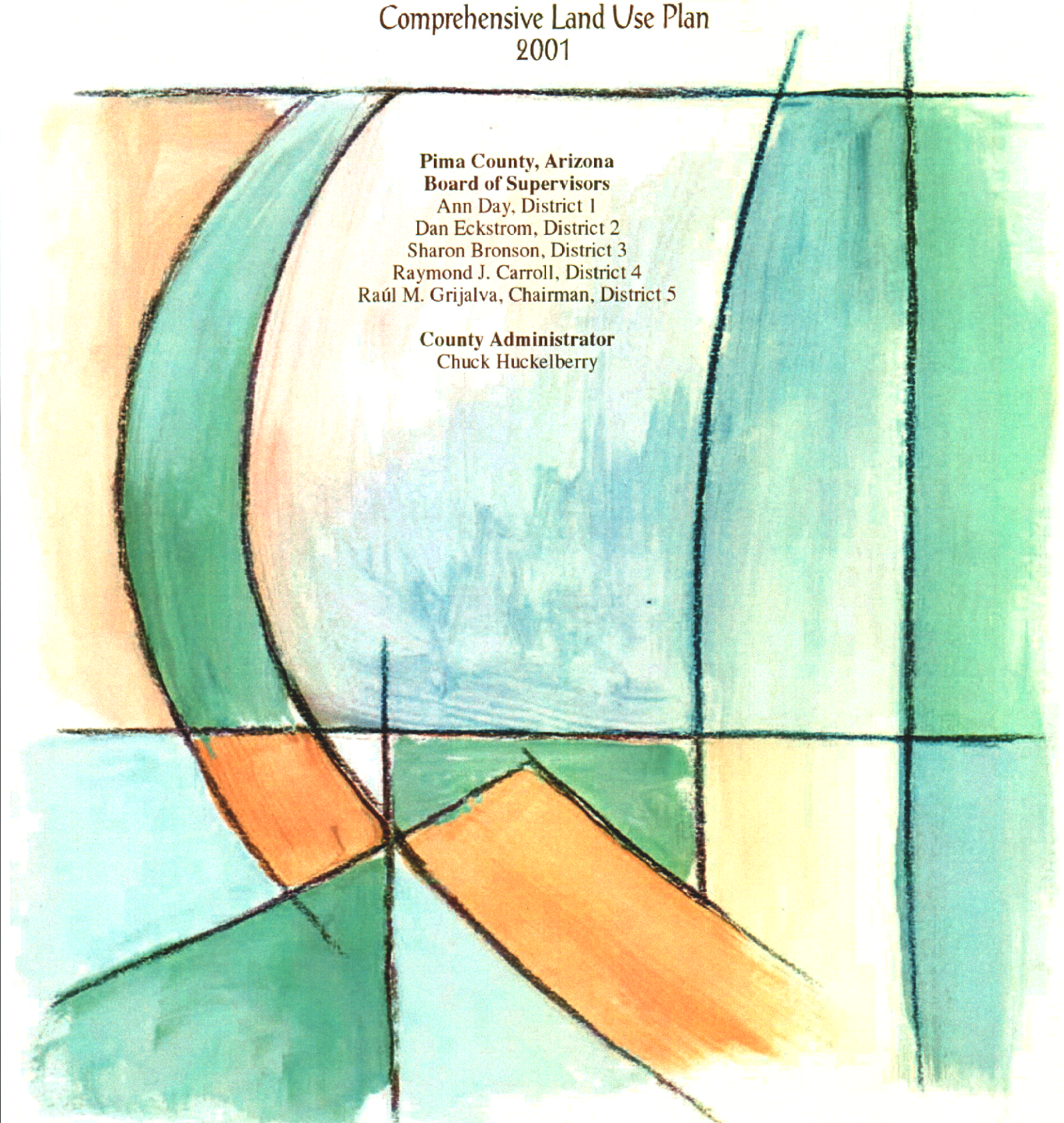
DRAFT

Water Quality Issues

Sonoran Desert Conservation and Comprehensive Land Use Plan 2001



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County Administrator
Chuck Huckelberry

MEMORANDUM

Date: November 19, 2001

To: The Honorable Chair and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Water Quality Considerations -- Sonoran Desert Conservation and Comprehensive Plan**

I. Background

The Pima Association of Governments has partnered with Pima County to study water quality issues related to both the Sonoran Desert Conservation Plan and the Comprehensive Land Use Plan Update. During the last months, a number of studies have been issued in draft form to carry out the workplan which provided for: (1) an overview of the quality of various water sources; (2) a review and summary of existing state and federal regulations; (3) a review and compilation of existing data on water quality requirements of aquatic species; (4) an identification of the highest priority watersheds for water quality monitoring and restoration; and (5) a compilation of water quality data for the streams that have been identified as priorities. This study brings together the findings of previous reports and suggests policies to address water quality issues in Pima County. A summary is presented below.

II. Groundwater Quality

A. Water Quality Issues -- Pima Association of Governments identifies the following as water quality issues related to groundwater:

- Current groundwater quality should be maintained or improved.
- Groundwater contamination from leaking underground storage tanks, landfills, industrial operations, or other land uses should be prevented or remediated as necessary.
- Septic systems contribute to shallow groundwater contamination when they are not properly installed or maintained.

B. Suggested Policies -- Pima Association of Governments suggests that the following groundwater related policies be considered.

- Encourage the protection of groundwater quality within the framework of federal, state, and local laws, regulations, and guidelines that govern water quality.
- Continue to coordinate with federal, state, and local agencies on current groundwater remediation efforts.
- Continue to assess soil and groundwater quality in the vicinity of all County-owned sites of concern, including landfills.
- Monitor soil and groundwater, develop and implement cleanup strategies.
- Continue to operate existing remediation systems.
- Continue existing monitoring programs, or implement new programs to protect groundwater quality at County facilities that have the potential to impact groundwater.
- Continue to ensure septic systems are installed and maintained in accordance with applicable federal, state and local requirements.
- Encourage coordination among County departments that use or generate hazardous materials and waste to institute pollution prevention policies and practices.
- Implement practices that reduce the generation of wastes that could impact groundwater quality and implement spill management plans.
- Discourage the proliferation of septic systems in areas adjacent to the priority streams.

III. Natural Waterbodies

A. Water Quality Issues -- Pima Association of Governments identifies the following as water quality issues related to natural waterbodies.

- Shallow groundwater sources contributing to streamflow can be vulnerable to contamination if certain land uses are present.
- Unforeseen discharges to surface waters may cause water quality degradation.
- Residential or commercial development could result in degradation of water quality due to sedimentation, erosion, household chemicals, and contaminated runoff.

- More water quality information is needed to protect high priority streams.
- Monitoring plans need to be developed to ensure existing water quality is maintained.
- Water quality requirements for aquatic species maintenance must be addressed.
- Protecting water quality of perennial and intermittent streams requires substantial resources.
- Watersheds need to be managed to maintain water quality conditions in streams designated as "unique" by the state of Arizona.
- Watershed management needs to address the cumulative impacts of development.

B. Suggested Policies -- Pima Association of Governments suggests that the following related policies be considered.

- Evaluate planned activities within the County relative to their cumulative impacts and compliance with state water quality standards. Strive to minimize human impact to aquatic and riparian ecosystems from development, roads, and trails.
- Encourage land use decisions that maintain the function and quality of watercourses and areas designated in the Sonoran Desert Conservation Plan as riparian and aquatic habitat. Land use proposals should be evaluated as to their potential to cause water quality degradation.
- Further protect surface water from degradation through land use planning to limit the potential for unforeseen discharges and review emergency response plans for existing transportation corridors.
- Work with the appropriate entities to ensure suitable stream flows that maintain channel morphology and function, support hydrological connected wetlands and promote biological diversity in these systems.
- Evaluate land use proposals including transportation as to their potential impact on water quality. County and utility roads should be graded and maintained in such a way as to reduce side-casting of material into streams or watercourses.
- Work with landowners and other entities to promote sound conservation practices to ensure water quality and where appropriate, establish cooperative management plans.
- Encourage private land owners to investigate and utilize the preservation programs offered by other government entities and private foundations, and make information on such programs available to the public.

- Plan, encourage, and participate in long range monitoring of waterbodies and work with Arizona Department of Environmental Quality (ADEQ), Bureau of Land Management (BLM), U.S. Forest Service, Arizona Game and Fish and other appropriate entities in the monitoring and management of natural water resources. Encourage the use of trained volunteers in monitoring efforts and in implement monitoring programs. Use water quality data over the long term as a management tool to identify and prevent degradation.

C. Suggested Implementation Measures -- Pima Association of Governments suggests that the following implementation measures be considered.

- Work with Arizona Department of Environmental Quality to identify which priority streams could be included in its ongoing surface water quality monitoring program.

- Work with other entities, including Arizona Game and Fish, the University of Arizona, U. S. Forest Service, Bureau of Land Management, and the U. S. Geological Survey, to discuss any plans they might have for research or monitoring projects that might include priority streams; identify possible cooperative research projects that could involve water quality monitoring at these streams.

- Determine which priority streams are accessible, as far as terrain, vehicular access, and landowner permission to sample.

- Identify and pursue potential funding sources for water quality monitoring.

- Continue to support monitoring of priority streams within County-owned lands.

- If necessary, expand the existing County-supported monitoring program to include any priority streams that will not be monitored by other entities.

- Continue research on aquatic species and their habitat utilizing County staff, state resources, professionals, and volunteers. Develop a plan for native fish reintroduction at appropriate times and locations (Pima County, 2000).

- Nominate additional perennial streams for unique water status designation.

- Continue to serve in the role as Designated Management Agency and participate actively in the Water Quality Management Planning Process and work with Pima Association of Governments to regularly update the current plan.

IV. Stormwater Quality

A. Water Quality Issues -- Pima Association of Governments identifies the following as water quality issues related to stormwater:

- Stormwater runoff can affect the water quality of surface water systems.
- Flows that are not a result of precipitation, that enter storm drains, can contain contaminants.
- The EPA has identified erosion and runoff from construction sites, and improper containment of hazardous substances at industrial sites and landfills, as a potential source of stormwater quality degradation.
- Flood events can cause entrainment of pollutants that would otherwise be stationary during non-flood stormwater flows.

B. Suggested Policies -- Pima Association of Governments suggests that the following related policies be considered.

- Promote land use policies and best management practices that protect the quality of stormwater runoff where a receiving waterbody is a perennial or intermittent stream with habitat for native aquatic species.
- Continue to comply with Clean Water Act stormwater permit requirements.
- Continue to operate and manage County-owned facilities and properties in a manner that does not degrade stormwater quality.
- Continue to implement the Floodplain and Erosion Hazard Management Ordinance to manage and purchase lands in the regulatory floodplain areas to enhance overall watershed management.
- Continue to implement the Watercourse and Riparian Habitat Protection and Mitigation Requirements Ordinance to protect endangered natural riparian areas.
- Continue to comply with requirements for pollutant control at landfills.

V. Wastewater Quality

A. Water Quality Issues -- Pima Association of Governments identifies the following as water quality issues related to wastewater:

- A proliferation of private wastewater treatment facilities would be detrimental to the environment and to the orderly, effective protection of public health.
- Effluent quality needs to meet federal and state permit requirements. In some cases existing water quality standards and designated uses might not be appropriate for streams in the arid West.
- Using effluent in riparian habitat restoration projects should be pursued.

B. Suggested Policies -- Pima Association of Governments suggests that the following related policies be considered.

- Continue to support the area wide water quality management plan which includes the policy that all wastewater will be treated in the regional publicly owned facilities.
- Pima County Wastewater Management Department will continue in their role as Designated Management Agency for wastewater treatment.
- Continue to monitor and ensure that all treated effluent discharged from its treatment facilities is in compliance with NPDES permit requirements and state water quality standards.
- Continue to research appropriate uses of and water quality standards for treated effluent, including the use of effluent to restore or maintain riparian ecosystems.

VI. Conclusion

The attached study on the *Water Quality Issues Pima County* provides an excellent summary of previous work, and a reasonable set of suggestions for policies and implementation. The work of Pima Association of Governments will also inform the alternatives analysis of the Environmental Impact Statement (EIS) for the Sonoran Desert Conservation Plan.

Attachment

Pima County Comprehensive Plan and Sonoran Desert Conservation Plan

Water Quality

Summary and Recommended Policies

Draft

Prepared for Pima County

November 2001

Pima Association of Governments

Acknowledgments

PAG would like to thank Maeveen Behan and Julia Fonseca at Pima County for including this project in PAG's work program and the County Administrator's Office for providing the funding to make this project possible.

In addition, PAG would like to thank the following people who graciously provided information and input in this project: Dr. Lin Lawson and Kyle Palmer at Arizona Department of Environmental Quality, Heidi Blasius at Arizona Game and Fish, Ed Curley, Glen Peterson, Byron McMillan and Karen Sierra at Pima County Wastewater Management Department, Karen Dotson and Jean Melillo at Tucson Water, Catesby Knight at the City of Tucson Transportation Department, Eric Shepp and Adam Amante at Pima County Department of Environmental Quality, Dr. Phil Rosen and Dr. Scott Bonar at the University of Arizona, Bob Lefevre at the United States Forest Service and Jeff Simms at the Bureau of Land Management.

Pima County Comprehensive Plan and Sonoran Desert Conservation Plan

Water Quality Element

Summary and Recommended Policies

Introduction

Background

Pima County is updating the Pima County Comprehensive Land Use Plan as required by the state's Growing Smarter legislation. This legislation specifies that each municipal planning authority must address certain elements in its planning process. There is a specific Water Quantity Element and a conservation, or environmental element, that must address rivers and other water resources with regard to prevention of pollution, use of land in stream channels, control of soil erosion, and the general protection of watersheds. While the County is updating the comprehensive plan it is also developing the Sonoran Desert Conservation Plan (SDCP). The focus of the SDCP is on preservation of species and natural resources.

Pima Association of Governments (PAG) is the state designated Water Quality Planning Agency for Pima County under section 208 of the Clean Water Act, and at the County's request assisted in the preparation of the water quality portion of the Environmental Element of the Comprehensive Land Use Plan.

As part of the foundation for the Water Quality Element for the Pima County Comprehensive Land Use Plan and for the Sonoran Desert Conservation Plan, PAG prepared several draft reports dealing with different aspects of water quality. The first report was a general overview of the quality of the various water sources in Pima County, including groundwater, Central Arizona Project (CAP) water, stormwater, treated wastewater, and surface water. This was followed by a review of the existing federal, state, and local laws, regulations, and programs that impact the quality of water sources in Pima County. The third report was a review and compilation of known water quality requirements of aquatic species covered by the SDCP and a descriptive overview of these requirements. The most recent report prepared by PAG examined the high priority streams in the SDCP. Existing water quality data for those streams were reviewed. Data gaps were identified, and land uses were evaluated. A monitoring program for identifying

problems and ensuring water quality was also addressed. All of these reports are in draft form, and will likely be revised as the plan evolves.

Purpose

This report is based on the information and conclusions drawn from the previous PAG water quality studies completed for the SDCP and Comprehensive Plan. The purpose of this report is to identify water quality issues, and suggest policies that the County can use to address these issues and satisfy the State's planning requirements.

Information Sources

This report relies on existing documents and Internet sources that contained information on land use planning and water quality. In addition, this report builds upon the recent draft PAG reports: *Water Quality in Pima County, August, 2001*; *Water Quality Regulatory Summary, August, 2001; Water Quality Requirements of Native Aquatic Species in Pima County, September, 2001*; and *Water Quality of High Priority Streams in Pima County, October, 2001.* On-line land use plans from Boulder, Colorado; Maricopa County; Clark County, Nevada; and a Watershed Plan for San Juan County, Washington, were also reviewed. Internet sources also included the United States Environmental Protection Agency (EPA), Arizona Department of Environmental Quality (ADEQ), United States Forest Service, Pima County, and others.

Scope and Limitations

This report is the final deliverable under PAG's contract with Pima County to provide assistance with developing the water quality element of the Comprehensive Land Use Plan and the Sonoran Desert Conservation Plan. The study area is all of Pima County, excluding Indian lands. However, the focus is on eastern Pima County.

This document is intended as a general overview of water quality for informational purposes. It is not meant to cover all existing laws, regulations, and water quality situations. PAG did not conduct any original research for this project but relied on water quality data and information that was readily available and from reliable sources. In addition, the time and budget available for this project did not permit an exhaustive search for all literature or data that might be available on water quality in Pima County.

This report focuses on general water quality issues and does not specifically address water uses, habitat, water quantity, or supply. However, all of these issues are very closely related. Water quality can have an impact on the use of a water source, just as habitat, use, and quantity can have an effect on the water quality.

Overview of Water Resources, Water Quality Regulations, Aquatic Species and Priority Streams in Pima County

Water Resources

The five principal categories of water sources in Pima County are:

- Groundwater pumped from wells;
- Naturally occurring perennial and intermittent surface waterbodies, such as streams, springs, and spring-fed ponds and pools;
- Stormwater runoff;
- Imported Central Arizona Project (CAP) water; and
- Treated wastewater.

These water sources are closely linked in many ways. Therefore, in many aspects of planning, they should not be treated entirely separately. For example, springs and many perennial and intermittent streams are directly fed by groundwater. Wastewater is also primarily derived from groundwater that is used for domestic, commercial and industrial purposes. Therefore, the quality of wastewater and many surface waters can be influenced by the quality of local groundwater. Also, stormwater, CAP water, and wastewater recharge the groundwater in many locations of the County, either naturally or artificially. The quality of these sources can therefore affect the quality of local groundwater.

Water Quality Regulations

The quality of water resources in Pima County is protected through various federal, state, and local laws. In the late 1960s and early 1970s there was new emphasis and great public interest in protecting and remediating the waters of the United States. Nationwide there were examples of waterbodies that had been degraded to the point that aquatic life or public health was likely threatened. The public outcry against polluting the environment resulted in a number of new laws. The most comprehensive law that affected water was the Clean Water Act. This was followed by the Safe Drinking Water Act and a number of state and local laws and regulations that were designed to protect and mitigate future environmental damage. Other major federal laws that had a direct or indirect effect on surface and groundwater quality were also enacted. The result is that we now have a complex web of laws and regulations, administered by different agencies, which deal with water, its use, and the protection of its quality.

Aquatic Species

As part of the water quality element for the Sonoran Desert Conservation Plan, the water quality requirements of priority native aquatic species were researched. The species included in this research were:

- Chiricahua Leopard Frog (Rana chiricahuensis)
- Lowland Leopard Frog (Rana yavapaiensis)

- Longfin Dace (Agosia chrysogaster)
- Desert Sucker (Catostomus clarki)
- Sonora Sucker (Catostomus insignis)
- Desert Pupfish (Cyprinodon macularius macularius)
- Gila Chub (Gila intermedia)
- Gila Topminnow (Poeciliopsis occidentalis)

Little information was readily available on the specific water quality requirements of the priority aquatic species. Most studies that were found were limited in scope. This is significant, because toxicity testing in aquatic environments is highly complex, due to the varying effects of hydrologic conditions, and the interrelationships between, and combined effects of, multiple water quality constituents.

Water quality factors generally associated with the health of streams and rivers, as well as fish survival rates, include the chemical characteristics of pH, buffering capacity, dissolved oxygen and nutrient levels. They also include physical characteristics such as stream width, temperature, substrate, water velocity, and volume. Several detailed studies have been done, but in general more data are needed to establish meaningful water quality standards for fish and frogs in the Southwest.

Priority Streams

As part of the water quality element for the Pima County Comprehensive Plan and the Sonoran Desert Conservation Plan, PAG and Pima County staff created a list of the highest priority streams for water quality and quantity monitoring, management and restoration. Stream selection was based primarily on the presence of perennial or intermittent stream flow, the area of riparian habitat, the presence of historic or existing populations of native fish and frog species, and location with respect to other surface water sources and possible wildlife corridors. The SDCP Riparian Element report, especially Appendix A1 – Table 1 and the historic occurrence of native fish were used to determine the resources present in and around each stream.

The following Pima County streams are considered high priority:

Agua Caliente Canyon
Arivaca Creek
Buehman Canyon
Canada del Oro
Empire Gulch
Florida Canyon
Quitobaquito Spring
Sabino Canyon
Santa Cruz River (mid/lower)
Wakefield Canyon
Agua Verde Creek
Bingham Cienega
Cienega Creek (upper and lower)
Davidson Canyon
Espiritu Canyon
Mattie Canyon
Rincon Creek
San Pedro River
Tanque Verde Creek (upper)

Readily available water quality data for these streams were reviewed along with land uses and possible water quality threats. A number of these high priority streams had no known water quality data available. Evaluating these streams is important in order to design a land use plan that will take into consideration pollution prevention, habitat destruction, and degradation of water quality.

Water Quality in Pima County
Summary of Findings and Conclusions

Water Quality

Groundwater Quality

Groundwater is the most widely used water resource in Pima County. Water quality data for this source are abundant, due to its extensive use and regulatory monitoring requirements. It is generally of very good quality and suitable for its intended uses, which include drinking water, irrigation and industry. Groundwater contamination has occurred in several locations. Nitrates and VOCs are the predominant contaminants. Other contaminants, such as metals and pesticides, are insignificant compared to VOCs. Contaminated groundwater is generally not used for potable purposes, with the exception of locations where it is either treated or blended to meet drinking water standards. Contaminated groundwater in Pima County is intensively monitored, and in most cases is either under remediation or further investigation. Groundwater in some areas of the County would likely exceed the recently proposed arsenic standard for drinking water of 10 ppb.

Surface Water Quality

Although it is relatively scarce, naturally occurring surface water in perennial and intermittent streams provides very important habitat in Pima County. Most of the streams that have been monitored are of a quality sufficient for their intended use or habitat. However, monitoring is very limited compared to the other water sources. The vast majority of perennial and intermittent streams in Pima County are not regularly monitored for water quality.

CAP Water Quality

CAP water is being used in increasing quantities in Pima County. Current uses include artificial groundwater recharge, crop irrigation, and potable supply. The quality of this water is extensively monitored, and its quality is sufficient for its intended uses, which include drinking water, aquifer recharge, irrigation, and industry.

Stormwater Runoff Quality

This water is not widely used as a resource. However, it is extensively monitored under existing regulations. The water quality meets NPDES permit requirements.

Treated Wastewater Quality

Treated wastewater is also being used in increasing quantities. It is extensively monitored, and its quality meets standards for its intended uses, which include reuse for turf irrigation, agriculture and discharge to an effluent dependent stream. The effluent discharges currently support valuable riparian habitat subject to major stormwater events.

Water Quality Regulations

All of the major categories of water sources in Pima County are amply regulated with regard to water quality by multiple programs at the state, federal and local levels. Surface waterbodies, stormwater runoff, CAP water and treated wastewater are protected to varying degrees by the Clean Water Act, Resource Conservation and Recovery Act and other regulations at the federal level, and by the Environmental Quality Act at the state level. Permits issued under the federal NPDES program and the state Aquifer Protection Permit program are key mechanisms by which water pollution is prevented. Arizona's unique waters program is a means by which surface waterbodies can receive additional protection. Groundwater quality in Arizona is protected primarily through the state's Aquifer Protection Permit program. Additional protection and remediation occurs through the federal CERCLA program and the state's Water Quality Assurance Revolving Fund. Opportunities for further protection are available through the state's voluntary wellhead protection program.

Given the extensive set of state and federal regulations, additional laws aimed directly at regulating water quality and pollutant discharges are probably not warranted. However, the effectiveness of the existing regulatory programs depends on the financial resources available to implement them and the degree to which regulatory agencies are able to enforce them. Also, even though existing regulations contain numerous provisions relating to pollution prevention, they cannot eliminate the possibility that spills or other accidental discharges of pollutants will occur.

Future unforeseen discharges of pollutants will presumably be of a short-term nature, due to the regulations that are already in place, provided that state and federal water quality regulatory programs are adequately funded. Such discharges are therefore unlikely to have significant, long-term adverse impacts on most of the water resources in Pima County, such as CAP water, groundwater, and stormwater runoff. However, the impact of an unforeseen discharge on some surface waterbodies would probably be more severe. For example, a chemical spill into a small, perennial waterbody supporting an endangered aquatic species population could have serious consequences. Therefore, additional protection of surface waterbodies, through land use planning to limit the potential for unforeseen discharges, and emergency response plans for existing transportation corridors, might be warranted.

Water Quality Requirements of Aquatic Species

Little detailed information is readily available on the specific water quality requirements of Pima County's native aquatic species. Other threats aside, aquatic species generally thrive when the waterbodies in which they reside have water quality characteristics that are typical of "healthy" waterbodies. This includes physical characteristics as well as chemical characteristic of pH ranging from 6.5-8.5, electrical conductivity (EC) from 50-1500 micromhos per centimeter (μmhos/cm) (potable water), and dissolved oxygen (DO) between 7.5-8.3 milligrams per liter (mg/l) (Lawson, 1995; Standard Methods, 1998).

Native aquatic species seem to be able to tolerate low dissolved oxygen levels, a wide range of temperatures and pH, and high salinities. High concentrations of nutrients, especially nitrite and ammonia, and metals appear to be toxic.

At this time, the Habitat Characterization Study, which is a compilation of ten case studies on selected ephemeral and effluent dependent streams in the West, is nearing completion. Existing data on the characteristics of the aquatic and riparian habitats of those streams were reviewed and analyzed. In addition, a site reconnaissance level field assessment of aquatic habitat, aquatic species, terrestrial habitat, and terrestrial species was conducted at each site. Commonalties as well as differences among the sites were identified and these findings used as a basis for a discussion regarding regulatory implications and management of water quality in effluent dependent waters.

This study is being conducted by the Arid West Water Quality Research Project (WQRP), which is managed by Pima County Wastewater Management Department with funding from the U.S. Environmental Protection Agency. The objective of the WQRP is to improve the scientific basis for regulation of water quality and protection of species, habitats, and uses of effluent dependent and ephemeral waters in the arid West (Pima County Wastewater Management Department, 2001).

In addition, the University of Arizona is just beginning work on two projects aimed at studying water quality requirements of desert fish. One project will look at temperature requirements of selected desert species and the other will involve mapping stream conditions in Arizona and their relationship with fish distribution (Bonar, 2001).

Habitat destruction and the introduction of non-native species appear to be the major threats to these vulnerable species. However, additional water quality data are needed on the specific requirements and threats to the native species, and in particular the leopard frogs and the desert suckers. More information might be available in the future with the completion of the above mentioned studies.

Priority Streams Water Quality

Available water quality data for the high priority streams in Pima County indicate that the overall water quality is good. Of the twenty high priority streams identified in Pima County, twelve are included in ADEQ's Water Quality 305 (b) Report 2000. Out of these twelve, eleven are in full support of their designated uses. The Santa Cruz River from Canada del Oro to Guild Wash was listed as not in full support of its designated use due to past low dissolved oxygen (DO) readings. However, recent DO data from Pima County Wastewater Management Department indicate that DO levels are currently at levels that would warrant a full support designation. The State will reassess the use support designation in its next 305(b) report.

Due to a lack of data, and due to the evidence of high-value habitat, the following waterbodies appear to warrant the first priority for further investigation and monitoring:

- Agua Verde Creek

- Davidson Canyon
- Empire Gulch
- Florida Canyon
- Mattie Canyon
- Rincon Creek
- Wakefield Canyon

Most of the priority waterbodies are located at least partly within protected lands, such as national forests, national parks, or county preserves, and are therefore fairly unlikely to experience significant degradation. However, Agua Verde Creek, Rincon Creek, the San Pedro River, and Davidson Canyon could be somewhat more prone to degradation than the other priority waterbodies in the future, due to current land uses or land uses likely to occur in the future. In addition, most (if not all) of the waterbodies are located in areas with one or more land uses that present some degree of risk to water quality, including dirt roads, off road vehicle use, other recreational activities, and grazing.

Causes of Pollution

According to ADEQ the major sources of stressors in streams are, in order of impact: natural sources, agriculture, mining, land development, urban runoff, point sources, septic systems, bank modification and recreation. The most common pollutants in Arizona streams are turbidity, metals, pH, pathogens, pesticides, other inorganics, nutrients, low dissolved oxygen, and radiochemicals.

Natural conditions are considered a source of stressors because many of Arizona's soils are highly erodible or contain naturally high levels of metals. It should be noted that if a stressor is entirely caused by natural conditions it is not a violation of the water quality standard.

Water Quality Protection

A comprehensive effort to ensure that the water quality of priority streams in Pima County is not degraded will likely involve three components: (1) land use planning to identify which future land uses (including potential pollutant dischargers) are appropriate near the streams; (2) minimization of impacts from existing and future land uses; and (3) regularly-scheduled monitoring to ensure that the quality of the streams is not degraded. Implementation of these components would involve landowners, land management agencies, regulatory agencies, and planners. Cooperation among different jurisdictions, private and public interests, and various stakeholders would be necessary.

A further option would be to nominate additional perennial streams for unique water status. This status provides stringent protection against water quality degradation. The State can classify a surface water as unique if it finds the nominated body is an outstanding state resource water. Many of the priority streams appear to meet the criteria the state uses to base its decisions. The criteria are as follows:

- perennial water;

- free-flowing condition;
- good water quality;
- meets one or both of the following conditions: is of exceptional recreational or ecological significance, or threatened or endangered species are known to be associated with the surface water and the existing water quality is necessary to maintain the species.

Water Quality Issues And Policies

One of the seven elements of the Pima County Comprehensive Plan is the Environmental Element. Water Quality is part of the Environmental Element. The Growing Smarter legislation requires "analysis, policies and strategies to address anticipated effects, if any, of plan elements on air quality, water quality, and natural resources associated with proposed development under the comprehensive plan." The goal is to establish a land use plan that minimizes environmental impacts to water quality. An objective of developing policies is to protect and preserve the inherent environmental qualities of the water resources and to avoid adverse impacts that could degrade them.

Each water source in Pima County has its own issues, and therefore, different policies will need to be developed and implemented to meet the goal of the Comprehensive Plan. The following are proposed regional plan policies for the Water Quality Element of the Environmental Element. Some of the suggested policies were taken from land use plans for other counties or communities. Where applicable the sources are shown with footnotes.

Groundwater quality

Water Quality Issues

Current groundwater quality should be maintained or improved.

Groundwater contamination from leaking underground storage tanks, landfills, industrial operations, or other land uses should be prevented or remediated as necessary.

Septic systems contribute to shallow groundwater contamination when they are not properly installed or maintained.

Policies

For the purpose of discussion we suggest the following policies be considered:

> "The County will encourage the protection of groundwater quality within the framework of federal, state, and local laws, regulations, and guidelines that govern water quality."[1]
>
> "The County will continue to coordinate with federal, state, and local agencies on current groundwater remediation efforts. Continue to assess soil and groundwater quality in the vicinity of all County-owned sites of concern, including landfills. Monitor soil and groundwater, develop and implement cleanup strategies. Continue to operate existing remediation systems."

"The County will continue existing monitoring programs, or implement new programs to protect groundwater quality at County facilities that have the potential to impact groundwater."[2]

"The County will continue to have Pima County Department of Environmental Quality ensure septic systems are installed and maintained in accordance with applicable federal, state and local requirements."[2]

"The County will encourage coordination among County departments that use or generate hazardous materials and waste to institute pollution prevention policies and practices. Implement practices that reduce the generation of wastes that could impact groundwater quality and implement spill management plans."

"The County will discourage the proliferation of septic systems in areas adjacent to the priority streams."

Natural waterbodies

Water Quality Issues

Shallow groundwater sources contributing to streamflow can be vulnerable to contamination if certain land uses are present.

Livestock access to stream corridors could result in stream bank destruction, riparian vegetation destruction, and water quality degradation.

Unforeseen discharges to surface waters may cause water quality degradation.

Residential or commercial development could result in degradation of water quality due to sedimentation, erosion, household chemicals, and contaminated runoff.

More water quality information is needed to protect high priority streams.

Monitoring plans need to be developed to ensure existing water quality is maintained.

Water quality requirements for aquatic species maintenance must be addressed.

Protecting water quality of perennial and intermittent streams requires substantial resources.

Watersheds need to be managed to maintain water quality conditions in streams designated as "unique" by the state of Arizona.

Watershed management needs to address the cumulative impacts of development.

Point source discharges might be inappropriate for some streams.

Policies

For the purpose of discussion we suggest the following policies be considered:

> "The County will evaluate planned activities within the County relative to their cumulative impacts and compliance with state water quality standards. Strive to minimize human impact to aquatic and riparian ecosystems from development, roads, and trails."[3]
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> "The County will encourage land use decisions that maintain the function and quality of watercourses and areas designated in the Sonoran Desert Conservation Plan as riparian and aquatic habitat. Land use proposals will be evaluated as to their potential to cause water quality degradation."[3]
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> "The County will further protect surface water from degradation through land use planning to limit the potential for unforeseen discharges and review emergency response plans for existing transportation corridors."
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> "The County will work with the appropriate entities to ensure suitable stream flows that maintain channel morphology and function, support hydrological connected wetlands and promote biological diversity in these systems."[3]
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> "The County will evaluate land use proposals including transportation as to their potential impact on water quality. County and utility roads must be graded and maintained in such a way as to reduce side-casting of material into streams or watercourses."[4]
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> "The County will work with landowners and other entities to promote sound conservation practices to ensure water quality and where appropriate, to establish cooperative management plans."[3]
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> "The County will encourage private land owners to investigate and utilize the preservation programs offered by other government entities and private foundations and will make information on such programs available to the public."[5]
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> "The County will plan, encourage, and participate in long range monitoring of waterbodies and work with Arizona Department of Environmental Quality (ADEQ), Bureau of Land Management (BLM), U.S. Forest Service, Arizona Game and Fish and other appropriate entities in the monitoring and management of natural water resources. Encourage the use of trained volunteers in monitoring efforts and in implement monitoring programs. Use water quality data over the long term as a management tool to identify and prevent degradation."[5]

In order to implement the monitoring program, the following steps are recommended:

Work with ADEQ to identify which priority streams could be included in its ongoing surface water quality monitoring program.

Work with other entities, including Arizona Game and Fish, the University of Arizona, U. S. Forest Service, Bureau of Land Management, and the U. S. Geological Survey, to discuss any plans they might have for research or monitoring projects that might include priority streams; identify possible cooperative research projects that could involve water quality monitoring at these streams.

Determine which priority streams are accessible, as far as terrain, vehicular access, and landowner permission to sample.

Identify and pursue potential funding sources for water quality monitoring.

Continue to support monitoring of priority streams within County-owned lands.

If necessary, expand the existing County-supported monitoring program to include any priority streams that will not be monitored by other entities.

"The County will continue research on aquatic species and their habitat utilizing County staff, state resources, professionals, and volunteers. Develop a plan for native fish reintroduction at appropriate times and locations (Pima County, 2000)."

"The County will pursue nominating additional perennial streams for unique water status designation."

"The County will continue to serve in the role as Designated Management Agency and participate actively in the Section 208 Water Quality Management Planning Process and work with PAG to regularly update the current 208 plan."

Stormwater Quality

Water Quality Issues

Stormwater runoff can affect the water quality of surface water systems.

Flows that are not a result of precipitation, that enter storm drains, can contain contaminants.

The EPA has identified erosion and runoff from construction sites, and improper containment of hazardous substances at industrial sites and landfills, as a potential source of stormwater quality degradation.

Flood events can cause entrainment of pollutants that would otherwise be stationary during non-flood stormwater flows.

Policies

For the purpose of discussion we suggest the following policies be considered:

> "The County will promote land use policies and best management practices that protect the quality of stormwater runoff where a receiving waterbody is a perennial or intermittent stream with habitat for native aquatic species."
>
> "The County will continue to comply with NPDES stormwater permit requirements."
>
> "The County will continue to operate and manage County-owned facilities and properties in a manner that does not degrade stormwater quality."
>
> "The County will continue to implement the Floodplain and Erosion Hazard Management Ordinance to manage and purchase lands in the regulatory floodplain areas to enhance overall watershed management."
>
> "The County will continue to implement the Watercourse and Riparian Habitat Protection and Mitigation Requirements Ordinance to protect endangered natural riparian areas."
>
> "The County will continue to comply with RCRA requirements for pollutant control at landfills."

CAP Water Quality

Water Quality Issues

In the past, public misunderstanding about CAP water quality has hampered efforts to use CAP water to its full extent.

Policies

The County has no direct influence on CAP water quality. However, for purposes of discussion, we suggest the following policy be considered:

> "The County will support owners of CAP allocations in their efforts to educate the public about CAP water quality and the benefits of its use."

Wastewater Quality

Water Quality Issues

A proliferation of private wastewater treatment facilities would be detrimental to the environment and to the orderly, effective protection of public health.

Effluent quality needs to meet federal and state permit requirements. In some cases existing water quality standards and designated uses might not be appropriate for streams in the arid West.

Using effluent in riparian habitat restoration projects should be pursued.

Policies

For the purpose of discussion we suggest the following policies be considered:

> "The County will continue to support the section 208 area wide water quality management plan which includes the policy that all wastewater will be treated in the regional publicly owned facilities. Pima County Wastewater Management Department will continue in their role as Designated Management Agency for wastewater treatment."
>
> "The County will continue to monitor and ensure that all treated effluent discharged from its treatment facilities is in compliance with NPDES permit requirements and state water quality standards."
>
> "The County will continue to research appropriate uses of and water quality standards for treated effluent, including the use of effluent to restore or maintain riparian ecosystems."

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[1] Maricopa County,[2] City of Tucson, [3] Boulder County, Colorado, [4] US Forest Service, [5] San Juan County, Washington

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