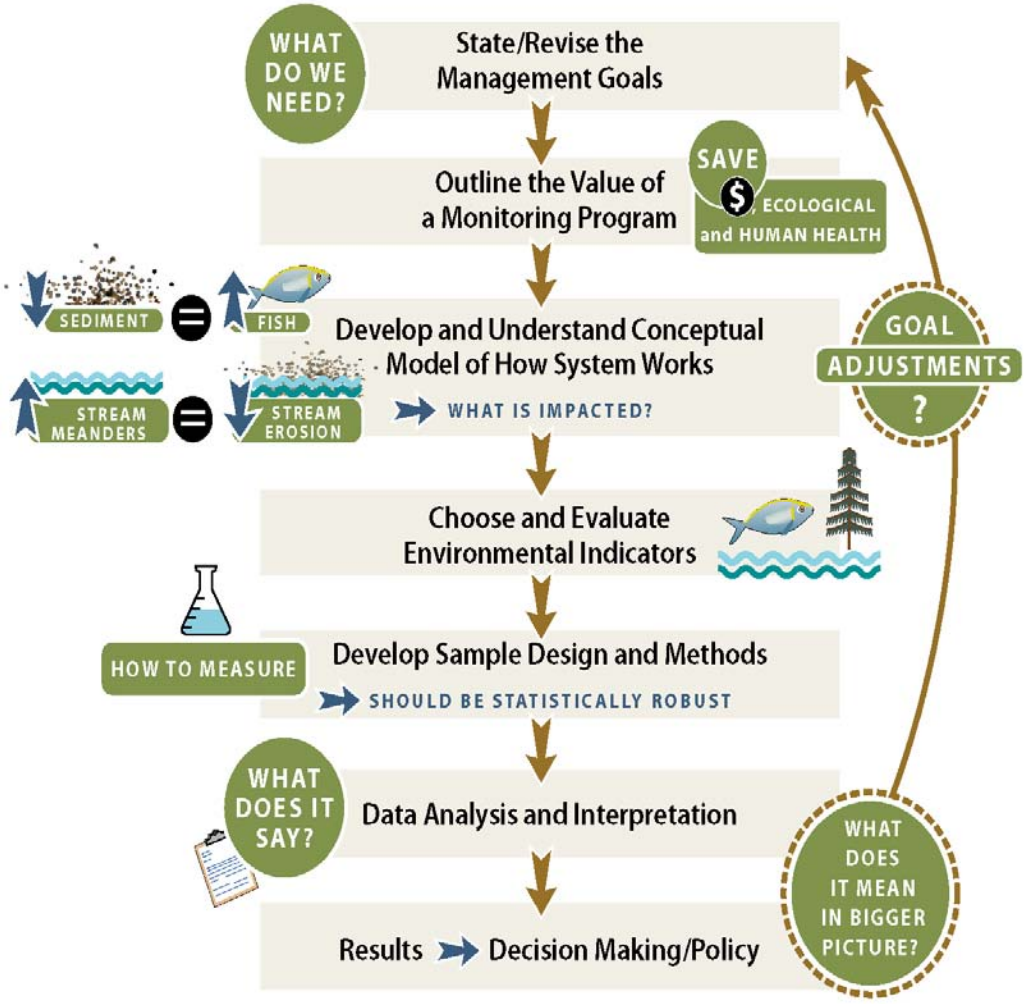
Monitoring represents an important element in a feedback loop to insure that human activities (watershed management activities) intended to achieve a desired set of conditions

actually perform in the most socially efficient manner. Proper monitoring provides adaptive management the required feedback and assessment information. Informative monitoring insures that management systems respond to changing watershed conditions and processes, including the human communities that affect and are affected by them.

Essential Elements of a Monitoring Strategy

Napa County and the WICC Board are fortunate to be able to build on numerous similar monitoring strategy development efforts throughout the nation. Figure 1 provides a sketch of the required elements, beginning with an assemblage of management goals and objectives that can be used to develop assessment questions at increasing levels of specificity.

Figure 1. Strategy for Development and Implementation of a Monitoring Plan



Several challenges exist in developing a meaningful and sustainable monitoring program. One challenge lies in the selection of an appropriate mix of monitored parameters (vital watershed components or elements) that can be combined into a set of key indicators that are representative of environmental conditions and are responsive to changes in management actions. In most cases, it is unclear what key indicators should represent progress toward broad watershed goals (e.g., "protect sensitive lands"). Furthermore, watersheds, including their social, cultural, and economic elements, are complex systems with a large number of variables. Complete certainty about the desired effects of a specific management practice on environmental conditions is in most cases impossible at best. The correct mix of monitored parameters providing just the right weight of evidence can help improve the likelihood of moving ahead with sound decisions. What the "right weight of evidence" is depends on the risks of inaction or business as usual (e.g. possible species extinction, periodic flood damage, continued declines in water quality) and the investment necessary to implement a set of management actions.

Investment in monitoring, as part of the adaptive management cycle, needs to be commensurate with the potential costs of course corrections toward more sustainable practices and the magnitude of short- and long-term risks to the environment and society if no action is taken. A well-established tool for dealing with monitoring challenges is to begin with broad goal statements and develop appropriate monitoring objectives. From the developed goals and objectives, specific assessment questions relating to each goal are then derived.

1. Management Goals

1.1'Community Goals' for Napa County's Watershed Lands

WICC has begun to identify conservation and planning goals based on community needs and interests for the county's watersheds. Broad goals have first been established for the Napa River Watershed and expanded to encompass the watersheds of upper Putah and Suisun Creeks. These broad goals are:

- Protect sensitive lands;
- Facilitate restoration of priority habitats;
- Support existing watershed stewardship programs;
- Partner with municipalities to address urban impacts and cost sharing;
- Conduct fundraising to support monitoring;
- Coordinate research, monitoring and data management;
- Conduct public outreach and education; and
- Coordinate compilation of baseline watershed conditions.

In addition to the goals above, the upper Putah Creek agricultural community (as part of a larger coalition group under specific . surface water runoff requirements) has signed on to goals in order to protect the beneficial uses of water bodies in the Putah Creek watershed. A critical goal of that effort is to determine the existing ecological conditions of agriculturally dominated water bodies by:

- Assessing the impacts of waste/polluted discharges of surface run-off from irrigated lands to receiving surface waters;
- Determining the degree of implementation of management practices to reduce discharge of specific pollutants that impact surface water quality;
- Determine the effectiveness of management practices and strategies to reduce discharges that impact water quality;
- Determine concentration and loading of pollution in these discharges to surface waters; and
- Evaluate compliance with existing narrative and numeric water quality objectives to determine if additional implementation of management practices is necessary to improve and/or protect water quality.

In addition to the broad WICC goals above, specific environmental endpoints or targets have been proposed in draft form by the RWQCB for the Napa River watershed that relate to the restoration of impaired beneficial uses through proposed implementation of a "Total Maximum Daily Load" (TMDL) for sediment, pathogens, and nutrients under Section 303(d) of the Clean Water Act. California water quality objectives designed to protect cold and warm freshwater habitat, fish migration and spawning, preservation of rare and endangered species, wildlife habitat, and human health/recreation are currently not met in the Napa River watershed.. The currently proposed pathogen TMDL for Napa River is based on bacterial density targets (geometric mean and ninetieth percentile of E. coli density of 126 and 406 CFU/100mL, respectively), as well as zero discharge of untreated human waste to the river, its tributaries, or connected groundwater flows (Krottje and Tuden 2005). Future numeric water quality targets for nutrient TMDLs will be based on water column nutrient concentrations (using draft objectives of 0.025 mg-N/L, annual median) for un-ionized ammonia and 10 mg-N/L for nitrate), algal densities, and water column dissolved oxygen concentrations (draft objectives of 5.0 mg/L minimum for warm water habitat and 7.0 mg/L for cold water habitat) (Krottje and Whyte 2003). TMDL allocation targets for sediment have been proposed using anadromous fish species (steelhead and Chinook salmon) and the endangered California freshwater shrimp as indicator species of watershed health, primarily because land and water use practices that restore these species are also likely to be protective of other valued ecosystem components (Napolitano et al. 2005). Attainment of these proposed targets will require a reduction in human-caused sediment inputs by 50%.

The Implementation Plan for the proposed TMDLs will include: (1) a description of the types of management actions needed to achieve state water quality objectives and recommendations for all responsible parties, public and private; (2) an action time schedule; and (3) descriptions of the compliance monitoring and surveillance measures to ensure successful implementation of management practices. Each TMDL implementation plan will be based on the adaptive and performance-based management principles outlined in the introduction to this report, and monitoring information will provide the basis for flexible and most cost-effective implementation for reductions in human-induced pollutant inputs. Monitoring will also allow managers to determine if they have reached their goal or if the goal needs to be adjusted based upon newly collected and more robust information and data about the watershed and how it functions.

1.2 Proposed Goals and Monitoring Objectives

In June 2005, the WICC formed an ad-hoc sub-committee to refine management goals and to guide development of a countywide watershed monitoring strategy. In consideration of proposed TMDL target allocations and the community's current concerns for watershed health and management, the WICC proposed a fundamental set of candidate watershed goals that were derived from a broader assortment watershed objectives. Those fundamental watershed goals include:

- Protection and enhancement watershed lands and natural processes,
- Achieving improved watershed health,
- Protection and restoration of water quality and beneficial uses, and
- Continuous application of new information and lessons learned from management action or inaction to adjust future steps.

A broader set of watershed monitoring objectives specific to support the above goals are also proposed and will need to be reviewed by the WICC's Technical Advisory Committee (TAC), agreed upon by WICC Board and accepted by the community before a monitoring program can developed and ultimately implemented. Those more specific monitoring objectives are:

- Characterize watershed conditions and trends using appropriate indicators of "healthy" watershed processes and natural resources associated with both aquatic and terrestrial components of the watershed,
- Improve the condition of the county's waterbodies recognized as having beneficial use impairment (e.g. water quality) problems,
- Prevent degradation of intact (i.e. unimpaired) waterbodies throughout the county,
- Prioritize potential activities designed to protect and restore beneficial uses ranging from the project specific level all the way up to the larger landscape-scale watershed level, and
- Insure monitoring information is available and used in decision-making.

2. Assessment Questions

The next step in developing and implementing a watershed monitoring program is to derive a set of assessment questions related to each goal and objective that are designed to provide answers relevant to the specific needs of local watershed protection. These questions can be developed on several scales and arranged in hierarchical order into an increasingly specific set of questions that range from the very general to very explicit. Appropriate assessment questions help guide the design of the monitoring program and can focus monitoring expenditures commensurate with the level of uncertainty, potential implementation costs, and risks of inaction. In addition, previously collected watershed data and information can be evaluated as to their relevance to the newly identified set of assessment questions and combined into representative watershed indicators suitable for planning and project design or performance evaluation after implementation (. Based on

the above goals and objectives, a set of initial assessment questions was developed to determine possible data needs and to focus a monitoring strategy that is relevant for the community and local decision-makers (Appendix A). These types of assessment questions need to be agreed on and prioritized before a monitoring program responsive to the needs of the community can be successfully designed.

3. Monitoring Program Design

3.1 Key Elements

The design of the monitoring program is crucial and should be guided by several principles, including budget affordability and design adaptability. The design must provide data that meet specific informational needs, are comparable within all of the county's watersheds, and are scientifically robust enough to draw accurate conclusions. The design should allow for monitoring at various spatial and temporal scales as expressed by the different range of the assessment questions identified. An integrative design approach is necessary to accomplish this. For example, some assessment questions may target environmental trends through time for each watershed, which would require a probabilistic, random sampling design that generates data representative of watershed conditions. If an assessment question pertains to monitoring the success of a particular restoration project or management action within one watershed, a non-random, 'targeted' design would be more appropriate. The incorporation of both designs within the larger monitoring strategy is necessary to answer the variety of assessment questions. The merits of such an integrative approach are described in more detail in the USGS's testimony to the US Senate on February 2005 concerning monitoring designs (Appendix B). Additionally, a watershed monitoring design should utilize multiple indicators at varying spatial and temporal scales to provide a greater weight of evidence in the data acquired. A suitable framework that incorporates these principles consists of three levels: 1) inventory of watershed resources (e.g., habitat types, water body types); 2) rapid assessment of condition using appropriate indicators; and 3) more detailed or intensive monitoring and assessment of relationships between watershed management actions and watershed health indicators.

One of the first steps in design development is to identify current and past inventories and monitoring efforts undertaken in the county's watersheds. Since the creation of the WICC, significant progress has already been made on inventorying habitats, biological resources, and the factors that control them. The most significant has been the development of the Baseline Data Report (BDR) for Napa County and the impairment assessment work by the RWQCB to support their TMDL obligations under federal and state legislation. The BDR describes and documents current watershed conditions for the entire county, and the TMDL impairment assessments identify limiting factors for beneficial uses of state waters (e.g., recovery of anadromous fisheries and water contact recreation).

Once assessment questions are derived from the management goals and objectives and agreed upon by the community, the BDR can be used as a valuable tool in conceptual model development, for identifying data gaps that should be filled through additional

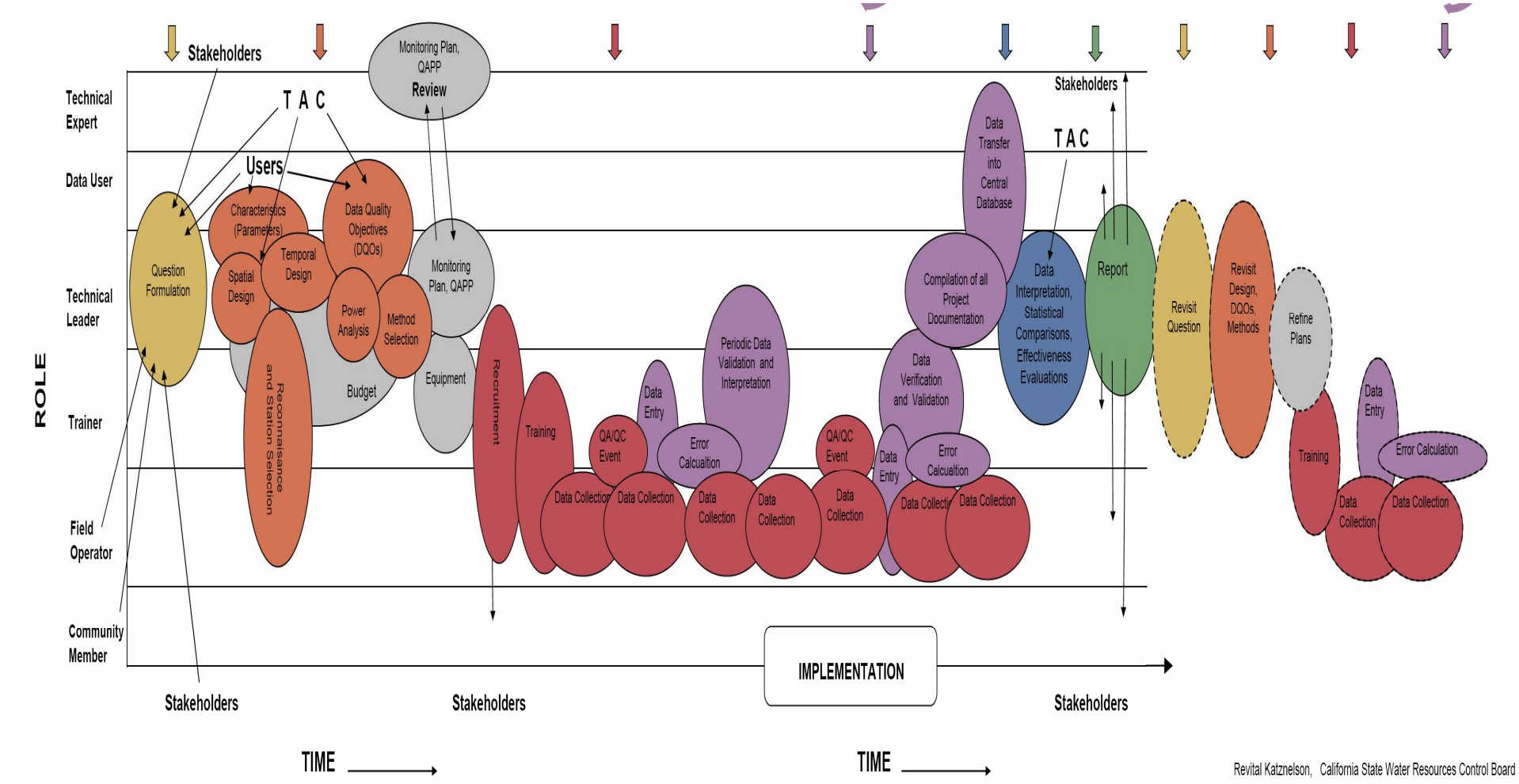
watershed studies, and insuring that data are collected in a comparable manner at appropriate intervals and in the right places to track progress toward obtaining identified goals. Appendix C lists some potential sources of past and current watershed monitoring efforts in Napa County.

3.2 Implementation Prioritization

Local prioritization of data collection efforts will need to be governed by the community's prioritization of the assessment questions through use of the WICC and its Technical Advisory Committee (TAC). In some areas, landowners may be ready now to participate in monitoring, and those areas might receive higher priority consideration. The common information needs of individual landowners should be identified first, followed by higher landscape-level concerns. Prioritization criteria should be established to specifically address the protection/prevention of impairment in currently intact water bodies, as well as the potential progress toward delisting currently impaired water bodies. Prioritization will help to insure that intact and unimpaired beneficial uses can be maintained and preserved. Development and implementation of the monitoring program will require several stages through time, but progress can be easily tracked (Figure 2).

Data collection activities can be grouped into short-term research or special-studies designed to inform specific questions and long-term monitoring activities designed to track trends.

Figure 2. Roles of stakeholders and participants in monitoring program development and implementation *(from Revital Katznelson, SWRCB)*



4. Watershed Indicator Selection

An important element of monitoring implementation is to identify watershed health indicators that correspond with prioritized assessment questions, and are chosen to balance cost and achievable/effective results. A list of preliminary watershed indicators specific to Napa County should be chosen so that they reflect representative geographic areas, ecosystem functions and their component parts.

A list of preliminary watershed indicators specific to the watersheds of Napa County should be chosen so that they reflect representative geographic areas and ecosystem functions and components (Appendix D). Indicators can be organized in a variety of ways. The most broadly accepted organizational tools is the "Pressure – State – Response" (PSR) Model and variations thereof (OECD 2003, http://www.oecd.org/dataoecd/7/47/24993546.pdf). It represents an easy-to-understand organizing framework to ensure a weight of evidence can be generated that links societal responses and reductions in adverse environmental impacts (pressures) to improvements in environmental condition (improved state).

Cost also plays an important role in indicator selection, as achievable monitoring efforts must be balanced with available funding resources. Surrogate indicators that yield sufficient data to answer assessment questions may be chosen above more costly indicators. For instance, in order to assess improvement in salmonid populations, it is cheaper and just as effective to measure the quality of the spawning habitat (e.g. percent shading) rather than survey actual salmonid numbers.

5. Quality Assurance

A watershed monitoring program will include the development of data quality objectives for chosen watershed indicators/parameters, data verification, as well as validation and audit procedures for laboratory testing and field sampling. Establishing a Quality Assurance (QA) team may be appropriate to develop and guide QA procedures and review standard operating procedures (SOP), produce QA reports, and evaluate data quality from past and current monitoring efforts. A number of useful guidance documents exist and are in development that can easily be adapted to the local needs (Appendix E).

6. Data Management

A goal expressed through the WICC Board is to make credible watershed monitoring data and information available to all stakeholders in the community in a timely and accessible manner. Concerns regarding privacy issues will require decisions about the scale and in what format data will be presented. It is envisioned that the WICC WebCenter (www.napawatersheds.org) will be the centralized storage database and the foundation for a cooperative information management system to capture geospatial data for every indicator sample collected throughout the county. Water quality, toxicity, sediment chemistry, microbiological, habitat, biological, fish and shellfish tissue data and metadata should be associated with geographical assessment units such as the National

Hydrography Dataset (NHD) or more finely delineated sub-watersheds within the Napa River, Putah Creek, and Suisun Basins. Implementation considerations include:

- Establishing and maintaining an electronic data management system for integrating multiple ambient watershed monitoring data types,
- Developing guidelines and technical specifications for data organization, flow and verification/validation to maintain data quality and comparability on a local and regional level,
- Data verification and validation,
- Loading historic and current monitoring data into the database,
- Providing expanded training on the WICC interactive WebCenter to expand coordination by data generators throughout the local area, and
- Facilitating intra- and inter-agency data comparability by developing and providing general use tools such as protocols and formats for electronic data transfer, procedures and tools for batch uploading of data, protocols and tools for data verification and validation and query and analytical tools for summarizing and analyzing data.

7. Data Analysis and Assessment

An effective watershed monitoring program achieves the goal of providing a consistent, defensible framework for the evaluation of monitoring data relative to state and countywide standards and supplies a methodology for assessing watershed conditions relative to various benchmarks and guidelines. The methodology must incorporate key elements that identify the available data and procedures used to collect it, document requirements relating to data quality issues, include or reference procedures for evaluating the quality of datasets, and explain data reduction procedures that are appropriate for comparing data to applicable water quality standards and land use goals. Data from different sources needs to be in a consistent format and of known quality.

The methodology must describe how existing available data and information relevant to applicable water quality standards, land use guidelines, species recovery plans, and other conservation and protection goals will be compiled and analyzed to make decisions about how these standards and goals may be attained or adjusted. The methodology should:

- Identify the likely sources of existing and available data and information and procedures for collecting or assembling them,
- Describe or reference requirements relating to data quality and descriptive accuracy, such as analytical precision, temporal and geographical representation and metadata documentation needs,
- Include or reference procedures for evaluating the quality of datasets, and
- Explain data reduction procedures (e.g., statistical analyses) appropriate for comparing data to applicable water quality standards and watershed goals.

8. Program Reporting and Communication

8.1 Data sharing: Web-based maps, graphs, standard database formats

Watershed health indicators are comprised of a wide range of parameters comprised in seven general categories:

- Landscape condition (e.g., habitat types, landscape structure, land cover),
- Biotic condition (e.g., ecosystems and communities, species and populations),
- Chemical and physical characteristics (e.g., nutrients, trace inorganic and organic chemicals, temperature, oxygen),
- Ecological processes (e.g., primary production),
- Hydrology and geomorphology (e.g., surface and groundwater flows, groundwater elevations, channel and floodplain morphology/complexity, sediment transport and storage),
- Natural disturbance regimes (e.g., frequency, intensity, extent, duration), and
- Human uses and watershed services (e.g., timber, water use, land use, recreation, food production).

Data from these kinds of categories are collected either routinely or sporadically by numerous entities from individual landowners to federal agencies. In order to combine data from different sources, they need to be of known quality and in a consistent format.

The WICC WebCenter (www.napawatersheds.org) provides one tool for a variety of users to access data for reporting purposes and general assessment. However, continual summary reports and condition assessments require considerable long-term resources to maintain and additional tools that may not be available at the local level.

8.2 Communication to identified audiences

Information derived from watershed health indicators at various spatial scales (individual parcel to whole river basin) has different audiences and requires different communication mechanisms. Individual landowners, e.g., need to know if their management measures produced certain outcomes that may not be very relevant for the general public or policy-makers. However, broad indicators at the landscape level may be of interest to a general audience interested in the "state of the watershed." Monitoring program implementation requires careful thought about:

- The frequency of reporting required for timely management intervention at the project level (e.g., real time stream flow data), or at the landscape level for larger community policy development, and
- Media and reporting venues (e.g., videos, fact sheets, newsletters, annual reports, workshops, public meetings, etc.)

9. Programmatic Evaluation

A successful watershed monitoring should incorporate periodic external scientific and administrative reviews to obtain feedback on the program's validity and the effectiveness of its implementation to meet the community's needs. Most rigorously conducted monitoring programs conduct periodic external scientific and administrative reviews to remain relevant. Approximately five years of data collection and interpretation are required to effectively evaluate lessons learned, to determine the degree of which assessment questions have been answered that formed the rationale for the monitoring program, and to propose effectual adjustments to improve the monitoring effort.

10. General Support and Infrastructure Planning

Several key infrastructure and planning elements must be considered to sustain a watershed monitoring program and foster institutional collaborations and coordination. A successful program will likely be implemented with support from a wide variety of funding sources.

10.1 Planning Coordination/Institutional collaborations

This element of the monitoring strategy deals with the support needed to implement a coordinated and comprehensive watershed health monitoring and assessment program, which includes identifying:

- The required number of staff needed for monitoring program implementation and oversight,
- Needed laboratory support to perform scientifically appropriate documented methods,
- Training needs for program implementation, including for field, laboratory, data management and data assessment staff,
- Required funding (for example, for salaries, training, travel, equipment, laboratory analysis, and external scientific review of assessment reports) for implementing the program, along with anticipated sources and amounts of funding and the effects of any shortfalls, and
- Needed support for grant-writing and other localized fundraising activities.

10.2 Funding options

A watershed monitoring program will likely be implemented with a wide variety of funding sources, examples of which may range from federal, state, and private foundation grants to voluntary contributions, local General Fund allocations, impact fees, or possible fines imposed on violators. However varied the funding arrangement might be, a minimum level of locally based long-term and reliable funding is required to maintain a basic trend record and understanding of changes in core watershed health indicators.

11. References

CVRWQCB. July 11, 2003. Conditional Waivers of Waste Discharge Requirements for Discharges from Irrigated Lands within the Central Valley Region. Resolution No. R5-2003-0105. California Regional Water Quality Control Board, Central Valley Region, Rancho Cordova, Ca.

Krottje P. and D. Whyte. 2003. Conceptual Approach for Developing Nutrient TMDLs for San Francisco Bay Waterbodies. California Regional Water Quality Control Board, San Francisco Bay Region, Oakland, CA.

Ministry of Forest and Range, Government of British Columbia. August 9, 2000. Forest Practices Branch. http://www.for.gov.bc.ca/hfp/amhome/Amdefs.htm

Napolitano, M., Potter, S. and D. Whtye. April 18, 2005. Napa River Sediment Total Maximum Daily Load Draft Technical Report. California Regional Water Quality Control Board, San Francisco Bay Region, Oakland, CA.

OECD. 2003. OECD Environmental Indicators, Development, Measurement and Use, Reference Paper. Organization for Economic Co-operation and Development (OECD). Paris, France. **http://www.oecd.org/dataoecd/7/47/24993546.pdf**

R. Katznelson. 2005. Designing an Environmental Monitoring Project (powerpoint presentation). California Regional Water Quality Control Board, San Francisco Bay Region, Oakland, CA.

PMC Conservation and Resource Planning Group. 2005. Watershed Information Center and Conservancy of Napa County. Final 2005-06 Strategic Plan.

USEPA. 2005. Watershed Academy's Distance Learning Program - Watershed Academy Web. United States Environmental Protection Agency, Washington, DC. http://www.epa.gov/watertrain/index.htm

USEPA. 2000. Principles for the Ecological Restoration of Aquatic Resources. EPA841-F-00-003. Office of Water (4501F), United States Environmental Protection Agency, Washington, DC.

USEPA. 1977 (amended). Clean Water Act, Federal Water Pollution Control Act Amendments of 1972. United States Environmental Protection Agency, Washington, DC.

Wikipedia Simple English Online Encyclopedia. 2005. http://simple.wikipedia.org/wiki/Main_Page

Appendix A. Examples of Assessment Questions based on Management Goals (MG) and Monitoring Objectives (MO)

MG 1. Protect and enhance watershed lands and natural processes

MO 1. Characterize watershed conditions and trends using appropriate indicators of "healthy" watershed processes and valued ecosystem components

A1. Which watershed lands should be protected and enhanced?

- Where are the sensitive lands and priority habitats within each watershed?
- What are the social and economic factors associated with the use of those resources/lands?

A2. To what extent have natural processes been disturbed, and where do they need to be restored and protected?

- Where are current restoration projects?
- What are the urban and rural pollutant sources within each watershed, and what are their relative contributions to impairments in sensitive and priority habitats?
- What management practices are in place to prevent and reduce pollution in impaired waterbodies?
- What further efforts are needed to reduce impacts from urban and rural runoff?

A3. What are appropriate indicators of success?

- What indicators are reasonable representations of surface water condition?

MG 2. Achieve improved watershed health

MO 2. Improve the condition of the county's waterbodies recognized as having beneficial use impairment

A1. How do we want to define watershed health?

A2. What conditions do we consider desirable?

A3. What are existing trends of appropriate indicators of watershed health?

- What is the condition of representative habitats over time - improving, degrading, staying the same? Conditions in the past, present, and future?
- How are pollution patterns and trends affected by management actions (BMPs, source control)?
- What watershed segments in each watershed have the most concern over current and future social and economic pressures impacting environmental resources?

MG 3. Protect water quality and beneficial uses

MO 3. Prioritize beneficial use protection and restoration activities

A1. What is the present condition of water quality?

- Are aquatic beneficial uses (cold and warm freshwater habitat, fish migration and spawning, wildlife habitat, and preservation of rare & endangered species) impaired in identified sensitive habitats?
- Where are draft TMDL targets being exceeded? At several scales – watershed, project site.

A2. What are appropriate indicators of beneficial use condition and trends?

- What indicators show a signal relative to implemented management measures?

MO 4. Prevent degradation of intact (e.g. unimpaired) waterbodies throughout the county

- Which stewardship programs exist?
- What are the criteria for prioritizing support to these programs?
- What programs/efforts would benefit the most from fundraising?
- Where are significant research studies occurring in each watershed that can be used to evaluate the relative environmental and social benefits of various management options?
- What are current monitoring methodologies employed within each watershed by various agencies/organizations, and where are areas of intersection and/or gaps?
- Where are significant individual and watershed-based management actions/ projects?

MG 4. Continuously apply new information and lessons learned from actions to adjust future steps

MO 5. Insure monitoring information is used in decision-making

- What baseline data are necessary to promote standardization and robust science-based decision-making?

Appendix B. USGS Testimony to Congress on Water Quality Monitoring

Monitoring in the 21st Century to Address our Nation's Water-Resource Questions

By Timothy L. Miller, USGS
February 25, 2005

A time of increasing complexity

Water-quality monitoring has become a high priority across the Nation, in large part because the issues are more complex and money is tighter. The demand for high-quality water is increasing in order to support a complex web of human activities and fishery and wildlife needs. This increasing demand for water, along with population growth and point and nonpoint sources of pollution, threatens the quality *and* quantity—and therefore the availability—of all our water resources.

This is a challenge all across the country. Areas once thought of as "water rich"—mostly in terms of limitless availability—are now considered "water challenged," such as in southern Florida, where available water must support 6 million people along their coasts, extensive agriculture south of Lake Okeechobee, and ecosystems in the Everglades and the Florida Bay. No longer is only the arid western U.S. challenged to manage its water needs for drinking, irrigation, aquatic ecosystems, and recreation.

As was acknowledged more than 30 years ago when the Clean Water Act was implemented, monitoring is fundamental to successful management of water resources. However, the nature of monitoring must adapt to increasingly complex water demands and issues. Monitoring is no longer limited to "end of pipe" site-specific data on dissolved oxygen or suspended solids, collected for day-to-day evaluations of compliance or decisions about permitting. Three specific challenges force a shift in monitoring since the implementation of the Clean Water Act.

- Most water-quality problems are caused by diffuse "nonpoint" sources of pollution from agricultural land, urban development, forest harvesting, and the atmosphere. These sources are more difficult to monitor, evaluate, and control than point sources, such as discharges of sewage and industrial waste. The amount of pollution from nonpoint sources varies from hour-to-hour and season-to-season, making it difficult to monitor and quantify the sources over time.
- Water-quality issues themselves have become more complex. Forty years ago, concerns about water quality focused largely on the sanitary quality of rivers and streams—in bacteria counts, nutrients, dissolved oxygen for fish, and a few measures like temperature and salinity. While these factors are still important, new and more complex issues have emerged. Hundreds of synthetic organic compounds, like pesticides and volatile organic compounds (VOCs) in solvents and gasoline have been introduced into the environment. Over the last 10 years, improved laboratory techniques have led to the "discovery" in our waters of microbial and viral contaminants, pharmaceuticals, and hormones that weren't measured before.
- Evaluation and monitoring of pollution sources and of the condition of our water resources have been limited because available information is fragmented. Inconsistency in the types of data collected, the standards and analytical methods used, and the selection of monitoring sites makes it difficult to integrate the findings.

Different questions require different kinds of monitoring. It's important to understand that one monitoring design cannot solve all of our water-resource issues or questions. For example, depending on specific interests or responsibilities, one might ask:

- Is the water meeting beneficial uses; that is, is it acceptable for drinking or swimming or irrigation or for sustaining aquatic habitat?
    - What percentage of streams is impaired within a State?
- Are regulatory requirements being met? Are concentrations or loads below those allowed in discharge permits?
- How does the water quality of one water body compare with those nearby or across the Nation?
- Is water quality getting better or worse? Does water quality change during certain times of the year?
- What are the sources of contaminants and causes of the problems?
- How do changes in land use or management practices affect water quality?

None of these questions is easy to answer, and each requires a different kind of monitoring—a specific set of data collected in certain places and at certain times. So, undoubtedly, monitoring designs end up being unique or different—varying in the timescales and spatial scales covered. The process, however, is always the same. The process begins with clearly defining the water-resource questions; outlining the decisions that will be made from the data; and then identifying the data (or monitoring) needed to make the decision.

Water-resource issues or questions determine monitoring objectives. And the objectives determine the monitoring design. No design, therefore, is "better" or "more successful" than another. Success is measured by whether the monitoring design addresses the specific objectives. Different types of monitoring—such as "probabilistic" and "targeted" designs—answer different sets of questions. Although both of these designs can contribute to statewide, regional, or national assessments, and improve understanding of the general or "ambient" water resource, they provide different types of information. Both types of monitoring are important, and therefore, should not be viewed as competitive or duplicative, and both need support with adequate funding. In fact, these designs are so different that discussions should not focus on whether one design can substitute for another but on how to integrate the two in order to go beyond what each can provide individually, particularly in predicting conditions in unmonitored areas. This can be illustrated by addressing an overarching question driving many discussions "What is the quality of our Nation's waters?"

What monitoring design best answers "What is the quality of our Nation's waters?" Again, it depends on specific objectives and questions. To some, this may reflect an overall assessment of the resource as required in the Clean Water Act section 305(b): "What percentage of the Nation's waters is impaired? What percentage is in good condition? What percentage of streams is meeting their beneficial uses?" Such questions require a broad-based probabilistic monitoring design, in which sites are chosen randomly and are distributed across a certain region. This type of monitoring provides a quantitative, statistically valid estimate of, for example, the number of impaired stream miles within a region or State. Probabilistic monitoring and assessments help to document what is going well (how much of the resource is in good condition) and what is not (how much is in poor condition). The data collected help decision makers prioritize regions having the most degraded waters and assess which stressors—such as nutrients, sedimentation, and habitat disturbance—are of most importance in that region or State. Many probabilistic monitoring programs are currently implemented by States and within the U.S. Environmental Protection Agency, such as the Environmental Monitoring and Assessment Program (EMAP).

Probabilistic monitoring is a useful and cost-effective method for getting an unbiased, broad geographic snapshot of "whether there is a problem" and "how big the problem is." To others, "assessing the Nation's waters" leads to other questions, including "Why are water-quality conditions happening and when? Do certain natural features, land uses, or human activities, and management actions affect the occurrence and movement of certain contaminants? Are water conditions changing over time? "

These are equally important questions, but require a "targeted" monitoring design that focuses on understanding the relations between water-quality conditions and the natural and human factors that cause those conditions. Monitoring sites are therefore not selected randomly within a grid, but because they represent certain human activities, environmental settings, or hydrologic conditions during different seasons or times of year. For example, sites may be selected to assess the effects of agriculture and urban development on pesticide and nutrient contamination in streams.

A "targeted" monitoring design requires data collection:

- Over different seasons. This is important because, for example, USGS assessments generally show low concentrations of contaminants, such as pesticides, in streams for most of the year—lower than most standards and guidelines established to protect aquatic life and human health. However, the assessments also show pulses of elevated concentrations—often 100 to 1,000 times greater in magnitude, exceeding standards and guidelines—during times of the year associated with rainfall and applications of chemicals. Such pulses could affect aquatic life at critical points in the life cycle and also could affect drinking water.
- In different land uses, including agricultural, urban, and more pristine land-use settings. USGS assessments show that water conditions are very different among the different settings; insecticides, for example, are more frequently detected at higher concentrations in urban streams than in agricultural streams. Water conditions also are different among different land-use practices; phosphorus, sediment, and selected pesticides, for example, are at higher concentrations in streams draining agricultural fields with furrow irrigation than in agricultural fields with sprinkler irrigation.
- In different geologic settings. The setting—whether it is sand and gravel or volcanic rock, for example—affects how readily water moves over the land and into the ground.
- During different hydrologic conditions. The amount of streamflow and the timing of high and low flows determine how contaminants are carried in streams, and the connections between streams and ground water determine how the ground water will be affected.
- Over the long term. Without comparable data collected over time, assessments cannot distinguish long-term trends from short-term fluctuations and natural fluctuations from effects of human activities. USGS assessments show that water quality continually changes. The changes can be relatively quick—within days, weeks, or months, such as in streams in the Midwest where types of herbicides used on corn and soybeans have changed, or relatively slow, such as in ground water beneath the Delmarva Peninsula where nitrate concentrations are beginning to decrease after 10 years of improved management of nitrogen fertilizers.

Targeted sampling brings an understanding of the causes of water-quality conditions. It establishes relations between water quality and the natural and human factors that affect water quality. Targeted monitoring and assessments help decision makers to (1) identify streams, aquifers, and watersheds most vulnerable to contamination; (2) target management actions based on causes and sources of pollution; and (3) monitor and measure the effectiveness of those actions over time. Such monitoring would not be necessary if all streams and watersheds responded the same over time. But they are different. As shown by targeted assessments across the Nation, such as through the USGS National Water-Quality Assessment (NAWQA) Program,

even among similar land uses, the differences in sources, land-use practices, hydrology and other natural factors make one watershed more vulnerable to contamination than another and result in different ways that management strategies can improve water quality.

Integrating the two designs

Neither probabilistic nor targeted monitoring designs answer all questions about the Nation's water resources. While the targeted design cannot provide a quantified estimate of, for example, percentage of streams impaired within a broad geographic region, a probabilistic design cannot account for sources, seasonal differences, varying streamflow and ground-water contributions, or processes that control the movement and quality of water.

Ideally, data collection and monitoring should be consistent and comparable so that the findings can be integrated. National investments and partnerships must commit to increasing the comparability and integration of monitoring in order to enhance our ability to answer critical questions about water resources and understand the quality of the Nation's waters.

Appendix C. Potential sources of past and current Napa County watershed monitoring

- Resource Conservation District (RCD) turbidity and stage data at some stations
- Friends of Napa River fish surveys
- Friends of Napa River, RCD macroinvertebrate studies
- US Army Corps of Engineers (USACE) - Lower Napa River Flood Control
- US Geological Survey (USGS) stage and sediment data for Napa River
- San Francisco Estuary Institute (SFEI) nutrient and pathogen studies in Napa; also, historical ecology work
- National Wetlands Inventory (NWI) – wetland and riparian habitat mapping
- Stillwater Sciences' work on temp, turbidity, permeability, pool filling
- Robert Leidy and Jonathon Koehler fish surveys
- City of Napa water quality data
- Reservoirs – rainfall, storage, release
- California Department of Fish and Game (CDFG), Region 3
- Rutherford Dust
- WICC Baseline data report
- California Department of Water Resources (DWR) well data
- State Water Resources Control Board (SWRCB) water rights database

Appendix D. Potential Indicators: Matrix relating broad and specific level indicators to proposed Management Objectives

Management Objectives	Indicators Broad Level (Watershed)	Indicators Specific Level (Project, Stream)
Characterize watershed conditions and trends	• Current and Planned Land Management Activities • % Landscape Composition/ Landuse • Road density • Drainage density • Hydrological modifications of surface waters • Topography and soil type • Rainfall measures • Extent and diversity of habitat types • % Fragmentation of habitat patches • Biological community extent and composition • Surface water extent	• Connectivity to floodplain • % Riparian cover and buffer extent • Pool/Riffle composition • Species population size and diversity • Presence/Absence of sensitive species • Nutrient concentrations • Pathogen counts • Sediment quality characteristics • Water quality characteristics • Rates of bed and bank erosion • Scour potential • Bed permeability • Incision Rate
Improve the condition of the county's waterbodies recognized as having beneficial use impairment problems	• Change over time in watershed segments of concern (decreased erosion & incision, increased biological usage) • Trends in gravel permeability, scour depth, and meander wavelength • Trends in meeting numeric nutrient and pathogen targets • Increase of restoration activities (# permits) associated with impaired watersheds • % Decrease in fish barriers • % Decreases in drainage density • Decrease in # of swim advisories	• Sustained increase in salmonid numbers and diversity • Sustained decrease in nutrient concentrations and pathogen counts • Increase in riparian cover and composition • Sustained decrease in water temperatures • Increase in stream miles in channel equilibrium
Prevent degradation of intact (e.g. unimpaired) waterbodies throughout the county	• Available funding • Watershed permitting activities • Number of stewardship programs' activities in areas of concern • Current research and monitoring activities in areas of concern	• Road number and type • BMPs onsite and impacts • Riparian buffer changes (extent and composition) • Specific water quality parameters (including nutrients & pathogens) • Changes in chemical water quality

	• Population growth patterns • Land use changes (development pressure) • % Wetlands • % Riparian Corridor • BMPs applied • Change in % unimpaired vs. impaired	• Bed scour and permeability • Incision rate • Biological assemblage abundance and diversity
Prioritize beneficial use protection and restoration activities	• Available funding • % Watershed with TMDL targets exceeded • Land use changes (development pressure) • Population growth patterns • Permitted watershed restoration activities • % Coverage and overlap by stewardship groups	• Increased use of waterbodies by swimmers/fishermen • Riparian buffer changes (extent and composition) • BMPs onsite and impacts • Increased use of waterbodies by wildlife • Water quality monitoring (including nutrients & pathogens) • Biological assemblage abundance and diversity
Insure monitoring information is used in decision-making	• WICC meetings to review data and monitoring recommendations • # Policy documents referencing Strategic Plan • Monitoring information referenced in project review	• Data comparability among current studies • Communication between WICC Board, stakeholders, and monitoring entities

Appendix E. List of Existing QA/QC Guidance Documents

Lowe, S, Hoenicke, R and J. Davis. May 1999. Quality Assurance Project Plan for the Regional Monitoring Program for Trace Substances. San Francisco Estuary Institute (SFEI), Oakland, CA.

Nichol, G and E. Reyes. March 24, 2004. Surface Water Ambient Monitoring Program (SWAMP) - Compatible Quality Assurance Project Plans (Version 1.0). State Water Resources Control Board (SWRCB), Dept of Water Quality, Sacramento, CA.

US EPA. September 1996. The Volunteer Monitor's Guide To Quality Assurance Project Plans. EPA 841-B-96-003. Office of Wetlands, Oceans and Watersheds (4503F), United States Environmental Protection Agency, Washington D.C.

Appendix F. Glossary of Watershed Monitoring Terms
**** Denotes definitions from EPA Watershed Academy***

Adaptive Management - Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form–"active" adaptive management–employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed. (From Ministry of Forests and Range 2000)

***Ambient monitoring -** All forms of monitoring conducted beyond the immediate influence of a discharge pipe or injection well and may include sampling of sediments and living resources.

***Assessment -** The translation of scientific data into policy-relevant information that is suitable for supporting decision-making and action.

Assessment Questions – Questions developed to focus monitoring data on environmental management issues that clearly relate to ecological components or processes deemed important in ecological condition.

***Biological parameters -** Include measures related to the plant and animal life of the water body, such as fish species diversity and abundance, or the presence or absence of indicator fishes, aquatic invertebrates, or aquatic plants.

***Chemical parameters -** Include contaminants such as metals, dissolved nutrients, oils, and pesticides, and also include chemical properties of the aquatic system such as dissolved oxygen, chemical oxygen demand, and acid neutralizing capacity.

Conceptual Model - Visual or textual characterization of an ecosystem or watershed that defines problems, identifies the type of solutions needed, and provide logical steps in the development of a strategy and goals. (US EPA 2000)

***Data Quality Objectives (DQOs) -** In the context of water quality monitoring, the characteristics or goals that are determined by a monitoring or interpretive program to be essential to the usefulness of the data. They would include, but not be limited to, the specification of delineation of the limits of precision and bias of measurements, the completeness of sampling and measurements, the representativeness of sites relative to program objectives, the validity of data, and so forth.

Ecosystem - A naturally occurring assemblage of organisms (plant, animal and other living organisms—also referred to as a biotic community) living together with their environment, functioning as a loose unit. (From Wikipedia Encyclopedia)

***Effectiveness monitoring -** Documents how well the management practices meet intended objectives. Monitoring evaluates the cause and effect relations between management

activities and conditions of the riparian dependent resources. Terrestrial and in-stream methods constitute monitoring that evaluates and documents the total effectiveness of site-specific actions.

***Environmental indicator -** A measurable feature or features that provide managerially and scientifically useful evidence of environmental and ecosystem quality or reliable evidence of trends in quality. The selection of relevant indicators should be derived directly from the assessment question and from professional judgment.

***Environmental restoration** - The return of a degraded ecosystem to a close approximation of its remaining natural potential.

Habitat - The physical environment that surrounds (influences and is utilized by) a species population. (From Wikipedia)

***Implementation monitoring -** Documents whether or not management practices were applied as designed. Project and contract administration is a part of implementation monitoring.

***Implementation Plan** - Developing a step-by-step plan for addressing management objectives, selecting the best watershed management alternatives, listing strategies for implementing selected management alternatives, and determining how to measure progress and evaluate efforts. The plan specifically identifies funding mechanisms, prioritizes management actions, and outlines plan review and stakeholder feedback process.

Management Goals and Objectives - Goals direct implementation actions and provide standards for measuring success. The chosen goals should be achievable ecologically, given the natural potential of the area, and socioeconomically, given the available resources and the extent of community support, and should have stakeholder consensus. Good goals provide focus and increase project efficiency. (US EPA 2000)

***Monitoring -** Periodic or continuous collection of data (measured parameters) using consistent methods to determine the status (the condition of the ecological resources) of a water body and watershed and the changes in those measurements over time.

***Physical parameters -** Include general conditions such as temperature, flow, sediment characteristics, water color, and within-channel habitat structure.

***Probability-based sampling** (Probabilistic Sampling Design) - A sampling method in which randomness is built into the design so that properties of the sampled population can be assessed in terms of their likelihood of occurrence or existence.

***Quality assurance/quality control (QA/QC) -**A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

***Random sampling -** A sampling method in which every possible sample has the same chance of being selected.

***Sampling design -** All of the details concerning sampling units, sample selection, timing, spatial distribution and other issues involved in gaining sufficient sampling data for a monitoring and assessment program.

***Statistically significant results -** Sampling data that collectively meet or exceed data quality objectives or pass a statistical testing method, and therefore can support or disprove a hypothesis or other inference.

***Systematic sampling -** A sampling method in which sample selection begins at a random starting point but subsequently selects additional sampling units at equal intervals along a stated gradient or numbered list; for example, sampling a river channel's width and depth at 1-kilometer intervals along its full length.

***Trends and changes -** A trend is the consistent directional change in a population's characteristics documented by a minimum of three sampling events over a period of time (or sometimes distance); a change is a difference in a characteristic between just two sampling events.

***Total Maximum Daily Load (TMDL) -** A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Water quality standards are set by States, Territories, and Tribes, and identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. (From Clean Water Act 1987)

***Water quality assessment -** The determination whether a water body is attaining its designated uses for such purposes as drinking, contact recreation, fisheries, and irrigation, based on state Water Quality Standards as provided for in the Clean Water Act of 1987.

***Water quality monitoring -** An integrated activity for evaluating the physical, chemical, and biological characteristics of water in relation to human health, ecological conditions, and designated water uses.

Watershed - A region of land where water flows into a specified body of water, such as a river, lake, sea, or ocean. Also a topographical boundary between catchment basins. (From Wikipedia)

***Watershed monitoring -** Monitoring primarily designed to sample and assess the characteristics and/or condition of a watershed or watersheds, or to sample and assess

specific entities on a watershed basis (i.e. as a geographic unit for sampling). For example, water quality monitoring conducted on a watershed basis would include monitoring physical, chemical, and biological condition of the water body as well as specific watershed characteristics (e.g., stream corridor traits, wetlands, and watershed land use/land cover patterns) that may be related to observed water quality.

1195 Third Street,
Suite 210
Napa, California
94559

Telephone:
707-253-4417

Fax:
707-253-4336

TO: WICC Board of Directors

FROM: Hillary Gitelman, Director
Patrick Lowe, Deputy Director

DATE: December 6, 2005

RE: Napa County Baseline Data Report (BDR)

The completion of the Napa County Baseline Data Report (BDR) reflects the culmination of a comprehensive effort to provide baseline or existing condition information for a wide range of environmental and resource topics in Napa County. The Introduction/Executive Summary, along with a CD-Rom copy of the complete BDR, is included for your information.

The BDR is intended to support the Napa County General Plan Update and it is already being used by our General Plan consultant and CDPD staff in that effort. The BDR will also support continuing improvements to our permit review process, as well as providing needed information to support the development of thresholds of significance for use in the County's review of projects under the California Environmental Quality Act (CEQA).

The BDR is envisioned as a "living" document and informational database that will continue to serve the planning efforts in Napa County well into the future. Over time, the BDR will require updates and database maintenance so that the information remains current and reliable. Chapters can be updated on an individual basis as warranted by each resource topic.

A Technical Appendix that details the hydrology/watershed modeling for the BDR will be added this January. This detailed modeling work will support the analysis of the various General Plan scenarios that will take place next year as a part of the General Plan's Program EIR (PEIR).

The BDR will be available on the County's website, as well as on the Watershed Information Center and Conservancy (WICC) WebCenter (www.napawatersheds.org), and on CD-Rom by request from the Conservation, Development and Planning Department.

If you have any questions or need additional information, please contact Patrick Lowe, Deputy Director at 259-5937 *(rlowe@co.napa.ca.us)*, or Jeff Sharp, Planner/Watershed Coordinator, at 259-5936 *(jsharp@co.napa.ca.us)*.

(Note - Opening the CD-Rom: The accompanying CD is designed to run its index page automatically upon insertion into your computer. If the CD does not open the index page in your computer's web browser, navigate to the CD in Window's Explorer or My Computer and double click on the file named **index.html** to activate the index page.

Napa County Baseline Data Report

Napa County Baseline Data Report (BDR)

The files that comprise the BDR require the *free* Adobe Acrobat Reader.

- Cover (2.4 Mb)
- Title Page (46 k)
- Executive Summary (597 k)
- Chapter 0. Introduction (89 k)
- Chapter 1. Geological Resources (1.4 Mb)
  - Map 1-1 (899 k)
  - Map 1-2 (1.2 Mb)
  - Map 1-3 (1.6 Mb)
  - Map 1-4 (1.4 Mb)
  - Map 1-5 (1.2 Mb)
  - Map 1-6 (1.4 Mb)
  - Map 1-7 (1.4 Mb)
  - Map 1-8 (718 k)
  - Map 1-9 (674 k)
  - Map 1-10 (1.0 Mb)
  - Map 1-11 (1.4 Mb)
- Chapter 2. Mineral and Rock Resources (460 k)
  - Figure 2-1 (844 k)
  - Figure 2-2 (1.8 Mb)
  - Figure 2-3 (3.5 Mb)
  - Map 2-1 (400 k)
- Chapter 3. Air Quality (802 k)
  - Map 3-1 (273 k)
  - Map 3-2 (441 k)
  - Map 3-3 (439 k)
  - Map 3-4 (293 k)
  - Map 3-5 (394 k)
  - Map 3-6 (284 k)
  - Chapter 3 Appendices (59 k)
- Chapter 4. Biological Resources (3.6 Mb)
  - Map 4-1 (570 k)
  - Map 4-2 (929 k)
  - Map 4-3 (4.8 Mb)
  - Map 4-4 (926 k)

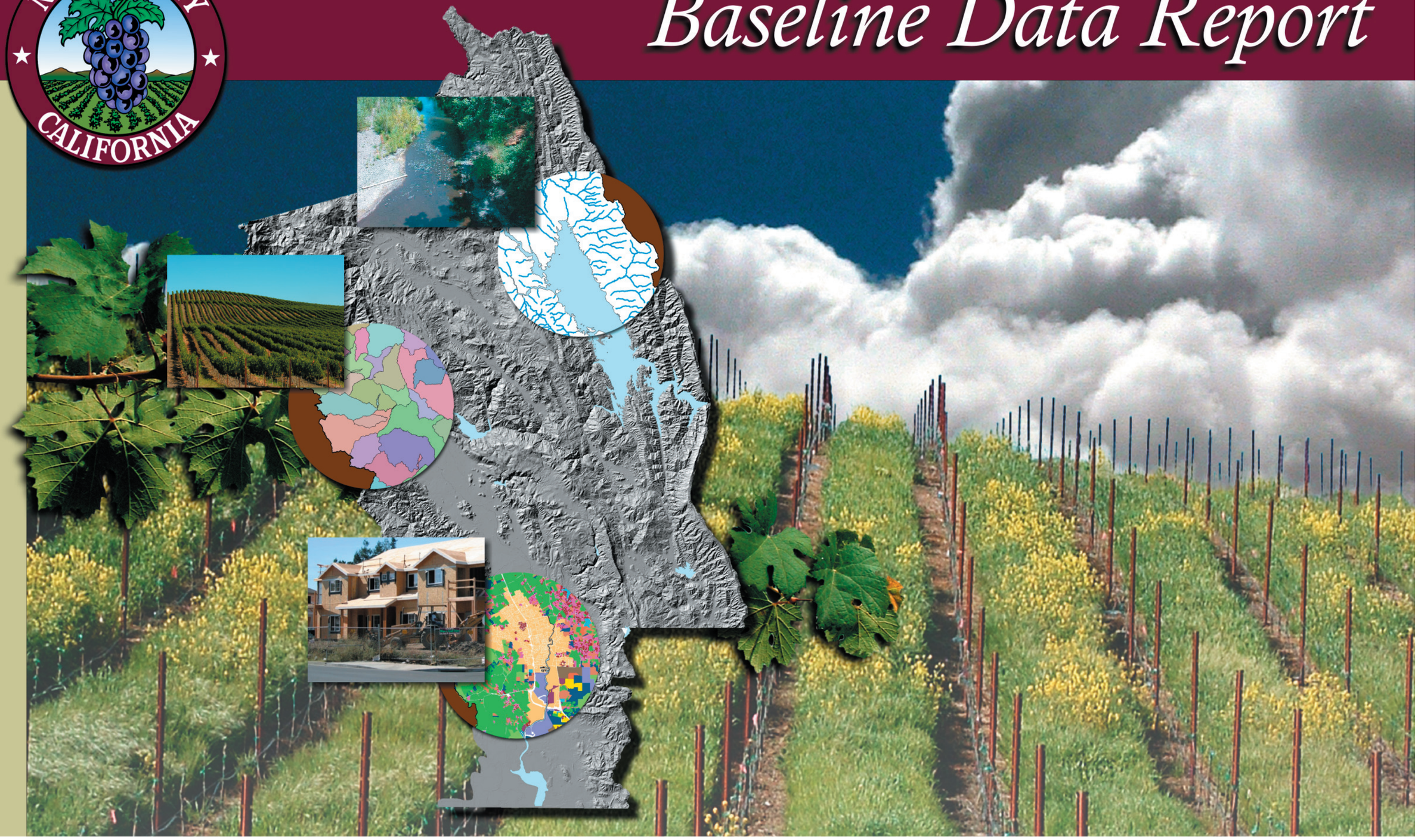
- Map 4-5 (637 k)
- Map 4-6 (768 k)
- Map 4-7 (4.6 Mb)
- Map 4-8 (2.9 Mb)
- Map 4-9 (580 k)
- Map 4-10 (595 k)
- Map 4-11 (4.5 Mb)
- Map 4-12 (542 k)
- Map 4-13 (1.0 Mb)
- Map 4-14 (1.0 Mb)
- Map 4-15 (1.0 Mb)
- Map 4-16 (1.0 Mb)
- Map 4-17 (1.3 Mb)
- Map 4-18 (5.1 Mb)
- Map 4-19 (1.7 Mb)
- Map 4-20 (2.7 Mb)
- Map 4-21 (1.2 Mb)
- Map 4-22 (3.4 Mb)
- Map 4-23 (4.7 Mb)
- Map 4-24 (3.4 Mb)
- Map 4-25 (2.8 Mb)
- Appendices (287 k)

- Chapter 5. Energy Resources (397 k)
- Chapter 6. Noise Resources (1.2 Mb)
  - Figures
  - Map 6-1 (440 k)
  - Map 6-2 (294 k)
  - Map 6-3 (395 k)
  - Map 6-4 (619 k)
  - Map 6-5 (401 k)
  - Map 6-6 (653 k)
  - Map 6-7 (323 k)
  - Map 6-8 (526 k)
  - Map 6-9 (329 k)
  - Map 6-10 (792 k)
  - Map 6-11 (523 k)
  - Map 6-12 (701 k)
  - Chapter 6 Appendices (119 k)
- Chapter 7. Public Health and Safety (681 k)
  - Map 7-1 (580 k)
  - Map 7-2 (7.1 Mb)
  - Map 7-3 (5.0 Mb)
  - Map 7-4 (4.5 Mb)
- Chapter 8. Population and Housing (2.1 Mb)
- Chapter 9. Land Use (630 k)
  - Map 9-1 (2.8 Mb)
- Chapter 10. Agricultural Resources (1.0 Mb)
  - Map 10-1 (4.5 Mb)
  - Map 10-2 (4.7 mb)
  - Map 10-3 (4.6 Mb)
- Chapter 11. Transportation and Circulation (553 k)
  - Map 11-1 (4.7 Mb)
  - Map 11-2 (4.7 Mb)

- Map 11-3 (4.5 Mb)
- Chapter 12. Visual and Aesthetic Resources (5.1 Mb)
  - Map 12-1 (1.3 Mb)
  - Map 12-2 (2.3 Mb)
  - Map 12-3 (3.0 Mb)
- Chapter 13. Public Facilities and Services (1.0 Mb)
- Chapter 14. Cultural Resources (965 k)
  - Map 14-1 (393 k)
  - Map 14-2 (301 k)
  - Map 14-3 (350 k)
- Chapter 15. Surface Water Hydrology (1.3 Mb)
  - Figures (897 k)
  - Map 15-1 (416 k)
  - Map 15-2 (4.4 Mb)
  - Map 15-3 (1.4 Mb)
  - Map 15-4 (539 k)
  - Map 15-5 (5.0 Mb)
  - Map 15-6 (7.0 Mb)
  - Map 15-7 (2.6 Mb)
  - Map 15-8 (630 k)
  - Map 15-9 (646 k)
  - Map 15-10 (744 k)
  - Map 15-11 (849 k)
  - Map 15-12 (4.2 Mb)
  - Map 15-13 (4.1 Mb)
  - Map 15-14 (794 k)
  - Map 15-15 (1.4 Mb)
  - Map 15-16 (895 k)
  - Map 15-17 (532 k)
  - Map 15-18 (351 k)
  - Map 15-19 (895 k)
  - Map 15-20 (893 k)
  - Map 15-21 (811 k)
  - Map 15-22 (722 k)
  - Map 15-23 (1.0 Mb)
  - Map 15-24 (898 k)
- Chapter 16. Groundwater Hydrology (566 k)
  - Figures (391 k)
- Chapter 17. Surface Water Quality (833 k)
  - Figures (265 k)
- Chapter 18. Fire Ecology (956 k)
  - Map 18-1 (4.2 Mb)
  - Map 18-2 (571 k)
  - Map 18-3 (588 k)
  - Map 18-4 (582 k)
  - Map 18-5 (589 k)
- Chapter 19. Report Preparation (351 k)

Napa County

Baseline Data Report



NAPA COUNTY
BASELINE DATA REPORT

PREPARED FOR:

NAPA COUNTY CONSERVATION, DEVELOPMENT AND PLANNING DEPARTMENT

1195 Third Street, Suite 210
Napa, CA 94559
707/253-4417

PREPARED BY:

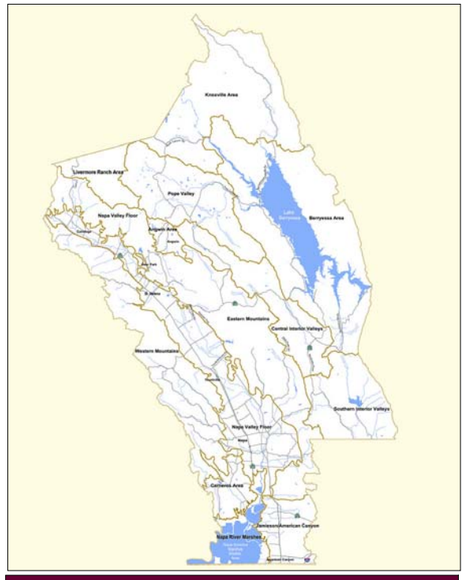
JONES & STOKES

268 Grand Avenue
Oakland, CA 94610
510/433-8962

EDAW, INC.

150 Chestnut St.
San Francisco, CA 94111
415/433-1484

VERSION 1—NOVEMBER 30, 2005



NAPA COUNTY EVALUATION AREAS

The Napa County Baseline Data Report (BDR) provides *baseline* or existing condition information for a wide range of environmental and resource topics in Napa County (County). The BDR contains resource chapters, geographic information system (GIS) maps and databases, figures, sophisticated hydrologic models, and other components. Taken together, these elements comprise comprehensive environmental and resource management information for the County.

BACKGROUND

The need for up-to-date, well-organized and accessible baseline data for the County was recognized in the 1990s. At that time, with development and land use conversions in the County increasing, there was strong community interest in preparing a program-level environmental impact report (PEIR). Such a countywide PEIR would provide a valid and defensible approach to comply with the California Environmental Quality Act (CEQA), while also improving the ability to evaluate environmental impacts from development, infrastructure, and other projects. However, the community could not reach a consensus regarding the scope, timeline, and ultimate use of a PEIR.

In response to these issues, the Napa County Board of Supervisors requested that the Planning Director prepare a framework for initiating development of a PEIR. In 2002, County staff began to define an approach to developing a PEIR and identify key individuals and groups whose participation would be important for its success. Interviews were conducted with key stakeholder groups and leaders to solicit input on important community issues that would affect the scope and budget of the document ultimately developed.

These discussions identified a need for the County to begin collecting data immediately as part of a countywide baseline data report (BDR). This BDR would be the first component of a PEIR and serve as a background document for other major County projects. Establishing such a current and rigorous baseline data record would provide a valid, consistent, and defensible basis for assessing and comparing projects, as well as an updated and advanced mapping database to improve overall regional planning.

In the summer of 2003, the County requested proposals from professional consulting services to assist with preparation of the BDR. After an extensive selection process, the BDR program was formally initiated with approval from the Board of Supervisors in late 2003.

DEVELOPMENT

The Napa County Conservation, Development and Planning Department has led the BDR effort working in close cooperation with the consultants, scientists, local agencies, resource managers, local agriculturalists, and residents. The Napa County Watershed Information Center and Conservancy (WICC) Board of Directors, which represents a balance of community interests, provided guidance and oversight throughout the course of the project. The Technical Advisory Committee to the WICC Board provided guidance, technical review, and feedback to County staff in developing the BDR. In addition, various federal, state, and local agencies and County staff have reviewed all BDR chapters for accuracy.

PURPOSE

The BDR is envisioned as a "living" document and database that will continue to serve planning efforts in Napa County well into the future. Over time, the BDR will require updates and maintenance so that information remains current and reliable for future planning. Chapters will be updated on an individual basis as warranted by each resource topic.

The BDR is specifically intended to support the following planning efforts currently underway in the County, although it will be valuable for many other uses.

- Updating the Napa County General Plan.
- Improving and updating the County's current Environmental Resource Mapping System.
- Providing baseline existing conditions information for environmental compliance, permitting, and planning projects.
- Providing information needed to support the development of thresholds of significance for use in future CEQA reviews.

CONTENTS

The BDR provides baseline data for a wide variety of resources in the County. It discusses various resource topics, and includes such items as species inventories; land use and population trends; geologic mapping; and runoff, water quality, and groundwater analyses.

The BDR contains the following chapters.

- Chapter 1 Geological Resources.
- Chapter 2 Mineral and Rock Resources.

- Chapter 3 Climate and Air Quality.
- Chapter 4 Biological Resources (including Fish Ecology).
- Chapter 5 Energy Consumption.
- Chapter 6 Noise.
- Chapter 7 Public Health and Safety.
- Chapter 8 Population and Housing.
- Chapter 9 Land Use.
- Chapter 10 Agricultural Resources.
- Chapter 11 Transportation and Circulation.
- Chapter 12 Visual and Aesthetic Resources.
- Chapter 13 Public Facilities and Services.
- Chapter 14 Cultural Resources (both historical and archeological resources).
- Chapter 15 Surface Hydrology.
- Chapter 16 Groundwater Hydrology.
- Chapter 17 Surface Water Quality.
- Chapter 18 Fire Ecology.
- Chapter 19 Report Preparation.

The BDR chapters are tailored to address the specific needs of individual resource topics. Each chapter summarizes relevant federal, state, and local policy considerations; describes the methods used to identify and define the baseline conditions; details the currently existing conditions in the County; provides overall conclusions and recommendations for updating the information in the chapter to keep the BDR up-to-date; and lists the references cited in the chapter. Additional relevant information is provided as necessary.

AVAILABILITY

The complete BDR is available on CD-Rom by request from the Napa County Conservation, Development and Planning Department. For further information or to request a copy of the BDR, contact:

Napa County Conservation, Development and Planning Department
1195 Third Street, Suite 210
Napa, CA 94559
707/253-4417
http://www.co.napa.ca.us/

Hillside vineyards, Napa County

INTRODUCTION

This Executive Summary provides an overview of the findings for the resource topics presented in the Baseline Data Report (BDR). The BDR provides baseline data for the following environmental and resource topics.

- Geological Resources
- Mineral and Rock Resources
- Climate and Air Quality
- Biological Resources (including fish ecology)
- Energy Consumption
- Noise
- Public Health and Safety
- Population and Housing
- Land Use
- Agricultural Resources
- Transportation and Circulation
- Visual and Aesthetic Resources
- Public Facilities and Services
- Cultural Resources (both historical and archeological)
- Surface Water Hydrology
- Groundwater Hydrology
- Surface Water Quality
- Fire Ecology

The BDR is envisioned as a "living" document and database that will continue to serve planning efforts in Napa County into the future. Over time, the BDR will require updates and maintenance so that information remains current and reliable for future planning. Chapters will be updated on an individual basis as warranted by each resource topic.

GEOLOGICAL RESOURCES

PHYSIOGRAPHY

This chapter describes in detail the geological resources found in Napa County. Eleven distinct and diverse geomorphic provinces are recognized in California. Each province displays unique, defining features based on geology, faults, topographic relief, and climate. Napa County is located in the Coast Ranges geomorphic province. This province is bounded on the west by the Pacific Ocean and on the east by the Great Valley geomorphic province. The Coast Ranges province extends several hundred miles northward from southern California to near the Oregon border.

A conspicuous characteristic of this province, including Napa County, is the general northwest-southeast orientation of physiographic features such as valleys and ridgelines. In Napa County, located in the eastern central section of the province, this trend consists of a series of long, linear, major and lesser valleys, separated by steep, rugged ridge and hill systems of moderate relief that have been deeply incised by their drainage systems. This physiography has influenced the local climate (creating several microclimates), the development of soils, and the existence and location of geologic hazards such as landsliding. The combination of physiography, soils, and climate has helped give rise to the production of premium wine grapes and other agricultural products for which Napa County is famous.

BEDROCK FORMATIONS AND GEOLOGIC STRUCTURE

Principal rock units of Napa County involve two key components: (1) an older set of rocks composed of accreted, highly deformed terranes that have been displaced—from hundreds to thousands of kilometers from their position of origin—by plate tectonics (at least in part); and (2) a younger, less deformed set of rocks—lying roughly in their original position (except for San Andreas fault system offsets and smaller localized dislocations)—that overlie the accreted terranes.

The structural geology of the County, like in all of the Coast Ranges, is complex and continues to evolve due to broadly influencing regional forces that act along the North American and East Pacific plate boundary. However, the current governing processes are consistent with events since the Pliocene (about 5–2 million years ago) and Quaternary (last 2 million years), which superimposed compressional deformation on earlier extensional deformation.

UNCONSOLIDATED SURFICIAL DEPOSITS

Unconsolidated surficial soil deposits (clay, silt, sand, gravel, and organic material) in Napa County are geologically young materials lying on bedrock at or near the Earth's surface. They are typically the

product of weathering from bedrock formations and have subsequently been transported and deposited by gravity, sheetwash, streamflow, wind, or other processes. Relative to the underlying bedrock, these deposits are most often loose, weak, and soft, and therefore more susceptible to erosion and landsliding. The soil horizons that have developed on the uppermost part of many of these deposits provide the medium for agriculture, including the County's valuable vineyard lands.

SEISMICITY

Structural damage from seismic shaking should be anticipated in the County sometime within the next few decades. Older, unreinforced masonry buildings and other buildings constructed before 1930 that have not been seismically retrofitted are most subject to structural failure or collapse.

The chance for a magnitude 6.7 or larger earthquake to occur in the Bay Area by the year 2032 is 62%. Smaller earthquakes (between magnitudes 6.0 and 6.7), capable of considerable damage depending on proximity to urban areas, have about an 80% chance of occurring in the Bay Area by 2032 (U.S. Geological Survey 2003). Depending on the proximity to the County and magnitude of the earthquake, damage could range from nominal to high.

Scenarios have been prepared to estimate future earthquake shaking damage in the ten Bay Area counties. Depending on the magnitude considered in the scenario, the estimated damage to buildings in the County could range from $10–$300 million. Most of this damage would be in the southern, more populated part of the County, especially in the deeper alluvium of the lower Napa Valley, which is more susceptible to amplified seismic shaking. It is anticipated that earthquakes on the much longer active and potentially more damaging faults located throughout the Bay Area would result in more ground-shaking damage in the County than earthquakes on the shorter active faults within the County.

GEOLOGIC AND SEISMIC HAZARDS

Landsliding, common to the entire Bay Area, is the most potentially damaging geologic hazard in the County. Though often referred to as "mudslides" these more rapid flows may carry various mixtures of debris including boulder to cobble-sized rock fragments, sand, silt, mud, and organic materials. All of the principal ridge and hill systems in the County have experienced at least some landsliding.

Most landslides present the risk of property damage. Rapidly moving slides such as debris flows and debris avalanches also present the risk of injury and death. Landslide hazards can be reduced by proper land use planning that includes identification of hazard, followed by avoidance measures, or corrective measures.

Surface fault rupture also presents a hazard. The highest potential for surface fault rupture is along the three known active faults in the County: West Napa fault, along the west side of Napa Valley; Green Valley fault, in the southeastern part of the County, and Hunting Creek fault, in the northeastern part of the County. These faults are zoned for special investigation according to the provisions of the Alquist-Priolo Earthquake Fault Zoning Act; human habitation structures cannot generally be built across them.

Ground shaking as a result of future earthquakes, common to other areas of the seismically active San Francisco Bay region, is likely on the three known active faults in the County. The intensity of earthquake motion at the site will depend on the characteristics of the generating fault, distance to the epicenter, the magnitude and duration of the earthquake, and specific geologic conditions. Portions of the County that are underlain by thicker soil deposits could experience slighter ground amplification during seismic activity than upland areas with very shallow bedrock. Severe ground shaking could also trigger secondary effects such as localized failure of slopes and compaction of settlement of loose fills.

Liquefaction refers to the sudden, temporary loss of soil strength during ground shaking. This phenomenon can occur where there is a unique combination of conditions, i.e., clean, saturated, loose granular deposits within depths of about 20–50 feet. Young alluvial soils (geologic map symbols Qhc, Qhay, Qhty, Qha, Qht, Qhf, Qa, Qt, and Qf) are the geologic deposits most likely to contain soils susceptible to liquefaction. The location of these deposits varies widely across the County.

Lateral spreading can occur during strong ground shaking. Lateral spreading generally occurs on slopes and near the tops of slopes where stiff soils are underlain by soft liquefiable deposits. Areas susceptible to lateral spreading are the younger alluvial areas adjacent to the Napa River or other incised rivers within the County.

Lurching and associated *ground cracking* is generally confined to areas underlain by soft deposits, which are also bordered by steep channel banks or by adjacent hard ground. Areas most susceptible are former and current marsh areas (geologic map symbols Qhbm, Qaf/Qhbm, Qhb) located at the southern end of the County.

Expansive soils and *accelerated erosion* (such as minor rutting and rilling to extensive gullying) are present at many locations throughout the County. While landslides are generally restricted to hillside areas, the base of slopes, and along steep stream banks, expansive soils and accelerated erosion can occur on both hills and more gently sloping valley areas. While these hazards do not present as high a risk as landsliding, they can be damaging to some kinds of land uses and associated improvements. Geotechnical measures are available to correct expansive soil problems, and accelerated erosion can be avoided by proper erosion control measures.

Subsidence and *settlement* result from the same physical processes. Subsidence takes place over a long time frame and broad regional area; settlement is usually considered to occur within a relatively short time frame and within a small area, for instance on the project scale. Subsidence/settlement can occur differentially; that is, one area or location subsides or settles more than another. The results of subsidence/settlement, especially when it occurs differentially, can be quite damaging.

Seiches and *tsunamis* pose a low potential for damage, due to lack of bay front exposure within the County. Some potential may exist for seiche within large bodies of water in the County, such as reservoirs. While presumably low, the risk has apparently not been evaluated. To evaluate seiche risk within large storage tanks requires a site-specific investigation.

Aerial view of Chiles Valley, Napa County

Landsliding is the most potentially damaging geologic hazard in Napa County. Landslide hazards can be reduced by proper land use planning.

Former Homestake Mine, Napa County

Various mineral resources have been mined in Napa County. Mercury and mineral water were the most valuable mineral resources historically. Today, because of growing development, building stone and aggregate are the most valuable commodities.

MINERAL AND ROCK RESOURCES

This chapter describes in detail the mineral and rock resources in Napa County. Historically, various mineral resources have been mined in Napa County. The two most valuable mineral commodities in economic terms have historically been mercury, or quicksilver, and mineral water. More recently, building stone and aggregate have been the most economically valuable mineral commodities in the County. This reflects the growing need over recent decades for construction materials as the population of the region grows.

The principal regulatory document pertaining directly to mining and mining reclamation in California is the Surface Mining and Reclamation Act (SMARA) of 1975 (Chapter 9, Division 2, of the Public Resource Code). Napa County is the lead agency for implementing the requirements of SMARA. Special Report 146, prepared under the authority of SMARA, focused on classifying land in the San Francisco-Monterey Bay region, including Napa County, into mineral resource zones (MRZs) based on guidelines adopted by the California State Mining and Geology Board. Areas were zoned MRZs if they were identified as being within areas subject to urbanization. This classification project has been designed to assist and guide local lead agencies, such as Napa County, in preserving essential mineral resources for future use through proper zoning ordinances. Three principal MRZs were identified in Napa County, although MRZ maps were not prepared for the entire County.

There are currently four active mines (rock quarries) in Napa County, two of which are not presently being mined but only serve as mineral storage areas. These quarries produce construction materials. The only significant mine currently in operation in Napa County is Napa Quarry.

The principal constraints to future mining operations in Napa County relate to permitting, economics, the environment, and politics. The geologic opportunities for future mineral extraction in Napa County are not clearly known because the County has not been fully mapped for MRZ zones. However, the general geology of the County suggests that the potential for favorable aggregate rock does exist.

CLIMATE AND AIR QUALITY

This chapter describes existing climate and air quality conditions in Napa County (County). It introduces national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS), as well as the overall policy framework for air quality management in California and the Napa region. Information presented is based in part on guidance provided by the Bay Area Air Quality Management District (BAAQMD).

Countywide emissions of the following criteria pollutants were assessed.

- Ozone (O_3).
- Carbon monoxide (CO).
- Oxides of nitrogen (NO_X).
- Sulfur dioxide (SO_2).
- Particulate matter 10 and 2.5 microns or less in diameter (PM10 and PM2.5, respectively).
- Lead (pb).

Carbon monoxide modeling was performed for roadway segments with high daily traffic volumes using traffic data prepared by the project traffic engineers, Fehr & Peers. Regional climate and meteorology conditions were assessed, and precipitation patters were mapped. In addition, sensitive receptors and land uses were identified.

The existing air quality conditions in the County were characterized by assessing monitoring data collected for the region at the Jefferson Avenue monitoring station in the City of Napa. Air quality conditions within the County are such that it is listed as a non-attainment/maintenance area for several pollutants. It was determined that the Jefferson Avenue monitoring station has experienced three violations of the state 1-hour ozone standard; 24.4 violations of the state 24-hour PM10 standard; and no violations of the federal and state CO standard, federal 1-hour ozone standard, federal 8-hour ozone standard, and federal PM10 standard during the last 3 years for which complete data are available. PM2.5 is not monitored in Napa County. The U.S. Environmental Protection Agency (EPA) has classified Napa County as a nonattainment (other) "not classified/moderate" area, with a 2006 attainment deadline, for the 1-hour ozone standard, and a marginal nonattainment area for the 8-hour ozone standard. For the CO standard, the study area is classified as a moderate (≤ 12.7 ppm) maintenance area, while the rest of the County is classified as an unclassified/attainment area. The EPA has classified the County as an unclassified/attainment area for the PM10 and PM2.5 standards. The California Air Resources Board (ARB) has classified the County as a serious nonattainment area for the 1-hour ozone standard, and an attainment area for the CO standard. The ARB has classified the County as a nonattainment area for the PM10 and PM2.5 standards.

Although the County is designated as a non-attainment/maintenance area for several pollutants, monitoring data suggests that few violations of the NAAQS and CAAQS have occurred in the last few years, and air quality has been improving. Due to the relatively rural/agrarian nature of the County, it has relatively few traditional industrial/commercial sources of pollutants, and data from the ARB suggest that transport of some pollutants into the SFBAAB from neighboring air basins can adversely affect air quality within the County. Further, the bowl-shaped valley may also help to trap pollutants within the County.

BIOLOGICAL RESOURCES

This chapter describes the biological resources found in Napa County. It allows accurate assessment of impacts, evaluation of conservation plans, and review of proposed enhancements to biological

resources in Napa County. In addition, it provides a biological database that can assist in analyzing biological resources.

Napa County was divided into thirteen evaluation areas to facilitate the analysis of biological resources and management concerns in distinct regions of the County. Common and sensitive biological communities, wildlife movement, concentrations of valuable biological resources, fire ecology, and management concerns are discussed for each of the evaluation areas.

REGIONAL CONTEXT

California is considered a global "hot spot" for biological diversity, where species diversity, endemism, and threats to this diversity are all particularly high (Myers et al. 2000, Stein et al. 2000). California contains more native biological diversity than any other state, including more endemic species than any other state (1,295 species) (Stein 2002). Threats to this biological diversity are also high relative to the rest of the U.S. Napa County is located within the California Floristic Province, the portion of the state west of the Sierra Crest that is known to be particularly rich in endemic plant species (Hickman 1993, Stein et al. 2000).

COUNTYWIDE CONTEXT

Napa County has a high natural level of biodiversity compared to California as a whole. The County's biodiversity provides valuable goods, services, and scientific information. More importantly, the plants and animals of the County provide many critical ecological and social functions. Napa County's many species also represent a vast storehouse of scientific information, most of it unexplored and some of it endemic to the County.

The following are critical issues of concern for protecting biodiversity in the County.

- Planning and/or limiting development to avoid or minimize impacts on sensitive communities, special-status species, and wildlife movement between large and/or critical natural areas
- Protecting and enhancing the Napa River, Putah Creek, and the other streams in the County
- Controlling the spread of invasive exotic species
- Preventing type conversion of biotic communities through changes in natural disturbance regimes, such as fire and flooding

BIOTIC COMMUNITIES

Ten general land cover types have been identified in Napa County: grassland, chaparral/scrub, oak woodland, riparian woodland and forest, coniferous forest, wetlands, open water, rock outcrop, agricultural cropland, and developed lands. Of these ten, all except for two—rock outcrop and developed lands—are considered biotic communities. Dominant plants, general distribution, common wildlife, and special-status species for specific biotic communities within each of these general communities are described in the body of the biological resources chapter of the BDR.

The California Department of Fish and Game (DFG) recognizes 21 sensitive biotic communities in the County, not all of which are mapped. Many of these communities are subtypes of the general biotic communities described above. An additional six communities are considered sensitive because they are locally rare. Sensitive communities in the County include native grassland, serpentine chaparral, riparian forest, and cypress woodland. Six communities of limited distribution have been identified on a countywide scale: redwood forest, wet meadows, mudflats, Brewer willow scrub, ponderosa pine forest, and tanbark oak forest. Of these six communities, redwood forest is also recognized by DFG as potentially sensitive.

Several biotic communities are considered important to protect because of their relatively limited extent in the County and their importance to a large number of special-status plant and/or wildlife species. These communities are riparian woodland, freshwater wetlands, salt marsh, serpentine grassland, and streams, which are critical for the County's special-status plant and wildlife species. Rock outcrops are critical habitat features used by special-status plants and wildlife.

SPECIAL-STATUS PLANTS & WILDLIFE

Eighty-one special-status plant species occur or potentially occur in Napa County. Their distributions and habitat associations are summarized in the biological resources chapter of the BDR. Particular biotic communities, such as serpentine grasslands, are shown to have high importance to special-status plant species relative to their extent in the County.

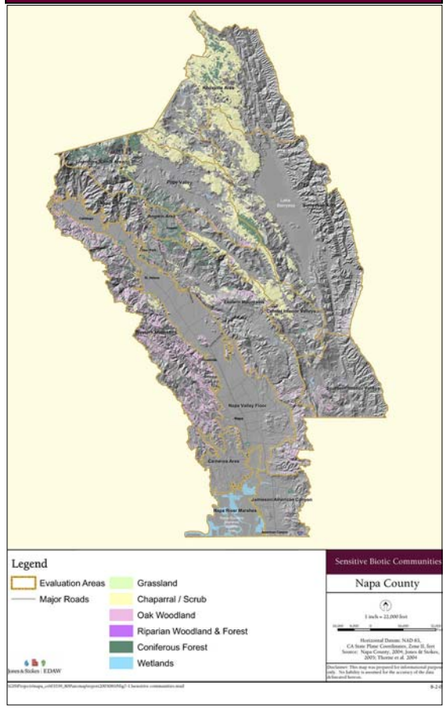
Sixty special-status terrestrial wildlife species and 9 special-status fish species occur or potentially occur in the County. Associations of these species with particular biotic communities are discussed in the chapter, which highlights the importance of a few communities, such as salt marsh and riparian woodland. A detailed analysis of streams and the riparian corridors is also provided, including a discussion of which stream channels are supportive of sensitive fish species.

WILDLIFE MOVEMENT AREAS

Three major, regional north-south wildlife movement routes have been identified in Napa County: the Western Mountains, the Napa River, and the Blue Ridge-Berryessa Natural Area. Constraints to east-west movement and the importance of riparian corridors are discussed in the BDR, as is the potential for zoning buildout to constrain wildlife movement in particular parts of the County. Maintenance of wildlife movement areas is important to conserve the diversity of wildlife and plants within Napa County.

California contains more native biological diversity than any other state. Napa County has a high natural level of biodiversity compared to California as a whole.

SENSITIVE BIOTIC COMMUNITIES



ENERGY RESOURCES

The purpose of the energy resources chapter of the Baseline Data Report is to discuss historical, existing, and projected electricity and natural gas production, consumption, and peak demand in the County. Gasoline consumption by vehicles in the County is also discussed.

In this chapter, the County is assessed as a single region rather than divided into evaluation areas due to data limitations. The primary sources for information in this energy chapter are Pacific Gas and Electric Company (PG&E) and the California Energy Commission (CEC). The CEC provided GIS maps of major electrical transmission lines and natural gas pipelines in the County as well as estimates of electricity and natural gas consumption rates for the entire County for the years 1990–2003. PG&E provided estimates of transmission capacity and system upgrades. Vehicular energy consumption is based on Caltrans' California Motor Vehicle Stock, Travel, and Fuel Forecast reports, which project vehicle fuel consumption in gallons (Caltrans 2004). Vehicular fuel consumption estimates utilize long-term projections of statewide population, economic growth (total personal income), fuel prices, inflation, and interest rates to estimate gallons of gasoline and diesel consumed per County.

PG&E is the main energy provider for all sectors of the Napa County community. In addition, small-scale private energy generation by solar, wind, and biogas is on the rise throughout the County, particularly in association with wineries.

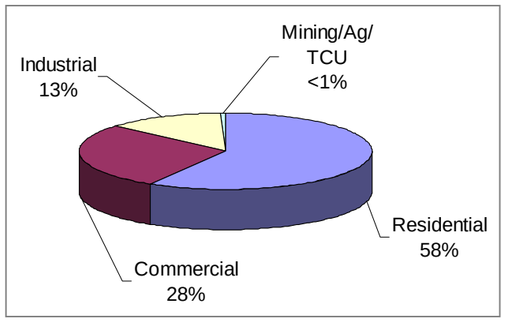
ELECTRICITY

In the County, PG&E is the main energy utility provider for all sectors of the community. There are six energy-producing facilities in the County, providing a total capacity of 20.06 megawatts (MW). This was sufficient to supply approximately 8.5% of the County's peak electrical demand for 2004. Small-scale, private energy generation by solar, wind, and biogas is also on the rise throughout the County, particularly in association with wineries.

Total electricity consumption in 2003 in Napa County was 512.5 thousand barrel of oil equivalents (BOEs), compared to 365 thousand BOEs in 1990 (i.e., 40% greater in 2003). Per capita use increased at a much slower rate during the same time period (1.2% per year on the average), to 2.89 BOEs in 2003. However, total energy consumption peaked in 2000 at 540.8 BOEs. This peak, and subsequent decline, is attributed to fluctuations in the mining and commercial sectors. In 1990, electricity consumption by mining operations accounted for 0.5% of the total energy delivered to the County. Seven years later, in 1997, mining accounted for over 9% of total consumption in the County. This fluctuation represents an increase of over 2,400%. Increases in the consumption by the mining industry, combined with a consumption peak within the commercial industry, led to an overall energy consumption peak in 2000.

Napa County Per Capita and Total Electricity Consumption

Year	Per Capita Electricity Consumption	Total Electricity Consumption
1990	3.30 BOE	365.4 thousand BOE
2000	4.35 BOE	540.8 thousand BOE
2003	3.89 BOE	512.5 thousand BOE



Countywide Natural Gas Consumption (2003) by sector

The residential sector is by far the largest consumer of natural gas in the County, accounting for 44% of the Countywide annual consumption in 2003. The commercial sector is the second largest consumer of electricity, accounting for 32% of consumption in that same year. The industrial sector was a distant third, accounting for 16%. The remaining sectors—transportation, communication and utilities [TCU]; mining; and agriculture—each accounted for less than 8% of the total electricity consumed.

Trends in peak electricity demand in the County are similar to those discussed for total annual energy consumption. Peak demand over the 13-year period has increased 38% (approximately 2.5% per year on average) to 105.1 BOE in 2003. Per capita peak demand, on the other hand, has actually decreased 16% overall or 1.1% per year on average.

There are three major electrical transmission routes that cross from east to west through the County, and nine electrical substations in the County, all owned by PG&E.

NATURAL GAS

There are no natural gas production wells in Napa County (CEC 2004).

Between 1990 and 2003, annual energy consumption as natural gas has been consistently higher than annual energy consumption as electricity, but the difference has been steadily decreasing. While electricity demand has grown, natural gas demand has remained relatively constant. In 2003, total natural gas use was at 663 thousand BOEs, compared to 669 thousand BOEs in 1990. Per capita natural gas use has actually dropped 1.4% per year on the average over this period to 5.04 BOEs in 2003.

Napa County Per Capita and Total Natural Gas Consumption

Year	Per Capita Natural Gas Consumption	Total Natural Gas Consumption
1990	6.04 BOE	668.79 thousand BOE
2000	5.57 BOE	691.77 thousand BOE
2003	5.04 BOE	663.65 thousand BOE

The residential sector is by far the largest consumer of natural gas in the County, accounting for 58% of the countywide annual consumption in 2003. The commercial sector is the second largest consumer of natural gas, accounting for 28% of consumption in that same year. The industrial sector accounted for 13%, and the TCU, mining, and agriculture sectors combined accounted for less than 1% of the total natural gas consumption in 2003.

PG&E designs gas facilities to ensure reliable gas service to core customers on an "abnormal peak day" (APD). The expected APD gas daily demand for Napa County in 2004 was 36,890 thousand square feet (mcf) (378,860.3 therms). The current transmission capacity is above this peak demand.

PG&E predicts that there will be no gas transmission capacity constraints in Napa County within the next 5 years. Currently, PG&E reviews capacity in 5-year periods; however, it plans to begin projecting transmission demand for 10-year periods. The manager of Transmission System Planning (PG&E) believes that current transmission capacity may last past the project 5-year period. The last gas transmission upgrade in Napa County was performed in 2004 in the St. Helena/Calistoga/Angwin area. No upgrades are planned to the Napa County gas transmission system in the next 5 years.

GASOLINE

Between 1993 and 2003, annual gasoline consumption in Napa County increased nearly 27%, or 2.4% per year, to 61.935 million gallons in 2003. Per capita use also increased but by a smaller amount (just under 11%). This is expected because a portion of the increase in overall use appears to be related to increased tourist travel in the Napa Valley. This conclusion is supported by the fact that the average annual per capita gasoline consumption for Napa County in 2003 (470.09 gallons per capita) is 9.3% (almost 44 gallons) higher than the average for California as a whole.

NOISE

This noise chapter provides a detailed discussion of existing noise conditions for Napa County. The chapter discusses the federal, state, and local policies that govern environmental noise in Napa County (County), describes the methods used to quantify noise conditions in the County, and identifies noise-sensitive land uses and major noise sources, as well as existing noise conditions.

The County's currently adopted Noise Element (amended on August 1, 1990, and reformatted in December 1996) and the County's noise ordinance establishes policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The County has established guidelines to assist in determining compatibility with surrounding land uses.

General noise practice identifies noise-sensitive land uses as being land uses where noise can adversely affect use of the land. These are often places where people live, sleep, recreate, worship, and study; they are generally considered sensitive to noise because intrusive noises can be disruptive to these activities. Such land uses were identified and mapped in the County. In addition, primary sources of noise were identified in the County. The dominant sources of noise in the County are related to transportation, and include automobile and truck traffic, aircraft, and trains. Stationary sources are also present in the County, and they include construction sites, agricultural activities, and commercial and industrial facilities.

Noise levels produced by traffic on state highways and county roads with more than 3,000 vehicles per day were calculated using the FHWA Traffic Noise Prediction Model. Aircraft operations were also assessed, as was train activity, although no active freight rail lines are in operation within the County. Noise from construction, agricultural, commercial, and industrial facilities was also quantified, based on information from short- and long-term noise monitoring locations. The County, in consultation with consulting experts, identified all short- and long-term monitoring locations. The noise metric used is day-night noise level (Ldn) and equivalent sound level (Leq).

Contours for existing noise conditions were mapped based on results from the monitoring study described above, as well as on noise modeling and information from previous studies.

In general, it was determined that there are very few existing noise conflicts within the County. A key indicator of noise conflicts is the number of complaints registered with the County. Data provided by the County sheriff's department indicate that there were few noise complaints received for the years 2003 and 2004.

I-80, SR 12, SR 9, SR 121, SR 128, and Silverado Trail are sources of traffic noise in Napa County.

PUBLIC HEALTH AND SAFETY

This chapter provides a discussion of the public health and safety hazards in Napa County. The chapter describes the methods used to analyze hazard potential for human-made hazards, including vehicular accidents, crime, and hazardous materials spills; as well as natural hazards, including seismically related hazards, wildland fires, and flooding.

HUMAN-MADE HAZARDS

TRAFFIC

To assess traffic hazards, five law enforcement agencies, including the California Highway Patrol, were contacted. Napa County is below average compared to adjoining counties in the total numbers of persons killed and injured from auto and motorcycle accidents. From 1993 to 2003, the total number of accidents in Napa County has increased by 30%. The City of Napa experienced approximately 60% of the total accidents in the County in 2003, although only 1 of the 20 deaths occurred in the City. Overall, the total number of traffic accident-related deaths within the County remained relatively constant from 1993 to 2003 despite increases in population; this may be due in part to safer vehicles and improved enforcement of seatbelt laws.

CRIME

The Office of the Attorney General at the California Department of Justice (CDJ) and the Napa County Sheriff's Department were contacted to collect information on crime rates and trends. Napa County has a lower crime rate than the state as a whole. Solano, Yolo, and Lake Counties report higher crime rates than Napa County, but Napa County reported more incidents of crime than Sonoma and Marin Counties. From 1993 to 2003, the total reported crimes (per 100,000 people) in Napa County decreased 27%, from 4,230 to 3,074 (CDJ 2004). The highest population-adjusted crime rate occurred in the year 1994 and the lowest in 2000.

Reported crimes fall into four general categories: violent crimes (homicide, rape, robbery, and aggravated assault); property crimes (burglary and motor vehicle theft); larceny/theft; and arson. Larceny/theft is the most common type of reported crime in Napa County, followed by property crimes, violent crimes, and arson. Of the four types of violent crimes, aggravated assault is the most prevalent.

HAZARDOUS AND CONTAMINATED SITES

Napa County is known for its agricultural production. Due to the use of fuel, pesticides, and other chemicals, agricultural production is a major source of hazardous wastes and contaminated sites. However, due to increasing population in all Bay Area counties, including Napa, hazardous materials are also becoming more widely used throughout the urban centers, including in Napa County.

Potential human exposure, magnitude of risk associated with contaminated sites, chemical spills, and polluted groundwater within Napa County are all public health and safety issues. Existing data provided by Napa County regarding hazardous sites included contaminated site listings from the many databases identified in this chapter. The database search described in the methods section identified hundreds of sites, each with varying levels of information and detail. From this information, a hazardous sites map was developed and divides the hazardous site locations into four different classes (red, orange, yellow, and white) based on the potential risk to human health.

NATURAL HAZARDS

EARTHQUAKES, SEISMICITY, AND OTHER GEOLOGIC HAZARDS

Napa County, similar to the San Francisco Bay region, is subject to primary and secondary seismic hazards (resulting from earthquake activity) and other non-seismic geologic hazards. As stated in the geological resources chapter, a number of faults have been mapped within the County, but only three have been designated active by the California Geological Survey in accordance with the Alquist Priolo Earthquake Fault Zoning Act. The primary seismic hazard generated from earthquakes on these faults is surface rupture. Secondary seismically induced hazards, which could be generated from faults within the County or regionally, include groundshaking, landslides, liquefaction, lateral spreading, lurching, differential settlement, and failure of levees and dams. Non-seismically induced geologic hazards include ground subsidence/settlement, landslides and soil creep, and erosion. These hazards have the potential to cause injury to people or damage to property. GIS maps created for these hazards are provided in this chapter to identify the potential for occurrence in the County.

FIRE HAZARD SEVERITY

Most of Northern California, with its cool wet winters and long dry summers, is considered a high fire hazard environment. Wildfire is a natural and integral component of California's landscape that has sculpted the geology, soil, and vegetation of the region. Napa County is characterized by narrow valley floors surrounded by steep, hilly terrain and fire-evolved vegetation, which, combined with the plentiful wildland recreational opportunities, leads to the high wildland fire rates experienced in the County. Wildland fires are so frequent that in the last 30 years wildfires have burned 232,000 acres of land in or directly adjacent to Napa County, a county of approximately 482,000 acres.

Fire hazard zoning is one of the first steps in comprehensive land use planning. To determine the fire hazard severity in the County, a GIS-based model was developed. This model uses digital mapping of parameters that affect wildfire hazards such as landscape characteristics, historical data, weather, and structural value, to rank areas within the County from low to high on a fire hazard severity scale. The model analyzed and ranked the risk, hazard, and value for each evaluation area. Based on results of the model, Napa County has 47,441 acres of severe high fire hazard land, which represents about 10% of the County. The Napa Valley floor, eastern mountains and Cameros areas, which comprise 16,358, 12,645, and 3,587 acres respectively, had the greatest amount of high fire hazard severity land. The Angwin area has the highest percentage, with 41.8% of its area characterized as high hazard. With 0.72%, the Knoxville area has the lowest percentage of high fire hazard land. The fire hazard severity model and data used will be given to the County upon completion of the BDR analysis, which will allow the California Department of Forestry and Fire (CDF) and Napa County Fire to easily make adjustments when more data become available in the future.

FLOODING

Napa County is a flood-prone region because it has a Mediterranean climate of wet winters and dry summers and a landscape of steep hills and a wide valley floor. Recent population and development pressures have also increased the flood hazard potential in the County. The Napa River flows through the Napa Valley Floor past Calistoga, St. Helena, Yountville, and Napa. The City of Napa, located where the Napa River flattens into the San Pablo Bay estuary, is the most flood-prone populated area in the County and the fifth most flood-prone community in California in terms of flood damage payments from the Federal Emergency Management Agency (FEMA). To assess flooding hazards, FEMA flood zone maps for the 100- and 500-year floods were analyzed. Specific areas subject to flooding in City of Napa are generally from Trancas Street in the north to Imola Avenue in the south, Coombs Street to the west and Silverado Trail to the east. Between 1862 and 1997, the City of Napa experienced 27 floods, the largest of which occurred on February 18, 1986 (Wadsworth 1998).

During a 100-year flood, more than 325,000 gallons of floodwater per second would flow through the City of Napa, or five times the volume of Lake Hennessey, over the span of the flood. More than 3,500 people and 2 million square feet of business and office space would be inundated.

POPULATION AND HOUSING

Based on the 2000 Census, the total population of Napa County was 124,279, with the majority (78%) living within the five incorporated cities, and 22% living in the unincorporated portion of the County. The City of Napa has the highest population, 72,585 persons (58% of the total County population).

The median household income in Napa County was $51,400, which is 8% higher than the 2000 statewide median. The highest median income in the County was in the unincorporated areas, with a

median income of $63,600, and the lowest median income was found in Calistoga, with a median of $39,500.

As of 2004, the labor force in Napa County was 72,400, with a 3.9% unemployment rate. It is estimated that the total farm worker population in Napa County ranges from 2,965 to 6,500, with approximately 12% regular workers, 38% seasonal workers, and 50% harvest-only workers.

GROWTH TRENDS

Between 1990 and 2000, Napa County experienced an approximately 12% increase in overall population and a 10% increase in number of households. The American Canyon area experienced the most rapid population growth, with an approximate 26% increase in this time period. The second most notable population increase occurred in the City of St. Helena, with a 19% increase between 1990 and 2000. Both the Town of Yountville and the unincorporated areas of the County experienced a decrease in total population during this period. The Association of Bay Area Governments (ABAG) projects that populations in Napa County will continue to experience steady growth over the next 25 years. However, the anticipated levels of growth differ greatly between the 12 geographic regions assessed in this chapter. American Canyon is projected to be the most rapidly growing incorporated area, with a projected 61% increase in population over the next 25 years, and an almost doubling in the number of available jobs. Economically, Napa is the second fastest growing city in the County, with the number of jobs projected to increase by 40% by 2030. It also remains the jurisdiction within which the bulk (64%) of the 29,000+ person increase in population is projected to take place. The remaining incorporated areas in the County, St. Helena, Calistoga, and Yountville, seem to have reached their maximum populations with relatively low growth rates projected for the future. Future growth rates in the Town of Yountville and the unincorporated portion of Napa County are expected to be even less significant if they continue to decline.

HOUSING CHARACTERISTICS

As of the 2000 Census, the total number of housing units in Napa County was 48,554, with 45,402 (93.5%) occupied housing units and 3,152 (6.5%) vacant housing units. According to the ABAG Regional Housing Needs Determination, the total housing need in Napa County for 2001 to 2006 is 7,063 units. Each of the Housing Elements for the jurisdictions in Napa County addresses current and future housing needs and future supply of housing stock to meet the projected regional demand. The Housing Elements of the Cities of Yountville, Napa, and Calistoga contain housing objectives that exceed ABAG requirements, raising the programmed amount of new housing in Napa County above ABAG's projected need. However, available housing is not necessarily affordable for all segments of the population in Napa County.

Housing will continue to remain a critical issue for Napa County over the coming decade. Land availability and housing for lower income levels and special needs groups, such as farm workers, is a current challenge. Housing needs for these population groups will only be met through the implementation of the housing policies and programs set out by each jurisdiction's Housing Element.

LAND USE

Preservation of agriculture and open space lands is a high priority in Napa County's current General Plan. According to the data collected through the digital land use database in GIS maintained by the County, Napa County consists of approximately 506,000 acres, 94% of which is unincorporated. The county assessor has designated a large portion of the land within Napa County as Rural Lands (50%); this designation includes non-farming and non-grazing operations such as vineyards, residential parcels larger than 10 acres with residences, and vacant residential parcels larger than 10 acres. Of these Rural Lands, 72% are vacant, largely because of steep terrain, mountain ridges, and narrow valleys. These natural features, in addition to the predominance of agricultural land uses, contribute to the County's rural character.

Current land use patterns and projected land use trends have been analyzed in the report for twelve land use evaluation areas: Cities of (1) American Canyon, (2) Napa, (3) St. Helena, (4) Calistoga; (5) Town of Yountville; (6) Carneros/Napa River marshes/Jamieson/American Canyon-unincorporated; and (7) Napa Valley floor-unincorporated/western mountains area, (8) Livermore Ranch/Pope Valley/Knoxville area, (9) Angwin area, (10) eastern mountains-unincorporated/central interior valleys area, (11) southern interior valleys, and (12) Berryessa area. In addition, potential land use conflicts are analyzed.

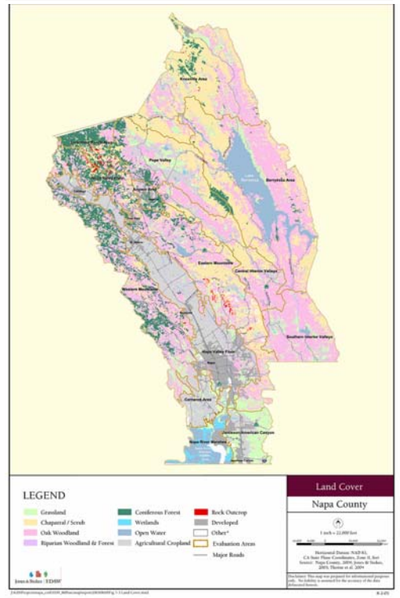
LAND USE DEVELOPMENT PATTERNS

Historically, residential and commercial development in Napa County has generally occurred within the five incorporated areas of the County; unincorporated areas have generally remained predominantly agricultural, rural residential and open space. The County's current General Plan directs development toward existing incorporated and urban areas. Recent agreements between the County and unincorporated areas allow for incorporated cities to provide the majority of the County's new housing development. In addition, Measure A, approved in 1980 by voters and extended by the Board of Supervisors in 2004, and Measure J approved in 1990 extending until 2020, both limit the pace of market-rate housing development in the unincorporated County.

The vast majority of growth and development has occurred predominantly within the Cities of Napa and American Canyon, and the City of American Canyon has experienced the most significant growth and land conversion over the past decade. The majority of growth on the Napa Valley floor has also occurred within incorporated areas, particularly in the City of Napa. The Town of Yountville and the City of St. Helena have experienced limited growth. The City of Calistoga has experienced moderate growth in the past decade.

There has been very little development or growth within the unincorporated areas of the County over the past 15 years. In particular, there has been very little commercial development activity in these areas. The Napa County General Plan strongly emphasizes preservation of agriculture and open space resources. Current development patterns within the County are reflective of this, as described below.

NAPA COUNTY LAND COVER



Between 1990 and 2000, Napa County experienced an approximately 12% increase in overall population and a 10% increase in number of households. The Association of Bay Area Governments projects that populations in Napa County will continue to experience steady growth over the next 25 years.

- *Carneros/Napa River Marshes/Jamieson/American Canyon-Unincorporated Evaluation Area.* New development includes small areas of rural low-density residential development just outside the City of American Canyon's planning area, and a large amount of industrial development between the City of Napa and the City of American Canyon.
- *Napa Valley Floor/ Western Mountains Area*. Both areas have experienced little or no development. Development of the Napa Valley floor has been primarily new wineries. The western mountains area has seen very limited development.
- *Livermore Ranch/Pope Valley/Knoxville Area*. This very rural area has seen only minimal recent development.
- *Angwin Area*. This area has experienced minimal recent development.
- *Eastern Mountains-Unincorporated/Central Interior Valleys Area*. This area is almost entirely undeveloped, and has remained so over the past decade.
- *Southern Interior Valleys*. This area does not contain any urban lands and has not undergone any major developments in the past decade.
- *Berryessa Area*. This area has consisted of mostly rural residential and agricultural land uses over the past decade.

EXISTING LAND USE

Current land use information for this analysis was obtained through the Napa County land use GIS, which is based on parcel-level information obtained by the Napa County Assessor's Office. Assessor's data differs from other sources and uses definitions that differ from the zoning code definitions used by the Napa County Conservation, Development and Planning Department. All data and conclusions presented should be viewed with this in mind.

The following land use categories are based on the existing General Plan land use designations, but have been adapted and expanded for use in the BDR to provide an up-to-date and more thorough and realistic analysis of the existing land use conditions within Napa County. Land use groups were defined as follows for conversion from Assessor's Parcel data to the Napa County Land Use Database.

- Commercial
  - Parcels or portions of parcels of any size containing commercial uses including retail sales, offices and motels/ B&Bs as identified by the Napa Co Assessor
  - Vacant commercial parcels of any size as identified by the Napa Co Assessor
  - Parcels of any size containing commercial recreational uses
- Industrial
  - Parcels of any size containing industrial uses including warehousing as identified by the Napa Co Assessor
  - Parcels of any size in industrial areas containing wineries with approved production capacities of 25,000 gallons/yr or greater
  - Vacant industrial parcels of any size as identified by the Napa Co Assessor
- Public/Quasi-Public
  - Parcels of any size containing schools (both public and private), colleges, churches, railroads, substations, water treatment plants, water tanks, sewage treatment facilities, airports, etc as identified by the Napa Co Assessor
  - Vacant public/quasi-public parcels of any size as identified by the Napa Co Assessor
- Parks and Open Space
  - Publicly owned parcels of any size identified by Napa Co Assessor and the Land Trust of Napa County not committed to some other form of developed public use
- Urban/Suburban Residential
  - Residential parcels < 2 acres in size
  - Vacant residential parcels < 2 acres in size as identified by the Napa Co Assessor
  - Parcels < 2 acres in size with vineyard, orchard, and/or grazing use only
  - High-density residential parcels of any size as identified by the Napa Co Assessor
  - Vacant high density residential parcels of any size as identified by the Napa Co Assessor
  - 14 vacant high density affordable housing sites *[per County ordinance #1246, establishing the AH affordable housing combination district, governed under Chapter 18.82 in the Napa County Code]*
- Rural Residential
  - Residential parcels 2 to 10 acres in size
  - Vacant residential parcels 2 to 10 acres in size as identified by the Napa Co Assessor
  - Parcels 2 to 10 acres in size with vineyard, orchard, and/or grazing only
- Rural Lands
  - Non-farm and non-grazing land portions of parcels >10 acres in size that contain one or more residences and/or a winery
  - Vacant residential parcels >10 acres in size as identified by the Napa Co Assessor

  - Parcels >10 acres in size with secondary vineyard, orchard, and/or grazing use
  - Portions of 10-acre and larger parcels with secondary vineyard, orchard, and/or grazing use
- Farming
  - Parcels or portions of parcels containing vineyards and/or orchards totaling together 10 acres or more in extent
  - Parcels outside urban/suburban residential, commercial and industrial areas containing wineries with approved production capacities of 25,000 gallons/yr or greater
  - Parcels or portions of parcels containing 10 acres or more of unplanted potential vineyard
- Grazing
  - 40-acre and larger parcels or portions being grazed under Williamson Act Contract or as identified by the County Agricultural Commissioner's Office

The table below provides a detailed land use breakdown for unincorporated areas. It includes a breakdown of land uses by land use category, and treats separately land that is currently developed from and land that is designated in that category but is currently vacant/ undeveloped. It is important to note that the Napa County GIS does not contain detailed land use information for areas within the five incorporated cities/towns within Napa County. Since data for the incorporated areas of the County is not available through the County's GIS, data for these areas were collected through contacting city/town planning departments and using information from each incorporated area's General Plan.

Napa County Land Use Summary (Unincorporated Areas)

Land Use Category	Existing/ Developed Acres	% of Total	Designated/ Vacant Acres	% of Total	Total Acreage	% of Total
Commercial	2,374	0.5%	814	0.2%	3,188	0.6%
Industrial	1,474	0.3%	1,474	0.3%	2,948	0.6%
Public/Quasi-public	6,642	1.3%	208	0.0%	6,850	1.4%
Parks and Open Space	89,823	17.7%	0.00	0.0%	89,823	17.7%
Urban/Suburban Residential	3,751	0.7%	648	0.1%	4,399	0.9%
Rural Residential	8,406	1.7%	2,329	0.5%	10,735	2.1%
Rural Lands	72,552	14.3%	183,711	36.3%	256,263	50.6%
Farming	50,586	10.0%	103	0.0%	50,689	10.0%
Grazing	54,024	10.7%	0	0.0%	54,024	10.7%
Total Unincorporated County	*289,632*	*57.2%*	*189,287*	*37.4%*	*478,919*	*94.5%*
Incorporated Areas/Areas Outside Parcels/ROW	–		–		27,828	5.5%
Total County Land Area					*506,747*	*100%*

POTENTIAL LAND USE CONFLICT AREAS

The most obvious potential future land use conflicts in Napa County focus on potential urban growth and development, which could reduce the amount of agricultural lands unless it is confined to existing urban areas. Another area of potential conflict is the interface between agricultural and other uses. This interface has been addressed by "right to farm" policies, but complaints often surface when residents are inconvenienced by winery activities or farming practices. The following are among the most common causes of land use conflict.

- Urban limit lines
- Juxtaposition of agricultural and other uses
- State-mandated housing production in unincorporated areas
- Juxtaposition of industrial lands and other uses

AGRICULTURAL RESOURCES

For the analysis of agricultural resources, the County was divided into 11 evaluation areas (totaling approximately 485,000 acres). Within these areas, approximately 51,000 acres are active agricultural land, containing primarily vineyards with smaller areas of crops and orchards. Approximately 53,800 acres are grazing land. (Napa County 2005) Agriculture is the leading source of revenue for Napa County. Wine grapes alone, produced in 2004, were valued at $350 million, and total agriculture in 2004 was valued at $357 million.

The greatest and most obvious trend in Napa County is the conversion of Farmland of Local Importance, Grazing Land, and Other Land to Irrigated Farmland. This conversion has taken place on parcels ranging in size from 10 acres to 260 acres. Between 2000 and 2002, approximately 8,385 acres were converted from Farmland of Local Importance, Grazing Land, and Other Land to Irrigated Farmland. This conversion of agricultural land from one type to another is mostly due to the conversion of lower economic value grazing lands or orchards into higher value vineyards.

According to the Farmland Mapping and Monitoring Program (FMMP), the 11 evaluation areas examined all show their own unique trends concerning land use conversion between 1992 and 2002. For example, in the Lower Napa Valley, Angwin area, eastern mountains area, and central interior valley, urban and built-up lands have steadily increased over the years. Other areas, like the western mountains, pope valley, and Berryessa areas, have remained constant or decreased their urban and built-up lands. Urban and built-up lands are defined by the FMMP as "land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage

Winery and vineyards

treatment, water control structures, and other developed purposes." (Note: FMMP produces maps and statistical data used for analyzing impacts on California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. For more information, visit: http://www.consrv.ca.gov/DLRP/fmmp/.

The acreage of grazing land has decreased in the majority of the evaluation areas. Acreage of Prime Farmland has increased overall in the Lower Napa Valley, Napa Valley floor, Pope Valley, and central interior valleys. Overall acreage of Prime Farmland has decreased in the Livermore Ranch area, Angwin area, eastern mountains, southern interior valleys, and Knoxville area. The acreage of Prime Farmland in the western mountains and the eastern mountains has fluctuated.

Napa County's 11 evaluation areas currently have a total of 51,230 acres of potential cropland; 86,688 acres of other potentially productive soils; 135,969 acres of potential rangeland (or grazing land); and 40,542 acres of potential timberland (all numbers approximate).

Rural roadways in Napa County serve a variety of users.

TRANSPORTATION AND CIRCULATION

Napa County has traditionally been home to primarily rural agricultural communities. Recently, tourism and development pressures have been challenging the County's transportation infrastructure. The transportation and circulation chapter describes an assessment of existing transportation facilities and conditions in the County.

The number of Napa County residents commuting in single-occupant vehicles has increased steadily since 1980. This trend corresponds directly to a decrease in the number of residents who commute by carpool, walking, and bicycling.

The following roadway segments currently operate near or above their capacities on a daily or peak-hour basis.

- Portions of State Route (SR) 29 south of the City of Napa
- SR 29 between the northern Yountville City Limits and Bale Lane, north of Saint Helena
- Napa-Vallejo Highway south of the City of Napa
- SR 12, west of SR 29
- SR 12, near the eastern County Line
- Flosden Road, south of American Canyon Road
- American Canyon Road, east of SR 29
- Imola Avenue, east of the Napa-Vallejo Highway
- First Street, west of SR 29
- Trancas Street, between Soscol Avenue and Silverado Trail

In addition, there are several roadways in the County that are classified and designed as rural arterial streets that function similarly to highways, including SR 29, SR 12, and the Silverado Trail. These are the main roadways connecting cities within the County and connecting the County to other nearby urbanized areas. As such, they tend to carry relatively heavy traffic volumes traveling at relatively high speeds. By designing these facilities as rural arterials, numerous driveways and access points remain, creating conflicts between vehicles accessing adjacent land uses and traffic using these facilities for commuting.

The primary collision factor for automobile collisions in Napa County between January 2002 and December 2004 was unsafe speed.

Within the City of Napa, transit service is provided such that 85% of the city's population is within ¼ mile of a bus stop; typical headways are 45 minutes. The smaller cities offer either a single bus deviated fixed-route system or demand response vehicles. Paratransit services are available in all of the cities and in much of the County. Vallejo is accessible by transit service operating on a 1-hour headway, and service to Santa Rosa is available via transit service operating on a 2-hour headway.

Within cities, bicycling and walking has the potential to play a relatively substantial role in transportation. Many cities in the County are on relatively flat ground, making cycling a viable option, although currently, cycling is not heavily used as a commute mode within the County. Additionally, many cities in the County are pedestrian-friendly and include desirable pedestrian amenities such as street-fronting businesses, relatively dense development, and wide sidewalks.

The primary factor for automobile collisions involving pedestrians in Napa County was pedestrian right-of-way violation. The primary factor for collisions involving bicycles in Napa County was bicyclists riding in the wrong direction. The City of Napa is currently implementing a program to install "Bicycle Wrong Way" signs on the back of bicycle lane signs in the city.

The only rail service in Napa County related to transportation is commercial freight transport. The Napa Valley Wine Train is a recreational service traveling between the Cities of Napa and St. Helena. However, this train is recreational in nature and does not play a role in Countywide transportation.

The only formally adopted traffic calming program in Napa County is within the City of Napa. This program has been in place since July 2005. To date, one set of traffic calming measures has been implemented within the city. Many more are expected soon.

There are no County-required transportation demand management (TDM) programs in the County. However, the County has established a "Trip Reduction Program" by which County employees who commute to work by alternative modes (e.g., carpooling, transit, bicycling, walking) are rewarded with cash bonuses of either $10 or $20 per month, depending on the employee's participation rate.

The only transportation systems management (TSM) programs in Napa County consist of several sets of coordinated traffic signals in the City of Napa, three traffic-monitoring cameras, three emergency message signs, and a highway advisory radio system at key locations.

VISUAL AND AESTHETIC RESOURCES

This chapter presents the visual and aesthetic resources in Napa County (County). The chapter discusses applicable policies and regulations and discusses the most recent case law decisions relevant to visual resource analysis and management in California. The section includes maps that present viewshed analyses and identify scenic corridors and major and minor ridgelines. The bulk of this chapter presents the visual resources of thirteen distinct evaluation areas within Napa County. The chapter concludes by recommending preferred methodologies and areas of particular focus for future assessment.

Established federal methodologies utilized by the Bureau of Land Management, Federal Highway Administration, and United States Forest Service were reviewed for this visual assessment. The rationale for selecting a methodology for visual assessment that would not preclude the use of any or all federal methodologies in future evaluation of visual impacts is presented. The technical approach involved field research, the photo-textual presentation of visual resources in Napa County, and the preparation of maps that present viewshed analyses and identify scenic corridors and major and minor ridgelines.

REGIONAL AND COUNTYWIDE CONTEXT

Just as Napa County is set within the diverse northern California landscape—centrally located with regard to urban centers (San Francisco and Sacramento) and geographic features (the wooded north coast region and the Great Central Valley)—the County contains within its boundaries a landscape that allows for great visual variety. Mountainous ridgelines running predominately north and south form the eastern and western boundaries of three major watersheds of Putah Creek, Suisun Creek and the Napa River. The accompanying streams and canyons of these watersheds surround Pope Valley and Lake Berryessa, Wooden Valley and the Napa Valley Floor. The setting provides for a rich and varied discussion of visual and aesthetic resources.

COUNTYWIDE VISUAL AND AESTHETIC RESOURCES

For purposes of this visual analysis, Napa County was divided into thirteen evaluation areas: Napa River marshes, Jamieson/American Canyon, Carneros area, Napa Valley floor, western mountains, eastern mountains, Angwin area, Livermore Ranch area, southern interior valleys, central interior valleys, Pope Valley, Berryessa area, and Knoxville area. Each of these evaluation areas offers a distinct landscape character. A general description is provided for each area, detailing its location, landscape character (i.e., type of vegetation, presence of water, general color and texture of the area), and the degree to which its environment is built, managed, or natural. Unique visual resources are identified for each and described and supported with accompanied by photographs. Typical viewers in the area are described, followed by a discussion of the changes, if any, in the landscape over the past decade, and what affect those changes might have had on the area's visual character.

PUBLIC FACILITIES AND SERVICES

Numerous public and private entities located in both the unincorporated areas of Napa County as well as the incorporated Cities of American Canyon, Napa, St. Helena, Calistoga and the Town of Yountville, provide potable water, sewer and wastewater services, solid waste, law enforcement, fire protection, medical facilities, schools, farm worker housing, recreation, and social services to unincorporated Napa County.

The majority of water suppliers and sewer service providers to Napa County appear to have more than sufficient capacity related to current demand. However, the County would not have sufficient water or sewer capacity if they were to expand urban development in the unincorporated areas. LAFCO policies discourage the County from planning for urban development in the unincorporated areas, and instead encourage cities to annex those areas slated for urban development and then extend their existing water and sewer systems to serve the new development (Napa County 2004b).

All of the solid waste landfills where Napa County's waste is disposed have more than sufficient capacity related to the current waste generation.

The majority of the providers of Fire Protection in Napa County have average to poor Insurance Services Office (ISO) ratings. The objective of the ISO is to provide a tool for the Insurance Industry to measure quantitatively, the major elements of a City's fire suppression system.

Recently, the farm worker housing providers in Napa County appear to have more than sufficient capacity related to current demand; however, this is not to suggest that more housing won't be needed in the future. Recently completed studies have shown that the number of additional farm worker camp beds that could be filled within the County is between 100 and 400.

Visitation is expected to increase in many of the parks and recreational areas in Napa County while many are understaffed.

Most of the social services in Napa County have adequate staff to meet the demand.

CDF/County Fire Station

CULTURAL RESOURCES

This chapter summarizes the discussion of cultural resources in Napa County. Discussed in detail in the chapter are the methods used to identify and create maps of known archaeological, historic, architectural, recreational, and scientific resources; the likelihood and type of future finds expected; and conclusions regarding cultural resource importance in the County.

There are many unique archaeological resources in Napa Valley, and the ethnographic record of the region shows the cultural complexity at the time of European-American contact. Napa County also played a historically significant role in the development of California and the West. The record of significant historic properties within the County is extensive and will surely grow as more properties are identified and evaluated.

There are many unique archaeological resources in Napa Valley, and the ethnographic record of the region shows the cultural complexity at the time of European-American contact. Napa County also played a historically significant role in the development of California and the West.

It is clear from the synthesis of information shown on the maps and in the datasets that Napa County was a rich resource base and home to many thousands of Native Americans stretching back for thousands of years. The archaeological and broad historical record of the County are important resources significant not simply to California, but to North America.

The initial effort to identify cultural resources in Napa County was limited to information provided by Napa County and the information obtained from the Northwest Information Center (NWIC) and provided by Napa County. A more intensive study utilizing primary and secondary historic source information as well as field surveys would be needed to expand the utility of the information presented in this chapter. Themes researched and documented should be tailored to address those events of Napa County's history against which cultural resource evaluations can be reasonably measured for historic significance on a more localized level.

CONTEXT

PREHISTORIC CONTEXT

The Napa Valley is known mostly for its premier wines.

The first recorded archaeological work in Napa County and many of the Bay Area communities was conducted in 1909. Early work noted that the shellmounds in Napa County exhibited large concentrations of ash and earth, which suggests a broad subsistence base. Minimal archaeological work was conducted in the Napa region between 1909 and the 1940s, at which time work began to concentrate on excavation of large habitation sites, extensive survey, and large-scale excavations.

From the late 1940s to the mid and late 1960s, American archaeologists' developed a new approach that focused on how and why people chose to organize, develop, modify, or discard certain modes of adaptation. The Central California Classification System was therefore revised to synthesize the state of current knowledge in central California archaeology.

Recent archaeological investigations in Napa County have been conducted in response to the increasing level of development in the area. Investigations have focused on management goals and site-specific mitigation (Jaffke and Meyer 1998). Many of the recent archaeological investigations have aided in the understanding of the prehistoric people who inhabited the Napa region. These investigations have advanced knowledge of the strategies used by the prehistoric cultures to adapt to their environment, changes climates, and intertribal technological and cultural influences. Archaeological artifact anaylsis and chronological dating methods have made understanding the adaptive processes of the prehistoric cultures more accessible through such techniques as the study of obsidian hydration dating techniques, trace element analysis, and radiocarbon dating (Moratto 2004).

ETHNOGRAPHIC CONTEXT

Artifacts indicate that the earliest dates of human occupation in Napa Valley are approximately 5,000 years ago (Bennyhoff 1994). Archaeological record shows that the Napa region was inhabited in prehistoric times primarily by the Wappo, Lake Miwok, and Patwin tribal groups. As with most of the hunting-gathering groups of California, the 50- to 150-person *tribelet* represented the basic social and political unit. The acorn was the primary plant food, along with a variety of roots, bulbs, grasses, and other edible greens; and deer, elk, and antelope were the primary big game. Trade was common. With the advent of the mission system in the latter half of the 1700s, the numbers of Native Americans in the Napa region decreased rapidly, as did all Native American populations throughout the Bay Area and California.

HISTORICAL CONTEXT

SETTLEMENT

In 1823, the first recorded European explorers in the upper Napa Valley traveled through the area in search of a site for a new mission. They explored present-day Petaluma, Sonoma, and Napa before eventually settling on Sonoma as the new mission site (Hoover 1990).

In the 1830s, the Napa Valley became one of the first in California to be settled by American farmers. In 1836, George C. Yount was baptized as Jorge Concepcion Yount and became a Mexican citizen; he then received the Rancho Caymus land grant in the Napa Valley, which included more than 11,000 acres, from the Mexican government. This grant marked the beginning of the rancho period in the Napa region in which cattle and horse ranching was conducted on extensive ranch spreads. The rancho period continued until 1850, when California became part of the United States, although cattle ranching continued on after statehood.

When California was granted statehood in 1850, the Napa Valley was in the territory of California, district of Sonoma. In 1850, when counties were first being organized, Napa became one of the original 27 counties of California, with Napa City (later shortened to Napa) as the county seat.

The Gold Rush of the early 1850s caused Napa City to grow. After the first severe winter in the gold fields, miners sought warmer refuge in the young city, and some worked on the cattle ranches and in

the lumber industry. Sawmills in the valley were cutting timber that was hauled by horse team to Napa City, where it was then shipped out via the Napa River to Benicia and San Francisco.

VITICULTURE INDUSTRY

The Napa Valley is known mostly for its premier wines. At the start of the industry, Euro-American settlers planted vineyards with cuttings supplied by Catholic priests from Sonoma and San Rafael. Wine production increased between 1845 and 1847. Little effort was made to improve the variety of mission grapes, growing techniques, or winemaking process until the mid 1850s, when zinfandel was introduced into California. Other European varietals, including Riesling, were introduced in the Napa Valley in the 1860s. During this time, the United States market for California wines was generally based on inexpensive price, rather than a sophisticated palate (Ferneau et al. 2000).

By the mid 1870s, grapes had become a major crop in the region. St. Helena became the focal point of wine growing in the Napa Valley (Ferneau et al. 2000). By the late 1870s and early 1880s, wine growers gradually began to replace old or diseased vines with a variety of the best European varietals. With experience, growers extended their vineyards into hillier terrain, where vines were less affected by hard valley frost, and planted other varieties, such as cabernet sauvignon, cabernet franc, and merlot. While total output varied over the years, California saw a relatively steady increase in wine production.

Agricultural diversity began to increase in the late 1800s in response to the problems that faced the wine and wheat industries. Fruit growing—apples, peaches, olives, and prunes—was a major enterprise in the late nineteenth century. The wine industry did not recover until the 1950s, after the Great Depression and World War II.

SURFACE WATER HYDROLOGY

The surface water hydrology chapter describes the baseline conditions for surface water hydrology of Napa County. This chapter is one of three chapters related to the hydrological system of the County. The hydrological system represents the occurrence, movement, and distribution of water movement in the air, on the ground, and beneath the surface.

The three hydrology/water-related chapters of the BDR characterize surface water, groundwater, and water quality conditions. These chapters also describe developing a regionally integrated surface water, groundwater, and water quality models developed for Napa County. It is important to note that the three-part surface water hydrology, groundwater, and water quality analyses and models were conducted and developed with the understanding that such models and analyses would be applied towards future planning considerations. More specifically, the hydrology studies were designed to establish baseline conditions by which Countywide projects and programs could be assessed and evaluated for their planning benefits, constraints, and environmental impacts.

Prior to building a model of the Napa County hydrologic system, the main features and driving forces of the natural hydrologic system were identified based on existing information, past studies, field visits, and engineering hydrology judgment. A conceptual model was then developed to describe hydrologic functioning, identify the significant hydrologic variables needed in the model, and provide a basis to advance the analysis and develop a valid mathematical model.

INTEGRATED SURFACE WATER MODEL

The integrated surface water, groundwater, and surface water quality models developed for the Napa BDR project are based on the MIKE SHE/MIKE11 code developed by DHI Water and Environment. The MIKE SHE/MIKE11 code is a physically based, distributed hydrologic model that simulates the major flow components of the hydrologic cycle, making it very well suited for simulating current and future water distribution in Napa County. Results from the surface water model include monthly values, graphs, and maps for all the major flow components of the hydrologic cycle; stream hydrographs; and water surface profiles. These models are also scalable, which allows for regional modeling as well as with more spatially detailed data, examination of the local effects of a project on the hydrologic system.

The principal flow components in Napa County's hydrological system include precipitation, evapotranspiration, overland flow, surface water runoff, vadose zone flow, and groundwater recharge. These components were each accounted for in developing the MIKE SHE/MIKE11 hydrology model of Napa County.

MODEL DEVELOPMENT

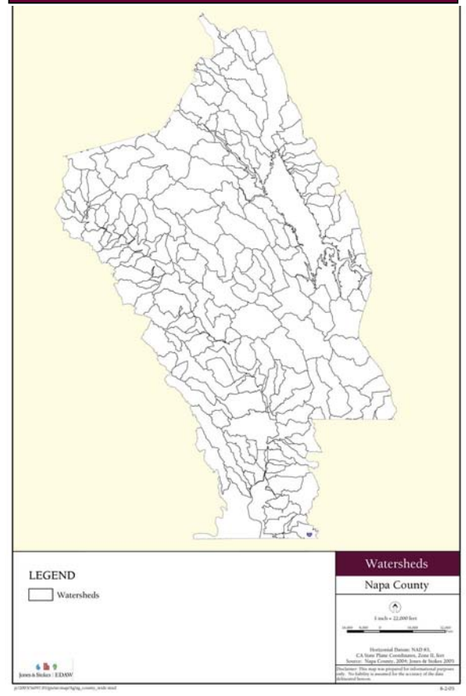
DRAINAGE NETWORK, SUBBASINS, AND STREAMFLOW

Independent models were developed for the hydrologically separate Napa River, Putah Creek, and Suisun Creek watersheds Each basin was further subdivided into a total of 188 subbasins to provide the County with a comprehensive set of subbasin planning units that could each be evaluated for baseline and alternative conditions. Delineation of the subbasin boundaries was based on Digital Elevation Maps (DEMs) of the County. Napa County covers approximately 728 m.^{2} and the model uses a grid size of 250 m. For purposes of flow routing, a principal drainage in each of the 188 subbasins was used for downstream routing.

PRECIPITATION AND EVAPOTRANSPIRATION

Precipitation distribution in Napa County is influenced by regional weather patterns as well as local county microclimates. In the Napa River Watershed, 69 precipitation polygons were linked with precipitation records to simulate the historic distribution of the precipitation. Evapotranspiration for all models used the rates from the CIMIS Oakville, Carneros, and Angwin stations.

NAPA COUNTY WATERSHEDS



LAND COVER

For modeling land cover, vegetation types described in the Biologic Resources Chapter of the BDR were used to describe bare ground, coniferous forest, deciduous shrubs, deciduous woodland, developed, Eucalyptus woodland, evergreen broadleaf wood, evergreen scrubland, grassland, rock outcrop, unclassified, vineyard, water, and wetland land covers. Parameters for rooting depth, leaf area index, overland flow roughness, and evapotranspiration were determined for each vegetation class.

SOIL WATER AND GROUNDWATER

Simulation of groundwater used a two-layer water balance to represent the shallower vadose zone and a series of linear reservoirs to simulate deeper interflow and base flow zones. The Natural Resource Conservation Service's (NRCS) Soil Survey Geographic Database (SSURGO) was used as the soil base data including depth, saturation conductivity, saturation point, wilting point, and field capacity. Napa County general soil types include: clay loam, deep clay, deep fine loam/clay, gravelly loam, loam, rock, undeep loam, and undeep loam/gravel. As part of the Groundwater Resources analysis (Chapter 16 of the BDR) a more complete physically based integrated surface water-groundwater model was developed for areas of the County that currently use significant portions of groundwater.

WATER USE

Groundwater hydrologic analyses and modeling conducted in support of the BDR were undertaken with the intention of applying the models and analyses for future planning.

In the northern Napa River Watershed, the majority of water demand is for agricultural use (about 80%), with 12% for municipal and industrial use, and 8% for other rural use. Water sources include: 60% from groundwater, 26% from diversion of water from the Napa River, 11% from municipal reservoirs, 1% from water imported from outside the watershed, and 1% from reclaimed water. In contrast, in the southern portion of the watershed, including the City of Napa, the majority of demand is for municipal and industrial use (about 65%), with 28% for agricultural use, and 7% for rural use. In the southern watershed, water sources include: 31% from municipal and other reservoirs, 29% from water imported from outside the watershed, 26% from groundwater sources, 7% from diversion of water from the Napa River and other rivers, and 7% from reclaimed water. In the Lake Berryessa and Suisun Creek Watersheds about 98% of water demand is for agricultural use, with 2% for rural use, with 46% coming from groundwater, 21% from Lake Berryessa and other reservoirs, 19% from diversion of water from the Napa River and other rivers, 11% from water imported from outside the watershed, and 3% from reclaimed water. In 2001, 34,900 acres of agricultural lands were under irrigation in the Napa River Watershed and 2,600 acres of agricultural lands were under irrigation in the Lake Berryessa and Suisun Creek Watersheds. This agriculture is almost entirely (96-98%) vineyards and the remaining lands are pastures and lands producing other truck crops. Irrigation applied water was 38,600 ac-ft for vineyards, 1,500 ac-ft for pastures, and 700 ac-ft for other truck crop areas in the Napa River Watershed during 2001.

MODEL CALIBRATION

Model calibration compares model results with actual streamflow data. In this way, model results are directly evaluated to see if "too much" or "too little" streamflow resulted from the modeling simulation, compared to how observed precipitation events resulted in streamflow. Stream gauge data is available along nine stations along the Napa River system in the western study area, as well as at two locations along Putah Creek: one downstream of Monticello Dam and the study area and the other upstream of Lake Berryessa and the study area. Additional historical (1961–1980) discharge data is available at five locations within the study area.

RESULTS

The Napa County MIKE SHE/MIKE 11 model is a dynamic model that can be refined and expanded as data becomes available and as new questions are identified. As the model is currently set up for regional analysis of the Napa County hydrologic system, it can be used to help evaluate alternatives developed as part of the current updating of the Napa County General Plan. In this way, the model can also be used to support a countywide program Environmental Impact Report of the General Plan Update (including evaluation of cumulative impacts). As described above, with adequate local data, the baseline model can also be developed for more localized and site specific environmental analyses of specific projects. In turn, the development of local information for site-specific projects can then be "returned" or input into the broader countywide model to also improve the accuracy of the regional model. A more complete description of the surface hydrology model and its results are found in a separate hydrology report (*Napa BDR Surface Hydrology Modeling Report).*

The model will be suitable for these purposes and provide a basis to compare alternatives and evaluate environmental impacts.

GROUNDWATER HYDROLOGY

This chapter of the BDR describes groundwater in Napa County, documents the groundwater system, and describes the methods used to determine existing groundwater hydrology and the policies that apply to groundwater in Napa County. This chapter also describes the approach and data used in developing a local integrated surface water and groundwater model. The Groundwater chapter is complementary and builds on the general surface water hydrology discussion presented in Chapter 15, *Surface Water Hydrology*, of the BDR. A supporting technical report (*Napa BDR Groundwater Hydrology Modeling Report*) was developed and includes a more complete documentation of the groundwater model construction, calibration, sensitivity analysis, and presentation of results. Consulting hydrologists from DHI Water & Environment led the surface hydrology, groundwater, and water quality tasks of the BDR (Chapters 15, 16, and 17, respectively), working collaboratively with other specialists from the Jones & Stokes/EDAW project team.

A physical-based integrated surface water/groundwater (ISGW) numerical model was refined for the groundwater resources chapter. The MIKE SHE/MIKE-11 groundwater model builds on the surface model described in the surface water quality chapter of the BDR, expanding the original model's capabilities to analyze groundwater resources as well. To facilitate the analysis of groundwater resources, the County was divided into 11 evaluation areas. Extent of the groundwater analysis focuses on the aquifers underlying the 11 evaluation areas. The resultant MIKE-SHE ISGW model represents the subsurface domain (saturated zone) as a single- or multi-layered two-dimensional model, depending on the geological and hydrogeological description.

Review of existing documents and collection of data was undertaken to support the development of the MIKE-SHE ISGW model. From the literature review, no regional groundwater studies or models that address the groundwater resources comprehensively across the County were found. USGS produced a groundwater model in the Lower Milliken-Sarco-Tulucay Creek area to examine groundwater resources in that subregion of the County. This document provides valuable information on the aquifer dimensions and properties in this area. Several regional studies of the groundwater resources studies and records from the California Department of Water Resources provide pumping rates throughout the evaluation areas. Well hole logs with geological information are also being investigated to construct the subsurface model.

The MIKE-SHE ISGW will allow the County to examine surface and groundwater use in the 11 evaluation areas. Specifically, the groundwater chapter of the BDR includes a technical report with estimated groundwater usages, water balances, groundwater elevation trends, appropriate maps, time-series graphs, and other graphics for each evaluation area. The following maps, at a scale of 1:12,000, are included in the groundwater resources chapter.

- Groundwater basins/recharge areas map showing well locations, groundwater flow patterns, recharge areas, discharge areas, and zones of influence
- Groundwater elevations/depths map
- Groundwater short areas map.

In addition, time-series graphs of water level conditions and derived information will be provided.

SURFACE WATER QUALITY

For the surface water quality chapter of the BDR, GIS-based soil erosion, sediment loading, and non-point source water quality loading tools are coupled to the MIKE-SHE integrated model developed for surface hydrology and groundwater to determine annual loadings and transport to (and within) the stream network. Specific constituents examined include sediment, temperature, nitrate, total phosphorus, and coliforms (e.g., E. coli). The dynamic coupling between the loading model and water quality modeling provide a tool for

- analyzing current water quality conditions, and
- assessing cumulative impacts of water quality following future land use changes in the watershed.

Where possible, the water quality analysis is making use of existing and available water quality information from on-going studies, including the TMDL process, Napa nutrient analyses, and other studies. Loadings are assessed using a GIS-based non-point calculation tool. Different types of land use have different run-off concentrations of nutrients, organic matter, and bacteria. Predominant land uses include: residential, commercial, industrial, mixed (variety of land uses), transportation, open space, forest, wetlands, and agriculture. These run-off concentrations are often refereed to as the land use estimated mean concentration (EMC). The pollution load from agricultural activity (primarily the use of fertilizer and domestic animals) is included in the non-point pollution load estimation. The GIS tool also links point sources and provides a first screening-level of assessment of the combined pollutant loadings. The GIS tool is applied to estimate the total load from the housing in the rural areas, taking the local treatment system efficiencies into account.

Potential sediment loading arising from soil erosion is analyzed based on available information about topography, soils, vegetation, land use, and rainfall. The analysis is a combination of GIS-based soil erosion modeling and evaluation of existing data. The soil source erosion assessment is applied to describe delivery index and sediment yield (ton sediment /acre/year) for all drainages. These soil erosion rates are applied as loadings to an in-stream sediment transport model that is fully integrated with the MIKE-SHE model developed. The river sediment transport model (including the main stem Napa River and major tributaries in the Napa River watershed only) will transport sediment as either suspended sediment or bedload. The model predicts areas prone to sedimentation and erosion and predicts total loadings from the watershed to the San Pablo Bay.

The coupling of GIS-based tools and MIKE-SHE ISGW allows the County to examine loading of water quality constituents and sediment throughout Napa County.

Results for the Surface Water Quality analysis are documented in a supporting technical report (*Napa BDR Surface Water Hydrology Modeling Report*), which includes a more complete description of the models' data requirements, computational algorithms, and outputs. Resulting maps include:

- Surface water pollutant-level maps for temperature, nutrients, organic material, and pathogens
- Sediment source map

FIRE ECOLOGY

This chapter focuses on the ecological role of fire in the County's biotic communities. The purpose of this chapter is to establish baseline data that will allow for the analysis of impacts on biological resources due to changes in the fire regime as the population of the County increases, development patterns change, and decisions and policies are considered regarding fuel management.

In the higher elevations, geologic structures that surround the structural troughs/basins of the County create source areas for surface water and groundwater.

California native grasslands have been identified as one of the most endangered ecosystems in the United States, so it is important to carefully consider the effects of fire on this grassland assemblage.

Fire suppression over the last 50 to 100 years has resulted in a decrease in fire frequency in many of the County's biotic communities. The reduction in fire frequency has likely led to declines in some special-status species that are favored by fires, and the degradation of some sensitive communities. Serpentine grassland is an example of one such sensitive community, which has undergone invasion by barbed goatgrass (*Aegilops triuncalis*), a fire-intolerant noxious weed. There are two principal mechanisms by which fire suppression threatens the County's biotic communities and special-status species: increased dominance by less fire-tolerant species, and increased probability of severe stand-replacing fires.

In some communities, the reduction in fire frequency has led to a buildup in fuels (biomass) such as woody shrubs and downed wood. Increased fuel loads have increased the probability of extensive and severe fires. Such fires have the potential to cause the loss of sensitive communities such as old-growth Douglas-fir–ponderosa pine forest, which would lead to declines in special-status species such as the northern spotted owl (*Strix occidentalis caurina*) that are dependent on this habitat.

The probability of extensive stand-replacing fires in many biotic communities in the County is increased by the spread of human development adjacent to natural areas. Increasing human development (including roads) is correlated with the frequency of wildfire ignitions. In contrast, agricultural development adjacent to natural areas has reduced the probability of extensive and severe fires in some areas. Vineyards have lower fuel loads than biotic communities such as oak woodlands, chaparral, and coniferous forest.

Most of the County's biotic communities are at moderate risk of losing key ecosystem components due to changes in the fire regime. These communities include non-native grasslands, xeric and mesic chaparral, and some areas of riparian woodland, oak woodland, and coniferous forest. Significant portions of the County's oak woodlands and coniferous forests are at high risk of degradation or type conversion due to the increased probability of severe fire.

There is also a strong need for better local and regional land use planning to slow or halt the increase in fire risk as the population increases and development spreads. Such planning is particularly important for the wildland urban interface, where developed areas and wildlands meet and where extensive property damage and loss of life from fire is typically concentrated (California Department of Forestry and Fire Protection 2000).

As the County population continues to grow, local, state, and federal agencies charged with biodiversity conservation and fire protection will continue to struggle with increased sources of ignition, the demand for increased fire suppression, and the concomitant changes in fire regime that accompany a growing population and continuing development. This report takes an initial step to assess and address fire management needs in the context of local land use planning in Napa County.