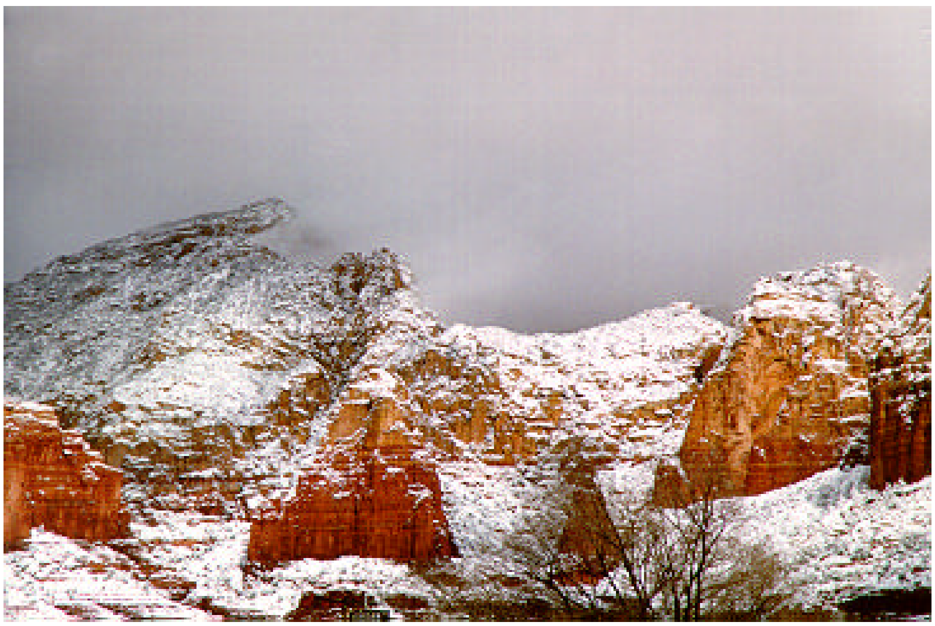
# FINAL
# Verde Watershed Association

## 2000 Watershed Restoration Action Strategy



Prepared in conjunction with the Verde Watershed Association
Natural Resource Committee and approved by
the General Membership on May 16, 2000.

Robert B Hardy

Robert Hardy, Chairman

# Verde Watershed Association

## 2000 Watershed Restoration Action Strategy

# SUMMARY


The Verde Watershed Association (VWA) was formally organized in 1993. The Association is made up of concerned citizens from the community, users of the Verde watershed resources, and local, State and Federal agencies. Members have aided in determining the areas of greatest concern, as well as initiating identification of the sources of its water and the real and potential threats of pollution to these waters. In addition, The VWA has initiated and/or participated in programs to remedy these concerns. It is important to understand that this is a locally led effort with the role of Federal and State governments being that of administrative assistance and technical support.

Throughout the existence of the Verde Watershed Association, there has been multiple agency/entity cooperation and successes. A few of the notable sucesses include the following: the Verde Cooperative River Basin Study; the establishment of Verde information Libraries around the watershed; participation in Verde River Days; the development and continuation of the upper and middle Verde Watershed studies; the Pecks Lake Study; the Stoneman Lake Study; the "Water Conservation and Golf Courses in the Verde Valley" Report; letters of support from nearly all of the towns,cities and counties within the watershed; leadership in the Arizona Alliance; and more.

The content of the Verde Watershed Association (VWA) Watershed Restoration Action Strategy (WRAS) includes information and guidance on the characteristics of the watershed, land ownership, potential sources of pollution and a description of the infrastructure. The infrastructure is continually evolving in order to address current concerns and, to initiate plans for responses to these concerns. This document is subject to periodic review and update, and is intended to serve as a guidance document for the VWA, while meeting the requirements of the Clean Water Action Plan WRAS Guidelines.

# MISSION STATEMENT

"The Verde Watershed Association is founded on the principle that wise and sustainable use of water resources is best accomplished by a voluntary association of members of the watershed communities, working together to understand both the watershed and each other. Such understanding will be the basis for resolving conflicts and promoting cooperative use of the water resources."

**Prepared by:**
**Verde Watershed Association**
**VWA Natural Resource Committee**
**Carvel R. Burtsell**
**Daniel Salzler**



**INTRODUCTION**

This plan supports the goals and objectives of the Clean Water Action Plan by bringing together Local, State, and Federal resources, as well as those of private businesses, organizations, and individuals to facilitate actions and projects, within the Verde Watershed. The purpose of the actions and projects is to evaluate and/or ameliorate natural resource issues of the Verde Watershed. The General Membership of the VWA initially adopted the plan for the watershed in October 1999 and finalized it in March 2000.

The State's WRAS requires broad public support, strong partnerships, and community leadership for the development and implementation of management strategies and remediation of stresses on the natural resources that are endorsed by existing local partnership groups with broad representations. This plan provides a description of the existing conditions and issues in the Verde Watershed and proposes ongoing and future projects within the watershed. It will be updated periodically to evaluate implementation projects, making it a continuous, forward-looking plan. The actions and projects resulting from or listed in the plan will be issue driven, as determined by the VWA, and will appear in the revised plan and the association Web site (http://vwa.southwest-water.org).

## I. GOALS AND OBJECTIVES

A. Goals of the Plan

1. Conserve natural resources and enhance the environment for all users.
2. Sustain, improve and diversify recreational opportunities.
3 

   improve water quality and water quantity.
4. Sustain, enhance and improve the environment for wildlife.
5. Reduce damage from storms, floods, man-made activities and/or natural disasters.
6. Engage and maintain public and governmental involvement including Local, State, Federal, and Tribal governments, through public outreach and education. A few of the specific outreach goals include:
   a. Enhancement of the Web site (http://vwa.southwest-water.org).
   b. Development of a multi- media, water quality/ water quantity campaign.
   c. Development of a Speakers Bureau to address local groups on the existence of the VWA and its programs.

B. Objectives of the Plan

1. Gain and share a better understanding of the characteristics and dynamics of the watershed and how it impacts the quality of life of those who live within the watershed.



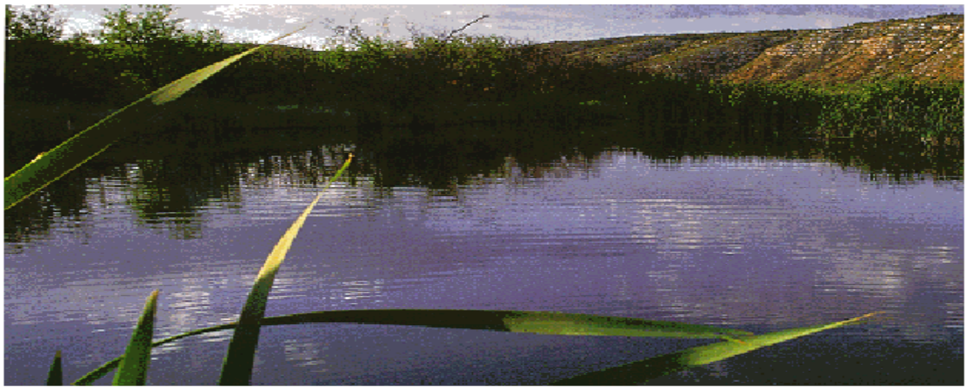
2. Prepare comprehensive lists of issues and concerns of the populace and of Local, State

and Federal governments relating to point and non-point source pollution in the watershed.

3. Identify and quantify the origins of point and non-point source pollution in the watershed.
4. Establish or aid in the development of monitoring programs for point and non-point source pollution.
5. Encourage action agencies, individuals and other governmental and non-governmental entities to use locally appropriate management practices (LAMPs) to reduce or eliminate point and non-point source pollution.
6. Encourage fair and equitable actions through public involvement.
7. Coordinate environmental planning and implementation with agencies, governments, environmental advocacy groups, and other private sector interests.
8. Provide a forum to foster ongoing evaluation and improvement of environmental programs and regulations.
9. Promote and sponsor public educational and outreach seminars and workshops for participants interested in learning about the watershed, water quality and quantity issues, and develop possible solutions for improvement.
10. Assist local communities and groups in priority setting for environmental problems and provide a sound technical basis to support environmental decisions.
11. Organize, store, and distribute information to the public on the watershed in general, upland areas, reaches of the river, urban areas, and valley areas.
12. Obtain grants and contracts related to watershed resource issues and concerns.

## II. DESCRIPTION OF THE WATERSHED

The Verde watershed focus area totals 3,266,693 acres (See Appendix A). The focus area starts at the northern part of the basin to the Plateau uplands and the Southern part extends into the Central Highlands Province. The watershed consists of approximately 68,919 acres of Tribal land; 416,434 acres of State and Federal land; 940,766 acres of private land; and 1,806,288 acres of U.S. Forest Service land.



The principle uses of the watershed land include grazing, irrigated agriculture, recreation, and some mining and silvacuture. A partial list of the recreational uses includes the following:

| | | |
|---|---|---|
| Hunting | Boating | Kayaking |
| Sailing | Fishing | Swimming |
| Canoeing | Hiking | Camping |
| Jogging | Off Road Vehicles | Group Gatherings |
| Painting | Photography | Wading |
| Picnicking | Sun Bathing | Bird Watching |
| Horseback Riding | Grazing | |

Hydrogeology of the Big Chino Sub-basin

The principal aquifer of the Big Chino sub-basin consists of widespread basin-fill sediments interbedded with basalt flows and alluvial sands and gravels in the major washes (Wallace and Laney, 1976). These deposits contain unconsolidated to moderately consolidated silts, sands, gravel, and interbedded volcanics and clays, and are bounded by low-permeability crystalline and consolidated rocks. Groundwater occurs under both water table (unconfined) and artesian (confined) conditions. Typically, confined conditions occur where buried lava flows are interbedded with clays and volcanic ash. Groundwater levels in wells range from above land surface due to confined conditions to over 200 feet below land surface. Wells can produce over 1,000 gallons per minute (Wallace and Laney, 1976).

Recharge to the Big Chino sub-basin is from runoff along the mountain fronts and the major washes; the amount of recharge is unknown. Discharges from the sub-basin include groundwater pumpage and surface water overflow. In 1984, 3,000 acre-feet were pumped for irrigation and domestic use a total of 16,000 acre-feet per year leaves the basin as surface water baseflow (Owen-Joyce and Bell, 1983). About 1,500 acre-feet per year of that comes from the Del Rio Springs (Arizona Department of Water Resources, 1991) which is in the Prescott AMA. Groundwater outflow as underflow is negligible. Groundwater, stored in the Big Chino sub-basin to a depth of 1,200 feet below land surface, has been estimated to be 8,000,000 acre-feet (Arizona Department of water Resources, 1988). Groundwater declines of less than 23 feet have occurred from the early 1950's to the mid 1970's in the lower part of the Big Chino sub-basin near Paulden (Wallace and Laney, 1976).

Hydrogeology of the Verde Valley Sub-basin

The Verde Valley sub-basin includes 2,600 square miles bounded by the Mogollon Rim to the northeast, Big Black Mesa to the northwest, the Black Hills to the southwest, and Fossil Creek to the southeast.

The shallow alluvial aquifer occurs within the floodplain of the Verde River and saturates gravels, sands, and silts to a thickness of less than 50 feet. The principal aquifer occurs in a thick sequence of flat-lying limestones throughout the area. Groundwater, as does surface water, follows the surface gradient towards the Verde River and exits towards the southeast through the Verde Canyon. Groundwater levels in wells tapping the principal aquifer occur generally at a depth less than 800 feet below land surface (Owen-Joyce and Bell, 1983). In most areas groundwater occurs under unconfined conditions, however; confined conditions do exist locally within the Verde formation. Generally, all aquifers are hydraulically connected. Wells produce an average of about 30-150 gallons per minute. Where present, faulting, fracturing, and solution cavities increase well yields, which may exceed 1,000 gallons per minute (Owen-Joyce and Bell, 1983). In many places, locally perched sources of water from fractured or decomposed granite, and volcanic rocks provide lesser amounts to wells.

Owen-Joyce and Bell (1983) estimated average inflow to the outflow from the regional aquifer. No appreciable changes in water levels have occurred in the sub-basin. Outflow that is assumed to equal inflow in a steady-state system is essentially unchanged. Recharge to the regional aquifer is from infiltration of precipitation in the higher elevations with small contributions from surface water in lakes and streams. Total recharge to the sub-basin is estimated at 138,000 acre-feet per year. Groundwater underflow from the Big Chino sub-basin and outflow to the Verde Canyon sub-basin is assumed to be negligible (Owen-Joyce and Bell, 1983). Current pumpage is approximately 8,000 acre-feet per year. Groundwater which discharges to tributaries of the Verde River maintains a base flow of about 80,000 acre-feet per year on the Verde River at the gauging station, Verde River near Camp Verde (Owen-Joyce and Bell, 1983). Evapotranspiration and irrigation consumptive uses are estimated at 35,000 and 31,000 acre-feet, respectively. Water that is not diverted for irrigation or infiltrates back to the regional aquifer leaves the basin as surface water outflow. In Sedona, the main source of groundwater supply is from the sandstone of the Supai Formation and the underlying Redwall and Martin Limestones. Depth to water varies from about 180 to 1,000 feet below land surface.  Wells produce an average of about 70-80 gallons per minute.  Groundwater level declines of less than one foot per year have been recorded in the Sedona area (Arizona Department of Water Resources, 1992).  Groundwater underflow through the Sedona area is estimated to be about 12,000 acre-feet per year.  Current withdrawals are about 2,350 acre-feet per year.  Committed additional demands amount to about 3,227 acre-feet per year (Arizona Department of Water Resources, 1992).

The main water supply for the Town of Payson is groundwater withdrawn from weathered and fractured granite.  Some wells near the center of town have experienced water-level declines of four to five and one-half foot per year.  Wells in other areas of Payson show water level fluctuations, but no trend of progressive declines (Arizona Department of Water resources, 1990).

Groundwater is of acceptable quality for most uses in the sub-basin except near Camp Verde. Owen-Joyce and Bell (1983) reported dissolved solids, sulfate, arsenic, and fluoride concentrations in groundwater withdrawn from the Verde Formation and alluvium exceeding the maximum contaminant levels for drinking water as recommended by the U.S. Environmental Protection Agency.

## Hydrogeology of the Verde Canyon

Groundwater development is small in the Verde Canyon sub-basin.  Water from wells and springs is used mainly for stock and domestic purposes.  Water-bearing characteristics of the units, which make up the aquifers, varies greatly because of the variable topographic relief and geologic diversity.  The unconsolidated sediments which are as much as a few tens of feet thick along the stream courses may yield from 50 to several hundred gallons per minute to wells (Ross, 1977).  Basalt flows, conglomerates, and semiconsolidated silt units, which cover a large portion of the sub-basin, may yield up to 100 gallons per minute to wells and springs where sufficiently fractured (Ross, 1977).  Sandstones and Limestones near Payson and Strawberry in the northern parts of the sub-basin can yield between 10 and 1,000 gallons per minute to wells and springs, but most produce less than 100 gallons per minute.  Mountains around the perimeter of the sub-basin are virtually void of groundwater (Ross, 1977).

When last reported by the U.S. Geological Survey in 1977, there was little or no change in water levels in wells (Ross, 1977); however, below normal precipitation during the mid to late 1980's has resulted in water-level declines in public supply wells in the Pine-Strawberry area.  Pumpage for the entire sub-basin is around 2,000 acre-feet per year and the water quality is good.

## Hydrogeology of the Oak Creek Sub-basin

The Oak Creek study area lies in the transition zone between the Central Highlands and Plateau Uplands water provinces of Arizona.  Recharge to the study area generally occurs in the high elevation areas to the north on the Mogollon Rim, where precipitation averages from 20 to more than 30 inches per year. Rainfall within most of the study area averages from 10 to 20 inches per year. Groundwater in the regional aquifer is derived mainly from the infiltration of precipitation. The main area of groundwater recharge, between the Mormon Mountain anticline and the Mogollon Rim, receives an average of 18 to 22 inches per year of precipitation (Sellers and Hill, 1974). A portion of the precipitation infiltrates permeable outcrops of basalt and limestone, which provide avenues for the downward movement of water to the regional aquifer. Recharge is probably negligible since during much of the year evaporation far exceeds precipitation placing the area in a water deficit. However, during the winter months precipitation exceeds evaporation with the resulting surplus of 2 inches possibly recharging the groundwater. In addition, perennial flow in Oak Creek is sustained by groundwater flow, but there are also areas where Oak Creek recharges the groundwater system.

The main source of groundwater in the Oak Creek area is the regional Coconino aquifer, which includes the Verde Formation, Coconino Sandstone, Supai Formation, and Redwall Limestone. Data from water wells and test holes indicate that the units are hydraulically connected and probably function as a single aquifer under water table (unconfined) conditions (Levings, 1980). Darr (1989), on the other hand, suggests that only the upper most aquifers in the system that occur under water table conditions and in many cases these are perched aquifers of limited area extent. The majority of aquifers in the Oak Creek area are under confined or artesian conditions. Darr included three additional hydrostratigraphic units namely the Rim Basalts Hermit Formation, House Mountain Volcanic, and Clastic Rocks.

Groundwater moves away from the groundwater divide to the north on the Mogollon Rim through the Flagstaff area and then southward through the Oak Creek sub-basin. Within the Oak Creek sub-basin, groundwater has a generally southward flow paralleling the topography to the low-lying valley floor.  Near the Verde River, groundwater flow generally follows the axis of the river toward the southeast.

## III. WATER QUALITY

Throughout the entire focus area of the VWA, the areas of concern are varied.  The concerns include, but are not limited to heavy metals, turbidity and low dissolved oxygen.  Many of these issues will be addressed with the assistance of the VWA; the Arizona Department of Environmental Quality (ADEQ) as studies to determine if Total Maximum Daily Loads (TMDLs) and pollution prevention programs will be required.  The specific concerns found in the table below originate from the Arizona Department of Environmental Quality Impaired Waters List (CWA Section 303.d), which  can be accessed by the public through ADEQs Web site at http://www.adeq.state.az.us .

| Waterbody Name & HUC Number | Concern | TMDL Candidate |
|---|---|---|
| Beaver Creek 15060202-002 | Turbidity, dissolved oxygen | Yes |
| Bitter Creek Tributary 15060202-868 | Turbidity, heavy metals | Yes |
| Munds Creek 15060202-415 | Nitrogen & Phosphorous | Completed, awaiting EPA approval |
| Oak Creek 15060202-017 | Turbidity | Yes |
| 15060202-018 | Nitrogen & Phosphorous | Completed, awaiting EPA approval |
| 15060202-019 | Turbidity, Nitrogen & Phosphorous | Yes |
| Peck's Lake 15060202-1060 | Dissolved Oxygen & pH | Yes |
| Stoneman Lake 15060202-1490 | Dissolved Oxygen, pH & Nutrients | Yes |
| Verde River 15060202-25 | Nutrients (Nitrogen and Phosphorous, | Yes |
| 15060202-27 | including NPDES discharges) | Yes |
| 15060202-37 | Turbidity | Yes |
| Wet Beaver Creek 15060202-004 | Turbidity | Yes |
| Whitehorse Lake 15060202-1630 | Turbidity | Yes |

The following water bodies are considered impaired by the VWA due to the physical conditions of the water bodies (See Appendix B). Also see summary of the ADEQ report entitled “Ambient Groundwater Quality of the Prescott AMA: A 1997-1998 Baseline Study” in the appendix.

## IV. WATER QUANTITY

The water quantity issues in the Verde River Basin relate to potential future increased water use by a growing population. Water quantity issues identified in the Verde River Basin problem statements (Verde Watershed Association, January 1999) are:

1. Identification of hydrologic monitoring locations, such as ground and surface water, springs, etc.,
2. An understanding of the cumulative effects of groundwater pumping on the hydrologic system,
3. An understanding of the relationships between surface and ground water withdrawal and movement of water between individual sub-basins,
4. The development of a hydrologic model to include surface and groundwater relationships; and;
5. The development of a comprehensive water budget.

## V. POPULATION CENTERS

There several population centers within the Verde Watershed. The principle centers include Payson, Prescott, Prescott Valley, Sedona, Camp Verde, Cottonwood, Clarkdale, Chino Valley, and a small portion of Flagstaff. The approximate number of acres that are held as a part of a population center is equivalent to approximately 3.0% of the total acreage for the watershed focus area.

## VI. FLORA AND FAUNA

The Arizona Game and Fish Department has identified 53 different Special Status Species within the Verde Watershed (See Appendix C). Activities within the watershed need to recognize and respect these sensitive species and practice responsible husbandry for their continued protection.

## VII. STRUCTURE AND FUNCTION OF THE WATERSHED ADVISORY GROUP

A. Organization of the VWA

1. Board of Directors
   The Board of Directors is responsible for ensuring broad representations from across the watershed at all VWA meetings. The VWA has a Chair, five Vice-Chairs and a Secretary-Treasurer positions (See Appendix D).
2. General Membership
   The general membership participates in conducting VWA business at meetings, including hearing and deliberation of watershed issues.
3. Standing Committees
   Standing committees assist in the planning, implementation, and evaluation of activities of the watershed, following the responsibilities indicated in the by-laws. The standing committees have the authority to create subcommittees. Standing committees include the following:
   - a. Funding Committee
   - b. Education/outreach Committee
   - c. Legal Committee
   - d. Natural Resources Committee, and
   - e. Conservation Committee

The VWA when necessary will establish other committees. Reference Web site for more details (http://vwa.southwest-water.org).

B. Administration of Funds

The VWA has secured a 501.c.3 status from the U.S. Internal Revenue Service, as a not-for-profit educational organization.

C. Coordination of Activities in the Watershed

The VWA recognizes the need to treat the watershed holistically and consequently tries to coordinate activities undertaken to ameliorate point and non-point source pollution anywhere in the watershed. Effective watershed management requires coordination with the activities of an individual or group of citizens, farmers, ranchers, industries, businesses, federal, tribal, state, or local agencies and entities.

D. Implementing Action Plans and Projects

The VWA will prepare its own Action Plans and projects. The plans and projects proposed must be approved at a general meeting of the VWA. Due to the voluntary basis of the VWA, implementation generally will require collaboration with an action agency and/or grants, and hiring of personnel for the conduct of the specific activity. Monitoring and evaluation of the task involved will remain a responsibility of the VWA, but may be assigned to a standing committee.

## VIII. SCOPE OF THE PLAN

A. Resource issues and concerns relate to point and non-point source pollution in the Watershed. Issues can be added to the list from various sources. The VWA will identify point and non-point sources of pollution and may assist the Arizona Department of Environmental Quality in the identification of the location through Global Positioning System (GPS) and Geographic Information System (GIS) technologies.

1. Issues defined to date include the following:
    - a. Potential pollutants, which might reach the Verde River, and its tributaries and lakes
    - b. Current condition of river and lake water quality and quantity
    - c. Method of determination of river and lake quality
    - d. Condition of river and lake bank stability
    - e. Uses of and quantity of river and lake water
    - f. Condition of river tributaries
    - g. Condition of uplands
    - h. Water quality standards as related to river and lake water quality
    - i. Flood control
    - j. Public education
    - k. Drinking water - quality, quantity, source assessment and protection
    - l. Determination of proper functioning condition of the rivers

m. Improper discharge of contaminants in rivers and reservoirs
n. Grazing
o. Groundwater flow and quantities
p. Mining
q. Fertilizer runoff
r. Pesticide runoff
s. Urban runoff
t. Impact of recreational and commercial usage in the watershed
u. Signage in English and Spanish
v. Enforcement of existing laws and regulations
w. Adequate restroom facilities
x. Vehicle access
y. Management of hazardous sites on river and reservoir areas
z. Use of groundwater for golf courses

2. Coordination of management policies and practices that could affect the plan, include the work of other agencies and entities such as:
    a. Bureau of Reclamation
    b. U.S. Forest Service (USFS) regulations for grazing, road use, road maintenance, road construction, plant harvesting, recreation, and fish/wildlife habitats
    c. Arizona Department of Environmental Quality (ADEQ) NPDES permits, storm water regulations, NPS
    d. Arizona Department of Water Resources
    e. Arizona Game and Fish wildlife and fish regulations
    f. Court decrees on water use, irrigation district regulations and practices
    g. Salt River Project
    h. Water companies
    i. US Geological Survey
    j. Natural Resources Conservation Service
    k. Verde NRCD
    l. Cocopai RC&D
    m. Rocky Mountain Forest Experiment Station
    n. Northern AZ University
    o. Coconino County
    p. Yavapai County
    q. Apache Tribe
    r. Local govermnents
    s. Northern Arizona Audubon
    t. The Nature Conservancy
    u. The University of Arizona

3. Examples of existing sources of pollution to be investigated include:
    a. Construction
    b. Urban runoff
    c. Resource extraction
    d. Landfills
    e. Hydrologic/habitat modifications
    f. Recreation
    g. Pesticide and fertilizer runoff and improper disposal

4. The recommended procedure for determining Action Plans and Projects include the following:
    a. Assessment of existing conditions, including literature search for past conditions
    b. Compilation of existing data from various sources such as private parties, water companies, cities, counties, states, universities, Arizona Geological Survey (AGS), U.S. Geological Survey (USGS), Natural Resources Conservation Service (NRCS), Forest Service, BLM, U.S. Fish and Wildlife Service, Arizona Game and Fish, irrigation districts, Tribes, meteorological stations, Salt River Project, Bureau of Reclamation, the U.S. Army Corps of Engineers, and AZ Dept. of Environmental Quality
    c. Collection of new data to demonstrate present condition
    d. Evaluation of the data

5. If pertinent to the Action Plan, the following facilities and activities may be included:
    a. Past reference data
    b. Present data
    c. Land uses, land ownership, soil types, and vegetation types
    d. Agriculture, grazing, and livestock
    e. Springs, wells, and canals
    f. Recreation
    g. Silviculture and resource extraction
    h. Fuels management
    i. Flood control structures/projects
    j. Sampling programs
    k. Construction projects and sewage treatment plants
    l. Erosion control projects/structures
    m. Roads and bridges
    n. Public outreach programs
    o. Riparian modifications
    p. Urban runoff
    q. Signage
    r. Etc.

B. Watersheds Relationship to Programs in Other Watersheds

1. Due to physical and various other relationships described above, the need for close coordination of activities to be undertaken with the adjacent watersheds is evident. In addition, Federal and State agencies have responsibilities, which apply to all of the watersheds along the Verde River and its tributaries. The action plans, which are to be developed and implemented as part of this plan, will therefore be reviewed to ensure that provisions for adequate coordination have been included. Where conflicts arise or might tend to arise, the action plans must be modified to eliminate or reduce them to tolerable levels.

2. The VWA is currently working with other watersheds throughout the state in an organization known as the Arizona Watershed Alliance.

C. The Verde WRAS functions as a general forum to facilitate the transformation of community-generated desired conditions into on-the-ground projects. The VWA with Federal, State, Tribal and Local government agencies serving as technical, staffing and funding support does planning. Regularly scheduled meetings are held throughout the watershed. Efforts will be directed to incorporate recommendations of the WRAS the plans and policies of the government agencies. Methods of involvement by local universities, community colleges and elementary, middle, and high schools project work will be investigated.

## IX. IMPLEMENTATION OF WATERSHED RESTORATION ACTION STRATEGY

The VWA helps to identify small areas in which to work. All first priority areas are those where there are willing people, agencies, and/or ongoing planning. This permits more rapid implementation by developing a management plan as an example of what can be accomplished. The areas to be targeted initially are reaches or sub-watersheds with unique problems and/or potential actions.

The mix of people and agencies is different and not everybody will want or need to work on every area. Focus is on those who have a vested interest in a specific area or problem and letting them do the work. The 5-Year WRAS and the VWA provide a guiding force to help small groups accomplish their goals and tasks. WRAS development will require addressing each of the following:

1. Issues and concerns (Scoping)
2. Assessment
3. GIS database as necessary
4. Site specific Local Area Management Plans (LAMPs)
5. Actions

6. Monitoring
7. Group/Agency lead
8. Implementation schedule
9. Public outreach
10. Funding amounts and resources

Locally Appropriate Management Practices (LAMPs)

In this watershed, the term "Best Management Practices" is referred to as "Locally Appropriate Management Practices (LAMPs)". As this designation implies, the LAMPs are site-specific for a sub-watershed, rancher, industry, municipality, or reach of the river. The LAMPs are cost effective and produce the desired results. LAMPs will be reviewed before acceptance for widespread use to ensure that their application will not result in the creation of problems in the upstream and downstream watersheds. LAMPs will be formulated for general and specific sites on the watershed. One of the objectives of this plan is to develop and then recommend LAMPs for different uses and areas of the watershed.

The LAMPs will be developed from local needs in order to meet the overall water quality standards for sub-watersheds of the river and its tributaries. LAMPs relate to the past, present, and future land use of the watershed. Some examples of land use are urban, riparian, agricultural, wilderness, mining, commercial, water supply, or flood control. In each of these areas different LAMPs apply. By following the LAMPs, pollution prevention is maximized.

Approach for Resource Management

The VWA has a six-phase approach
for resource management and improvement:

1. Evaluate existing data
2. Validate data
3. Identify issues
4. Develop LAMPs (BMPs)
5. Implement LAMPs (BMPs)
6. Monitor LAMPs (BMPs)

Involving Local Communities and People

The VWA will facilitate consultation and coordination with interested parties. A consensus-based approach will be used to include a wide variety of Federal, State, Tribal, public, industry, and land users/owners for supportive action. This will provide a strong framework for guidance of future point and non-point source pollution control programs. Consultation and coordination



will be accomplished through collaboration to achieve new programs, technical assistance, will be accomplished through collaboration to achieve new programs, technical assistance, monitoring, and supportive action. The following institutions and agencies have been identified as potential resources to assist the efforts of the VWA:

Arizona Cattlemen's Association
Arizona Department of Environmental Quality
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona Geological Survey
Arizona State Land Department
Arizona State Parks
Arizona State University
City of Cottonwood
City of Payson
City of Prescott
City of Sedona
Coconino County
Cooperative Extension Service
Farm Bureau
Gila County
Northern AZ Council of Govt.'s
Northern Arizona University
Salt River Project
The Nature Conservancy
Town of Camp Verde
Town of Clarkdale
Town of Jerome
University of Arizona
US Army Corps of Engineers
US Bureau of Indian Affairs
US Bureau of Land Management
US Bureau of Reclamation
US Environmental Protection Agency
US Fish and Wildlife Service
US Forest Service
US Geological Survey
US Natural Resources Conservation Service
Valley Irrigation Districts
Verde Watershed Association
Water Companies
Yavapai County

Costs of Implementing Management Plans and Projects

Budgets for implementing Management Plans and projects include direct and indirect costs to the implementing entity and sponsors of the resulting projects.

Traditional budget line items will be used in developing the budgets for WRAS. Included will be salaries and wages, fringe benefits, operations, capital equipment, and indirect (overhead) costs.

The benefits of the WRAS and ensuing projects must be identified and discussed. Beneficiaries of the WRAS and their relationship to who pays the budgeted costs also must be identified and discussed.

Implementing the Plans

The VWA through appropriate means will implement the WRAS. Implementation of other Federal or State management plans are the responsibility of the resource holder, although the VWA itself may develop plans or assist in developing plans. Efforts will be made by the VWA to integrate their project and WRAS with those plans of other Federal, State and other entities. Plans must be approved at a meeting of the general membership. The VWA will continue its coordination role during the implementation phase. Steps in implementation will generally include the following, not necessarily in the following order:

1. Submit WRAS to potential funding agencies
2. Modify plans as suggested by potential funding agencies
3. Submit revised plans
4. Wait for the grant money
5. Begin implementation according to approved schedules
6. Collect background data
7. Obtain necessary permits
8. Prepare bids as required for goods and services
9. Purchase goods
10. Hire services
11. Establish monitoring and evaluation activities
12. Organize volunteers as appropriate
13. Train staff and volunteers
14. Prepare reports

Monitoring Results

All projects will include a pre-implementation monitoring program with a Sampling Plan and Quality Assurance/Quality Control Plan attached. After completion of a project based on a



WRAS, long-term monitoring of results will demonstrate the success of the actions taken. The

WRAS, long-term monitoring of results will demonstrate the success of the actions taken. The VWA will provide the continuity needed to evaluate the current and future impacts on the watershed and the success in achieving the desired outcomes.

1. Results of the assessment of past and present conditions will be used for the following purposes:
    a. Reveal the most useful indicators for monitoring environmental change
    b. Detect magnitude and duration of changes in conditions
    c. Formulate and test hypotheses about the causes of the changes
    d. Understand the causes and predict impacts
    e. Manage the watershed for desired outcomes
2. Characteristics of good monitoring indicators:
    a. Answers a specific question
    b. Has a low spatial and temporal variability
    c. Easy to measure (accurate and precise)
    d. Relate directly to the actions taken on the watershed
    e. Represent broader or more complex processes within the watershed

1. Arizona Water Resources Assessment, 1994. AZ Dept. of Water Resources.
2. Arizona Water Quality Assessment, 1996. AZ Dept. of Environmental Quality
3. Heritage Data Management System, 1999. AZ Game and Fish Department.
4. 303(d) Listing, 1998. AZ Dept. of Environmental Quality.

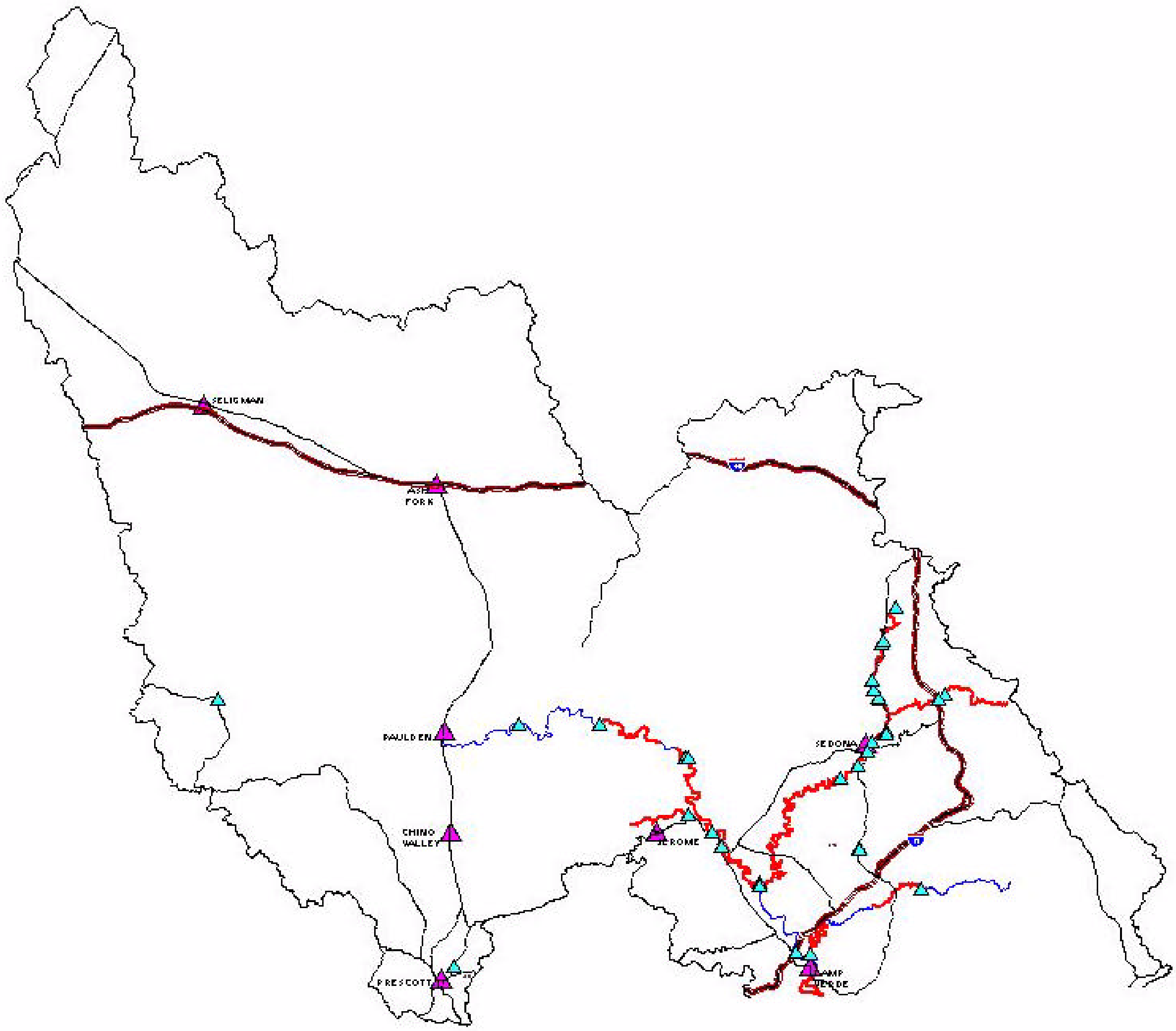
# APPENDIX

## Contents:

A. Map of the Watershed and Focus Area
B. Map of Water Quality Impaired Waters
C. Special Status Species
D. Summary of "Ambient Groundwater Quality of the Prescott AMA: A 1997- 1998 Baseline Study"
E. List of Current Officers

# APPENDIX A

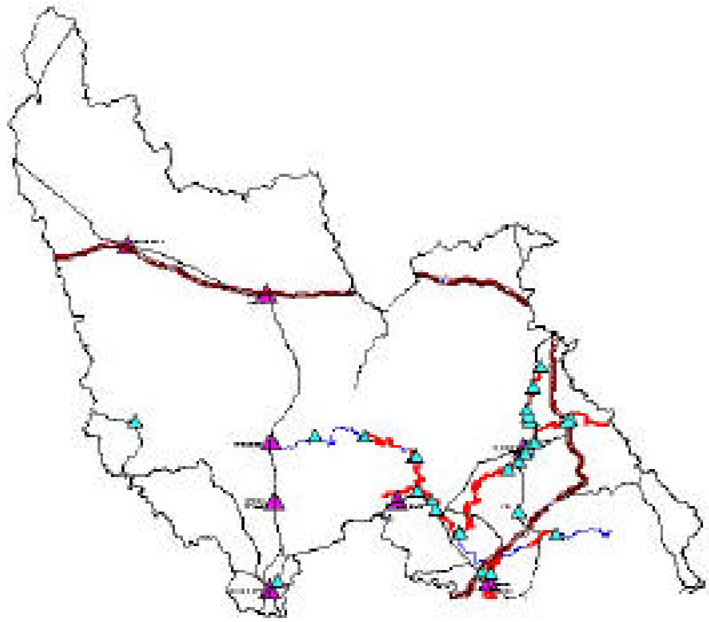
# Map of the Watershed and Focus Area


SELIGMAN
FORK
PAULDEN
CHINO
VALLEY
PRESCOTT
JEROME
SEDONA
AMP
ERDE

# APPENDIX B

# Map of Water Quality Impaired Waters

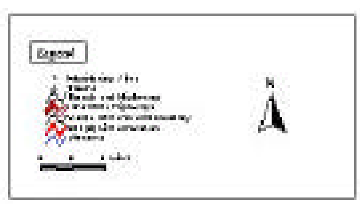
The Verde Watershed and
1998 303(d) Listed Waters



[illegible]
in the Verde Watershed

| Waterbody ID | Name | Stressors |
| --- | --- | --- |
| [illegible] | [illegible] Creek | Cu, DO, pH, Zn |
| AZ15060202-019 | Oak Creek | phosphorus |
| [illegible] | [illegible] Creek | [illegible] |
| AZ15060202-029 | Verde River | turbidity |
| AZ15060202-025 | Verde River | turbidity |
| [illegible] | Oak Creek | turbidity |
| [illegible] | Oak Creek | [illegible] |
| [illegible] | Oak Creek | turbidity |
| [illegible] | Wet Beaver Creek | turbidity |
| AZ15060202-029 | Verde River | turbidity |
| AZ15060202-003 | Beaver Creek | dissolved oxygen, turbidity |

| | | |
| --- | --- | --- |
| [illegible] | [illegible] Lake | turbidity |
| [illegible] | [illegible] Lake | dissolved oxygen, pH |
| [illegible] | [illegible] Lake | DO, [illegible], pH |
| [illegible] | [illegible] Lake | dissolved oxygen, turbidity |



# APPENDIX C

# Special Status Species

# Special Status Species

| Common Name | Scientific Name | Status |
|---|---|---|
| American peregrine falcon | *Falco peregrinus anatum* | WC |
| American redstart | *Setophaga ruticilla* | WC |
| Apache trout | *Oncorhynchus apache* | LT, WC |
| Apache wild-buckwheat | *Eriogonum apachense* | SR |
| Arizona bugbane | *Cimicifuga arizonica* | S, HS |
| Arizona cliff rose | *Purshia subintegra* | LE, HS |
| Arizona phlox | *Phlox amabilis* | S |
| Arizona toad | *Bufo microscaphus microscaphus* | S |
| Bald eagle | *Haliaeetus leucocephalus* | LT, WC |
| Bearded gentian | *Gentianopsis barbellata* | S |
| Belted kingfisher | *Ceryle alcyon* | WC |
| Bigelow onion | *Allium bigelovii* | SR |
| Blumer’s dock | *Rumex orthoneurus* | HS |
| Broadleaf lupine | *Lupinus latifolius leucanthus* | S |
| Chiricahua leopard frog | *Rana chiricahuensis* | C, WC, S |
| Common black-hawk | *Buteogallus anthracinus* | WC, S |
| Eastwood alum root | *Heuchera eastwoodiae* | S |
| Flagstaff beardtongue | *Penstemon mudiflorus* | S |
| Flagstaff pennyroyal | *Hedeoma diffusum* | S, SR |
| Gila chub | *Gila intermedia* | C, WC, S |
| Gila topminnow | *Poeciliopsis occidentalis occidentalis* | LE, WC |
| Green death camus | *Zigadenus virescens* | SR |
| Heathleaf wild-buckwheat | *Eriogonum ericifolium ericifolium* | S |
| Hualapai Mexican vole | *Microtus mexicanus hualpaiensis* | LE, WC |
| Hualapai milkwort | *Polygala rusbyi* | S |
| Lowland leopard frog | *Rana yavapaiensis* | WC, S |
| Maricopa tiger beetle | *Cicindela oregona maricopa* | S |
| Mexican garter snake | *Thamnophis eques megalops* | WC, S |
| Mexican spotted owl | *Strix occidentalis lucida* | LT, WC |
| Mogollon columbine | *Aquilegia desertorum* | SR |
| Montezuma Well springsnail | *Pyrgulopsis montezumensis* | S |
| Narrow-headed garter snake | *Thamnophis rufipunctatus* | WC, S |
| Northern goshawk | *Accipiter gentilis* | WC, S |
| Northern leopard frog | *Rana pipiens* | WC, S |
| Osprey | *Pandion haliaetus* | WC |
| Page springsnail | *Pyrgulopsis morrisoni* | C, S |
| Pine grosbeak | *Pinicola enucleator* | WC |
| Razorback sucker | *Xyrauchen texanus* | LE, WC |
| Ripley wild-buckwheat | *Eriogonum ripleyi* | S, SR |
| Rock fleabane | *Erigeron saxatilis* | S |
| Rocky Mountain bristlecone pine | *Pinus aristata* | SR |
| Roundtail chub | *Gila robusta* | WC, S |

| | | |
|---|---|---|
| Rusby's milk-vetch | *Astragalus rusbyi* | S |
| San Francisco Peaks groundsel | *Seneclo franciscanus* | LT, HS |
| | | |
| Southwestern willow flycatcher | *Empidonax traillii extimus* | LE, WC |
| Spikedace | *Meda fulgida* | LT, WC |
| Sunset Crater beardtongue | *Penstemon clutei* | S, SR |
| Tonto Basin agave | *Agave delamateri* | S, HS |
| Tusayan flame flower | *Talinum validulum* | SR |
| Verde Valley sage | *Salvia dorrii mearnsii* | S, SR |
| Western fairy slipper | *Calypso bulbosa* | SR |
| Western red bat | *Lasiurus blossevillii* | WC |
| Western yellow-billed cuckoo | *Coccyzus americanus occidentalis* | WC, S |

<u>Status Definitions</u>

LE - Listed Endangered. Species identified by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) as being in imminent jeopardy of extinction.

LT - Listed Threatened. Species identified by USFWS under ESA as being in imminent jeopardy of becoming Endangered.

C - Candidate. Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded by other listing activity.

WC - Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Department's listing of Wildlife of Special Concern in Arizona (WSCA, in prep.). Species included in WSCA are currently the same as those in Threatened Native Wildlife in Arizona (1988).

S - Sensitive. Species classified as "sensitive" by the Regional Forester when occurring on lands managed by the USDA Forest Service.

HS - Highly Safeguarded. Those Arizona native plants whose prospects for survival in this state are in jeopardy or are in danger of extinction, or are likely to become so in the foreseeable future, as described by the Arizona Native Plant Law (1993).

SR - Salvage Restricted. Those Arizona native plants not included in the Highly Safeguarded Category, but that have a high potential for theft or vandalism, as described by the Arizona Native Plant Law (1993).

In addition, this area appears to occur within designated Critical Habitat for the razorback sucker (Xyruchen texanus) (59 FR 13374, March 21, 1994) and the Southwestern willow flycatcher (Empidonax traillii extimus) (62 Federal Register 39129, July 22, 1997).

At this time, the Department's comments are limited to the special status information provided above. This correspondence does not represent the Department's evaluation of impacts to wildlife or wildlife habitat associated with activities occurring in the subject area. If an evaluation of impacts to fish or wildlife resources is necessary, please contact Mr. Rick Miller, Region II Habitat Program Manager at (520) 774-5045.

# APPENDIX D

# Summary of
# "Ambient Groundwater Quality of the Prescott AMA:
# A 1997- 1998 Baseline Study"

Summary of the 1999 ADEQ WQ Study in the Prescott AMA

The Prescott Active Management Area (AMA) is located in north central Arizona and covers approximately 485 square miles within the mountainous Central Highlands physiographic province. The boundaries of the Prescott AMA were politically established as this "basin" is hydrologically part of two larger groundwater basins, the Agua Fria and the Verde, that predominantly lie external to Prescott AMA boundaries. The Arizona Department of Environmental Quality (ADEQ) Groundwater Monitoring Unit designed a study to characterize the current (1997-98) groundwater quality conditions in the Prescott AMA. This study was conducted because Prescott AMA's groundwater has become so increasingly regulated and is considered to be such an important resource in this basin.

A total of 58 groundwater samples, 41 grid-based random samples, and 17 index well samples were collected. All samples were analyzed for Safe Drinking Water (SDW) inorganics, 10 samples were analyzed for SDW radiochemistry, and two samples were analyzed for Groundwater Protection List (GWPL) pesticides. Laboratory results indicated no detection of any of the 152 pesticides and products of degradation on the GWPL. One radiochemistry sample collected in the Granite Dells area exceeded health-based Primary Maximum Contaminant Levels (MCLs) for gross alpha. At least one primary MCL parameter was exceeded in 6 of the 58 Prescott AMA inorganic samples including arsenic (four samples), barium (one sample), fluoride (three samples), and nitrate (one sample). Aesthetics-based Secondary MCLs were exceeded in nine of the 58 samples including total dissolved solids (TDS) (six samples), iron (two samples), fluoride (four samples), manganese (two samples), and sulfate (two samples). These results suggest that regional groundwater quality conditions generally support drinking water uses in the Prescott AMA.

Most Prescott AMA groundwater samples are hard water consisting of calcium-bicarbonate chemistry, which is typical of recharge areas in Arizona. Limited areas of soft water, with sodium the dominant cation, generally occur immediately south of Chino Valley. Groundwater quality parameters varied by subbasin, aquifer, groundwater depth, and groundwater elevation (wellhead elevation minus groundwater depth). Parameters such as bicarbonate, sulfate, and TDS had significantly higher levels in the Upper Agua Fria subbasin in comparison to the Little Chino Valley. The fluoride levels produced a pattern opposite to the aforementioned parameters. When examining aquifers, the levels of bicarbonate, calcium, hardness, magnesium, manganese, and TDS were found to be significantly higher in the bedrock aquifer compared to the alluvial aquifer. An opposite pattern occurs with temperature and pH. Barium, bicarbonate, calcium, electrical conductivity (EC), hardness, magnesium, manganese, TDS, and total Kjeldahl nitrogen levels tended to decrease with increasing groundwater depth. Temperature, pH, and zinc levels typically increased with increasing groundwater depth. Similarly, the levels of barium, bicarbonate, EC, iron, hardness, magnesium, manganese, TDS, and turbidity increased with increasing groundwater elevation. While nitrate, pH, and temperature levels tended to decrease with increasing groundwater elevation.

Under specific sedimentary environments and oxidizing conditions (basin-fill sediments) elevated levels of arsenic, boron, and fluoride may exceed Primary MCLs. This will result in the presence of these parameters in natural occurring levels, throughout the Prescott AMA. A well having high pH levels and soft water would be considered at high risk for having elevated levels of arsenic, fluoride, boron, and possibly chromium. Conversely, even though hard water with a lower pH rarely has elevated levels of trace elements, hardness is positively correlated with nitrate levels in the study area. Due to the limited use of agriculture in the study area, septic systems may have the greatest impact on levels of chloride and nitrate in the Prescott AMA.

A time-trend analysis was conducted using groundwater data collected by ADEQ from 17 wells located throughout the Prescott AMA. Of the 12 parameters examined, levels of chloride, EC-field, fluoride, hardness, magnesium, nitrate, sodium, sulfate, TDS, total alkalinity, and zinc did not significantly increase or decrease between 1991-93. Only calcium levels significantly changed, increasing between the 2 time periods. This difference in calcium levels may be due to different testing methods used by the Arizona Department of Health Services laboratory during the two sampling periods.

# APPENDIX E

# List of Current Officers

# List of 2000 Officers:

| | | |
|---|---|---|
| ***Chairman*** | Robert B. Hardy | rhardy@ci.cottonwood.az.us |
| ***Vice-Chairman*** | Loyd Barnett | loyd@sedona.net |
| | John Munderloh | 520-636-2646 |
| | Tom O'Halleran | obarc@sedona.net |
| | Dave Roberts | 602-236-2193 |
| | Jay Wilkinson | 520-778-0528 |
| ***Secretary-Treasurer*** | Tom Bonomo | thomas_d_bonomo@yahoo.com |