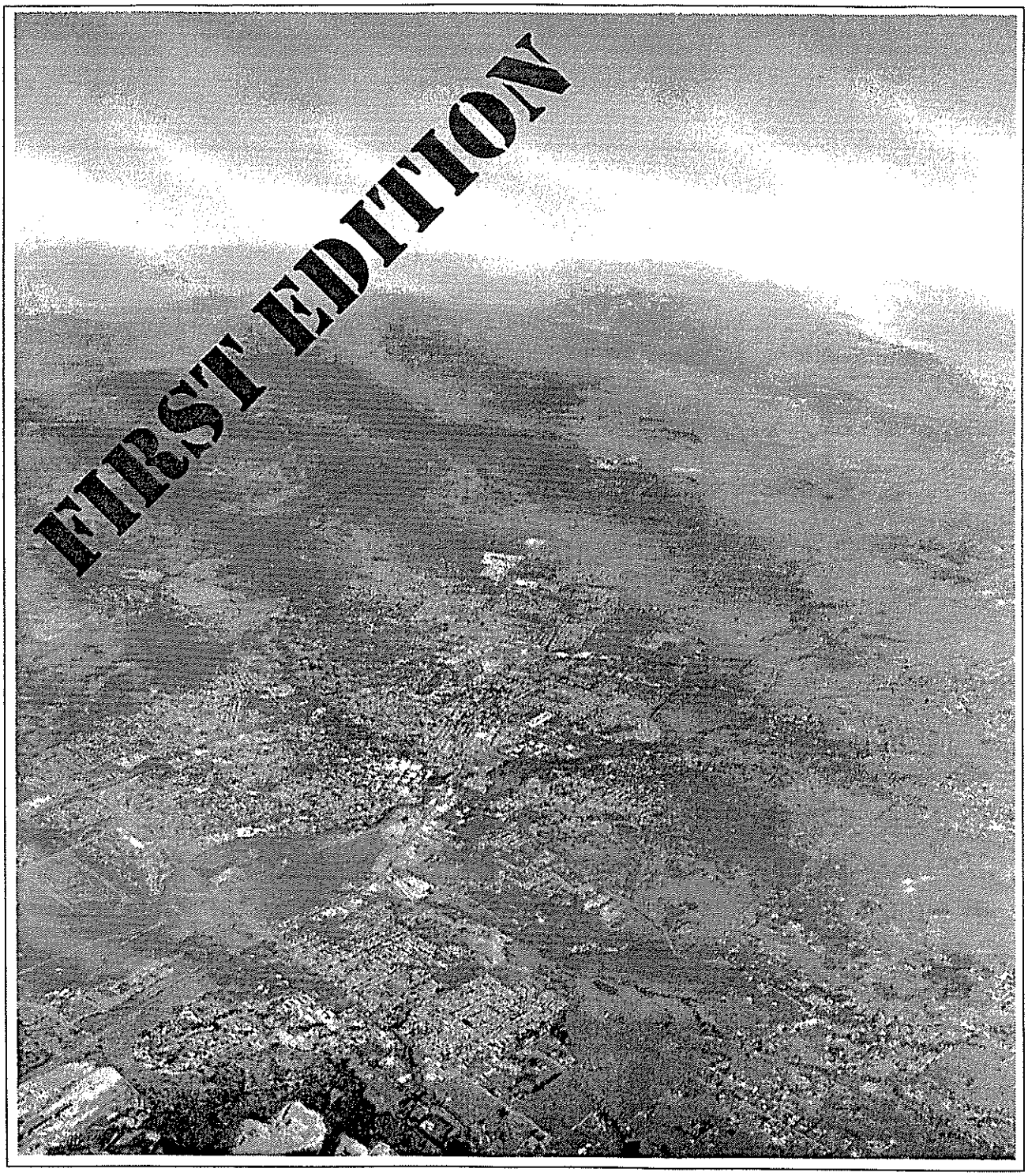
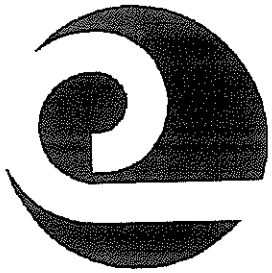
Napa River Watershed Owner's Manual

An Integrated Resource Management Plan



PREPARED BY: NAPA COUNTY RESOURCE CONSERVATION DISTRICT

Cover: Napa River watershed from rock quarry looking northwest toward St. Helena.
Photo by Ron Ruiz



Napa County Resource Conservation District

Most Napa County citizens can define "resource", and are aware of the meaning of "conservation". Most also know about special "districts" established to administer such duties as those related to sanitation and water. Many county residents, however, may not be familiar with the "Napa County Resource Conservation District", which represents virtually all of Napa County, and is charged with protecting and enhancing the resources within the district boundaries.

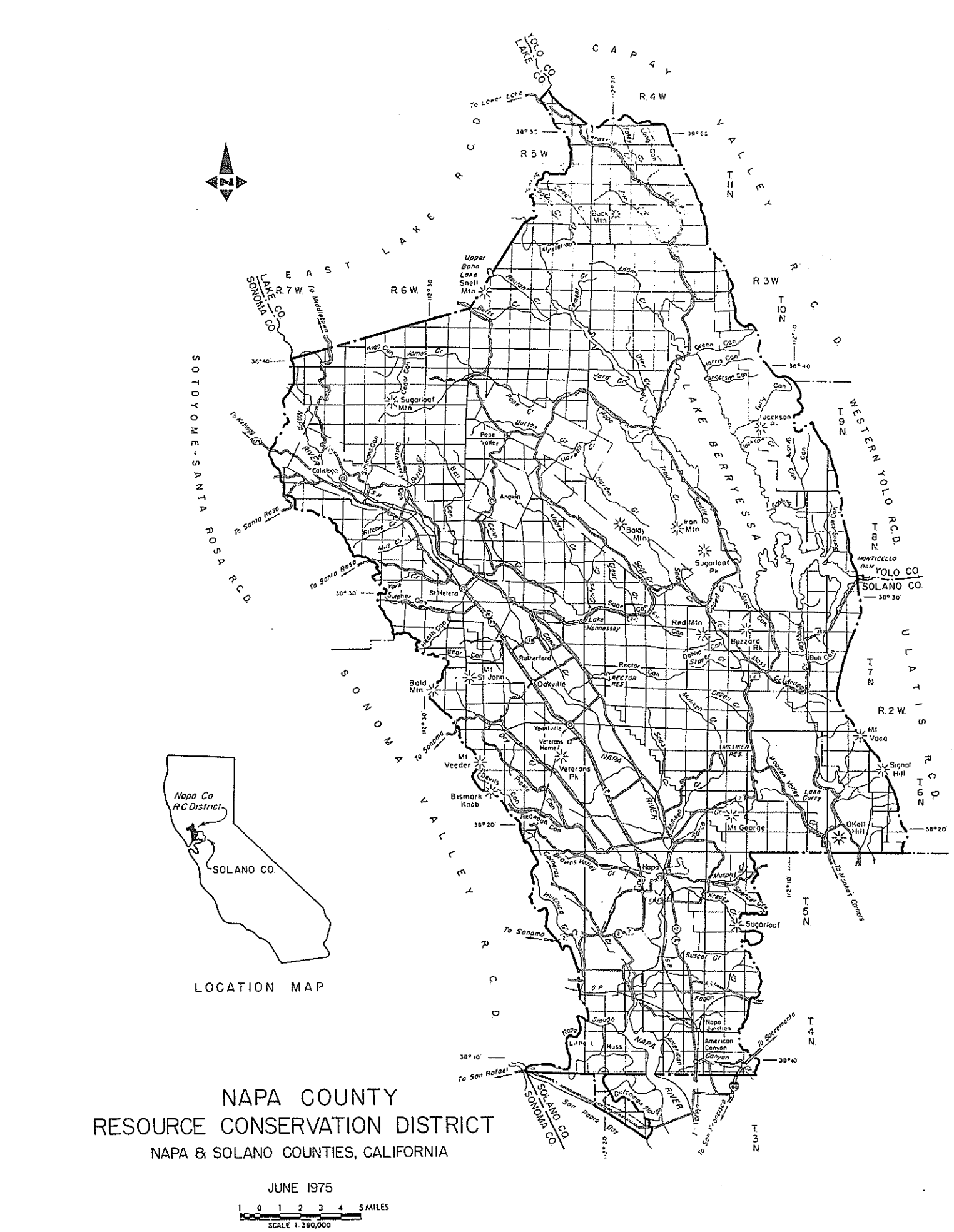
Established by state law, and funded through county property taxes, the Resource Conservation District (RCD) was formed in 1945. It is one of over 3,000 local Conservation Districts established in the United States since President Roosevelt wrote to the governors of all the states in 1937, urging them to enact legislation allowing landowners to form soil and water conservation districts. Originally established to aid farmers and ranchers in their soil erosion control efforts, and to provide assistance in water conservation, the districts have expanded their services to communities, school districts, economic development programs, river basin and watershed projects, and to environmental improvement programs.

The RCD is managed through its Board of Directors; five local landowners who serve as unpaid volunteers. The present Board members include Mitchell Klug, Gary Mathison, Donald Gasser, Matt Thompson, and Board President Clinton Pridmore. They provide the leadership in assessing the conservation needs of the district, and in developing programs to meet those needs.

The District is a technical information source for landowners, managers and residents. We have information on soils, watersheds, and resource conservation methods. The United States Department of Agriculture operates a Natural Resources Conservation Service field office through the RCD, which provides local landowners with experienced professional advice about soil and water development and conservation. Aerial photographs of virtually all of Napa County are available for purchase at the local office, and a county-wide soil survey is also on file for the use of district landowners.

Because education is of prime importance to the District, we have available a large array of school oriented materials. These are for the use of community groups, organizations such as Scouts and 4-H, and for private and public schools countywide. Each year, the RCD sponsors a speech contest for Napa County high school students that is a first level entry to statewide competition.

Our offices are open Monday through Friday from 8:00 a. m. to 5:00 p. m., and we encourage you to visit. We are located at 1303 Jefferson Street, Suite 500B, in Napa. Our telephone number is 252-4188, or 252-4189.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NAPA & SOLANO COUNTIES, CALIFORNIA
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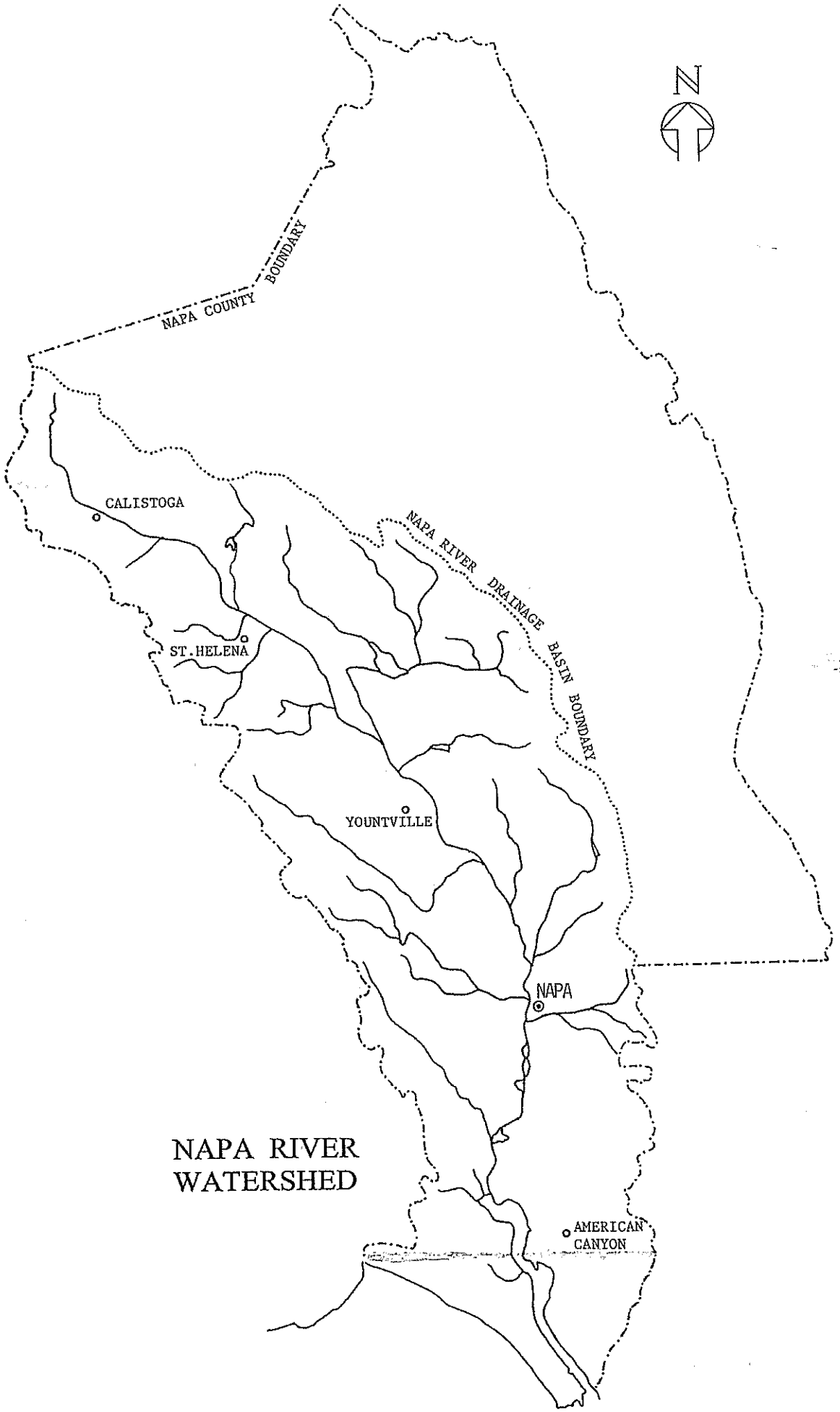
NAPA COUNTY R.C.D.,(41) CAL.M7-PL-10145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NAPA RIVER
WATERSHED

Napa River Watershed Owner's Manual

A Framework for Integrated Resource Management

The Napa Valley is known world-wide as a premier agricultural resource of the San Francisco Bay Area, and its wine products and physical beauty are enjoyed by millions of people every year. The citizens of Napa County have worked diligently to maintain its open rural character, including formation of the Agricultural Preserve in the 1960's. The preparation of this Owner's Manual is a further step toward preserving and enhancing the uniqueness of Napa Valley by helping its residents maintain the physical and biological assets on which its agriculture depends. In order to preserve agriculture open space, and the rural atmosphere of the watershed, it is necessary to also preserve the natural resources that enable agriculture to thrive.

This proposed "health care program" for the Napa River watershed can succeed with the energetic participation of the citizens who work, play and live in the watershed. Implementing the recommendations of this Manual is only the first step, however. Monitoring the health of the watershed and participating in the continual improvement of this Manual as more information and experience is gained, is also a necessary part of enhancing and maintaining our watershed. Building partnerships and working jointly to preserve the quality of life in Napa Valley will demonstrate the effectiveness of community based natural resource protection and enhancement that is responsive to the needs of the landowners and land users of the Napa Valley.

Special thanks and appreciation is extended to the Technical Advisory Committee and the Education Advisory Committee, who worked many long hours to produce this first watershed operator's Manual. The members of the Committees are listed below. In addition to the Committees, many other citizens of Napa Valley contributed to the assembling of this Manual by helping Committee members, attending Forums and meetings held by the Resource Conservation District and members of the Committee, and by those who have individually shared their concerns and ideas with us during the development of this Manual. The publication of the Manual is the beginning of a community-wide program to keep the Napa Valley healthy and prosperous. Opportunities to refine and improve the Manual will be provided regularly in coming years.

We at the Napa County Resource Conservation District look forward to continuing work with the Napa Valley community to establish a new standard of local responsibility and natural resource conservation awareness.

Clinton Pridmore, President

Mitchell Klug, Vice-president

Gary Mathison, Personnel Officer

Donald Gasser, Director

Matt Thompson, Director

Napa County Resource Conservation District Board of Directors
1303 Jefferson Street, Suite 500B, Napa, California 94559 **707-252-4188**

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TECHNICAL ADVISORY COMMITTEE MEMBERS

Rick Aldine	*Napa County Farm Bureau*
Phillip Blake	*USDA Natural Resource Conservation Service*
Dennis Bowker	*Napa County Resource Conservation District*
Tom Bonetti	*US Army Corps of Engineers*
David Briggs	*Sierra Club*
Kathleen Edson	*Napa County Resource Conservation District*
Leslie Ferguson	*SF Bay Regional Water Quality Control Board*
Nate George	*Deputy Napa County Agricultural Commissioner*
Teresa Geremia-Chart	*Napa County Farm Bureau*
Bruce Hagen	*California Department of Forestry and Fire Protection*
Walter Hampe	*Sutter Home Winery*
Bill Hanna	*Napa County Farm Bureau*
Nadine Hitchcock	*California State Coastal Conservancy*
Greg Holquist	*Greg Holquist Consultants*
Nadine Kanim	*US Fish and Wildlife Service*
Paul Kenney	*Sterling Vineyards*
Mitchell Klug	*Robert Mondavi Vineyards*
Wally Kolb	*City of Calistoga*
Laurel Marcus	*California State Coastal Conservancy*
Dan Marks	*City of Napa*
Linda Neal	*M & L Vineyard Management*
George Nielson	*Nielson Underground and Excavating*
Myke Praul	*County of Napa*
Jeff Redding	*County of Napa*
Daniel Roberts	*Sterling Vineyards*
Steven Rosa	*Town of Yountville*
Paul Schwarz	*SF Bay Regional Water Quality Control Board*
Robert Schwerin	*City of American Canyon*
Charles Slutzkin	*Napa Valley Gateway Business Park*
Bob Sorsen	*Napa County Flood Control and Water Conservation District*
John Stewart	*Napa Sanitation District*
Jim Swanson	*California Department of Fish and Game*
Ross Swenerton	*State Water Resources Control Board*
Charles Tyson	*California Department of Conservation*
Tim Vendlinski	*US Environmental Protection Agency*
Susan Whichard	*US Environmental Protection Agency*
David Whitmer	*Napa County Agricultural Commissioner*
Dyan Whyte	*SF Bay Regional Water Quality Control Board*
Peter Whyte	*Napa-Solano Audubon Society*

EDUCATION ADVISORY COMMITTEE MEMBERS

The Education Advisory Committee worked with the Resource Conservation District to develop a special curriculum that is now being implemented in several Napa Valley schools. Teachers and students "adopt" the Napa River watershed and follow it as a focal point of their school work through grade 12, and in some cases, into adult education and Napa Valley Community College programs. The watershed becomes a living laboratory in which they participate in hand-on activities. The program incorporates elements from "Adopt-A-Watershed" program; Project Learning Tree; Pawcatuck, RI Watershed Education Program, and other successful curricula. One of the goals of the program is to help students and teachers develop a land ethic and sense of stewardship toward their environment and community. The program develops partnerships between schools, agencies, organizations, industry and community members.

The curriculum incorporates systems thinking as students are taught to observe, analyze, infer, and take action within the context of community based, real life situations through:

- Hands-on activity classroom lessons that relate watersheds to concepts appropriate to the grade level
- Cross-discipline connections for each grade unit which includes connections among art, science, language arts, history, social science, and math
- Long term field studies which are repeated at specified grade levels so that data can be compared and trends recognized
- Restoration projects, which help students achieve a sense of caring and accomplishment in their watershed
- Community action projects, in which students communicate what they have learned about their watershed to the community

Restoration and monitoring projects use actual restoration sites and help to coordinate plans with individuals and agencies, including the California Conservation Corps, USDA Natural Resource Conservation Service, California Department of Fish and Game, City Parks departments, and the Resource Conservation District. The Advisory Committee will continue to assist with implementation of the curriculum throughout the watershed, and will participate in regular review of the program.

Sheila Adams	*Napa County Resource Conservation District*
Phillip Blake	*USDA Natural Resource Conservation Service*
Dennis Bowker	*Napa County Resource Conservation District*
Kathleen Edson	*Napa County Resource Conservation District*
Leslie Ferguson	*SF Bay Regional Water Quality Control Board*
Betsy Gewirz	*St. John's Lutheran School*
David Graves	*Saintsbury Winery*
Doris Klein	*St. John's Lutheran School*
Herm Lawson	*St. John's Lutheran School*
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Eileen Rohan	*Bel Aire Alternative School*
Rebecca Sijgers	*Bel Aire Alternative School*
Robert Sorsen	*Napa County Flood Control and Water Conservation District*
Jim Swanson	*California Department of Fish and Game*
Larry Week	*California Department of Fish and Game*
Peter Whyte	*Napa Solano Audubon Society*

SUMMARY AND INTRODUCTION

This manual is a collection of recommendations from the Napa County Resource Conservation District that have been developed with the advice and participation of community representatives; federal, state, and local government agency representatives; private citizens; and local citizen interest groups. Where possible, specific practices are listed that may be adopted by landowners and managers. Because there is usually more than one way to pursue any given land use, the practices include many alternatives from which to choose, dependent on specific site conditions and personal preferences. In many cases, the recommendations are to fill gaps in existing information to help develop additional practices to help the citizens of the Napa River watershed maintain a healthy, sustainable natural resource system. It is designed to be flexible, and will be updated as new information and new techniques become available. The recommendations in this manual are intended for use as a technical and educational resource for landowners and managers in the watershed who want to help ensure the long term protection of the soil, water, and other natural resources of the watershed.

The recommendations in this Manual will be reviewed for effectiveness and completeness during the next two years, including public workshops and forums to provide the widest participation possible. Implementation assistance such as funding and technical assistance will be sought to supplement the local effort, and a thorough monitoring plan will generate needed information to maintain a proper assessment of the effectiveness of implementation. With that information, adjustments can be made, and further recommendations can be developed to help maintain the health of the watershed for the use and enjoyment of future generations.

Voluntary, cooperative resource conservation

Historically, natural resource management planning has been done based on one resource only, or to deal with a single problem. This plan is an attempt to begin integrating the many parts of the watershed through recommendations for land use practices and programs developed with the complexity of the system in mind. Stated problems are presented as interests to be addressed, rather than as the purpose of planning. Voluntary implementation of the recommendations in this plan will not only help deal with identified problems, but will prevent others from occurring. Thus, this type of watershed planning is intended more as preventive maintenance than as an "after the fact" clean-up or mitigation program. Solutions to problems identified by citizens, agencies, public interest groups, etc., are more easily realized when problems are treated as interests to be addressed instead of positions to be defended. This plan is meant to provide the basis for a voluntary effort of the citizens of the Napa Valley to jointly address the concerns expressed while protecting and preserving their natural and community resources in an economically reasonable manner. As with personal health or home maintenance, preventive care is the least burdensome and least expensive way of keeping a watershed healthy. This manual provides a first step toward the mutual education within the community that will provide the basis for broad cooperative action. Community participation in development of a long term plan to manage and maintain the uniqueness of the Napa Valley will ensure that the positive attributes of the valley will persist for the constructive enjoyment of the citizens of Napa, and that elements that threaten that enjoyment will be recognized and avoided by cooperative action. Programs to expand long term planning will be introduced in the rest of the County in coming months, in order to allow the County as a whole to begin conscientious local management of its invaluable natural resources.

Several recent legislative and regulatory actions have noted the importance of the Napa River to the health and well-being of San Pablo Bay. Identification of the Napa River by the US Environmental Protection Agency and the San Francisco Bay Regional Water Quality Control Board as a priority pollutant contributor to San Pablo Bay has emphasized the need for proper management of the watershed to control sediment and other nonpoint sources of pollution in the watershed. In addition, the implementation of the Coastal Zone Management Act Reauthorization Amendments of 1990, and the State Nonpoint Source Pollution Management Program will address land management practices in the watershed in order to control pollutant loading (chiefly sediment) in

the River and San Pablo Bay. The National Pollutant Discharge Elimination System permitting requirements, and the programs proposed in the reauthorization of the Clean Water Act also address different land management practices in the watershed. Other programs and regulations such as the Comprehensive Conservation and Management Plan for the San Francisco Bay Estuary, Napa County Flood Plain and Riparian Ordinance, and the Napa County Resource Conservation Regulations emphasize the public desire to protect the natural resources on which the residents of Napa County so heavily depend. Many other regulations such as endangered species protection plans and agricultural pesticide use monitoring highlight specific areas of concern as well.

Each of these regulations and programs have an individual focus, frequently based on a demonstrated or assumed problem in the watershed. Some, however, conflict with one another because they do not take into account the complexity of a natural watershed system and the interaction of community systems within the watershed. Wetland and riparian corridor protection plans sometimes conflict with flood control efforts and insect vector control, for instance. This manual begins a process of finding solutions to such overlaps and conflicts by considering the interaction of each interest with other interests and programs. No amount of government funding or regulation can equal the effects of broad voluntary participation on the part of individuals in the effort to provide long term protection to the watershed's natural resource system.

Plan Goals and Objectives

This integrated resource management plan is designed to accomplish the **goal** of maintaining a **sustainable river ecosystem** for the Napa River watershed. With increasing population and diversity of land use in the watershed, systems management becomes more necessary in order to decrease negative impacts of human activities and to increase the positive impacts. Economic vitality is necessary to enable the community to address and solve resource problems such as non-point source pollution, and maintaining a healthy natural resource base is necessary for sustaining economic vitality. In order to keep the system in balance, land use and land management decisions must be made with full knowledge of the likely long term results of those decisions. Establishment of a goal oriented management program can prevent problems before they occur, and will result in much less expensive and much more efficient use of community energy.

Of the basic natural resources that make up a watershed, water is perhaps the most critical. The quality and quantity of water available to the community and its ecological system is important not only from an empirical standpoint, but also because the status of the water resource in a watershed is an excellent reflection of the health of the watershed in general. For this reason, two additional goals have been established that will enable the maintenance of a genuinely sustainable river ecosystem. These two goals are to **increase water quality** in the watershed, and to **increase water quantity** available for beneficial use of watershed human, plant, and animal communities.

The effort to attain the three listed goals will include programs to reach several listed **objectives** of the plan. These objectives are measurable milestones that will enable the community to track progress toward maintaining a natural balance in watershed resources. Most of the objectives are to promote and encourage practices and behavior that will support development of a healthy environment for the watershed. Education is therefore a major characteristic of this planning and management program. Education is desirable regarding not only the technological issues related to watershed management, but also social interaction that promotes more complete understanding of the respective needs of the citizens of Napa Valley. The nine objectives chosen for the program include:

- **Promote stream stabilization using natural processes**
- **Promote contiguous habitat**
- **Increase biological diversity**
- **Increase migratory and resident fish habitat**
- **Coordinate natural resource protection and planning efforts**
- **Encourage land stewardship**
- **Reduce soil erosion**
- **Promote sustainable land use concepts**
- **Promote and improve water management**

This plan is meant to provide the basis for a voluntary effort of the citizens of the Napa Valley to jointly address public and private concerns while protecting and preserving their natural and community resources in an economically reasonable manner.

Watershed Management Planning: *Why Bother?*

"Human vanity can best be served by the reminder that:
Whatever his accomplishments
His sophistication
His artistic pretension
Man owes his very existence to a six inch layer of topsoil and the fact that it rains."

Anonymous

Our soil and the water that flows over and through it are our most basic assets. The condition of other natural resources in a watershed, such as vegetation and animal life, are in many ways indicative of the underlying health of watershed soil and water. The inter-dependence of the many factors that make up natural resource systems require comprehensive planning and management to achieve maximum long term benefits from natural resources, without diminishing their availability. Planning and managing such a complex system cannot be done by single, individual effort, but is best accomplished through the cumulative effects of cooperative community awareness and involvement.

The Manual is intended for use in planning and management of watershed lands. The recommendations are listed three ways. First, they are listed by type of land use (*i.e.*, Agriculture, or Residential), then by type of habitat or resource associated with the land (i.e., Aquatic, or Upland). They are also listed by plan objectives.

The Napa River Watershed Owner's Manual is divided into five major parts:

I. Executive Summary

II. Recommendations listed by plan *Objectives*
- Promote stream stabilization using natural processes
- Promote contiguous habitats
- Increase biological diversity
- Increase migratory and resident fish habitat
- Encourage land stewardship
- Coordinate natural resource protection and planning efforts
- Reduce soil erosion
- Promote sustainable land use concepts
- Promote and improve water management

III. Recommendations listed by type of *Land Use*
- Agricultural (grazing; viticulture; other)
- Open space and watershed
- Residential (urban and rural)
- Commercial, Industrial, and Public Institutions
- Recreation

IV. Recommendations listed by type of *Resource*
- Aquatic
- Riparian
- Upland
- Social/civic/institutional recommendations

V. Technical Appendices and Reference Bibliography

There is also a *Glossary* of terms and acronyms and an *Index* to help find specific items or applications easily. Many of the bibliographic references are available in the Resource Conservation District office. Further technical information is available from the source(s) listed at the end of each technical reference. This Manual is not an exhaustive compilation of materials, but is an entry into a chain of references and assistance programs that can help the citizens of the Napa River watershed responsibly manage the watershed natural resources.

GLOSSARY

Anadromous fish: Fish that live some or all of their adult lives in saltwater but migrate to freshwater to spawn (see *salmonid*)

Aquatic: Water habitat dependent. Usually refers to such things as fish, macroinvertebrates, algae and other plants that require complete water submersion for survival

Aquifer: A water bearing geologic layer of permeable rock, sand, or gravel. The groundwater source for wells.

Bankfull flow: The channel forming flow of the stream usually equivalent to 1 ½ to 2 year storm recurrence interval.

Base Flow: That part of stream discharge that is not attributable to direct runoff from precipitation or melting snow, primarily sustained by groundwater discharge into the stream.

Baseline: A selected set of data that forms a known starting point that will enable determining of system status and help determine trends as the system changes..

Benthic: Pertaining to the bottom of a body of water. Benthic algae, for instance, is submerged algae growing on the bottom of a water body.

Biochemical oxygen demand (BOD): The amount of oxygen needed for biological decomposition and chemical oxidation of sediments.

Biodiversity: Biological diversity; variety of lifeforms in a given area.

Biota: All living organisms that exist in a region.

Brackish: Water that is less salty than sea water, but significantly more salty than typical river freshwater.

Brine: Concentrated water solution of salts.

Buffer areas: Zones created or sustained to buffer effects of unnatural land use practices on animals and plants and their habitats.

Canopy cover: The leafy crown of trees or large shrubs that rises above low growing forbs, grasses, and water. In viticulture, the reference is the leafy area of a grapevine.

Channelization: The straightening and smoothing of river channels, frequently for flood control, sometimes accompanied by paving or bank armoring.

Conjunctive use: The utilization of land, air, or water for more than one purpose or by more than one person, or the sequential use of a resource dependent on availability of source. Use of both groundwater and surface water at differing times of year, based on availability, is *conjunctive use* of water resources.

Contiguous habitats: Wildlife or other habitat that is connected physically, even if parcel lines or other political divisions otherwise bisect it.

Discharge: Volume of water flowing past a reference point per unit of time (e.g. cubic feet per second, cfs).

Dissolved oxygen concentration (DO): The amount of oxygen dissolved in water.

Diversion: In water rights, diversion is the alteration of natural water flow in a drainage. It includes such activity as collection of water in a reservoir before it reaches a main stream channel, as well as pumping from the stream or damming the stream itself.

Drainage basin: Land area drained by a given river or stream; watershed.

Dredging: The removal of accumulated sediments from the estuary and ocean floor.

Ecology: The study of the interactions of living things and their environment.

Ecosystem: An interdependent community of plants and animals interacting with one another and with the chemical and physical factors making up their environment.

Enhancement: Improving a system or habitat.

Entrapment zone: The area where salty ocean water moving upstream mixes with fresh water flowing downstream. The mixing dynamics in this zone traps nutrients, organic and inorganic materials (e.g. fish and invertebrate eggs), and other food sources. These circumstances enable considerable plant and animal growth. An entrapment zone's success or health depends on its location and surrounding conditions.

Ephemeral stream: A stream that flows only a short time (days or weeks) in direct response to rain storms.

Erosion: The movement of soil by water and wind and frost. **Sheet erosion** - Water moves over the soil surface in thin layers like a sheet; also called "invisible erosion" because it is difficult to see it happening. **Rill erosion** - As water picks up speed moving downhill, the sheets begin to form rills, or small channels. **Gully erosion** - If left unchecked, rills caused by erosion become larger, forming gullies.

Estuarine: Of, related to, or growing in estuaries.

Estuary: A body of water at the lower end of a river which is connected to the ocean and partially enclosed by land. In an estuary, seawater is measurably diluted by freshwater from the land.

Eutrophication: Excess decomposition of dead matter in water that lowers the dissolved oxygen concentration such that fish and other aquatic animal life are threatened.

Floodplain: Flat areas bordering streams that are subject to flooding..

Fluvial: Relating to a stream or river, or caused by the action of flowing water.

Fluvial geomorphology: The science that deals with the relationship of moving water and river forming relief features of the earth, such as vegetation, geology and topography.

Geomorphology: Geologic study of the evolution of landscape and land-forming processes.

Gradient: Degree of slope from horizontal or steepness of a geographic feature.

Groundwater: Water which occurs below the surface of the land.

Groundwater recharge: Replenishment of water removed or otherwise drained from an underground aquifer.

Habitat: The specific area or environment in which a particular type of plant or animal lives. To be complete, an organism's habitat must provide all of the basic requirements for life of that organism.

Hazardous waste: Any toxic waste that may pose a serious threat to human health or the environment when improperly managed.

Humus: decayed organic matter in or on the soil's surface

Hydrology: The study of relationships between water and the geologic environment.

Impoundment: A structure built to retain water, commonly a reservoir or pond.

Indicator species: A species whose characteristics show the presence of specific environmental conditions and are representative of a certain habitat type or function.

Indigenous: Species which originated naturally or has resided or utilized a given site since a given baseline time or date.

Infiltration: The downward entry of water into the soil.

Insecticides: Chemicals used to kill insects.

Integrated Pest Management: A systemic approach to agricultural pest control that utilizes cultural practices, biotechnology, chemicals and other crop protection techniques as a means to achieve acceptable levels of control with the least possible environmental harm.

Lacustrine: Of, related to, or growing in lakes.

Land stewardship: A land ethic or cultural value set that promotes existing land use practices that protect the resources for succeeding generations.

Leaching: Removal of salts, nutrients, and other materials from the soil by water movement through the soil profile

Levee: Raised bank of earth built to control or confine water, sometimes known as a dike.

Marsh: A wetland where the dominant vegetation is non-woody plants such as grasses and sedges (as opposed to a swamp where the dominant vegetation is woody plants like trees).

Monitoring: Scheduled sampling of selected environmental and biological variables.

Mulch: Any substance which is spread or allowed to remain on the soil surface to decrease the erosion effects of raindrop impact, water runoff or wind.

Native: Species that have originated naturally in a particular region.

Natural processes: Those physical, chemical and biological processes that normally function in nature without adjustment or interference from human activity.

Natural resources: Naturally occurring resources, such as soil, water, air, trees, that are needed by an

organism, population, or ecosystem, to sustain or optimize survival.

Nitrogen: A common necessary elemental nutrient that, in excess concentrations, can cause environmental problems. Excess concentrations can come from fertilizers, septic systems, and animal wastes. Nitrogen dissolves in rainfall or irrigation water and leaches to the groundwater.

Nonpoint source pollution: Water pollution from dispersed and uncontrolled sources (such as surface runoff from rain storms).

NPDES: National Pollutant Discharge Elimination System, a provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the US EPA, or a state or other delegated agency.

Nutrients: That portion of any element or compound in the soil that can be readily absorbed and assimilated to nourish growing plants.

Organic matter: Residue of plant or animal origin.

Percolation: Downward movement of water through soil.

Perennial: Occurs throughout a year.

Pesticide: A chemical substance used to kill or control pests such as weeds, insects, algae, rodents, or other undesirable agents.

pH: The symbol used to indicate an acid or alkaline condition (the relative concentration of hydrogen ions). A pH of 7 indicates neutrality, less than 7 is acid, and greater than 7 is alkaline.

Phosphorus: A common nutrient that in excess concentrations can cause problems in the environment. Phosphorus attaches to soil particles via chemical attraction. When soil erosion occurs and sediment enters water bodies, the phosphorous is carried with it.

Point source pollution: A source of pollutants from a single point of conveyance such as a pipe. For example, the discharge from a sewage treatment plant or a factory is a point source of pollution.

Pollutant: A harmful chemical or waste material discharged into the environment. Persistent pollutants are those that do not degrade, causing potential long-term chronic toxicity to the environment.

Pollution: Impairment of land, air or water quality by agricultural, domestic or industrial waste to a degree having an adverse affect on beneficial uses or the facilities that serve such beneficial uses.

Population: Total number of individuals of the same species inhabiting a specified area.

Rare, Threatened and Endangered Species: ***Rare*** is a classification given only to a species when, although not presently threatened with extinction, it exists in such small numbers throughout its range that it may become endangered if its present environment worsens. A species is ***threatened*** when , although not presently at risk of extinction, it is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. A species is considered ***endangered*** when it faces possible extinction throughout all, or a significant portion of, its range. The predominant cause is loss of habitat.

Resource Conservation District: Resource Conservation Districts are autonomous units of local government, originally formed by local vote under state law, and are governed by an unpaid Board of Directors. Their purpose is to provide local direction for federal and state governments to protect the soil, water and other natural resources of the District.

Resources: See Natural resources.

Restore: To bring back to the original condition, or to put back in place something that was lost. Ecological restoration is closely associated to the terms *rehabilitation*, *recovery* and *reclamation*.

Revetment: Facing, as with cement or rock, to support an embankment and prevent its erosion.

Riffles: The fast, shallow waters of a stream where current passes over gravel bars between two pools.

Riparian: Plant community succession naturally occurring along the bank of a natural freshwater waterway such as a river, stream, or creek. Riparian zones support diverse and abundant terrestrial wildlife species, protect stream banks and adjacent land from erosion, and contribute significantly to aquatic communities by providing shade, cover from predators, nutrients, a buffer from nearby land use activities, and a filter for overland soil erosion.

Riparian Stations: A station on a larger network that serves as a collection point for watershed monitoring data.

Riprap: rock covering used to protect streambanks from erosion

River Reach: A section of river between two specified points or possessing some common characteristic(s).

Riverine: Of, related to, or growing in rivers and streams.

Runoff: Water from rain, melted snow or agricultural or landscape irrigation that flows over the land surface.

Salinity: The relative dissolved salt content of water or soil.

Salmonid: Any species of a genus of Pacific Ocean fishes that can breed in rivers and streams tributary to the North Pacific. A fish in the salmon or trout family.

Scour: Localized concentrated erosion by flowing water, usually in stream bottoms or floodplains.

Seawater intrusion: Penetration of saline water into rivers, sloughs or groundwater aquifers normally containing fresh water flowing seaward, due to water diversion or low flows, or groundwater overdraft up-flow from the normal zone of salt-fresh water contact.

Sediment: Soils, mud, sand, silt, clay, and other particles transported from outside a stream system, or generated by erosion in the stream, that settle on the bottom of waterways.

Sediment load: Clays, silts, and sometimes sand that are held in suspension by turbulence in river water.

Sediment yield: The amount of sediment transported from a river basin or other drainage area.

Sensitive Habitat: Habitat, such as riparian corridors or wetlands, that exhibits rapid response to environmental changes.

Slough: Channel through a marsh or mudflat.

Soil: The loose upper layer of the earth in which plants grow; made up of inorganic material, organic material, air, and water.

Species: Individuals that are of the same kind or likeness that are able to interbreed and produce viable young.

Stakeholders: Anyone who lives in a watershed or has land management, administrative, or other responsibilities or interests in it. Stakeholders include (among others) private individuals, businesses, government agencies, and special interest groups, wildlife and fisheries.

Storm drain: A channel or pipe which carries rain water runoff from developed areas to a receiving water body such as a lake or river. sometimes also called a storm sewer system (which is usually separate from sanitary sewer systems).

Stream degradation: A lowering of the elevation of streambeds and flood plains by erosional removal of alluvium; may be caused when upstream sources of sediment are blocked, or if instream flows are increased above historic levels..

Stream flow: Volume of water carried by a stream. Stream flow has two major components: runoff and baseflow.

Stream order: A system used to classify and analyze streams.

Stream Stabilization: The coordination of hydraulics, hydrology, physics, biology, and geology to establish a stable stream system in equilibrium with the natural forces acting on and in the stream.

Streambed: The part of the stream over which a column of water moves.

Substrate: Inorganic material that forms the bottom of a stream.

Sustainable land use: Use of low input land management systems and concepts that leave the land in the same, or better condition that when the land use started. Land management measures that can continue indefinitely without natural resource depletion.

Swales: Low, usually damp areas of ground.

Total dissolved solids (TDS): The amount of dissolved material in water.

Toxic: Poisonous, or likely to cause harm to human beings and other life through direct contact, ingestion, or inhalation.

Transect: A line between two points of a study, area along which data is collected.

Turbidity: Degree to which light penetration is blocked because water is muddy or cloudy.

Water column: Layer of water between the surface and bottom of streams, estuaries and lakes..

Water table: Upper level of a saturated zone in an aquifer below the soil surface.

Watershed: A geographic area from which water, sediments, and dissolved materials are drained by a river and its tributaries to a common outlet. This outlet can be a larger river, a lake, an estuary or an

ocean. Also called a *drainage basin.* A watershed is separated from adjacent watersheds by a ridge or drainage divide. Within watersheds there are subwatersheds. Watersheds and subwatersheds usually take their name from the river or creek which drains them.

Wellhead protection: Practices that of prevent pollutants from seeping into wellwater at or near any active or abandoned well.

Wetlands: Transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Two major types of concern locally are seasonal wetlands inundated by winter and spring rainfall and flooding, and tidal wetlands flooded daily by ocean tides.

Section II: Recommendations by Objective:

A. Promote stream stabilization using natural processes

B. Promote contiguous habitats

C. Increase biological diversity

D. Increase migratory and resident fish habitat

E. Encourage land stewardship

F. Coordinate natural resource protection and planning efforts

G. Reduce soil erosion

H. Promote sustainable land use concepts

I. Promote and improve water management

A. OBJECTIVE:

PROMOTE STREAM STABILIZATION USING NATURAL PROCESSES

Background

Since the Gold Rush in California, it has been common practice to alter stream drainages to accomplish certain specific tasks. Because the changes have occurred for the most part in small increments, the cumulative effects of our river management and use have not always been clearly understood. Typically, alterations include straightening the channel; hardening the banks; changing the point of discharge; increasing or decreasing available flow; and separating the stream from its flood plain by the use of levees or floodwalls. Although such changes are appropriate in some cases, extensive historical and analytical work since the mid-1960's has shown that the degree of maintenance to sustain these altered systems, and the rate of failure of the alterations, is much higher than originally anticipated when the designs were installed. The 1993 floods in the Mississippi River drainage demonstrated very convincingly that many of our standard methods of stream management cannot be economically sustained over a long period of time.

Human development has greatly changed the natural systems of the Napa River. In the Napa Valley, most streams have been altered since 1800, either directly or indirectly (or both). Sloughs have been straightened, levees have been built, development of all types has occurred near streams and in their floodplains, and an estimated 6,500 acres of historical valley floor wetlands have been drained or filled. The past 150 years have seen native perennial grasses supplanted in many areas by introduced annual grasses; the original forests have been harvested; approximately 19,700 acres of the watershed are now under hardened pavement or rooftops; and another 26,000 acres have been developed to intensive cultivated agriculture. These alterations have changed the way the watershed works, and need to be accommodated in a new equilibrium that will preserve the watershed resources. One result of human activities is increased high peak storm flows during the winter, which decreases the amount of stream flow between storms and through the summer months.

Stream Dynamics

The dynamics of many Napa Valley stream systems are now out of equilibrium with the amount and timing of rainfall runoff from watershed lands. One typical result of the disequilibrium is an "incised stream," or a stream whose channel has cut so deeply into its floodplain that it is considered to have abandoned the flood plain altogether. Without a floodplain, a stream must discharge a large amount of water in a much smaller cross section, thus increasing the velocity of the water. This increased velocity generates more energy in the stream system, which is frequently balanced by adding sediment to the stream to absorb the excess energy. That sediment is from the banks and bottom of the channel, resulting in bank and levee failure, and further down-cutting of the channel itself.

Increasing water velocity of a stream in excess of its stable level has other effects beyond increased bank failure and sediment production. The higher level of sediment transport also means that pollutants entrained in the sediment become more widely distributed. In addition, when discharge does overtop the banks of a stream, flood damage may be considerably increased, owing to the increased energy of the stream. Lateral migration of a stream which is attempting to decrease its gradient by re-establishing meanders is responsible for many acres of farmland lost, and for very high maintenance costs in urban areas for development directly adjacent to the stream channel. Straightening or hardening of the banks of a portion of a stream usually simply moves the problem upstream or downstream, but does not truly stabilize it. Development of a balanced stream system greatly reduces maintenance costs and adds value to the properties in the system.

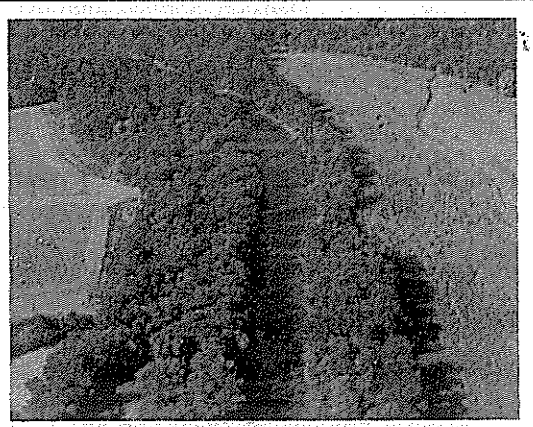
Traditional stream work for the past several decades addressed only one issue at a time. Usually, stream alteration was done for flood hazard reduction, and relied heavily on engineered mechanical channels based on straight, clean channel models. Maintenance of these projects is particularly high, and other aspects of the river system, such as vegetated riparian corridors, wetlands, public recreation and geomorphologic stability were left out of the final product. Wildlife enhancement projects frequently focused only on wildlife, and did not consider flood threat impacts of the enhancement work. Drainage work for urban or agricultural uses often did not consider either flood control or wildlife in their design and construction. A multi-objective approach to river development and enhancement includes all these factors and seeks to recreate a sustainable river system that requires much less long term maintenance and provides a far greater range of benefits. By anticipating and utilizing the natural energy of the river or stream, a

complete design may be developed that gives equal weight to flood hazard reduction; economic uses such as agriculture; aesthetic and recreational value; and environmental concerns. It necessarily also involves the participation of a much wider range of interests and skills, including technical, biological and community interests.

Multi-Objective Planning

Because a multi-objective river corridor management plan includes a greater variety of interests and concerns, it must also include a more complex data base. To answer this need, a computer model of the Napa river is under construction at the Napa County Resource Conservation District. The model will present hydrologic flow data; sediment delivery effects; stream geomorphology; rainfall/runoff relationships; vegetation effects on river flow and form; channel form; and many other factors that affect the final function of the river system. These factors are then modeled with the aid of a complex computer program to help determine the most effective and economical design to achieve stream stability while addressing a broader range of interests than traditional river design. The model will be used to help plan the location and type of practice best used to stabilize the system, and will be a valuable asset in monitoring and evaluation of the watershed.

The following recommendations are to help stabilize the streams of the Napa River system:



Streamside vegetated buffer strip

A1. Establish and maintain streamside buffer strips, both at individual sites and along streams through contiguous properties. *Vegetated buffer strips alongside waterways help stabilize stream banks; reduce sedimentation and introduction of pollutants into the stream by filtering runoff; provide valuable biological diversity of plant and animal species; decrease ambient summer water temperatures; decrease storm runoff peaks by increasing rainfall infiltration into the soil; increase between-storm stream flows through greater stream recharge; and provide valuable wildlife habitat throughout the year.*

A1.1. Provide tree cover *(late successional plant communities)* along streams to shade the stream, to decrease in-stream growth of vegetation (such as willows and tules) that may block flow in wet months; decrease water temperature; decrease evaporative losses of water; decrease algal bloom and subsequent eutrophication in dry months; and increase property values.

A1.2. Use native varieties of plants, or plants whose functions are equivalent to those developed in arid, hot summer, wet winter climates to revegetate riparian buffer zones.

A1.3. Enhance riparian cover that is contiguous across property lines to increase both wildlife habitat and real estate values.

A1.4. Utilize stream side areas for open space and parks in urban developments. Large developments should be designed to enhance and emphasize any natural riparian zones in the project.

A2. Promote regional park areas to reduce random access to the river, while controlling access (including trespass) to non-managed areas. *River and stream riparian zones do not naturally accommodate heavy traffic without damage. Unmanaged trails down riverbanks, for instance, frequently become concentrated water courses during the rainy season, accelerating bank erosion and collapse. By designating specific areas for public access for recreation, those areas can be specifically developed and maintained to withstand concentrated traffic.*

A2.1. Easily accessible public areas that are managed specifically for public recreation should be established, with protected areas for direct access to the river. The areas should be constructed and maintained to allow river and riparian use without unnecessary damage to the system.

A2.2. Provide a wide range of publicly accessible recreational experiences and environments, in order to minimize pressure on private property and unmanaged areas.

A2.3. Establish the use of signs and/or other passive deterrents to curtail trespass on private property,

or unmanaged access to public property in areas not designed for public use. An educational outreach effort should be ongoing that describes the reasons for not allowing unrestricted access to portions of the Napa River and its tributaries.

A2.4. Encourage golf courses, parks, and other public and private recreation areas to protect the streams through those properties by shielding them from direct access except in areas designed for access.

A3. Promote streambank stabilization. *One of the first noticeable effects of an unstable stream is the collapse or erosion of streambanks. Unstable banks are usually a symptom of other, less obvious problems, and repair of the failing bank does not often address the cause of the instability. Because streams are complex systems, altering one aspect of the system can have significant impacts on other aspects of the same system. Streambank repair and stabilization should always be done with careful planning and full awareness of the nature of the stream dynamics.*

A3.1. Flood control channels should be kept in functioning condition. Where possible, tree cover on channel banks should be used to control in-channel growth of vegetation.

A3.2. Provide streams with access to their flood plains where possible. Where streams are heavily incised, flood plains should be redeveloped beside the new channel at the new, lower elevation.

A3.3. Stream restoration should be done using techniques similar to those developed by Leopold, Rosgen, et. al. (see Bibliography and Appendices). Where possible and technically appropriate, redesign straightened reaches of stream and drainage channels using the same techniques.

A3.4. Control or eliminate livestock access to streamside areas by providing alternate, dispersed watering sites; fencing; or other practices associated with a managed grazing program. Protect livestock stream crossings and lake access points to minimize bank degradation at those sites.

A3.5. Streamside vegetation is an effective and inexpensive bank stabilization system, and should be the method of first choice in stabilization designs.

A3.6. Limit stream bank disturbing activities (such as utility installation) to the minimum amount necessary. Revegetate all disturbed areas as soon as practicable.

A3.7. Limit boat speeds in the estuary or near lake shores to protect against bank erosion from boat wakes.

A3.8. Develop shoreline wetlands to diminish bank erosion along waterways, ponds and lakes.

A3.9. Remove unnecessary man made channel barriers and weirs, which frequently cause bank and channel collapse laterally from the blockage.

A3.10. Register and upgrade illegal or non-permitted water diversions.

A4. Data management and public outreach. *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

A4.1. Conduct demonstrations and tours of stream management sites.

A4.2. Provide a method of delivering regular public training sessions for urban, suburban, and rural stream repair and maintenance.

A4.3. Utilize technical assistance from the UC Cooperative Extension Service and the USDA Natural Resource Conservation Service for grazing management planning and implementation.

A4.4. Utilize stream restoration design assistance from the USDA Natural Resource Conservation Service, and from the California Department of Fish and Game, and other local agencies.

A4.5. Establish a watershed team to classify all tributaries of the Napa River using Rosgen methods. Assess habitat values and stream stability by reach for use as baseline status for trends analysis.

A4.6. Begin a program of vegetation and geomorphic mapping of the Napa River and its tributaries.

A4.7. Utilize actual restoration sites for the field elements of the Napa Schools curriculum.

A4.8. Provide bilingual education activities for stream restoration techniques.

A4.9. Employ the monitoring protocols developed for Riparian Stations to track stability trends in streams of the watershed.

B. OBJECTIVE:

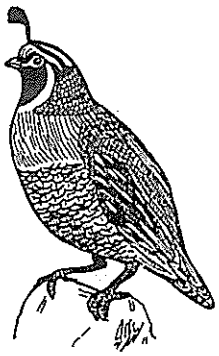
PROMOTE CONTIGUOUS HABITAT

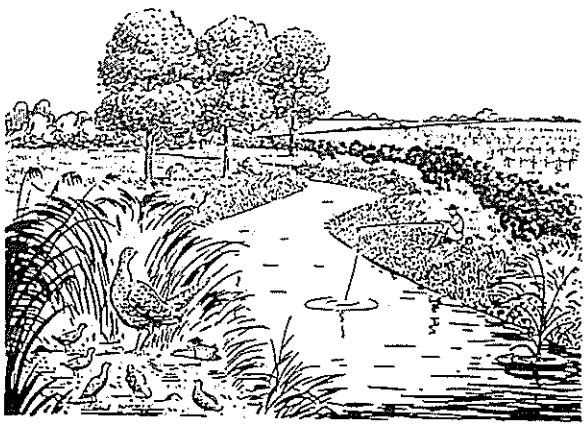
Background

Development of the Napa Valley has been markedly accelerated in the last 40 years, compared to the previous 100 years. The development has been incremental, and many of the watershed habitats of Napa River tributaries and the habitat along the River itself, have been gradually fragmented. Many historical migration corridors for wildlife have been segmented, and flyways for migratory birds now have widely differing characteristics along the flight paths. Site planning for individual projects or management plans have traditionally been done for the specific site only, and the recognition of the role the site may play in a larger natural system has not been part of the usual plan. Environmental benefits can be multiplied several-fold when planning is done with a watershed perspective in mind. Minor changes or additions in projects and plans can have significant impact when done in concert with neighboring parcels, and more complete natural systems are allowed to function.

The wildlife and biodiversity benefits of habitat enhancement are multiplied several fold when adjoining parcels can connect areas of habitat improvement. This is most pronounced when owners of contiguous parcels along a stream or in adjacent watershed ridgelines and headwaters, work together to create linear habitat along the stream or ridge through a series of adjacent parcels. Adjoining corners of parcels frequently offer the opportunity to jointly create habitat areas that can also be used for recreation by the parcel owners.

Benefits of these more efficient habitat areas include recreation; increased water infiltration into the soil; increased biological diversity and subsequent potential decrease in biological pests; and increased property values. They also help to maintain much of the natural uniqueness of Napa Valley and contribute to an improvement in the general quality of life for residents of the Valley. Implementation of the following recommendations will help improve and expand healthy wildlife habitat for the watershed:





B1. Reforest, afforest, and revegetate. *One of the more significant cumulative changes in the watershed is diminished forest cover. The change has been not only in the total extent of cover, but in the spatial distribution of the remaining habitat, and the diversity within it.*

B1.1. Reforest areas to the maximum extent feasible with native trees, shrubs, forbs and grasses, using seeds collected from the local area. Using local seed sources preserves the unique genetics of neighborhood species and guards against outbreaks of disease or insect infestation to which only local plants may be resistant.

B1.2. Manage existing ponds and watercourses as wildlife habitat

B1.3. Enhance, restore, or rehabilitate wetlands in the watershed

B1.4. Enhance habitat value of artificial drainage ditches with plantings on the ditch banks

B1.5. Increase the use of hedgerows along field and property lines to provide migration areas for birds and small mammals.

B1.6. Where possible, develop contiguous habitats to include transition zones from one type of habitat to another, i.e.: riparian zone to gallery forest to upland.

B2. Maintain corridors between open spaces. *Establishment of wildlife corridors between existing open spaces encourages wildlife diversity and density. The connecting corridors also add to property values of those properties*

containing the corridors, and those adjacent to the corridors.

B2.1. Evaluate and promote intercity green belts on public land and/or with the participation of the Napa County Land Trust.

B2.2. Encourage coordinated riparian enhancement along Napa River's tributary streams.

B2.3. Encourage development of contiguous east-west habitat corridors across the Valley at several points through cooperative efforts of adjacent landowners.

B2.4. Promote voluntary individual parcel planning that will help to connect enhanced riparian corridors on the eastern and western edges of the Napa Marsh, especially in the Huichica, Carneros, Suscol, Sheehy, Fagan, and American Canyon Creek watersheds.

B2.5. Provide public technical assistance to help landowners enhance and maintain a riparian corridor along both banks of the Napa River from north to south.

B3. Data management and public outreach

Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

B3.1. Encourage landowners in subwatersheds to cooperatively establish habitat goals for their regions, based on local interests.

B3.2. Develop locally specific monitoring by landowners to track habitat improvement in enhanced lands.

B3.3. Include species diversity counts in the monitoring portion of the Napa school curriculum developed by the Resource Conservation District.

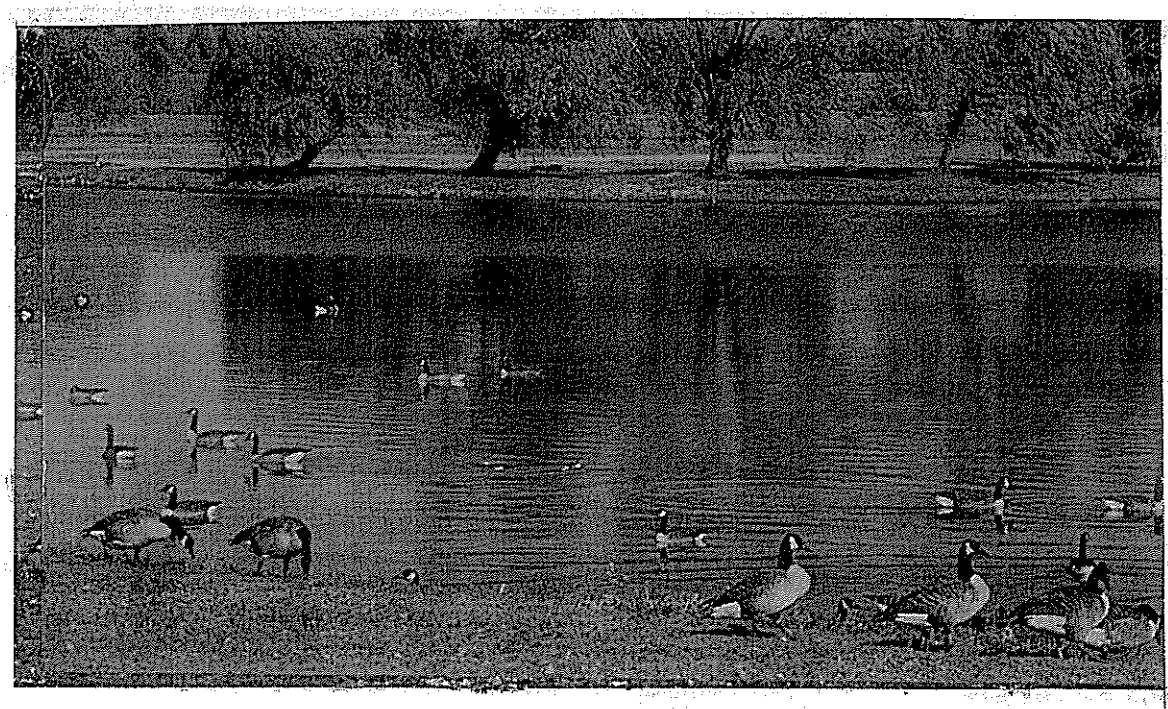
B3.4. Conduct workshops and tours to demonstrate the effectiveness of cooperative habitat enhancement by landowners.

B3.5. Increase the availability and use of financial assistance in the watershed from State and Federal programs for habitat enhancement on private lands.

B3.6. Support the creation of partnerships between local, state and federal governments, and between government and private landowners for contiguous habitat development.

B3.7. Encourage the adoption and use of the Napa Schools curriculum developed by the RCD to emphasize the importance of entire natural systems, rather than isolated "specimen" habitats.

B3.8. Seek support funding from federal and state programs established to restore and enhance river systems and biological diversity.



Waterfowl use ponds as breeding, feeding, and watering places and for resting during migration.
From: *Ponds - Planning, Design, Construction.* USDA SCS. 1982

C. OBJECTIVE:

INCREASE BIOLOGICAL DIVERSITY

Background

As development has occurred throughout the country, the number and variety of natural plant and animal species has decreased. Potential results of decreasing biological diversity include a decline in natural productivity of the land as food chains are interrupted; a rise in disease as genetic pools are lost; and more frequent pest infestations as predator/prey relationships become unbalanced. To maintain a healthier system that is able to adjust to fluctuating climatic conditions, an effort should be made to increase natural biological diversity in the watershed. The issue is particularly sensitive in the Napa River watershed, because the basin is uniquely centered at the transition crossroads of both major north-south and east-west biological regions. The Napa Valley represents the eastern-most habitat for Coastal Redwood, and the intermixing zone for Coastal and Interior live oak, for example. It is also the most significant southern range for the Spotted owl, and the most northern extension of San Francisco Bay wetland habitats.

The unique nature of the biological resource of the Napa Valley should be protected and enhanced by:

C1. Reforestation and afforestation. *Diminished forest cover and fragmentation of remaining forested areas decreases biological diversity in a watershed. Increasing forested areas and connecting those areas through enhanced corridors will greatly increase the productivity of the habitats.*

C1.1. Encourage the enhancement and expansion of oak woodlands and oak grasslands:
a) provide protection for selected volunteer oak seedlings.
b) plant new trees from acorns collected from a nearby site in areas that have no natural regeneration.
c) fence or otherwise protect areas of oak regeneration until seedlings are above grazing height.
d) plant appropriate companion species to increase the diversity of existing oak habitats.

C1.2. Use material collected from as close to the planting site as practicable, in order to maintain biological integrity of the many different genetic variations of the watershed.

C1.3. Restore riparian zone functions along watershed streams, including streamside buffer strips.

C1.4. Enhance transition areas between habitat types to promote greater diversity of habitat.

C1.5. Enhance riparian cover that is contiguous across property lines to increase both wildlife habitat and property values.

C1.6. Plant native trees in unused areas of agricultural lands, including farm roadsides.

C1.7. Strengthen tree planting efforts in urban areas.

C1.8. Encourage greater use of native trees in industrial development.

C1.9. Reforest edges of flood and drainage channels to shade the channels.

C1.10. Plant trees in median strips and along public roadsides and rights of way.

C1.11. Encourage coordinated riparian enhancement along Napa River's tributary streams.

C2. Enhance and expand wetland habitat. *Wetlands are critical parts of any watershed, and are nearly equivalent to tropical rainforests in biological productivity. Wetlands are the beginning of complex food chains, and they provide other indirect benefits that encourage development of biodiversity in a watershed. Water filtration, sediment retention, flood attenuation are some of the indirect benefits of wetlands.*

C2.1. Enhance and expand seasonal freshwater wetlands, including riparian wetlands.

C2.2. Manage existing ponds, lakes, and streams as wildlife habitat.

C2.3. Include riparian wetland enhancement in floodplains when designing stream restoration and repair.

C2.4. Utilize the San Francisco Estuary Institute Regional Wetland Habitat Goals to help in planning the distribution and restoration of different types of wetlands (tidal, brackish, fresh and seasonal).

C2.5. Form a community partnership of diverse interests to provide assistance to the California Department of Fish and Game with the restoration of the Cargill salt ponds, and to

participate in the North Bay Initiative planning effort for the Napa Marsh.

C2.6. Support the wetland education program incorporated into the Napa school curriculum developed by the Resource Conservation District.

C2.7. Form a coalition team to assess the present status of wetlands in the watershed, for inclusion in the GIS database for trends analysis.

C2.8. Establish trials in the watershed to determine the feasibility of using constructed wetlands as part of waste water treatment for non-consumptive purposes.

C3. Reduce pesticide and fertilizer use...*Both urban and rural pesticide and fertilizer use can present threats to biodiversity in a watershed when improperly used. They can also be beneficial tools when appropriately used. Development and use of alternative methods of pest and nutrition management can lessen cumulative negative impacts on watershed biodiversity.*

C3.1. Use Integrated Pest Management in agricultural areas, commercial landscaping, and private home maintenance.

C3.2. Develop and use pest computer models using California Irrigation Management Information System (CIMIS) data from the three Napa Valley CIMIS stations.

C3.3. Develop and use low-input management plans for golf courses, sports fields, cemeteries, parks, and other public areas.

C3.4. Provide regular educational programs for homeowners in proper use of fertilizers and pesticides around the home.

C3.5. Continue extensive investigation into the use of both permanent and annual vineyard cover crops for soil nutrition management.

C3.6. Revegetate annual grassland with native perennial grasses to reduce infestation of exotic weed species such as star thistle.

C3.7. Plant roadsides with perennial grasses and mow road shoulders and median strips in place of complete vegetation removal.

C3.8. Support the continued trial and use of natural predator insects for control of noxious weed species.

C4. Promote regional park areas to reduce random access to sensitive areas of the watershed, while controlling access (including trespass) to non-managed areas. *Sensitive habitat areas such as river and stream riparian zones do not naturally accommodate heavy traffic without damage. The biological functions and productivity of the areas may be impaired by excess traffic or unsuitable human activities. By designating specific areas for public access for recreation, those areas can be specifically developed and maintained to withstand concentrated traffic.*

C4.1. Provide a wide range of publicly accessible recreational experiences and environments, in order to minimize pressure on sensitive habitats, private property, and unmanaged areas.

C4.2. An educational outreach effort should be ongoing that describes the reasons for not allowing unrestricted access to portions of the Napa River and its tributaries.

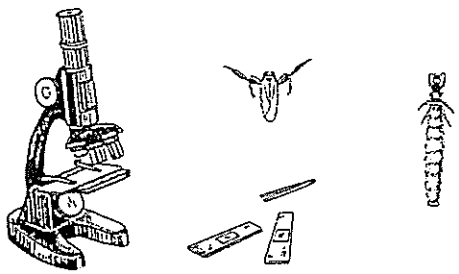
C4.3. Encourage golf courses, parks, and other public and private recreation areas to protect the streams through those properties by shielding them from direct access except in areas designed for access.

C5. Data management and public outreach
Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

C5.1. Establish Riparian Stations in the watershed to serve as data collection points for volunteer citizen watershed monitors.

C5.2. Develop and regularly publish a "biodiversity index" for public distribution, based on monitoring data from the Riparian Stations. The index will allow long term public observation of biological trends in the watershed.

C5.3. Support the use throughout the watershed of the Napa County Resource Conservation District school curriculum, including the Adopt-a-Watershed program and biodiversity monitoring system.

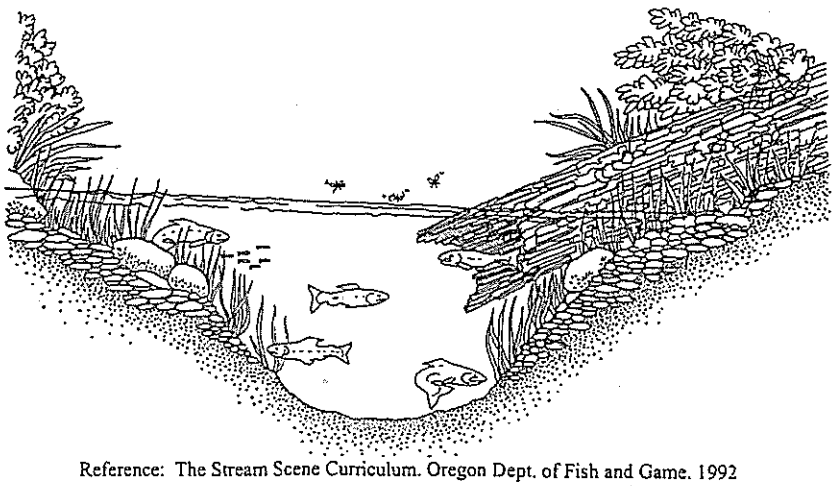


D. OBJECTIVE:

INCREASE MIGRATORY AND RESIDENT FISH HABITAT

Background

A major indicator of the health of a river and its drainage system is the condition of its fish and other aquatic resources. Migratory fish such as steelhead trout and salmon are highly sensitive to unstable systems. Decreases in water quantity or quality, and siltation of spawning beds results in rapid decreases in fish numbers. An increase in fish numbers and species diversity, however, is indicative of a healthy system whose parts are working well in concert with one another. The Napa River has seen the extirpation of its native Silver salmon run in recent decades, and other species are in serious decline. They are not the only fish species affected by the condition of the watershed, however. Other estuarine species also are sensitive to changes to siltation patterns and vegetation, and rely on a stable estuary to provide spawning grounds and protection from predators. Water temperature; water availability; food sources; salinity levels; water clarity; and many other factors determine the ability of fish populations to thrive. In a very direct way, the status of migratory and resident fish habitat tells a great deal about the condition of the watershed. Thus, fish habitat quality and quantity is a reflection of the cumulative results of land use practices in the entire watershed. Healthy habitat increases recreational possibilities as well, and helps support the complex chain of aquatic food supply.



Reference: The Stream Scene Curriculum. Oregon Dept. of Fish and Game. 1992

Migratory and resident fish habitat may be increased in two ways. The first is by improving the condition of existing habitat, thereby allowing greater and more diverse populations of fish to survive. The second is by expanding habitat to include areas not presently capable of supporting fish. Restoration of the Cargill salt ponds in the Napa Marsh is an example of habitat expansion. Some recommendations for increasing migratory and resident fish habitat include:

D1. Increase habitat quality. *One way to increase fish habitat is to make existing habitat more productive by increasing the quality of the habitat.*

D1.1. Manage urban storm water runoff to protect the quality of receiving waters: (See "L: Residential Land Use" and "M: Commercial, Industrial and Public Institutions" for more recommendations).
a) stencil storm drains to alert residents to the direct inflow to the river from the drains
b) sweep, rather than wash, paved areas to collect pollutants before they enter the river system
c) encourage the use of permeable materials for parking lots, walkways, etc.
d) direct storm gutter outlets underground to provide percolation of rainwater through the soil.

D1.2. Landscape maintenance debris such as grass clippings and leaves should be composted and recycled in areas away from riparian zones.

D1.3. Implement practices that will control erosion and subsequent sedimentation from agricultural areas. (for more recommendations, see "G: Reduce Soil Erosion" Objective, and "J: Agricultural" Land Use).

D1.4. Manage public access areas to restrict traffic impacts to small controlled and protected areas.

D1.5. Establish streamside buffer strips to filter runoff and provide shade.

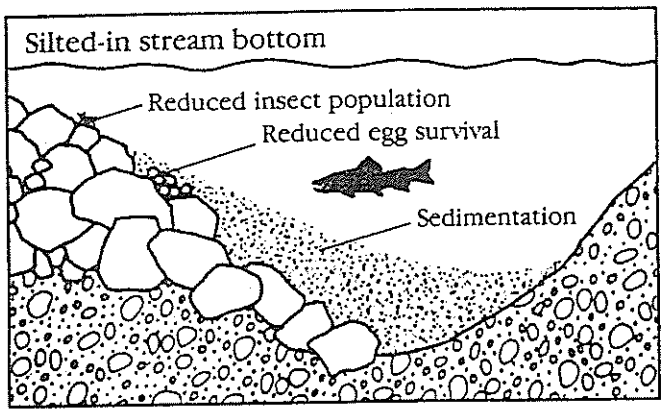
D1.6. Provide off stream watering areas for livestock.

D1.7. Filter runoff from confined animal facilities, including small horse pastures.

D1.8. Regularly inspect on site waste disposal systems (leach fields) to ensure proper functioning .

D1.9. Parks, golf courses, cemeteries and playing fields should adopt low pesticide and fertilizer use management techniques to eliminate tainted runoff into drainages.

D1.10. Carefully measure all pesticides and fertilizers before use and follow label instructions for application, storage, and disposal.



Sedimentation greatly reduces habitat area and fish populations.

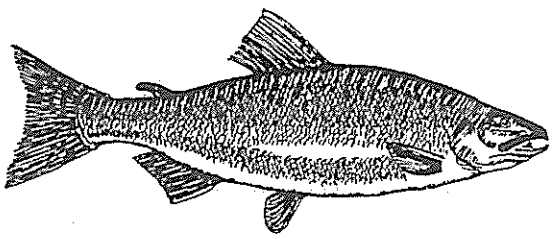
Reference: Western Shasta Resource Conservation District

D2. Increase habitat quantity. *A second means to increase fish habitat is to increase its spatial extent by construction of new habitat, or restoration of lost habitat.*

D2.1. Instream structures should be altered where necessary to facilitate upstream migration of fish in order to provide access to more extensive spawning areas.

D2.2. New instream structures should be built if necessary to allow upstream migration of fish. The floodplains of the river and its tributaries should be converted to appropriate wetland habitat where economically and scientifically feasible.

D2.3. Use of wetland filters for dispersal of treated wastewater should be developed where appropriate.



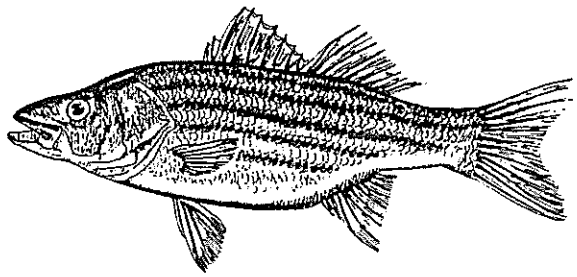
D2.4. Provide shading with riparian tree cover in presently unshaded reaches of the river and tributaries, in order to allow areas to become useable by fish.

D2.5. New developments should utilize riparian areas as enhanced amenities, rather than as separated drainage channels as part of their open space development.

D2.6. Where possible without increasing flood threat, flood control channel banks and drainage ditches should be vegetated to decrease evaporation and water temperature.

D3. Data management and public outreach

Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.



D3.1. Increase public awareness of the status and importance of fishery health through news releases, articles, public speaking opportunities, and educational material distribution.

D3.2. Assist the California Department of Fish and Game with salmonid inventories in the watershed, and publish the results in local news media.

D3.3. Promote the establishment of local land stewardships in the subwatersheds, with special emphasis on salmonid habitat enhancement.

D3.4. Include fish species data and habitat health assessments in the monitoring programs of the Riparian Stations.

D3.5. Promote the use of small aquaria and live native fisheries in bilingual school classroom units.

D3.6. Coordinate a common water quality monitoring network in the watershed.

D3.7. Monitor gravel spawning bed status in stream channels:.

a) for excess sediment

b)for insufficient gravel (such as below impoundments)

c)for adequate gravel size distribution

E. OBJECTIVE:

COORDINATE NATURAL RESOURCE PROTECTION AND PLANNING

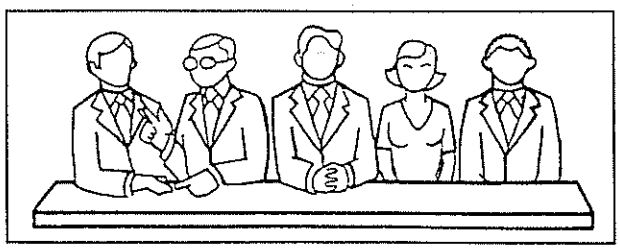
Background

One of the outcomes of growth and an increasingly complex community in the County has been the lessening of coordination and communication amongst agencies, municipalities, citizen organizations and trade groups operating in the watershed. While the activities, requirements, regulations and programs of each have been established for similar purposes, the procedures of each differ from one another. The confusion inherent in separate or isolated development of resource protection efforts creates inefficiency for both private citizens and government alike. Because the desired results of each of the protection efforts are similar, coordination of the procedures to implement them should be streamlined. The resulting clarity would enhance resource protection efforts considerably, while also decreasing their cost.

The incremental nature of community growth, and the spatial separation of communities in the Napa River watershed have resulted in a set of resource protection planning and regulatory tools that are not always closely aligned with neighboring entities. The following recommendations are to encourage greater coordination of natural resource protection and enhancement in the Napa River watershed.

E1. Provide a continuing forum for information and technology exchange amongst the private and public sectors. *Regular information exchange is an important element of coordination of resource conservation efforts. Open communication can provide a means to relate concerns, interests and issues among the community.*

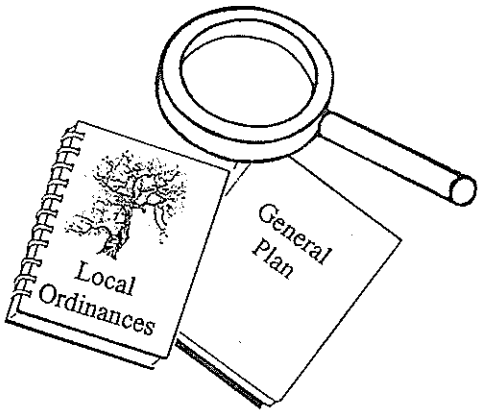
E1.1. Establish an *ad hoc* Inter-Agency County-wide task force to help coordinate natural resource protection planning and regulation.



E1.2. Establish an information sharing method to allow coordination and mutual assistance for County, municipal, and other public entities to develop and manage required National Pollutant Discharge Elimination System (NPDES) permits in the watershed.

E1.3. Provide access to the coordinated NPDES permit plans to private entities for use in development of project based NPDES permits.

E1.4. Establish an informal consultation among municipalities and the County to discuss coordination of General Plan language.



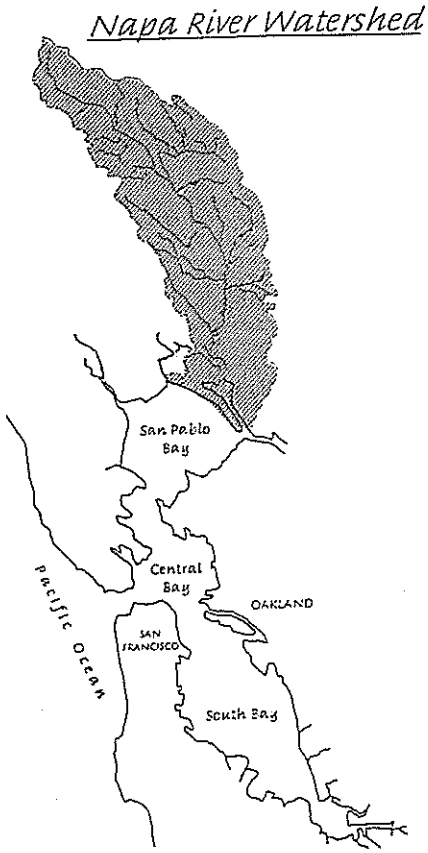
E1.5. Provide continuing informal exchange among local government; agricultural; development; and construction trade representatives to help develop consistency and effectiveness of existing regulatory programs.

E1.6. Utilize cooperative planning to concentrate improvements in presently developed areas to protect agricultural uses and open space lands and minimize new habitat disturbance.

E1.7. Provide frequent opportunities for agricultural and environmental interests to work with urban planners to find creative ways to enhance developed areas and lessen development pressure on open space and agricultural lands

E2. Participate in regional programs for environmental enhancement. *The Napa River is one of the largest streams inside the Carquinez Strait that feeds the San Francisco Bay system. The river watershed has a significant impact on San Pablo Bay, and is affected in turn by conditions in San Pablo Bay and in Carquinez Strait. Participation in*

regional efforts to enhance the entire Bay-Delta system will contribute toward establishing a healthy watershed in the Napa Valley.



E2.1. Assess County and Municipal programs to determine the degree to which they do or can support implementation of the Comprehensive Conservation and Management Plan for the San Francisco Bay Estuary.

E2.2. Provide formal and informal opportunities for local government and local citizens to participate in restoration of the Cargill salt ponds in the Napa Marsh.

E2.3. Encourage coordination of planning efforts and programs such as the State Lands Carquinez Plan, the North Bay Initiative, the Napa County Resource Management Plan for the lower Napa River, the Napa River Flood Control Project, and restoration and redevelopment plans for Mare Island.

E2.4. Work to establish continuity and standardization of watershed monitoring protocols to generate monitoring data that can be widely utilized, including use with the Regional Monitoring Strategy currently being developed for San Francisco Bay.

E2.5. Encourage regulators to utilize the Riparian Station monitoring protocols when requiring monitoring as part of permit issuance or mitigation, in order to increase available data for the GIS.

E3. Data management and public outreach

Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

E3.1. Promote necessary changes to federal, state, and local regulations to encourage voluntary wetland and wildlife area restoration on private lands.

E3.2. Establish a minimum of two Riparian Stations in the Valley to collect and sort watershed monitoring data.

E3.3. Establish a central data base for obtaining information regarding all natural resource protection regulations that pertain to activities in the Napa Valley. The information should be publicly available for data base search for specific proposed actions or projects in the watershed, and cooperatively maintained in a timely manner to reflect changes in regulations as they occur.

E3.4. Provide regular workshops for landowners, agencies and project managers that include explanation of permit and other regulatory processes of local, state and federal governments

E3.5. Encourage the integration of existing restoration and enhancement projects with implementation of the Napa School curriculum developed by the RCD.

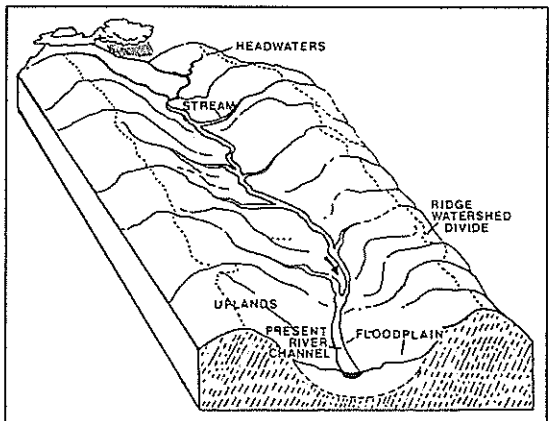
F. OBJECTIVE:

ENCOURAGE LAND STEWARDSHIP

Background

By considering long term effects of land use decisions, a community can avoid or minimize possible negative environmental results of those actions. To retain a long term perspective, however, requires education about the natural system in which we live and work. Most of the recommendations in this section are to provide more access to information to assist land users and managers in making decisions about how the land is to be used. By having educational and technical assistance readily available, land managers can reasonably and effectively implement practices that will enhance and protect natural resources for generations yet to come.

The purpose of land stewardship is to protect and enhance natural resources in order to maintain the long term integrity of the land.



Ref: The Stream Scene Curriculum.
Oregon Dept. of Fish and Game. 1992

F1. Encourage partnerships, alliances, and cooperation between and among groups. *Sharing interests and concerns on a regular basis can result in positive community building. Regular efforts to communicate interests promote greater creativity in planning and more flexibility in management options for watershed protection.*

F1.1. Foster private/public partnerships with agencies and groups such as local chapters of national and regional organizations; local public interest groups; trade associations; school district support organizations; and individuals.

F1.2. Promote greater interaction between agriculture, development, government and environmental groups through community meetings and forums.

F1.3. Provide greater opportunities for interaction of business and agricultural interests with Napa Valley schools through regular program curricula.

F1.4. Provide a central "clearing house" for information about management options and existing programs that can assist citizens and organizations in watershed enhancement efforts.

F2. Establish subwatershed stewardships. *Local community-based protection and enhancement efforts allow development of watershed protection and enhancement that more appropriately suits the needs and abilities of residents.*

F2.1. Seek assistance and funding to help establish local stewardships for each of the major tributaries to the Napa River.

F2.2. Provide assistance to urban neighborhoods to establish stewardship programs with emphasis on urban streams.

F2.3. Encourage the establishment of appellation based stewardship programs for grape growers and wineries in the grape growing areas of the Valley.

F2.4. Establish an incentive program to publicly recognize successful local watershed stewardship enterprise.

Get Government off your back
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Cooperative, Voluntary, Resource Conservation And Environmental Management

F3. Provide a continuing forum for information exchange amongst the private and public sectors. *Regular information exchange is an important element of successful stewardship of natural resources. Open communication can provide a means to relate concerns, interests and issues among the community and helps promote creativity in planning and management.*

F3.1. Establish an *ad hoc* Inter-Agency County-wide task force to help coordinate natural resource protection planning and regulation.

F3.2. Establish an informal consultation among municipalities and the County to discuss coordination of General Plan language.

F3.3. Provide continuing informal exchange among local government; agricultural; development; and construction trade representatives to help develop consistency, effectiveness and appropriateness of existing regulatory programs.

F3.4. Utilize cooperative planning to concentrate improvements in presently developed areas to protect agricultural uses and open space lands and minimize new habitat disturbance.

F3.5. Provide frequent opportunities for agricultural and environmental interests to work with urban planners to find creative ways to enhance developed areas and lessen development pressure on open space and agricultural lands

F4. Data management and public outreach

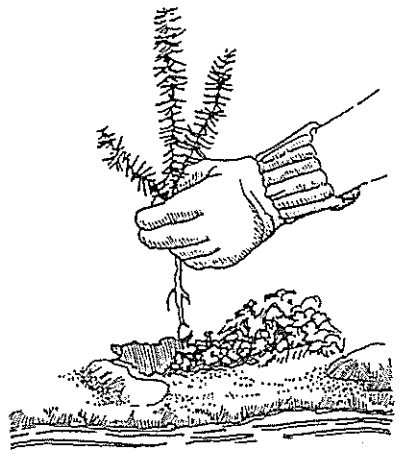
Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

F4.1. Hold regular stewardship watershed planning workshops for Napa Valley residents.

F4.2. Establish a stewardship newsletter to provide a means of information and idea exchange for local stewardship groups.

F4.3. Make monitoring data available to all stewardship groups for use in local planning and management.

F4.4. Provide an annual Resource Conservation forum and Fair for technical education and information exchange.



Adapted from *Silviculture Treatments*, General Technical Report, PNW-134, USDA, F. S., 1982.

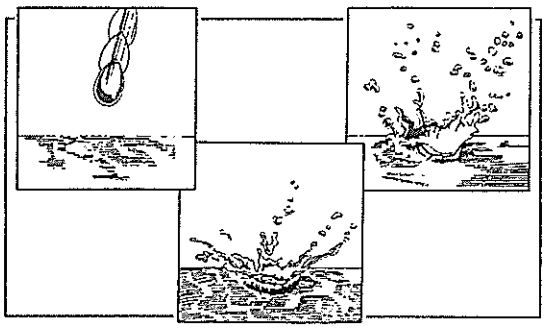
F4.5. Support the Napa School curriculum developed by the RCD to encourage development of a stewardship land ethic for watershed management.

G. OBJECTIVE:

REDUCE SOIL EROSION

Background

Soil erosion is a naturally occurring process that is easily accelerated by human activities. The Napa River watershed is naturally a relatively high producer of sediment owing to its climate, topography, geology and soil conditions. This natural production of sediment has been accelerated by human activities of the past 150 years. The sensitivity of the watershed to soil erosion amplifies the need for sound land management practices that minimize the loss of soil into the river and San Pablo Bay.



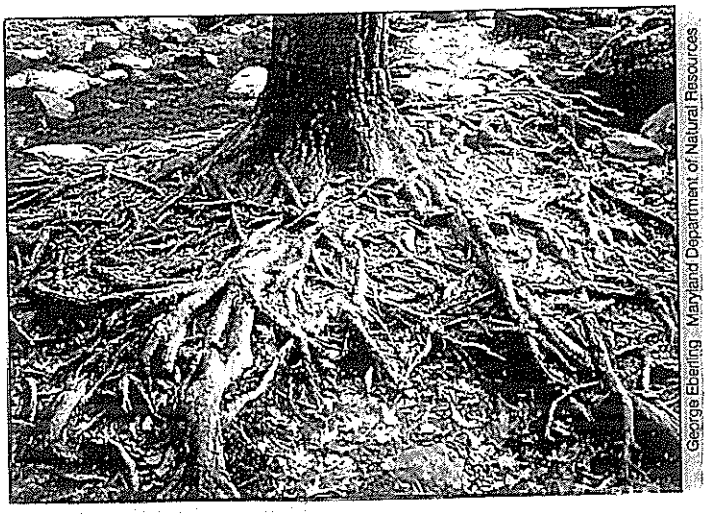
Three major types of erosion occur in the watershed:
Sheet and rill erosion, which represents a more or less even layer of soil removal over large areas, is rarely recognized as a significant drain on natural resources, because it is not visually spectacular at any given site. Most soils in the Napa River watershed form naturally at the rate of approximately 1 to 4 tons per acre per year. Sheet and rill erosion can remove up to 10 tons per acre per year without highly visible effects. Small concentrated water flows that are the beginning of gullies usually become apparent only when the rate exceeds 20 tons per acre per year.
Streambank and gully erosion, is another type of soil loss that is generally caused by concentrated water flows that are not in equilibrium with their channels. This type of erosion is more visually noticeable than sheet and rill erosion, and can represent 300 tons or more of soil loss per acre per year. It is found throughout the watershed, in both urban and rural areas. The systemic causes that creates this type of erosion are not usually as evident as the erosion itself, however. Land management practices; changes in hydrology; changes in rainfall infiltration rates; hardened surfaces; and inadvertent diversions are some of the non-natural causes of streambank and gully erosion.

Mass wasting, or landslide type activity is a third type of soil erosion that is found in many areas of the Napa Valley. There are many causes of this type of soil loss, including geologic instability, water holding characteristics of soils, and removal of tree cover. Some mass wasting takes the form of spectacular landslides, or debris flows, that can be several acres in extent, while others are less extensive, such as small slips along roadsides. Soil creep also occurs, where entire sections of hillsides slowly move downward. Leaning telephone poles and fenceposts are often the only indicators of this form of erosion. Mass wasting can be triggered by human activities such as road building, or house pad establishment, where the supporting toe of a slope is completely or partially removed, creating instability in the slopes above. Saturated leach fields, or improperly installed drains can also trigger mass wasting on hillslopes and streambanks.

In the Napa River watershed, two areas are particularly susceptible to mass wasting. The western hills from the City of Napa northward, particularly in the Mt. Veeder area, and the hills of southern Napa County are naturally less stable, and therefore more sensitive to alteration than other areas of the County.

Soil erosion and resulting sedimentation are among the most serious threats to the long term health of the Napa River system. The topsoil of Napa Valley is the wellspring from which its fame arises. Excess sediment in watershed streams represents not only loss of habitat and wildlife value, but a very real erosion of a basic asset that makes the Napa Valley a unique spot on earth.

G1. Reduce streambank instability and erosion. *Streambank erosion is one of the most significant contributors of sediment to the Napa River. Simply repairing a failing bank, however will not usually cure the problem. Streambanks are part of a complex dynamic system of physical, chemical and biological energy, and will chronically fail when the system is not in equilibrium. The longest term solution to streambank instability is to reestablish stream equilibrium through careful analysis and planning.*

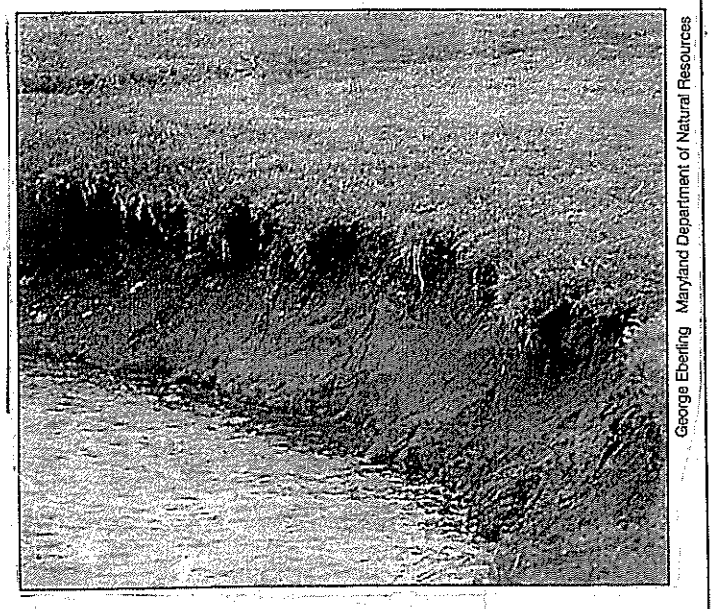


Well developed root systems help stabilize stream banks.

G1.1. Establish riparian buffer strips between developed land and stream channels.

G1.2. Provide streams access to adequate floodplains wherever it is economically achievable.

G1.3. Vegetate banks of existing streams with appropriate vegetation to maintain bank stability.



G1.4. Increase rainfall infiltration and decrease peak storm runoff by:

a) reforestation and afforestation.

b) replacing annual grasses with perennial grasses.

c) decreasing the use of impermeable surfaces in the watershed.

d) using infiltration beds for runoff from paved and roofed surfaces.

G1.5. Stream restoration should be done using techniques similar to those developed by Leopold, Rosgen, and others (see Bibliography and Appendices).

G1.6. Control or eliminate livestock access to streamside areas by providing alternate, dispersed watering sites; exclusionary fencing; hedgerows; or other practices associated with a planned grazing system.

G1.7. Limit stream bank disturbing activities such as utility installation and bridge construction to the minimum amount necessary, and revegetate disturbed areas promptly.

G1.8. Develop or enhance shoreline wetlands to diminish bank erosion along waterways, ponds and lakes.

G1.9. Remove unnecessary man made channel barriers and weirs, to forestall lateral stream movement and subsequent bank collapse.

G1.10. Where possible and technically feasible, reestablish wetlands to filter storm runoff and attenuate flooding.

G2. Reduce erosion resulting from agricultural activities. *Agricultural activities in the Napa River watershed include grazing, viticulture, small farms and horticulture. Soil disturbance or vegetation removal as a result of agricultural activities can result in loss of topsoil and subsequent water quality degradation. Good agricultural management can also benefit water quality and wildlife habitat, and can contribute to the overall good health of the watershed. (Also see "J. Agriculture Land Use").*

G2.1. Emphasize erosion prevention over sediment retention as a priority in agricultural planning and operations.

G2.2. Promote the use of permanent vegetative ground cover in vineyards. Support research, demonstrations and technology exchange to refine cover crop technology for vineyards and orchards.

G2.3. Establish tree cover in unused areas to decrease erosion of topsoil.

G2.4. Maintain access roads and farm roads to control stormwater runoff in agricultural areas. Utilize assistance from the USDA Natural Resource Conservation Service, or other erosion control professionals, for design of stormwater runoff control on rural roads.

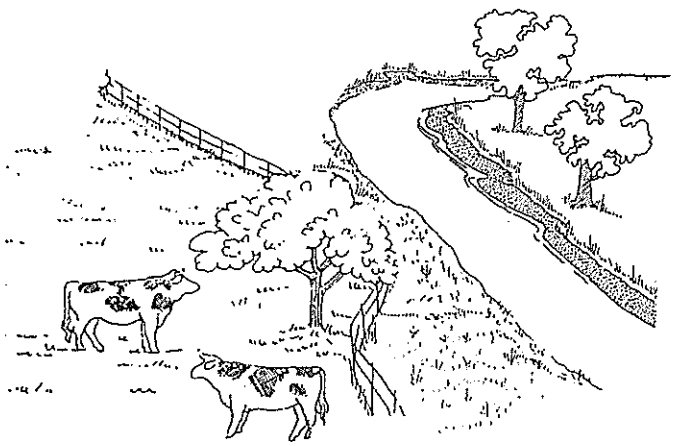
G2.5. Minimize wet weather vehicle traffic through or across agricultural areas, especially on hillsides.

G2.6. Provide adequate energy dissipaters for culverts and other drainage pipe outlets.

G2.7. Establish vegetated buffer strips along waterways.

G2.8. Develop grazing management plans to increase vegetation residue on rangeland.

G2.9. Exclude livestock from streams except in hardened, specially designed access areas, or develop grazing strategies that minimize negative impacts on streams.



G2.10. Develop dispersed water supplies for livestock designed to decrease animal concentrations in small areas.

G3. Reduce soil erosion resulting from urban and residential development. *Non agricultural development is an increasingly significant source of soil erosion and sedimentation as the watershed population increases. Good planning and thoughtful development can avoid most negative impacts to the watershed of urban and residential construction and growth (Also see "L: Residential Land Use," and "M: Commercial, Industrial and Public Institutions).*

G3.1. Build close to existing functioning roadways to minimize negative environmental impacts from roadway expansion and extension.

G3.2. Develop ways to re-use or redevelop existing structures before disturbing soil to build new ones.

G3.3. Where possible and technically feasible, drain roof tops and paved areas into underground dispersal pipes or vegetated infiltration beds.

G3.4. Increase the amount of permeable surfaces in urban areas to increase rainfall infiltration into the soil.

G3.5. Revitalize and restore urban waterways as functional amenities, including utilization of buffer strips between the streams and developed areas.

G3.6. Keep concentrated development away from sensitive areas such as riparian corridors and wetlands.

G3.7. Roadways and drainage ditches should be managed and maintained to avoid sediment production and movement.

G3.8. Replace herbicide and mechanical vegetation removal along roadsides with perennial grass mowing programs.

G3.9. Revegetate, mulch, or otherwise protect disturbed areas at all construction sites as soon as possible after disturbance.

G3.10. Establish temporary berms to contain wash waster and irrigation installation overflows on site in construction areas.

G3.11. Increase the use of permeable surfaces to encourage infiltration of rainfall into the soil, and decrease peak storm runoff.

G4. Minimize new road construction. *One of the major sources of soil erosion, sediment production, and habitat loss in the watershed is roadways and fire breaks. Proper design and maintenance of watershed roads can eliminate thousands of tons of sediment from reaching the river each year.*

G4.1. Utilize joint access wherever possible to minimize roadways into rural parcels.

G4.2. Erosion control and sediment reduction should be the highest priority in rural road design.

G4.3. Utilize USDA Natural Resource Conservation Service assistance to design roadway maintenance systems and erosion control practices for existing roads.

G4.4. Unpaved roads should have frequent waterbars or other storm water runoff controls, and controls should be kept in working order.

G4.5. Abandoned roads should be removed and revegetated.

G5. Manage public areas to minimize soil disturbance and threats of erosion. *Trails, picnic areas, parking lot perimeters and roads all present possible erosion source sites in recreation areas.*

G5.1. Design trails with waterbars and other erosion prevention techniques, such as eliminating "crossover" access on switchback trails.

G5.2. Maintain erosion control practices as a priority fall activity in public trail and other access areas.

G5.3. Provide informational signs to inform the public of erosion hazards.

G5.4. Control vehicle access to limit vehicles in unpaved areas.

G5.5. Provide sediment control, mulching and reseeding for areas cleared by heavy foot traffic, such as picnic areas and meeting sites.

G5.6. Carefully design trails to minimize damage from mountain bicycles and horse traffic.

G6. Increase the use of erosion control techniques and practices for existing land uses. *Awareness of the hazards of soil erosion is rising rapidly in the Napa River watershed. Techniques and practices to protect against erosion have are much more available and the technology much more advanced than when many of the existing uses were begun. Existing land uses with inadequate or non functional erosion control can frequently be protected through installation of one or more simple management practices. The cumulative impact of widespread use of erosion control practices is very significant, and could mean saving thousands of tons of virtually irreplaceable Napa Valley topsoil each year. The USDA Natural Resource Conservation Service is a primary source for erosion control advice and assistance.*

G6.1. Include erosion and sediment control as a priority when planning soil disturbing activities and projects in the watershed.

G6.2. Use water diversion ditches, pipes, or structures on hillsides to shorten the length of slope that rainfall must travel before safe discharge into a stable pipe or channel.

G6.3. Use storm drains and underground pipe to collect concentrated surface water flows and safely discharge into a stream or other receiving drainage.

G6.4. Use straw or other fiber mulch to protect soil from erosion until a permanent vegetative cover is established.

G6.5. Maintain permanent or annual waterbars in all unpaved roads, and direct them toward a protected ditch, pipe, or other appropriate conveyance for safe discharge.

G7. Data management and public outreach

Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

G7.1. In cooperation with the Regional Water Quality Control Board, determine a method for long term tracking of sediment movement in the Napa River, both from the watershed and from San Pablo Bay.

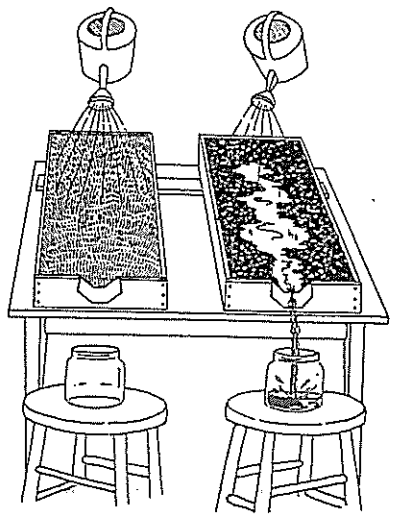
G7.2. Encourage local neighborhood land stewardship groups, especially in concert with the watershed programs of neighborhood schools.

G7.3. Establish "watershed awareness" centers at local libraries to have readily available information about watershed protection activities and practices.

G7.4. Locate sponsors for regular cooperative erosion control technical workshops in the watershed to include the Natural Resource Conservation Service, UC Cooperative Extension, RCD, trade organizations and other interested agencies and groups.

G7.5. Increase the use of erosion control cost sharing programs such as those offered by the Agricultural Stabilization and Conservation Service.

G7.6. Support the use throughout the watershed of the Napa County Resource Conservation District school curriculum.



Source: U.S. Department of Agriculture, Soil Conservation Service, *Soil and Water Conservation Activities for Scouts*, PA-978, 1977.

G7.7. Establish a network of representative monitoring sites to regularly assess erosion of stream banks; stream channels; agricultural areas, and public parklands in the watershed.

H. OBJECTIVE:

PROMOTE SUSTAINABLE LAND USE CONCEPTS

Background

With a growing population and a fixed amount of land to live on, the way we use our land is growing more critical. There is no more West to which Horace Greeley sent the young man of the last century. We as a community must be certain that we utilize the natural resources we have in an intelligent manner that will keep the resource base intact for coming generations. It means thoughtful use and development of our watershed, and sensitive enjoyment of the natural assets of the Napa River system. These recommendations provide concepts and practices that promote the long term availability of the natural resource systems of the watershed.

The balance between urban growth and maintenance of the rural character of the Napa Valley is a dynamic balance. Thoughtful anticipation of the long range effects of short range decisions is crucial to achieving a balance that will allow maximum long term appreciation of the Valley's assets. Much of the attractiveness of the Napa Valley is its rural character, yet that attractiveness has the potential of self destruction if land management and land use are based on other than long term considerations. Sustainable land use concepts are those that consider the impact of land use decisions on the entire watershed system, and that promote consumption of resources at a rate that does not deplete them.

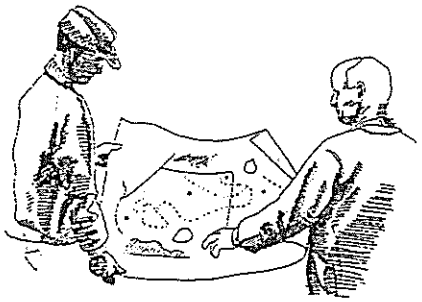
H1. Encourage long term coordinated planning between Municipalities and County governments. *As the municipal areas of Napa Valley expand, coordination of planning becomes more necessary. Protecting our natural resource base is best done through farsighted combined efforts of the entire watershed community.*

H1.1. Establish an inter-agency group to recommend ways of increasing coordination of planning activities and increasing communication between planning agents in the watershed.

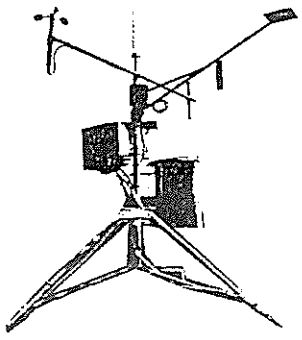
H1.2. Provide a method that includes informal, interest-based public participation in coordination of planning efforts by local governments, including General Plan development (see *Coordinate Natural Resource Protection and Planning* objective).

H1.3. Utilize cooperative planning to concentrate improvements in presently developed areas to protect agricultural uses and open space lands and minimize new habitat disturbance.

H1.4. Provide frequent opportunities for agricultural and environmental interests to work with urban planners to find creative ways to enhance developed areas and lessen development pressure on open space and agricultural lands.



H2. Protect and improve long term agricultural productivity of farmed lands in the watershed. *Because there is a limited amount of farmable acreage in the Napa River watershed, agricultural growth can continue only by protecting the long term productivity of what land there is. Lost topsoil takes hundreds of years to replace, and tainted water can make even the best soil unproductive. Thoughtfulness and foresight can, however help to maintain the ability of watershed resources to support agriculture indefinitely.*



CIMIS Station

H2.1. Promote wide use of the California Irrigation Management Information System (CIMIS) through regular publication of CIMIS data, and provide education in its use for pesticide and water use reduction.

H2.2. Implement practices that will control erosion and loss of topsoil from farmed areas (see "Reduce Soil Erosion" objective for recommended practices).

H2.3. Recycle vegetative and animal wastes from agricultural production through composting and reapplication as soil amendments.

H2.4. Develop grazing plans for livestock areas that will improve annual and long term production per animal unit acre.

H2.5. Plant non crop areas with native vegetation to increase biodiversity and decrease necessity for pesticide use.

H2.6. Stabilize creek banks and drainage canals with bio-engineering techniques to curb loss of farmlands to bank collapse and stream migration.

H2.7. Promote development of appellation stewardships to provide site-specific examination of resource conservation farming techniques for use in community based resource protection.

H3. Increase educational opportunities in sustainable practices for all watershed land users. *Long term planning requires knowledge of a wide range of disciplines. Providing opportunities for individuals to increase their knowledge of the watershed's social and natural systems also provides greater opportunity for creative planning and long term success.*

H3.1. Hold a regular series of jointly sponsored workshops to provide technical education for agriculture interests; urban interests; and rural residential land users.

H3.2. Establish classes at the Napa Valley Community College in sustainable land management.

H3.3. Develop partnerships with agencies, education institutions, private landowners and grower organizations to implement and improve Integrated Pest Management techniques.

H3.4. Organize a permanent forum for agricultural and environmental interests to foster greater direct communication on resource conservation issues.

H3.5. Provide specific training to city and county planning departments in sustainable land use planning and management.

H3.6. Support the use of the sustainable land use elements of the school curriculum developed by the Napa County Resource Conservation District.

H4. Use natural progressions and systems to increase water and soil retention, and to decrease long term maintenance costs of the watershed.

H4.1. Stream stabilization work and drainage ditch construction should utilize methods that reflect stable stream morphology.

H4.2. Establish and promote programs that manage for increases in indigenous perennial grasses in the watershed.

H4.3. Reforestation, including agroforestry, of unused lands should be encouraged.

H4.4. Continue to seek technical and financial assistance to eliminate noxious exotic plant species such as star thistle and French broom through range management, in order to restore the productivity of watershed lands.

H4.5. Develop conjunctive use of water resources throughout the watershed, with emphasis on the upper Napa River and Carneros.

H4.6. Where possible and technically feasible, reestablish wetlands to filter storm runoff and attenuate flooding.

Reference: *California's Rivers A Public Trust Report.* Calif. State Lands Commission. 1993

H4.7. Develop grazing management plans and controlled burning to manage fuel loads in fire hazard areas.

H5. Promote environmentally sensitive planning and development. *Improving the efficiency of existing developed areas is preferable to expansion into open or agricultural areas. Many of our present developed areas can be made more efficient and useful through careful planning.*

H5.1. Concentrate improvements in already developed areas.

H5.2. Build close to existing functioning roadways to minimize alterations from roadway expansion and extension.

H5.3. Develop ways to re-use or redevelop existing structures before building new ones.

H5.4. Revitalize and restore urban waterways as functional amenities.

H5.5. Keep concentrated development away from sensitive areas such as riparian corridors and wetlands.

H5.6. Encourage development to utilize existing roads to minimize construction of new rural road cuts.

H5.7. Cluster homes on contiguous parcels to minimize impacts on open space and wildlife habitat.

H5.8. Make erosion control a priority when designing site access and building construction.

H5.9. Plan for plumbing to utilize gray water where appropriate.

H5.10. Avoid development of buildings or roads near sensitive habitats.

H5.11. Design and site adequate on site waste disposal systems that can be easily maintained.

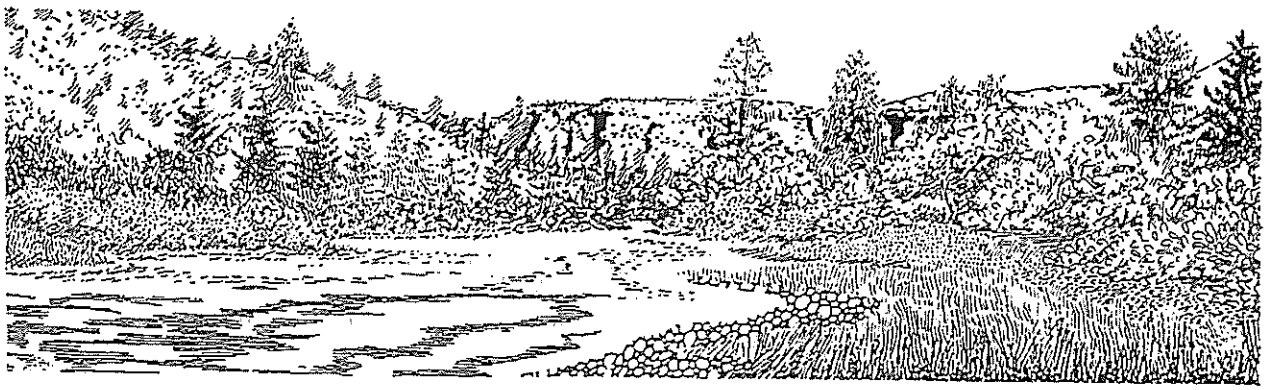
H5.12. Emphasize protection of entire habitat units, instead of just single tree or single feature preservation.

H6. Data management and public outreach *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

H6.1. Conduct a cooperative biological assessment of the watershed and identify sensitive areas to be included in a Geographic Information System database for public and private reference.

H6.2. Form a cooperative watershed assessment team to classify the Napa River and tributaries by reach according to the Rosgen classification scheme.

H6.3. Establish bank and channel monitoring points in major tributaries to monitor channel stability, and to track the effects of changing land use over time.



Reference: The Stream Scene Curriculum. Oregon Dept. of Fish and Game. 1992

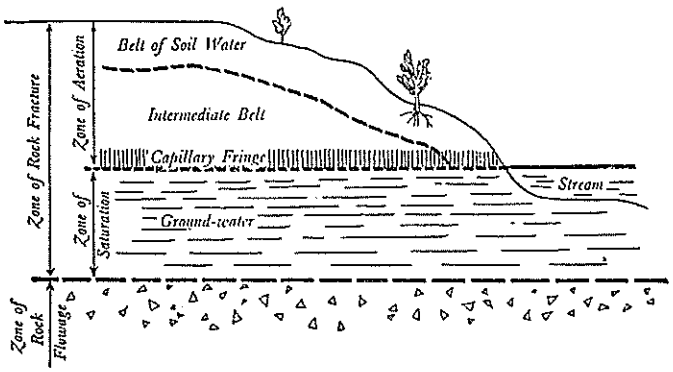
I. OBJECTIVE:

PROMOTE AND IMPROVE WATER MANAGEMENT

Background

Water development has long been separated into three distinct categories: groundwater, surface water, and reclaimed water. Hydrologic systems, however, are rarely so segmented. Availability of groundwater is directly related to surface water conditions, and groundwater conditions have an impact on surface water supply. As groundwater drops, for instance, the level of surface streams drops as well. High water table lands increase rainfall runoff, and can recharge streams that may otherwise be losing flow to lowered water table elevations. Managing the water system as a whole allows use of groundwater when it is at its peak, allowing more surface water to be used for wildlife, or stored for use when seasonal drops in water tables occur. This type of combined water use is called "conjunctive use" of the resource, and requires a degree of monitoring and planning that is not presently part of the usual water use pattern. Water management also includes the maximum reuse of water for further beneficial uses once it is treated.

Ground-water Zones and Belts



Cumulative changes in land management practices can be significant in water management. In addition to the obvious benefits of water conservation techniques, practices can be implemented that allow more water to penetrate the soil and less to run off into drainages. Napa River watershed soils vary in their ability to hold water, from about 1 inch of water per foot of depth to over 3 inches per foot of soil depth. Easier penetration through the soil surface and subsequent percolation to greater soil depths brings greater storage of water in the soil itself. That additional storage is then available for river recharge during the summer, for use by pumping from wells, and for stabilization of the diverse biological community in the valley. The additional infiltration of rainwater into the soil would also reduce the amount of runoff by an equal amount each year, helping to decrease local flooding.

The following recommendations are intended to contribute to the long term availability of adequate water supplies in the Napa River watershed by making better use of that which we already have. Decreasing reliance on outside water supplies increases the security of the valley's domestic and agricultural economies. Development of a complete water budget will also allow the enhancement of Napa Valley's fisheries, and provide long term support for the return of a strong anadromous fish population to the region.

I1. Estimate water budgets for tributary watersheds to the Napa River, including time distribution and existing diversion amounts, for use in local and individual land use planning

I1.1. Calibrate tributary flows for accurate estimates of rainfall runoff and runoff potential.

I1.2. Estimate groundwater recharge rates for tributary watersheds.

I1.3. Expand community voluntary groundwater monitoring, with the assistance of the USDA Natural Resource Conservation Service, the Napa County Flood Control and Water Conservation District, and the Regional Water Quality Control Board.

I1.4. Cooperate with the California Department of Fish and Game and other local and state agencies, to estimate optimum wildlife minimum flows in the river and tributaries.

I2. Encourage conjunctive use of groundwater and surface water in the watershed

I2.1. Utilization of groundwater during dry times when surface water is less available should be augmented with use of surface water during times of high availability in wetter months.

I2.2. High winter surface water runoff should be directed into facilities such as floodplain wetlands, to encourage groundwater recharge in wet months, especially in the Tulocay-Coombsville area, and in the lower Milliken Creek area.

I2.3. Assessment of the state of Valley aquifers, particularly in and around St. Helena, should be made in order to determine rates and sites of renewable extraction (*safe yield*) of groundwater. Establish a long term water budget and aquifer monitoring program based on this analysis.

I2.4. Utilize the Geographic Information System database as a common reference for water use and development decisions in the watershed.

I3. Increase the reuse of treated waste water for irrigation and wildlife habitat enhancement and restoration

I3.1. Investigate feasibility of expansion of the use of dual plumbing systems for wastewater reuse where the recycled water is or may be available, in order to replace potable water use for irrigation and wildlife management.

I3.2. Utilize properly designed gray water reuse systems for on site irrigation.

I3.3. Priority use for recycled water should be to supplant the use of potable water where potable water is presently used for non-consumptive purposes.

I3.4. Establish trials in the watershed to determine the feasibility of using constructed wetlands as part of waste water treatment for wineries and homes.

I3.5. Define a local lead agency to collect data and develop a watershed wide water management plan.

I4. Increase the use of the California Irrigation Management Information System (CIMIS) by water users throughout the watershed. *CIMIS information is recorded daily at three stations in the watershed: Carneros, Angwin and Oakville. The information is available by personal computer and modem on a daily basis in many different formats.*

I4.1. Use CIMIS information to publish lawn irrigation recommended amounts for areas represented by each of the three stations.

I4.2. Provide training for homeowners, park managers, landscapers and agricultural interests in the acquisition and use of CIMIS data.

I4.3. Utilize CIMIS data to plan irrigation scheduling for public parks, golf courses, industrial parks, cemeteries, and other large irrigated areas.

I4.4. Arrange for regular publication of CIMIS data in local press media.

I5. Increase awareness and use of efficient water management in urban areas. *The share of water use by urban areas in Napa is increasing as the urban population grows. To help maintain the supply of local water, and to decrease the reliance on imported water, it is important to make the most efficient use of water wherever and whenever possible.*

I5.1. Encourage the use of low water use plants in urban landscaping.

I5.2. Provide regular continuing information about water conservation techniques.

I5.3. Continue conservation programs such as the low water volume toilet exchange.

I5.4. Minimize irrigated turf areas in parks and other recreation areas to only high traffic zones such as ball fields.

I5.5. Increase the use of permeable pavement surfaces to increase groundwater recharge.

I6. Data management and public outreach. *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

I6.1. Maintain a program of water conservation awareness in the watershed.

I6.2. Form a cooperative venture with schools, private organizations and government agencies to establish demonstration gardens and herbariums to display alternative home landscaping using native and other low water use plants.

I6.3. In cooperation with the Regional Water Quality Control Board, establish a network of aquifer monitoring stations, and begin a program of accurate determination of well head and well screen elevations of the monitored wells.

I6.4. Cooperate with the Regional Water Quality Control Board in developing a voluntary, cooperative groundwater management strategy.

Section III: Recommendations by Land Use:

- **J. Agriculture**
- **K. Open Space and Watershed**
- **L. Residential (urban and rural)**
- **M. Commercial, Industrial, and Public Institutions**
- **N. Recreation**

J. LAND USE:

AGRICULTURE

Background

Napa County is the last primarily agricultural county in the Bay Area. The citizens of Napa have worked diligently to promote and protect the agricultural base of the Napa County economy. Political and social decisions to enhance the agricultural segment of Napa Valley, however, must be accompanied by a commitment to preserve and enhance the natural resources that support a healthy agricultural economy. The recommendations in this section are to help protect and enhance the environmental underpinnings of agriculture in order to ensure a continued ability to farm the lands in the watershed profitably.

The recommendations in this section are divided by general type of agriculture, to make use of the Manual easier. There are many general agricultural recommendations, however, which are presented below.

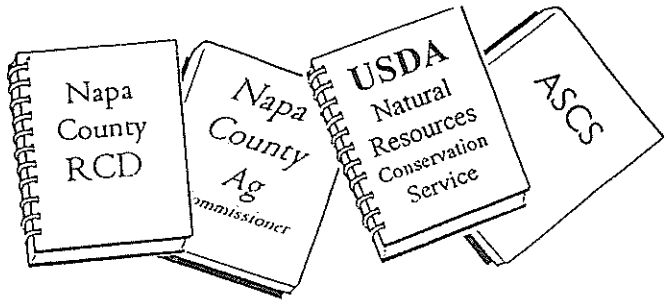
General Agricultural Recommendations

J1. Provide greater opportunities for technology development and exchange. *Encouraging more communication among agricultural interests and between agricultural interests and urban interests will allow greater exchange of creative ideas and successful solutions for watershed protection.*

J1.1. Community groups, government agencies and industry associations should form partnerships to provide field days, classes, educational brochures, and other assistance to increase public awareness of the connections and interactions of agricultural and urban interests in the watershed.

J1.2. Encourage greater communication between the agricultural and urban community through forums, exchange speakers, school programs, and field tours.

J1.3. Expand awareness of assistance programs available from UC Cooperative Extension Service; USDA Natural Resource Conservation Service; Napa County Resource Conservation District; Napa County Agricultural Commissioner's Office; and the Agricultural Stabilization and Conservation Service.



J1.4. Increase industry and community support for the agricultural education elements of the Napa school systems, including Napa Valley Community College.

J2. Encourage development and use of pesticide and fertilizer management plans. *Applied chemicals are necessary and valuable tools for maintaining agricultural productivity. Planning for appropriate use of these tools includes monitoring to assess the need and proper application rate for fertilizer and pesticides, and follow up analysis to assess the effectiveness of their use on a site by site basis.*

J2.1. Use only pesticides approved for the desired use, following label instructions

J2.2. Increase the use of Integrated Pest Management techniques for all types of agricultural and horticultural operations.

J2.3. Using the model developed by landowners and managers in Huichica Creek watershed, develop local endangered species habitat labels for pesticide use in areas of the watershed designated as endangered species habitat.

J2.4. Develop buffer zones and/or adapt application methods to avoid drift of fertilizers and pesticides into waterways.

J2.5. Include domestic and agricultural well head protection practices in pesticide and fertilizer management plans.

J2.6. Provide for proper discharge of shallow wells and sump pumps to avoid sediment and other pollutant intrusion into waterways.

J2.7. Incorporate soil and plant tissue analysis as a part of planned fertilizer and pesticide use.

J3. Utilize sound management practices to protect surface and groundwater quality. *Agriculture in general is very dependent on sufficient supplies of good quality water. Protection of water quality must be a critically important component of any sustainable agricultural enterprise.*

J3.1. Direct surface water flows away from well heads to avoid surface water movement into wells.

J3.2. Accurate application of ground applied pesticides and fertilizers is critical in Napa County. Whereas only two soil types (Cortina and Reyes) are listed by the USDA as having severe potential for leaching of chemicals into groundwater, two-thirds of the soils are listed as having severe potential for pesticide loss by water runoff. Assistance from the Napa County Agricultural Commissioner; the UC Cooperative Extension Service; and the USDA Natural Resource Conservation Service should be utilized to ensure proper application rates, times, and methods for ground applied pesticides and fertilizers.

J3.3. Monitoring of wells for pesticide and fertilizer residue in the Valley should continue, and be coordinated with any aquifer level monitoring that may be established.

J3.4. A well head assessment program should be provided for well users to assess well head protection status for all wells in the watershed. The program should provide recommendations to well users for well head protection planning.

J3.5. Regular use of the California Irrigation Management Information System (CIMIS) should be expanded, and utilized with on-site soil moisture or plant stress measuring devices to efficiently use irrigation water.

J3.6. Fuel, pesticides, fertilizers and other chemical should be stored away from wells and streams, and out of stream floodplains.

J3.7. Stream stabilization work and drainage ditch construction should utilize methods that reflect stable stream morphology.

J4. Reforest, afforest, and revegetate. *One of the more significant cumulative changes in the watershed is diminished forest cover. The change has been not only in the total extent of cover, but in the spatial distribution of the remaining habitat, and the diversity within it.*

J4.1. Reforest unused areas to the maximum extent feasible with native trees, shrubs, forbs and grasses, using seeds collected from the local area. Using local seed sources preserves the unique genetics of neighborhood species and guards against outbreaks of disease or insect infestation to which only local plants may be resistant.

J4.2. Manage existing ponds and watercourses as wildlife habitat.

J4.3. Enhance, restore, or rehabilitate wetlands in the watershed.

J4.4. Enhance habitat value of artificial drainage ditches with plantings on the ditch banks.

J4.5. Increase the use of hedgerows along field and property lines to provide migration areas for birds and small mammals.

J4.6. Where possible, develop contiguous habitats to include transition zones from one type of habitat to another, i.e.: riparian zone to gallery forest to upland.

Grazing

A major historical land use in Napa County is cattle grazing. It began nearly at the moment that Spanish settlers first arrived in the Bay Area. With a continually growing population, and changing agricultural economy, Napa Valley has seen a significant drop in grazing acreage. Housing, grapes, and other land uses have supplanted livestock operations in many parts of the watershed. Because of decreasing availability of good grazing lands, productivity per acre of the remaining lands is ever more critical. Many cattle interests have begun to investigate recently developed grazing management systems that can provide more feed per acre per animal unit, and also provide protection for water quality, soil integrity, and wildlife habitat. These integrated livestock management systems emphasize maximum forage production by protecting the integrity of the natural resource system of grass, trees, soil and water.

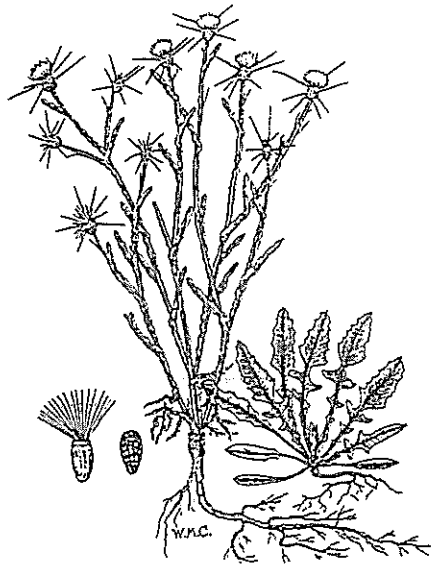
J4. Provide wider public assistance for rangeland planning to the cattle grazing industry through the USDA Natural Resource Conservation Service and the UC Cooperative Extension Service. *Establish grazing plans for all major grazing areas of the Napa Valley to maximize forage production and minimize soil erosion.*

J5.1. Develop economic analyses on a ranch-by-ranch basis to determine benefits and costs of instituting grazing management programs.

J5.2. Control or eliminate livestock access to streamside areas by providing alternate, dispersed watering sites; fencing; or other practices associated with a managed grazing program. Protect livestock stream crossings and lake access points to minimize bank degradation at those sites.

J6. Control noxious plant pests such as purple star and yellow star thistle. *Star thistle was probably introduced to California from straw and hay brought from Europe on early sailing ships. Its life cycle allows it to grow in arid areas during a time when resident annual grasses are dormant and provide little competition. It is toxic to some livestock, and can make movement through heavy infestations nearly impossible because of its thorns. The past decade of dry weather has abetted its spread, and the various species now have become a very serious economic problem throughout northern California. Other species such as broom and tarweed compete with native plants, landscaping schemes, and commercial crops for water, soil, and space.*

J6.1. Thistles, brooms, tarweed and other non-native species of plants have diminished range values considerably in the watershed. Adoption of a range rejuvenation program, followed by well planned range management will help control exotic species.



Yellow star thistle
from *Weeds of California*, Robbins, 1970

J6.2. A public-private partnership should be established to aid in funding a range rejuvenation and management venture, with particular emphasis on the Lake Hennessey, Garnet Creek, Jericho Canyon, and Jameson/American Canyon area watersheds.

J6.3. Support the trial and use of plant and insect species that may help with the control of noxious weeds in the watershed.

J7. Protect against introduction of new exotic plant types that may decrease forage value of rangelands. *Most noxious weed pests in the Napa River watershed were introduced inadvertently or escaped from cultivated plantings. Many hundreds of acres of range land have been seriously impaired by invasions of exotic plants that do not provide high quality forage, and in some cases are actually injurious to livestock. While attempting to eradicate existing exotic problem plants, it is important to guard against introduction of new pests.*

J7.1. To the maximum degree practicable, utilize hay, straw, and other forage from clean sources only.

J7.2. In conjunction with the UC Cooperative Extension Service and the USDA Natural Resource Conservation Service, develop grazing management plans that will encourage the re-establishment of perennial grass range land.

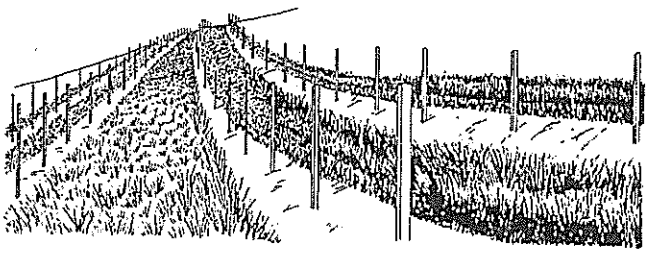
J7.3. Investigate the feasibility of a voluntary, cooperative master grazing plan for the Napa Valley developed by grazing interests in the watershed.

Viticulture

Grape growing and winemaking are a very large part of the Napa Valley, especially since the late 1970's. With virtually all of the valley floor taken up with grapes, cities, and other development, the vineyard growth has been largely in the hills of the eastern and western ridges, and in the southern portion of the County known as Carneros. Vineyard acreage has increased from a total of 9,800 acres in 1965 to over 35,000 acres in 1994. Winery expansion has increased, as well, and there are over 100 operating wineries in the Napa Valley today.

The following recommendations are for development and management of both valley floor and hillside vineyards, and for winery operations, that will protect and enhance the Napa River watershed natural resources. Further recommendations and practices are found in Appendix B, the *Hillside Vineyard Manual.*

J8. Promote and improve the use of vegetative vineyard floor management. *Cover crops, either permanent or annually planted, are a significant tool for the protection of watershed water quality and environmental health. Properly used, they can decrease operation costs and assist with vineyard pest control. Increased rainfall infiltration into the soil, enhanced gas exchange, and greater microbial activity in the rooting zone from cover crop development help to sustain a healthy soil environment for perennial crops such as grapes.*



J8.1. Establish a cover crop data exchange at the UC Cooperative Extension, USDA Natural Resource Conservation Service, or Resource Conservation District offices to provide a central point for technology and experience sharing regarding cover crop trials.

J8.2. Increase the amount of technical and financial aid available for establishment and trials of different vegetative covers and management techniques in vineyards.

J8.3. Provide more extensive and frequent educational opportunities for cover crop development through cooperative joint ventures of grower organizations, UC Cooperative Extension Service, USDA Natural Resource Conservation Service and the Resource Conservation District.

J8.4. Support the operation and education outreach of the Sustainable Agriculture Demonstration Vineyard at Huichica Creek Vineyards in Carneros.

J9. Develop buffers and setback areas from riparian zones, sensitive habitats, and critical erosion zones. *Avoiding disturbance of sensitive areas and protecting riparian corridors have many benefits including protection of water quality and wildlife habitat and production and maintenance of pest predator habitats to decrease pest caused losses and expenses in vineyards.*

J9.1. Utilize a "profit per farm" economic model that considers long term repair, maintenance, and rehabilitation costs relative to net profit per vine, rather than a "production per acre" model to determine economically reasonable setbacks from waterways and sensitive habitat areas.

J9.2. Provide technical and financial assistance to growers for installation of appropriate trees and other vegetation in otherwise unused portions of their vineyard parcels.

J9.3. Develop a specific suite of practices for riparian protection that can be supported by the Agricultural Conservation and Stabilization Service cost share programs.

J9.4. Store chemicals, fertilizers and fuel (including orchard heaters) in areas away from riparian zones and floodplains.

J10. Support an expanded program of riparian zone vegetation management trials to address the threat of Pierce's disease. *Pierce's disease is caused by a bacteria found in plant tissue and transmitted to grape vines primarily through the feeding habits of the blue-green sharpshooter insect. It presents a significant long term threat to wine grape production in some areas, especially adjacent to riparian corridors.*

J10.1. Support the cooperative program begun by the University of California, USDA Natural Resource Conservation Service and local growers to establish a trial and demonstration on Conn Creek.

J10.2. Encourage other efforts to establish management demonstrations and trials in the Valley.

J10.3. Promote the formation of a coordinated joint information and technology exchange among participants in Pierce's disease investigation throughout the watershed.

J10.4. Design project monitoring to be compatible with a GIS program for watershed assessment.

J11. Provide training and educational materials to encourage the adoption of erosion control techniques in existing vineyards. *Many existing vineyards were installed when awareness of the hazards and negative consequences of soil erosion were not well recognized. Many of these vineyards can be protected from excess soil loss in an economically reasonable manner by installing*

simple practices or adopting a well planned maintenance program.

J11.1. Through cooperative joint effort of grower organizations, the UC Cooperative Extension Service, the County of Napa, and the USDA Natural Resource Conservation Service, provide demonstrations and training in erosion control development to watershed grapegrowers. Many different practices have been designed to prevent soil erosion in perennial crop lands, but materials to help determine when and where to use the practices are not readily available.

J11.2. Investigate methods of increasing funding for voluntary adoption and installation of erosion control practices in existing vineyards.

J11.3. Encourage watershed grapegrowers to work with the UC Cooperative Extension Service and the USDA Natural Resource Conservation Service to establish an erosion prevention technical committee to provide site assessment and erosion prevention advice to local growers.

J12. Increase water management efficiency in both irrigation and production. *As the Napa Valley increases in population, water use is becoming a more important issue. Efficiency of use is critical to maintaining an adequate clean water supply for future operations.*

J12.1. Increase the use of the California Irrigation Management Information System (CIMIS) in irrigation scheduling. There are three stations in the Napa River watershed: Oakville, Angwin, and Carneros.

J12.2. Continue and expand efforts to design water re-use methods for constructive use of winery waste water.

J12.3. Consider the feasibility of jointly operated area treatment plants for winery waste water, especially on the valley floor.

J12.4. Support the reuse of waste water from the Napa Sanitation District and other publicly operated waste water treatment plants, for displacement of potable water wherever economically and technically feasible.

J12.5. Calibrate and properly maintain frost sensors to ensure that sprinklers are used only when necessary, and only for the length of time necessary.

J12.6. Investigate the feasibility of establishing cooperative frost protection districts that may more efficiently provide frost control for areas based on topography, rather than on parcel lines.

J12.7. Encourage the use of buried drip tube irrigation to decrease water evaporation from irrigated fields.

Other Agriculture

There are many other forms of agriculture in the Napa Valley other than grazing and grapes. Small truck gardens for vegetables; flower production; small animal husbandry; horse breeding; specialized herb production; and hay production are some of the agricultural products found in the Napa Valley. Dairy production has declined dramatically in the past 20 years, with only one operating dairy left in the Valley.

J13. Protect streams and waterways from contamination and bank collapse caused by grazing animals. *Heavy use of waterways by domestic animals can create large amounts of sediment and can contribute to such water pollution as high coliform and nitrogen content of stream waters.*

J13.1. Use fencing, hedgerows, or other exclusion techniques to keep domestic livestock from streams and other waterways.

J13.2. Develop water sources for livestock away from concentrated surface flows.

J13.3. Protect well heads and surface streams from animal waste contamination from runoff.

J13.4. Direct wash water into safe areas or holding ponds for treatment before discharge into waterways.

J13.5. Provide hardened or protected stream crossings where necessary for livestock movement.

J13.6. Locate small confined animal facilities away from creeks and other concentrated waterways.

J14. Utilize pesticides and fertilizers in a safe manner on small farms. *Small area usage of some commercial chemical products is difficult because of low per-acre rates of application, and overuse of a chemical is more likely than with large acreage applications.*

J14.1. Follow label instructions carefully when using and disposing of pesticides and fertilizers.

J14.2. Calibrate application equipment before use.

J14.3. Use laboratory analysis and other Integrated Pest Management techniques to schedule application rates and timing for pesticides and fertilizers.

J14.4. Use laboratory analysis to determine actual application rates when using animal manure for fertilizer.

J14.5. Properly compost animal and vegetable wastes for reuse as soil amendments.

J14.6. Use CIMIS information to schedule irrigation and pesticide applications.

K. LAND USE:

OPEN SPACE AND WATERSHED

Background

Growth and development in the Napa Valley since World War II has gradually increased community awareness of the value of open space and undeveloped areas. The conditions of watersheds, especially those feeding into municipal water supplies, have taken on more importance as more people live on and use the limited amount of land available. Watershed functions such as non point source pollution filtration; rainfall percolation and groundwater recharge; vegetative climate moderation; storm water runoff control and flood attenuation; and biological balances, are left to fewer acres as community development grows. Careful stewardship of these open areas in combination with thoughtful management of developed areas, can help to keep a watershed in balance, with major physical and biological functions intact.

K1. Encourage the enhancement and expansion of oaks and oak woodland habitat. *Oak woodlands and oak grasslands are a valuable but diminishing asset in the Napa River watershed. Blue oak habitat in particular, where trees can be as old as 30 years per inch of diameter, is in serious decline. Many areas have not had new oak generations for over 70 years, leaving no replacement trees when the older ones die.*

K1.1. Provide protection for selected volunteer seedlings.

K1.2. Using locally collected acorns, plant new seedlings in areas that have no recent regeneration.

K1.3. Fence or otherwise protect areas of oak regeneration until seedlings are above grazing height.

K1.4. Increase the use of grazing management and controlled burns to encourage the return of perennial native grasses.

K1.5. Plant appropriate companion plant species to increase the diversity of oak habitats.

K2. Promote regional park areas to reduce random access to wildlife areas and other non-managed areas. *Unmanaged trails frequently become concentrated water courses during the rainy season, causing erosion and sedimentation. By designating discrete areas for public access for recreation, those areas can be specifically developed and maintained to withstand concentrated traffic.*

K2.1. Easily accessible public areas that are managed specifically for public recreation should be established, with protected areas for direct access in riparian zones. The areas should be constructed and maintained to allow stream and riparian use without unnecessary damage to the system.

K2.2. Provide a wide range of publicly accessible recreational experiences and environments, in order to minimize pressure on private property and unmanaged areas.

K2.3. Establish the use of signs and/or other passive deterrents to curtail trespass on private property, or unmanaged access to public property in areas not designed for public use. An educational outreach effort should be ongoing that describes the reasons for not allowing unrestricted access to portions of the Napa River watershed.

K2.4. Encourage golf courses, parks, and other public and private recreation areas to protect the streams through those properties by shielding them from direct access except in areas designed for access.

K3. Maintain corridors between open spaces. *Establishment of wildlife corridors between existing open spaces encourages wildlife diversity and density. The connecting corridors also add to property values of those properties containing the corridors, and those adjacent to the corridors.*

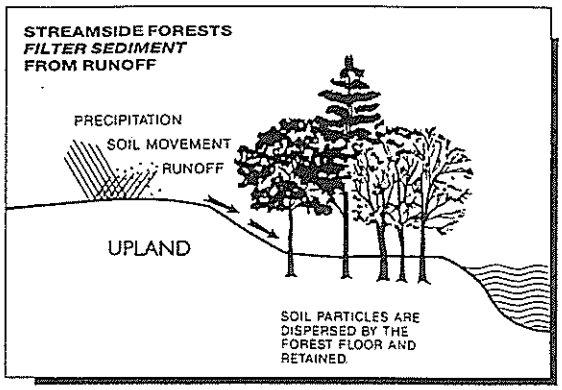
K3.1. Evaluate and promote intercity green belts on public land and/or with the participation of the Napa County Land Trust.

K3.2. Encourage coordinated riparian enhancement along Napa River's tributary streams.

K3.3. Encourage development of contiguous east-west habitat corridors across the Valley at several points, through cooperative efforts of adjacent landowners.

K3.4. Promote voluntary individual parcel planning that will connect enhanced riparian corridors on the eastern and western edges of the Napa Marsh, especially in Huichica, Carneros, Suscol, Sheehy, Fagan, and American Canyon Creek watersheds.

K3.5. Provide public technical assistance to help landowners enhance and maintain a riparian corridor along both banks of the Napa River.



Reference: Maryland Department of Natural Resources

K4. Establish and maintain streamside buffer strips, both at individual sites and along streams through contiguous properties. *Vegetated buffer strips alongside waterways help stabilize stream banks; reduce sedimentation and introduction of pollutants into the stream by filtering runoff; provide valuable biological diversity of plant and animal species; decrease ambient summer water temperatures; decrease storm runoff peaks by increasing rainfall infiltration into the soil; increase between-storm stream flows through greater stream recharge; and provide valuable wildlife habitat throughout the year.*

K4.1. Provide tree cover along streams to shade the stream, to decrease in-stream growth of vegetation (such as willows and tules) that may block flow in wet months; decrease water temperature; decrease evaporative losses of water; decrease algal bloom and subsequent eutrophication in dry months; and increase property values.

K4.2. Use native varieties of plants, or plants whose functions are equivalent to those developed in arid, hot summer, wet winter climates to revegetate riparian buffer zones.

K4.3. Enhance riparian cover that is contiguous across property lines to increase both wildlife habitat and real estate values.

K4.4. Utilize stream side areas for open space and parks in urban developments. Large developments, both agricultural and urban, should be designed to enhance and emphasize any natural riparian zones within the project.

K5. Reforest, afforest, and revegetate. *One of the more significant cumulative changes in the watershed is diminished forest cover. The change has been not only in the total extent of cover, but in the spatial distribution of the remaining habitat, and the diversity within it.*

K5.1. Reforest areas to the maximum extent feasible with native trees, shrubs, forbs and grasses, using seeds collected from the local area. Using local seed sources preserves the unique genetics of neighborhood species and guards against outbreaks of disease or insect infestation to which only local plants may be resistant.

K5.2. Manage existing ponds and watercourses as wildlife habitat.

K5.3. Enhance, restore, or rehabilitate wetlands in the watershed.

K5.4. Enhance habitat value of artificial drainage ditches with plantings on the ditch banks.

K5.5. Increase the use of hedgerows along field and property lines to provide migration areas for birds and small mammals.

K5.6. Where possible, develop contiguous habitats to include transition zones from one type of habitat to another, i.e.: riparian zone to gallery forest to upland.

K6. Use natural progressions and systems to increase water and soil retention, and to decrease long term maintenance costs of the watershed

K6.1. Stream stabilization work and drainage ditch construction should utilize methods that reflect stable stream morphology.

K6.2. Establish and promote a program to replace introduced annual grasses with indigenous perennial grasses in the watershed.

K6.3. Continue to seek technical and financial assistance to eliminate noxious exotic plant species such as star thistle and French broom through range management, in order to restore the productivity of watershed lands.

K6.4. Develop conjunctive use of water resources throughout the watershed, with emphasis on the upper Napa River and Carneros.

K6.5. Where possible and technically feasible, reestablish wetlands to filter storm runoff and attenuate flooding.

K6.6. Develop grazing management plans and controlled burning to manage fuel loads in fire hazard areas.

L. LAND USE:

RESIDENTIAL

Background

Urban

The fastest growing land use in Napa Valley is urban housing and the tertiary commerce that it supports. Whereas a single home or parcel may not have a significant impact on the watershed, the growing cumulative impact of thousands of homes is substantial. Streets, roofs, parking lots and driveways all add to the amount of impervious surfaces that do not allow rainfall to percolate into the groundwater. Increased storm runoff changes the character of the receiving streams by increasing the peak flow during and immediately after storms, and decreases the amount of stream recharge from groundwater between storms and during the summer. In addition to cumulative changes in water runoff characteristics, urban development also adds to the amount of non-point source pollution that may find its way into our waterways, estuary and bay. It is important to know the possible impacts of urban growth, in order to plan for changes in the natural balance of the watershed, and to allow for adjustments to maintain watershed equilibrium and natural function.

The following practices will help to keep the balance intact in the watershed. Just as thousands of small decisions in a watershed can have a damaging cumulative effect, thousands of thoughtful decisions can have a very stabilizing effect on the watershed. Regular and consistent educational efforts in the schools and in the community at large are critical to successful stewardship of the natural resources of the Napa River watershed. When supported by a strong watershed monitoring program, informed individual action may be the most powerful tool available for natural resource conservation and enhancement.

L1. Adopt measures to decrease and eliminate sedimentation from construction sites. *Urban and suburban construction sites can frequently be significant acute sources of sediment and other pollution into adjacent waterways. Several simple and inexpensive measures can markedly decrease the amount of sediment allowed to leave the site during construction and in the following months before vegetation can be fully established.*

L1.1. Protect storm drains from sediment intrusion with the use of straw bales or silt fence.

L1.2. Sweep dirt and debris from streets in the construction zone before rainfall or project water can flush it into the storm drains.

L1.3. Establish temporary berms to contain wash water and irrigation installation overflows on site.

L1.4. Store waste concrete, cement, stucco, asphalt, etc. in non-riparian areas where the residue can be incorporated into the project, or removed for disposal elsewhere.

L1.5. Establish grass or other vegetative cover on the construction site as soon as possible after disturbance.

L2. Develop consistent and effective storm water runoff controls for urban areas. *A significant source of non point source pollution of watershed streams is the cumulative pollutants washed from paved and covered urban areas into storm drains.*

L2.1. Stencil storm drains to notify residents of the direct connection of the drains to the river. This stenciling program will have to be supported with long term maintenance and educational outreach.

L2.2. Encourage the removal and recycling of vegetative debris from landscape maintenance. Develop an education program that informs residents of the negative effects of disposing of leaves and clippings in streams and storm drains.

L2.3. Keep paints, solvents, pesticides, etc., away from waterways and storm drains. Dispose of such products in a safe manner as described in the product labels.

L2.4. Establish an information sharing method to allow coordination and mutual assistance for County, municipal, and other public entities to develop and manage required National Pollutant

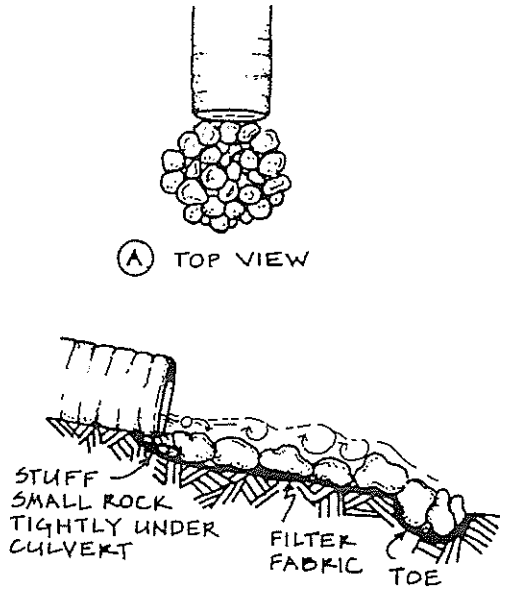
Discharge Elimination System (NPDES) permits in the watershed.

L2.5. Provide access to the coordinated NPDES permit plans to private entities for use in development of project based NPDES permits.

L2.6. Where possible and technically feasible, drain roof tops and paved areas into underground dispersal pipes or vegetated percolation beds.

L2.7. Increase the amount of permeable surfaces in urban areas to increase rainfall infiltration into the soil.

L2.8. Maintain drainage functions of storm runoff ditches, pipes, and other conveyances.



Drainage pipe rock energy dissipater
Reprinted from ***Ground Works***, Marin County RCD.

L3. Increase awareness and use of efficient water management in urban areas. *The share of water use by urban areas in Napa is increasing as the urban population grows. To help maintain the supply of local water, and to decrease the reliance on imported water, it is important to make the most efficient use of water wherever and whenever possible.*

L3.1. Encourage the use of low water use plants in urban landscaping.

L3.2. Provide regular continuing information about water conservation techniques.

L3.3. Sweep, rather than wash paved areas and sidewalks.

L3.4. Continue conservation programs such as the low water volume toilet exchange.

L3.5. Minimize irrigated turf areas in parks and other recreation areas to only high traffic zones such as ball fields.

L3.6. Utilize CIMIS data to schedule amounts and timing of irrigation.

L3.7. Increase the use of permeable pavement surfaces to increase groundwater recharge.

L4. Implement practices that decrease threats to water quality from non point sources of pollution. *Nonpoint source pollution has by nature a cumulative negative impact on water quality in receiving waters in urban areas. Widespread implementation of many small positive increments, however, can have an equally positive impact on the quality of those waters.*

L4.1. Carefully measure all pesticides and fertilizers before use and follow label instructions for application.

L4.2. Utilize the periodic hazardous waste collection events sponsored by the County Agricultural Commissioner and other agencies to dispose of unused or unneeded toxic products.

L4.3. Keep motor vehicles in good repair to avoid loss of petroleum products, antifreeze, and other automobile fluids.

L4.4. Stencil storm drains and provide information to notify residents of the hazards of disposal of chemicals and other debris into storm drains.

L4.5. Keep irrigation of lawns, gardens and other areas to efficient levels to avoid runoff or excess leaching into groundwater.

L4.6. Establish neighborhood groups to help keep riparian corridors free of litter and other unnatural debris.

L4.7. Encourage neighborhood involvement with local schools in implementation of the school curriculum developed by the Resource Conservation District

Rural

Residential development in the rural areas of Napa Valley has seen a steady increase in the past two decades. The attractiveness of the valley makes a rural home in the watershed very desirable. Frequently, these rural homes have small agricultural enterprises associated with them, such as rearing horses or goats.

One of the most significant steps a rural homeowner can take is to develop and implement a management plan for concentrated animal facilities. Simple steps to control erosion and runoff from domestic animal facilities can provide very significant improvement in downstream water quality.

L5. Promote environmentally sensitive site planning and development. *Adequate assessment of a building site to determine the location and type of construction that provides the least negative environmental impact can help to maintain higher habitat values both on the site and in surrounding areas.*

L5.1. Encourage development to utilize existing roads to minimize construction of new rural road cuts.

L5.2. Cluster homes on contiguous parcels to minimize impacts on open space and wildlife habitat.

L5.3. Make erosion control a priority when designing site access and building construction.

L5.4. Plan for plumbing to utilize gray water where appropriate.

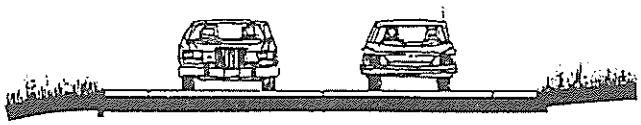
L5.5. Avoid development of buildings or roads near sensitive habitats.

L5.6. Design and site adequate on site waste disposal systems that can be easily maintained.

L5.7. Emphasize protection of entire habitat units, instead of just single tree or single feature preservation.

L6. Minimize new road construction. *One of the major sources of soil erosion, sediment production, and habitat loss in the watershed is roadways and fire breaks. Proper design and maintenance of watershed roads can eliminate thousands of tons of sediment from reaching the river each year.*

L6.1. Utilize joint access wherever possible to minimize roadways into rural parcels.



L6.2. Erosion control and sediment reduction should be the highest priority in rural road design.

L6.3. Utilize USDA Natural Resource Conservation Service assistance to design roadway maintenance systems and erosion control practices for existing roads.

L6.4. Unpaved roads should have frequent waterbars or other storm water runoff controls, and controls should be kept in working order.

L6.5. Abandoned roads should be removed and revegetated.

L7. Protect streams and waterways from contamination and bank collapse caused by farm animals. *Chronic use of waterways by domestic animals can create large amounts of sediment and can contribute to such water pollution as high coliform and nitrogen content of stream waters.*

L7.1. Use fencing, hedgerows, or other exclusion techniques to keep domestic livestock from streams and other waterways

L7.2. Develop water sources for livestock away from concentrated surface flows.

L7.3. Protect well heads and surface streams from animal waste contamination from runoff.

L7.4. Direct wash water into safe areas or holding ponds for treatment before discharge into waterways.

L7.5. Provide hardened or protected stream crossings where necessary for livestock movement.

L7.6. Filter runoff from confined animal facilities, including small horse pastures.

L8. Utilize pesticides and fertilizers in a safe manner on small farms. *Small area usage of some commercial chemical products is difficult because of low per-acre rates of application, and overuse of a chemical is more likely than with large acreage applications.*

L8.1. Follow label instructions carefully when using and disposing of pesticides and fertilizers.

L8.2. Calibrate application equipment before use.

L8.3. Use laboratory analysis and other Integrated Pest Management techniques to schedule application rates and timing for pesticides and fertilizers.

L8.4. Use laboratory analysis to determine actual application rates when using animal manure for fertilizer.

L8.5. Properly compost animal and vegetable wastes for reuse as soil amendments.

L8.6. Use CIMIS information to schedule irrigation and pesticide applications.

M. LAND USE:

COMMERCIAL, INDUSTRIAL, PRIVATE AND PUBLIC INSTITUTIONS

Background

Large and medium scale developments can be designed and managed to avoid negative impacts on water quality and other environmental assets. Industrial parks, hospitals, schools, shopping centers, etc., usually have large paved or covered areas that can collect pollutants over the dry season which then are flushed directly into storm drains or nearby waterways with the first rains. Activities such as landscaping, construction, and debris disposal can have cumulatively serious impacts on watershed resources. Thoughtful development and management can add both economic and ecologic value to such areas, while protecting water quality in the basin.

M1. Encourage commercial and residential developments to utilize riparian corridors through the projects as amenities. *Attractive riparian corridors through developed areas can add to real estate values in the area, in addition to the natural resource enhancement the corridors represent.*

M1.1. Open space designed into development projects should be established along existing streams or drainages to enhance the riparian values of the waterway and the attractiveness of the project.

M1.2. Adjacent projects should be encouraged to develop green belts, open space, or other park improvements in such a manner as to provide continuity with neighboring natural habitat improvements.

M1.3. Sensitive habitat areas should be considered in the design phase of projects to encourage their protection and enhancement.

M1.4. Landscaping should consider low water use native plants that are compatible with any nearby open or natural areas.

M2. Adopt measures to decrease or eliminate sedimentation from construction sites. *Urban construction sites can frequently be significant acute sources of sediment and other pollution into adjacent waterways. Several simple and inexpensive measures can markedly decrease the amount of sediment allowed to leave the site during construction and in the following months before vegetation can be fully established.*

M2.1. Protect storm drains from sediment intrusion with the use of straw bales or silt fence.

M2.2. Sweep dirt and debris from streets in the construction zone before rainfall can flush it into the storm drains.

M2.3. Establish temporary berms to contain wash water and irrigation installation overflows on site.

M2.4. Flush concrete, cement, stucco, etc. onto areas where the residue can be incorporated into the project, or removed for disposal elsewhere.

M2.5. Keep paints, solvents, pesticides, etc., away from waterways and storm drains. Dispose of such products in a safe manner as described in the product labels.

M2.6. Establish grass or other vegetative cover on the construction site as soon as possible after disturbance.

M3. Develop consistent and effective storm water runoff controls for urban areas. *A significant source of non point source pollution of watershed streams is the cumulative pollutants washed from paved and covered urban areas into storm drains.*

M3.1. Stencil storm drains to notify residents of the direct connection of the drains to the river. This stenciling program will have to be supported with long term maintenance and educational outreach.

M3.2. Encourage the removal and recycling of vegetative debris from landscape maintenance. Develop an education program that informs residents of the negative effects of disposing of leaves and clippings in streams and storm drains.

M3.3. Establish an information sharing method to allow coordination and mutual assistance for County, municipal, and other public entities to develop and manage required National Pollutant Discharge Elimination System (NPDES) permits in the watershed.

M3.4. Provide access to the coordinated NPDES permit plans to private entities for use in development of project based NPDES permits.

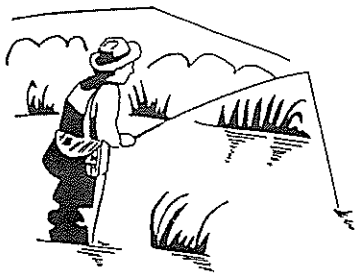
M3.5. Maintain drainage functions of storm runoff ditches, pipes, and other conveyances.

N. LAND USE:

RECREATION

Background

The increasing population of Napa Valley increases the demand for more recreational activities. Parks, golf courses, trails, waterways and other recreational areas are subject to growing popularity and use. In order to preserve the opportunity for watershed residents to experience the natural assets of the Napa Valley, recreation sites must be planned and maintained in an efficient manner. Many of the needs of the recreation sites can be met through community efforts such as expanding education opportunities and regular volunteer work to support the public and private entities that manage recreation areas.



Providing a wide range of recreation options also helps to acquaint the community with the diversity of natural assets in the watershed. Careful maintenance and sensitive use will help ensure the long term availability of recreation experiences ranging from hiking on Mt. St. Helena to exploring the sloughs and wetlands of the Napa Marsh State Wildlife Area. Responsible use of hunting and fishing areas of the watershed will preserve those options for generations yet to come, as well.

N1. Promote regional park areas to reduce random access to the river, while controlling access (including trespass) to non-managed areas. *River and stream riparian zones do not naturally accommodate heavy traffic without damage. Unmanaged trails down riverbanks, for instance, frequently become concentrated water courses during the rainy season, accelerating bank erosion and collapse. By designating specific areas for public access for recreation, those areas can be specifically developed and maintained to withstand concentrated traffic.*

N1.1. Easily accessible public areas that are managed specifically for public recreation should be established, with protected areas for direct access to the river. The areas should be constructed and maintained to allow river and riparian use without unnecessary damage to the system.

N1.2. Provide a wide range of publicly accessible recreational experiences and environments, in order to minimize pressure on private property and unmanaged areas.

N1.3. Establish the use of signs and/or other passive deterrents to curtail trespass on private property, or unmanaged access to public property in areas not designed for public use. An educational outreach effort should be ongoing that describes the reasons for not allowing unrestricted access to portions of the Napa River and its tributaries.

N1.4. Encourage golf courses, parks, and other public and private recreation areas to protect the streams through the properties by shielding them from direct access except in areas designed for access.

N2. Manage public areas to minimize soil disturbance and threats of erosion. *Trails, picnic areas, parking lot perimeters and roads all present possible erosion source sites.*

N2.1. Design trails with waterbars and other erosion prevention techniques.

N2.2. Maintain erosion control practices as a priority fall activity in public trail areas.

N2.3. Provide informational signs to inform the public of erosion hazards.

N2.4. Control vehicle access to limit vehicles in unpaved areas.

N2.5. Provide sediment control for areas cleared by heavy foot traffic, such as picnic areas and meeting sites.

N2.6. Carefully design trails to minimize damage from mountain bicycles and horse traffic.

N3. Increase awareness of the impacts of aquatic recreation, particularly in the estuary. *The use of boats and other water craft is rapidly increasing in the Napa Valley, with most of the increase occurring in the Napa estuary below*

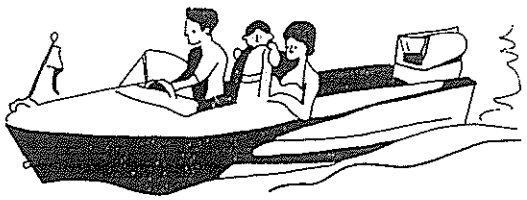
the Third Street bridge in the City of Napa. With increased use comes increased exposure to environmental hazards, and a need to increase the awareness level of recreational boaters.

N3.1. Limit boat speeds in the estuary or near lake shores to protect against bank erosion from boat wakes.

N3.2. Provide adequate public restroom facilities in recreation areas expected to be regularly utilized by the public.

N3.3. Promote regular volunteer litter control programs in all public recreation areas.

N3.4. Store petroleum and other potentially hazardous supplies away from aquatic areas.



N3.5. Perform boat maintenance and cleaning above the waterline, and dispose of waste from cleaning in a proper manner.

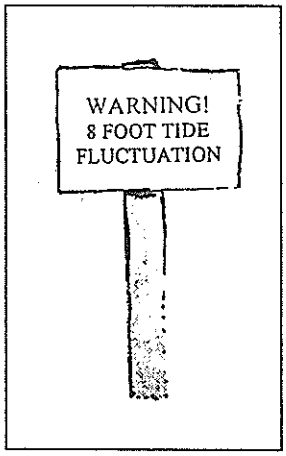
N3.6. Maintain engines in good repair, to avoid loss of fluids or excess exhaust into waterways.

N3.7. Properly dispose of septic wastes in approved facilities only.

N3.8. Subdrains from fertilized areas should be drained across a vegetated filter strip before entering the stream.

N3.9. Clearly mark sensitive and shallow areas to notify boaters of sensitive habitat zones.

N3.10. Provide signage in the estuary to warn of tidal fluctuations and to give instruction on the proper means of anchoring vessels or securing boats to shore in the tidal zone.



N4. Data management and public outreach

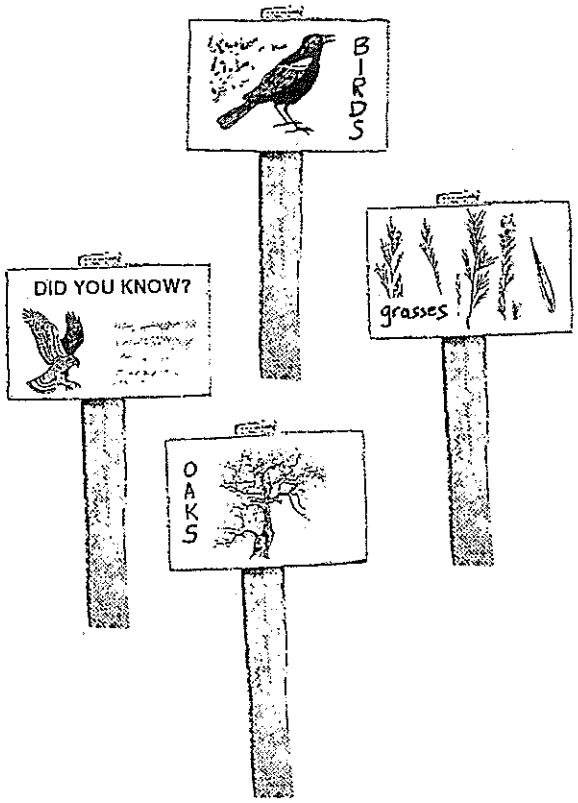
Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.

N4.1. Increase public awareness of sensitive and endangered species in the watershed through brochures, trail signs, lectures, and press releases.

N4.2. Maintain public awareness of the impacts of poaching on watershed resources.

N4.3. Encourage the expansion of regular community volunteer maintenance of public parks and recreation areas.

N4.4. Develop a sponsorship program to establish greater signage in wildlife areas to identify natural resources, such as vegetation species, wetland types, geologic phenomena, and animal habitat types.



N4.5. With the cooperation of the USDA Natural Resource Conservation Service, develop an erosion hazard inventory and management recommendations for all public recreation areas in the watershed.

Section IV: Recommendations by Type of Resource:

- **O. Aquatic**
- **P. Riparian**
- **Q. Upland**
- **R. Social, Civic, and Institutional**

O. RESOURCE TYPE:

AQUATIC

Background

Aquatic resources are those found in the ponds, lakes, wetlands and rivers that have standing or moving water at some time during the year. The aquatic resources of the Napa River watershed range from salt water and brackish water marshes near the estuary at the mouth of the river, to the freshwater streams and riparian wetlands along the upper reaches of the watershed. The aquatic resource base is a complex blend of continuously changing habitat. Habitat characteristics found in any given area in the rainy season will be different than those in the same area during the dry season. Salt water movement into the estuary in the city of Napa during the summer reverses in the winter, and seasonal wetlands that teem with life in the winter become dormant and dry in the summer. These variations in aquatic habitat can provide the basis for a wide variety of biological diversity to support a healthy, complex watershed system.

Natural, healthy headwater stream
From *Riparian Forest Buffers*, USDA Northeastern Area

Aquatic habitats support recreational activities such as fishing, boating, and swimming. They also serve as the breeding grounds for many types of commercially important fish such as salmon, trout, striped bass and sturgeon. Most of the species listed by the State and Federal governments as rare, threatened, or endangered (such as the California freshwater shrimp and Mason's lilleopsis) in the Napa River watershed, also live in or are dependent on, the aquatic habitat resource. Farm ponds and reservoirs are also aquatic habitats that support economic and biological functions in the watershed.

O1. Increase habitat quality. *One way to increase net useable aquatic habitat is to make existing habitat more productive by increasing the quality of the habitat.*

O1.1. Manage urban storm water runoff to protect the quality of receiving waters:
  a) stencil storm drains to alert residents to the direct inflow to the river from the drains
  b) sweep, rather than wash, paved areas to collect pollutants before they enter the river system
  c) encourage the use of permeable materials for parking lots, walkways, etc.
  d) direct storm gutter outlets underground to provide percolation of rainwater into the soil.

O1.2. Manage public access areas to restrict traffic impacts to small controlled and protected areas.

O1.3. Establish streamside buffer strips to filter runoff and provide shade.

O1.4. Provide off stream watering areas for livestock.

O1.5. Filter runoff from confined animal facilities, including small horse pastures.

O1.6. Regularly inspect on site waste disposal systems (leach fields) to ensure proper functioning .

O1.7. Parks, golf courses, cemeteries and playing fields should adopt low pesticide and fertilizer use management techniques to eliminate tainted runoff into drainages.

O1.8. Utilize the periodic hazardous waste collection events sponsored by the County Agricultural Commissioner and other agencies to dispose of unused or unneeded toxic products.

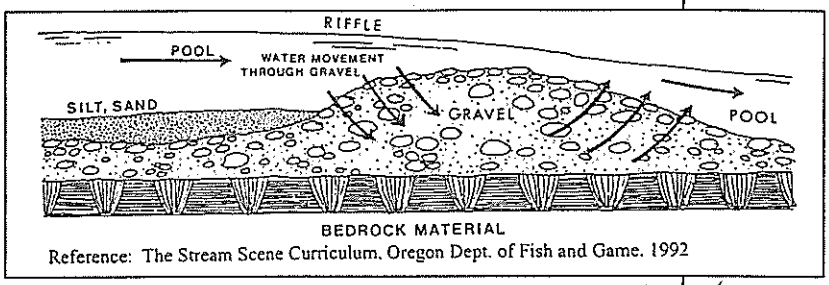
O1.9. Keep motor vehicles in good repair to avoid loss of petroleum products, antifreeze, and other automotive fluids.

O1.10. Monitor gravel spawning bed status in stream channels:.

a) for excess sediment

b) for insufficient gravel (such as below impoundments)

c) for adequate gravel size distribution



Reference: The Stream Scene Curriculum. Oregon Dept. of Fish and Game. 1992

O2. Increase habitat quantity. *A second means to increase aquatic habitat is to increase its spatial extent by construction of new habitat, or restoration of lost habitat.*

O2.1. Instream structures should be altered where necessary to facilitate upstream migration of fish in order to provide access to more extensive spawning areas.

O2.2. New instream structures should be built if necessary to allow upstream migration of fish. Areas near the river and its tributaries should be converted to appropriate wetland habitat where economically and scientifically feasible.

O2.3. Use of wetland filters for dispersal of treated wastewater should be developed where appropriate.

O2.4. Provide shading with riparian tree cover in presently unshaded reaches of the river and tributaries, in order to allow areas to become useable by fish.

O2.5. New developments should utilize riparian areas as enhanced amenities, rather than as separated drainage channels as part of their open space development.

O2.6. Where possible without increasing flood threat, flood control channel banks and drainage ditches should be vegetated to decrease evaporation and water temperature.

O2.7. Investigation should begin on the feasibility of joint water treatment facilities for wineries, developing wetlands as biofiltration systems.

O3. Increase awareness of the impacts of aquatic recreation, particularly in the estuary. *The use of boats and other water craft is rapidly increasing in the Napa Valley, with most of the increase occurring in the Napa estuary below the Third Street bridge in the City of Napa. With increased use comes increased exposure to environmental hazards, and a need to increase the awareness level of recreational boaters.*

O3.1. Limit boat speeds in the estuary or near lake shores to protect against bank erosion from boat wakes.

O3.2. Provide storage for petroleum and other supplies away from aquatic areas.

O3.3. Perform boat maintenance and cleaning above the waterline, and dispose of waste from cleaning in a proper manner.

O3.4. Maintain engines in good repair, to avoid loss of fluids or excess exhaust into waterways.

O3.5. Properly dispose of septic wastes in approved facilities only.

O3.6. Clearly mark sensitive and shallow areas to notify boaters of sensitive habitat zones.

O3.7. Provide signage in the estuary to warn of tidal fluctuations and to give instruction on the proper means of anchoring vessels or securing boats to shore in the tidal zone.

O4. Data management and public outreach: *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

O4.1. Establish a reliable and consistent method of monitoring sediment loading in the Napa River system, both from sediment generated in the watershed and from sediment transported by tidal action from San Pablo Bay.

O4.2. Expand the volunteer monitoring program operated through the Riparian Station database sponsored by the RCD.

O4.3. Complete a fisheries and aquatic habitat assessment for each of the major tributaries to the Napa River.

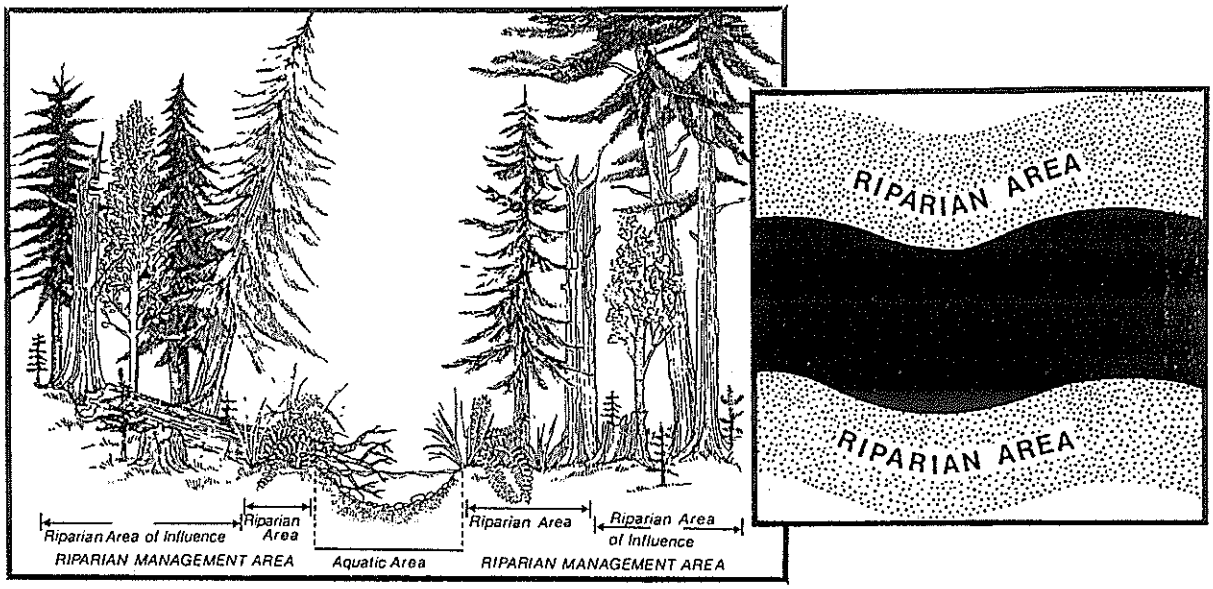
O4.4. Support the use of aquaria and native fish rearing as a part of the school curriculum developed by the RCD.

P. RESOURCE TYPE:

RIPARIAN

Background

Riparian areas are those portions of the watershed that border the river, streams and creeks. Typically, the flood plains as well as the channel banks are included in the riparian area. Riparian areas cover only a relatively small portion of the watershed, yet their functions are of significant importance in maintaining biological diversity. The type and amount of vegetation and management of the riparian corridor is directly related to and interdependent with, the nature of the stream channel itself.



Reference: The Stream Scene Curriculum. Oregon Dept. of Fish and Game. 1992

Riparian areas can furnish a wide variety of food, water, shelter and breeding areas for wildlife; can provide water quality protection through storm runoff filtering and stream shading; can improve bank stability of streams; and can add aesthetic value to landscapes. Riparian zones can also provide harbor and habitat for organisms that are health and economic pests to the human community, such as mosquitoes and blue-green sharpshooters, (which vector a bacterial disease to grapevines). Managing corridors properly will include balancing all parts of the system such that positive impacts are emphasized and negative ones diminished.

P1.. Establish and maintain streamside buffer strips, both at individual sites and along streams through contiguous properties. *Vegetated buffer strips alongside waterways help stabilize stream banks; reduce sedimentation and introduction of pollutants into the stream by filtering runoff; provide valuable biological diversity of plant and animal species; decrease ambient summer temperatures; decrease storm runoff peaks by increasing rainfall infiltration into the soil; increase between-storm stream flows through greater recharge; and provide valuable wildlife habitat throughout the year.*

P1.1. Provide tree cover along streams to provide shade for the stream, which decreases in-stream growth of vegetation (such as willows and tules) that may block flow in wet months; decreases water temperature; decreases evaporative losses of water; decreases algal bloom and subsequent eutrophication in dry months; and increases property value.

P1.2. Use native varieties of plants, or plants whose functions are equivalent to those developed in

arid, hot summer, wet winter climates to revegetate riparian buffer zones.

P1.3. Enhance riparian cover that is contiguous across property lines to increase both wildlife habitat and real estate values.

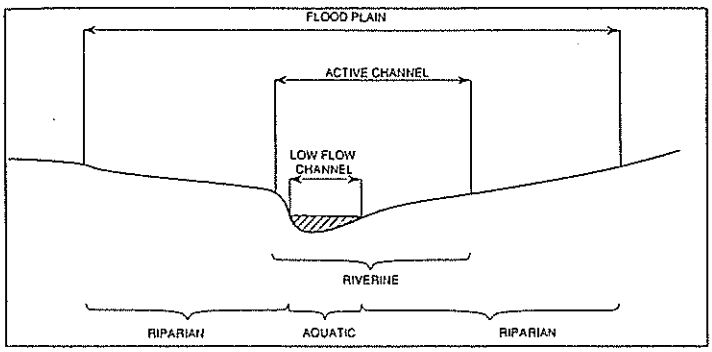
P1.4. Utilize stream side areas for open space and parks in urban developments. Large developments should be designed to enhance and emphasize any natural riparian zones in the project.

P2. Promote streambank stabilization. *One of the first noticeable effects of an unstable stream is the collapse or erosion of streambanks. Unstable banks are usually a symptom of other, less obvious problems, and repair of the failing bank does not often address the cause of the instability. Because streams are complex systems, altering one aspect of the system can have significant impacts on other aspects of the same system. Streambank repair and stabilization should always be done with careful planning and full awareness of the nature of the stream dynamics.*

P2.1. Flood control channels should be kept in functioning condition. Where possible, tree cover on channel banks should be used to control in-channel growth of vegetation.

P2.2. Provide streams with access to their flood plains where possible. Where streams are heavily incised, flood plains should be redeveloped beside the new channel at the new, lower elevation.

Channel Cross-section and Ecological Zones.



P2.3. Stream restoration should be done using techniques similar to those developed by Leopold, Rosgen, et. al. (see Bibliography and Appendices). Where possible and technically appropriate, redesign straightened reaches of stream and drainage channels using the same techniques.

P2.4. Control or eliminate livestock access to streamside areas by providing alternate, dispersed watering sites; fencing; or other practices associated with a managed grazing program. Protect livestock stream crossings and lake access points to minimize bank degradation at those sites.

P2.5. Streamside vegetation is an effective and inexpensive bank stabilization system, and should be the method of first choice in stabilization designs.

P2.6. Limit stream bank disturbing activities (such as utility installation) to the minimum amount necessary. Revegetate all disturbed areas as soon as practicable.

P2.7. Develop shoreline wetlands to diminish bank erosion along waterways, ponds and lakes.

P2.8. Remove unnecessary man made channel barriers and weirs, which frequently cause bank and channel collapse laterally from the blockage.

P2.9. Register and upgrade illegal or non-permitted water diversions.

P3. Data management and public outreach: *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

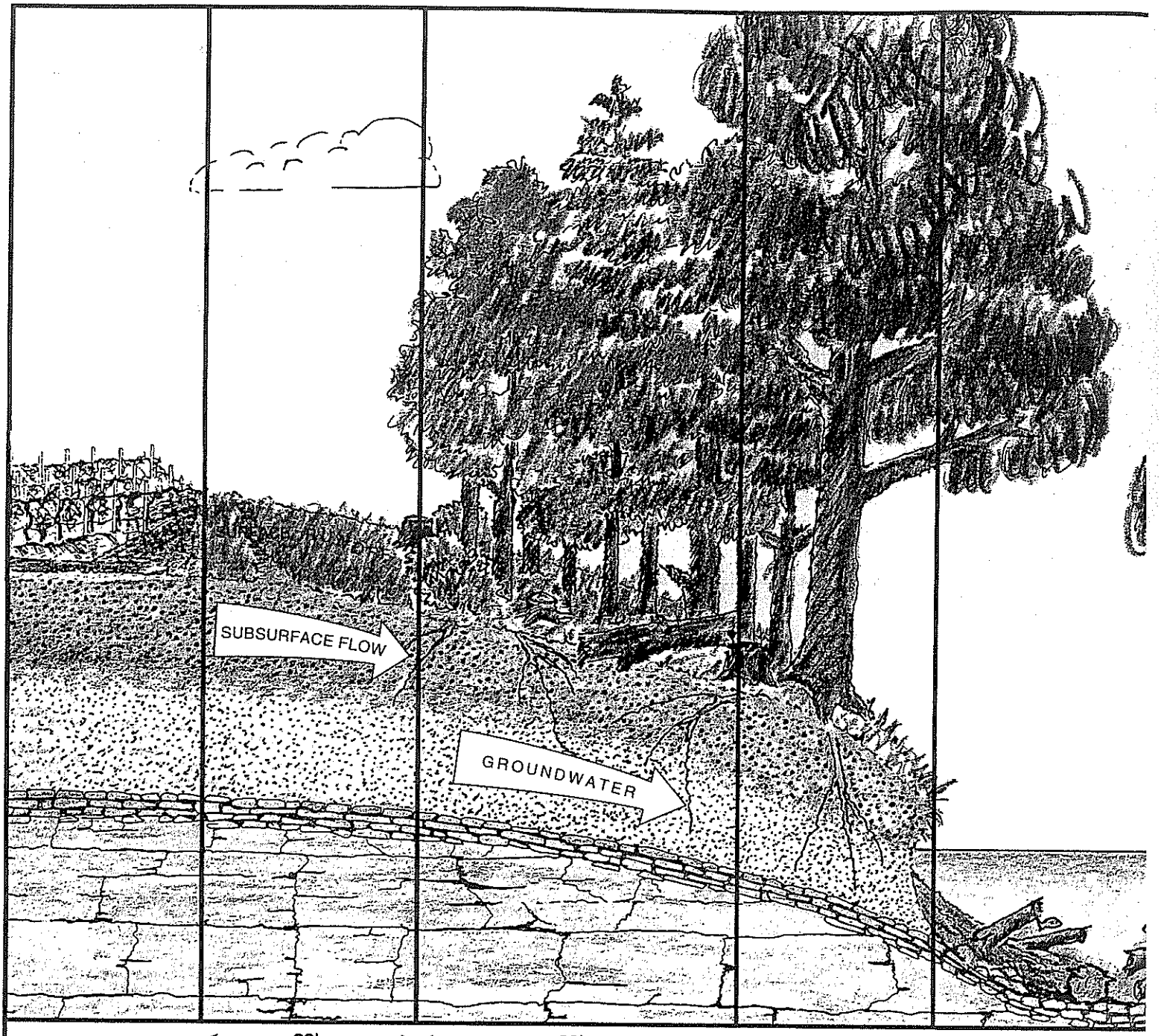
P3.1. Support the Napa school curriculum developed by the RCD to encourage development of an education and monitoring program.

P3.2. Provide training through the RCD for volunteer monitoring and database compilation.

P3.3. Establish and maintain a Riparian Station and volunteer monitoring network with sub-stations in major tributaries to the Napa River.

P3.4. Make vegetation and geomorphic mapping results available to the public through computer networks and public libraries.

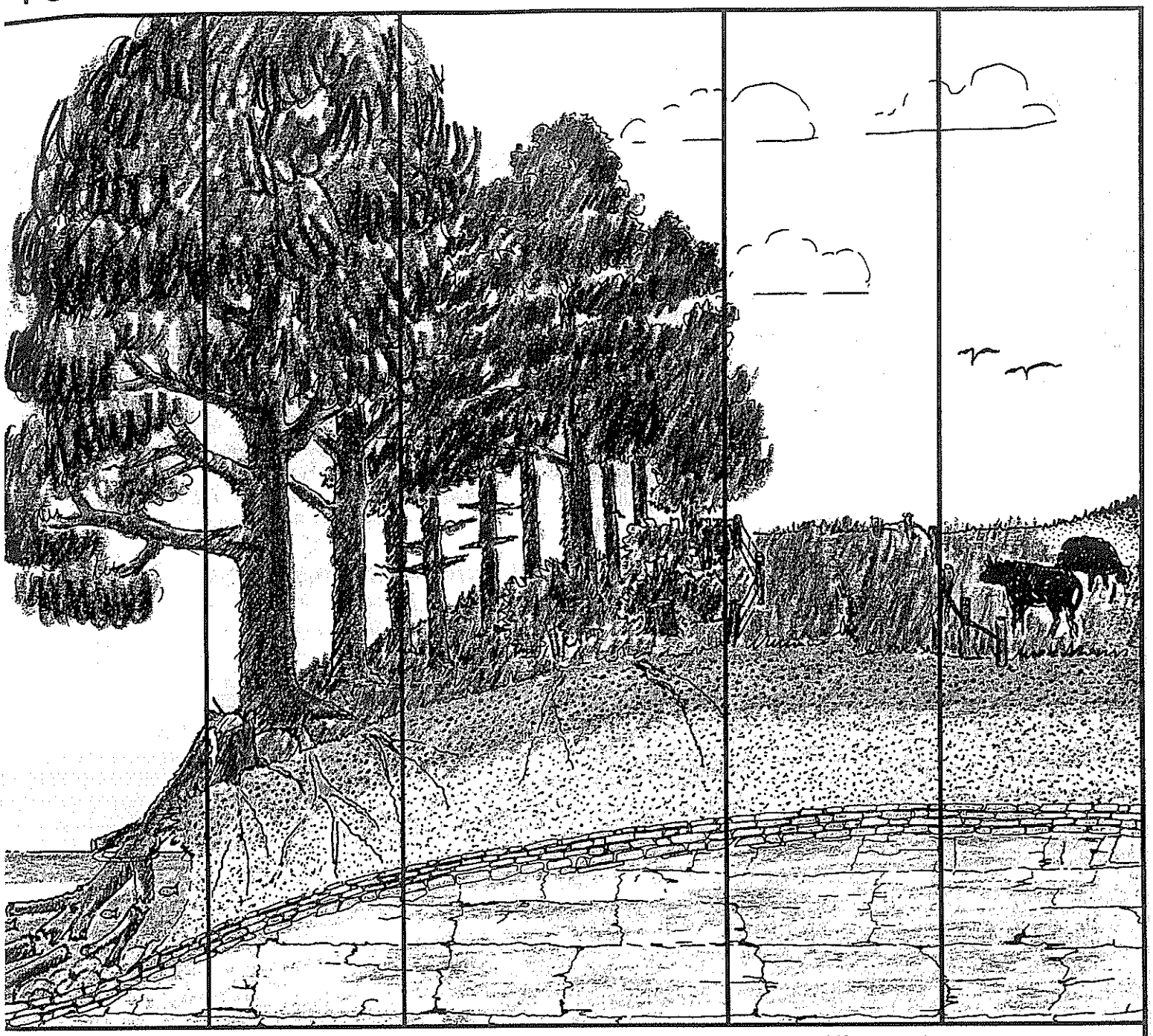
P3.5. Provide multi-lingual education materials to schools and local organizations.



20' 60' 15'

VINEYARD	ZONE 3 RUNOFF CONTROL	ZONE 2 MANAGED FOREST	ZONE 1 UNDISTURBED FOREST	STREAM
Sediment, fertilizer and pesticides are carefully managed.	Concentrated flows are converted to dispersed flows by water bars or spreaders, facilitating ground contact and infiltration.	Filtration, deposition, plant uptake, anaerobic denitrification and other natural processes remove sediment and nutrients from runoff and subsurface flows.	Maturing trees provide detritus to the stream and help maintain lower water temperature vital to fish habitat.	Debris dams hold ing by aquatic fauna and cooling shade stream dwellers.

FOREST BUFFER



15'	60'	20'	
BOTTOM	**ZONE 1 UNDISTURBED FOREST**	**ZONE 2 MANAGED FOREST**	**ZONE 3 RUNOFF CONTROL**	**PASTURE/ RANGELAND**
detritus for process- and provide cover for fish and other	Tree removal is generally not permitted in this zone.	Periodic harvesting is necessary in Zone 2 to remove nutrients sequestered in tree stems and branches and to maintain nutrient uptake through vigorous tree growth.	Controlled grazing or haying can be permitted in Zone 3 under certain conditions.	Watering facilities and livestock are kept out of the Riparian Zone insofar as practicable.

Q. RESOURCE TYPE:

UPLAND

Background

Upland habitat areas are those areas beyond the riparian zone of streams, continuing to the top of the ridges separating watersheds. Napa County's upland areas vary widely, and have the potential of being one of the most diverse biological upland areas in the San Francisco Bay Area counties. Maintenance of that diversity and the complex biological balance it represents is very important to sustaining a healthy watershed. In an agricultural area such as the Napa Valley, upland habitat is especially valuable in keeping a healthy diversity of species of plants and animals; in keeping soil erosion down to sustainable, background levels; in providing filtration of storm water runoff to protect water quality; and in increasing rainfall percolation into the groundwater storage aquifers.

In a large portion of the watershed, especially on the eastern side of the valley, oak woodland and oak grassland are the dominant upland habitat type. The western slopes are naturally covered with conifers and mixed hardwood and conifer forest. Other areas of the watershed have various upland habitats that include chaparral, grassland, rock outcrops and serpentine adapted plant communities. The remainder of the upland habitat in the watershed is made up of land uses such as vineyards, homes, roads, wineries, and recreation installations. Each of these habitat characteristics provides an opportunity for different communities of plants and animals, but the maximum benefit to each is achieved they are considered and managed as parts of the inter dependent system that makes up a watershed.

There are many things that can be done to enhance the productivity and quality of upland habitats. The following recommendations are to not only improve each type of upland habitat, but to encourage the combination of the many types into a stable, integrated upland habitat with appropriate transitions between types.

Q1. Increase quality oak habitat in the watershed. *Oak woodlands and oak grasslands are a valuable but diminishing asset in the Napa River watershed. Blue oak habitat in particular, where trees can be as old as 30 years per inch of diameter, is in serious decline. Many areas have not had new oak generations for over 70 years, leaving no replacement trees when the older ones die.*

Q1.1. Provide protection for selected volunteer seedlings.

Q1.2. Using locally collected acorns, plant new seedlings in areas that have no recent regeneration.

Q1.3. Fence or otherwise protect areas of oak regeneration until seedlings are above grazing height.

Q1.4. Increase the use of grazing management and controlled burns to encourage the return of perennial native grasses.

Q1.5. Plant appropriate companion plant species to increase the diversity of oak habitats.

Q2. Reforest, afforest, and revegetate. *One of the more significant cumulative changes in the watershed is diminished forest cover. The change has been not only in the total extent of cover, but in the spatial distribution of the remaining habitat, and the diversity within it.*

Q2.1. Reforest areas to the maximum extent feasible with native trees, shrubs, forbs and grasses, using seeds collected from the local area. This preserves the unique genetics of neighborhood species and guards against outbreaks of disease or insect infestation to which the local plants may be resistant.

Q2.2. Enhance, restore, or rehabilitate wetlands such as seeps and vernal pools in the upland areas of the watershed

Q2.3. Increase the use of hedgerows along field and property lines to provide migration areas for birds and small mammals, and other animals.

Q2.4. Encourage development of continuous east-west habitat corridors across the valley through cooperative efforts of neighboring landowners.

Q2.5. Begin a long term program to re-establish upland native perennial grasses throughout the watershed. The perennial grasses increase rainfall infiltration into the soil; decrease fuel load and fire danger; discourage intrusion of exotic pest plants such as star thistle; and provide high quality forage and wildlife habitat.

Q2.6. Assist forest regeneration through planned use of controlled burning, managed grazing, or other techniques developed through cooperative efforts

of the California Department of Forestry and Fire Protection, California Department of Fish and Game, and the UC Cooperative Extension Service.

Q2.7. Create a task force to investigate the feasibility of establishing small scale sustainable timber production and harvest on private lands in the watershed.

Q3. Increase public awareness of the value of upland habitat protection and enhancement. *The connection of upland regions with the river and estuary should be emphasized through public education programs to increase understanding of the way a watershed functions.*

Q3.1. Provide a wide range of publicly accessible recreational experiences and environments in upland areas. Produce and distribute trail brochures, fact sheets, and trail side signage.

Q3.2. Support the introduction and use of the Resource Conservation District school curriculum units that relate to upland habitats and the effects of upland land use on that habitat.

Q3.3. Encourage frequent presentations by resource agency representatives to public and private organizations to give information about the characteristics and values of upland habitats.

Q3.4. Conduct tours and field trips to demonstrate the effectiveness of cooperative habitat enhancement by landowners.

Q3.5. Provide regular educational programs for homeowners in proper use of fertilizers and pesticides around the home.

Q4. Reduce pesticide and fertilizer use... *Both urban and rural pesticide and fertilizer use can present threats to upland habitats when improperly used. They can also be beneficial tools when appropriately used. Development and use of alternative methods of pest and nutrition management can lessen the threat of negative impacts on upland habitats.*

Q4.1. Use Integrated Pest Management in agricultural areas, commercial landscaping, and private home maintenance.

Q4.2. Develop and use pest computer models using California Irrigation Management Information System (CIMIS) data from the three Napa Valley CIMIS stations.

Q4.3. Develop and use low-input management plans for golf courses, sports fields, cemeteries, parks, and other public areas.

Q4.4. Continue extensive investigation into the use of both permanent and annual vineyard cover crops for soil nutrition management.

Q4.5. Plant roadsides with perennial grasses and mow road shoulders and median strips in place of complete vegetation removal.

Q5. Reduce negative impacts of residential maintenance on upland habitat. *Home and small farm maintenance should be done in a thoughtful manner to avoid degradation of surrounding uplands.*

Q5.1. Regularly inspect on-site disposal systems (septic tanks and leach fields) to ensure proper functioning, and promptly repair malfunctioning systems.

Q5.2. Where possible, utilize permeable surfaces for patios, driveways, car parks and other paved areas.

Q5.3. Utilize low water consuming native plant materials for landscaping

Q5.4. Provide upland wildlife habitat enhancements such as birdhouses, raptor roosts, and bat boxes.

Q6. Data management and public outreach: *Communication, education, and monitoring are critical aspects of systems management. More complete knowledge of watershed conditions allows more creative options for maintaining system balance. A community that has a high degree of awareness of the condition and trends of their watershed is better equipped and more likely to manage the watershed in a thoughtful, sustainable manner.*

Q6.1. Encourage local organizations and neighborhoods to conduct tree planting programs in upland areas, with particular emphasis on oak regeneration.

Q6.2. Improve public awareness of the negative impacts of poaching on watershed systems.

Q6.3. Develop general habitat typing maps for watershed uplands using Wildlife Habitat Relationship guidelines.

Q6.4. Increase public awareness of sensitive habitats and special status species in upland areas through publications, presentations to local groups.

R. COMMUNITY RESOURCES:

SOCIAL, CIVIC, AND INSTITUTIONAL RECOMMENDATIONS

Background

Natural resources are not found as separate and independent parts of a watershed. Their condition, availability and usefulness is often affected by our social systems, and by the institutions we have established to support those systems. Human activities are not the antithesis of natural systems, but may be seen as part of the natural system. Public recognition of the need to include natural resource stewardship in the implementation of social policy is demonstrated in such laws as the California Environmental Quality Act, and the National Environmental Protection Act. There are many less sweeping changes we can make, however, that will have positive impacts on our local natural resources.

Increased communication and education are critical elements of any system management plan. Increased communication can improve the quality of information available to the community, and to the many different levels of government that have activities in the Napa River basin. The following recommendations are intended to promote more coordinated planning and management for and of the Napa Valley by its residents.

R1. Encourage and support wide availability of watershed management technical information to the residents of the Napa River Watershed. *Perhaps the most significant step towards establishing a sustainable river ecosystem is to provide access to information and education about watershed functions and how to sustain them.*

R1.1. Encourage the establishment of a "watershed management" section at local public libraries that includes the reference materials cited in the Bibliography of this Manual, and other pertinent information about watershed management.

R1.2. Begin regular (monthly or weekly) columns in local newspapers to promote watershed management and awareness.

R1.3. Develop community cooperative "Watershed Fairs" that promote watershed protection and enhancement and for demonstration of new products, techniques, ideas, and local successes.

R1.4. Support the use of the Napa County Resource Conservation District watershed school curricula in Napa Valley schools.

R1.5. Provide a copy of this Manual to each new purchaser of property in Napa Valley, and through such groups as Welcome Wagon.

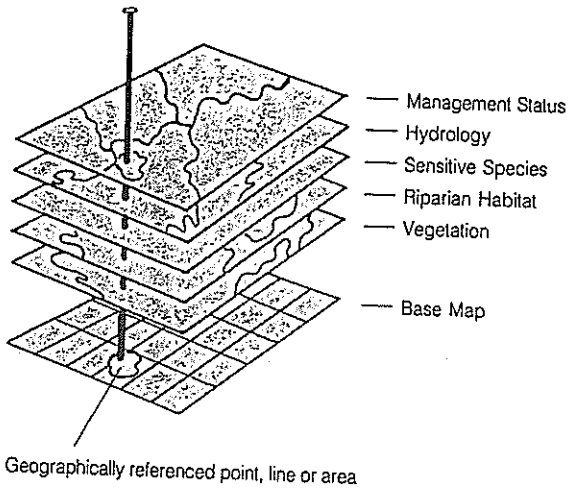
R2. Establish a central Geographic Information System (GIS) to receive monitoring data from watershed Riparian Stations and other sources. *A central database for collection of data and analysis of watershed conditions will allow local governments, trade associations, interest groups and individuals to have access to up to date information for use in project planning and land management.*

R2.1. Establish and maintain access points to the GIS at city and county planning offices, the Resource Conservation District office, and at the Napa Public Library.

R2.2. Investigate the feasibility of designing regulation required monitoring to follow the monitoring protocols established as part of the implementation of this plan, in order to expand the data available for inclusion in the GIS.

R2.3. Develop maintenance and calibration strategies to continually improve the accuracy of the GIS.

R2.4. Assess the location and function of Riparian Stations on a bi-annual basis to determine effectiveness of Station location and operation.



Geographic Information System
From California Rivers Assessment, National Park Service. 1994

R3. Complete and maintain the watershed computer model at the Resource Conservation District. *The model will be used by local governments, individuals, and educational institutions for analysis of planning options and for watershed status assessment.*

R3.1. Develop a strategy for ongoing calibration of the computer model as more information and experience become available.

R3.2. Establish compatibility of the model with the GIS, in order to keep the model current.

R3.3. Assess and adjust monitoring strategies no less often than bi-annually to further refine the model accuracy.

R4. Encourage the formation of an* ad hoc *group of representatives from governments; business and development interests; agriculture interests; and citizen special interest groups to recommend methods of developing consistent enforcement of existing conservation regulations. *Inconsistent enforcement of resource conservation regulations often results in less effective natural resource protection than intended. In many cases, it also creates uneven competition when enforcement is sporadic or ineffective.*

R4.1. Evaluate the feasibility of "single plan" development for satisfaction of all local environmentally related regulation.

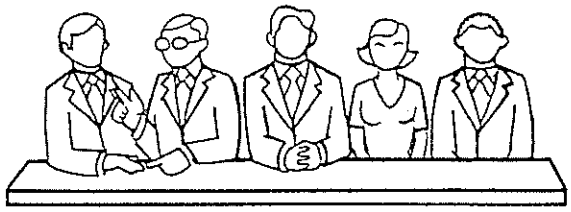
R4.2. Increase availability of information regarding regulatory requirements by producing a single source reference that describes all local, state, and federal environmental regulations that may apply the Napa River watershed.

R4.3. Examine the feasibility of providing a single clearing house for permit applications and issuance relating to natural resource protection regulations.

R4.4. Assess the enforceability of resource related regulations and make recommendations for improvement, if necessary.

R4.5. Recommend methods to increase communication and cooperation amongst regulators to lessen conflict and duplication of requirements.

R5. Provide a continuing forum for information and technology exchange amongst the private and public sectors. *Regular information exchange is an important element of coordination of resource conservation efforts. Open communication can provide a means to relate concerns, interests and issues among the community.*



R5.1. Hold an annual public forum including local, state and federal agency representatives to discuss policy changes; present and future programs; administrative expectations; and new legislation.

R5.2. Establish an *ad hoc* Inter-Agency County-wide task force to help coordinate natural resource protection planning and regulation.

R5.3. Establish an information sharing method to allow coordination and mutual assistance for County, municipal, and other public entities to develop and manage required National Pollutant Discharge Elimination System (NPDES) permits in the watershed.

R5.4. Provide access to the coordinated NPDES permit plans to private entities for use in development of project based NPDES permits.

R5.5. Establish an informal consultation among municipalities and the County to discuss coordination of General Plan language.

R5.6. Provide continuing informal exchange among local government; agricultural; development; construction trade; and community interest group representatives, to help develop consistency and effectiveness of existing regulatory programs.

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There are available at the Napa County Resource Conservation District office many documents, conference proceedings, and educational and curriculum materials not referenced here. If you want more information about a specific subject, please contact the RCD office: 1303 Jefferson Street, 500 B, Napa, CA 94559, 707-252-7049.