



**ALTAR VALLEY CONSERVATION ALLIANCE
WATERSHED RESOURCE ASSESSMENT**

WATERSHED ACTION PLAN AND FINAL REPORT

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WATERSHED ACTION PLAN AND FINAL REPORT

In the two years since the Altar Valley Watershed Resource Assessment began, the range of resource issues facing the area has expanded. Most of the watershed has been designated by the U.S. Fish & Wildlife Service (USFWS) as Critical Habitat or Recovery Areas for the cactus ferruginous pygmy-owl (CFPO). Research conducted under Pima County's Sonoran Desert Conservation Plan has identified the Altar Valley as important habitat for a variety of plant and animal species, and as the highest priority in the county for ranch conservation. Recovery planning for the Pima pineapple cactus (PPC) also views the valley as an important conservation area. Issues related to open space, suburban development, planning and zoning, flood control, and wildlife in the Altar Valley are increasingly the focus of debates involving a wide range of agencies, constituencies, regulations, and procedures.

This assessment did not intend to cover all of these resource issues, and it cannot do so here. It has gathered information on the history, management, landownership, cultural features, and vegetation of the watershed, primarily with a view toward resource enhancement in a context of continued livestock ranching. This focus has brought the assessment to fruition with an extraordinary degree of landowner participation. The result is an assessment that combines objective data concerning resource conditions with a proactive strategy for continued conservation. In the coming years, this foundation will aid greatly in addressing the broader range of resource issues that is emerging.

The purpose of this final report is to summarize the results of the assessment and outline a Conservation Action Plan for the Altar Valley watershed. This entails identifying gaps in the scientific and management information available at this time, and suggesting a means to fill those gaps in the future.

SUMMARY OF WATERSHED RESOURCE ASSESSMENT

HISTORIC CONDITIONS

The land use history completed establishes a baseline picture of the watershed's potential conditions and an understanding of the important role of management in modifying those conditions, for better and for worse. This information shapes the management goals and objectives for the assessment as a whole.

Baseline conditions in the watershed can be summarized as follows:

- The broad floodplain of the valley was unincised and dominated by Giant sacaton (*Sporobolus wrightii*).
- The uplands were dominated by native perennial grasses, including several species of grama (*Bouteloua* spp.), bush muhly (*Muhlenbergia porteri*), and Tobosa (*Pleuraphis mutica*).
- Mesquite trees (*Prosopis velutina*) were confined to drainages and the margins of the floodplain, increasing in density at lower elevations.

- Wildfires played an important role in maintaining the grassland aspect of the watershed.
- Natural surface water sources were absent in the main portion of the valley, and limited in the surrounding mountains.

Dramatic changes in these conditions occurred in the first half of the twentieth century, directly or indirectly related to the combined effects of drought and excessive livestock grazing. Chief among these were:

- The formation of an arroyo in the floodplain, beginning in 1905 and rapidly growing through the 1950s.
- A shift from sacaton to Johnson grass (*Sorghum halepense*) in the floodplain vegetation, gradually supplanted by mesquites and shrubs as the arroyo lowered the shallow alluvial water table.
- Diminution of native perennial grasses in the uplands. Initially, perennials were replaced by annual species; later, mesquite trees and other shrubs gained dominance.
- The development of hundreds of artificial water sources to provide water to livestock. Stocktanks and dams also served to mitigate erosion.
- Extensive fuel wood cutting throughout the watershed, especially to power early steam pumps that drew water from very deep wells in the center of the valley.
- The virtual elimination of fire as a disturbance in the watershed, due to lack of fine fuels and aggressive suppression efforts.

Throughout the twentieth century, ranch owners and managers worked with government conservation agencies to mitigate the damage of the early period and improve conditions in the watershed. Stocking rates declined steadily from the early 1900s to about 1970, stabilizing at a present level that is one-fifth to one-third of peak levels. Spreader dams, contour plowing, and dikes were used to mitigate arroyo formation and, in some areas, prevent headward cutting of tributary drainages. Fences, stocktanks, wells, and waterlines were installed to enhance control of grazing. A variety of mechanical and chemical methods were employed to control the spread of mesquites and restore grasses. The non-native perennial, Lehmann lovegrass (*Eragrostis lehmanniana*) proved exceptionally well-adapted to local conditions and came to dominate large areas, especially where seeded following mesquite removal.

Beginning in the 1970s, new management practices were implemented in the watershed. Rest-rotation systems allowed vegetation to recover from grazing before being grazed again. Prescribed fires helped to control shrubs and mesquite recruitment. More flexible stocking rates helped reduce the impacts of drought. Systematic monitoring of vegetation composition and cover provided managers with better information for evaluation of management decisions.

PRESENT CONDITIONS

Assessment of present conditions in the watershed confirms that the management practices of the past three decades have generally stabilized or improved resource conditions.

The Mexican Oak-Pine Woodland and Oak Savanna areas of the watershed (Major Land Resource Area [MLRA] D41-1) are at or near their potential condition, dominated by native grass, forb, and tree species. Rangeland conditions are healthy, with trends stable or upward. These areas, located at higher elevations and receiving more precipitation than the balance of the watershed, are generally grazed in the winter months and rest through the summer growing season. Areas that have burned in the past 30 years are in particularly good condition.

The Southern Arizona Semi-Desert Grassland areas of the watershed (MLRA D41-3) are healthy or at risk, depending on the ecological site in question. Granitic hills, volcanic hills, shallow uplands, loamy hills, and limy slopes ecological sites meet the standards of rangeland health and watershed functioning. Trends are generally static, with similarity index scores of greater than 60 percent. By contrast, loamy uplands, sandy loam uplands, deep sandy loams, loamy bottoms, sandy bottoms, and deep sandy bottoms ecological sites have much lower similarity index scores and are classified as "at risk" for soil/site stability, biotic integrity, and watershed function. These tend to be the ecological sites where mesquite encroachment is most severe. Trends are also generally static. Mesquite densities are higher than desired, and will continue to increase in the absence of control measures and fire. Lehmann lovegrass helps to stabilize soils, provide forage, maintain a grassland aspect, and provide fuel for fires, but its dominance in many areas pulls the vegetation community away from its potential and desired mix of native grassland species.

The Upper Sonoran Desert Shrub areas of the watershed (MLRA 40-1) are generally in functioning condition. Rangeland conditions are healthy, except in certain ecological sites characterized by serious mesquite encroachment (sandy loam uplands and deep sandy bottoms). Trends range from static to upward. Lehmann lovegrass is present, but not as dominant as it is in the Semi-Desert Grassland MLRA.

Implications for Management

Assessment of historic and current conditions suggests that the Altar Valley watershed as a whole is in better condition today than at any time in the past 75 years. Nevertheless, it is not in its most desired potential condition, and two factors present serious obstacles to the long-term sustainability of watershed resources.

First, the Altar Wash arroyo, extending the length of the valley and up into most major tributaries, impairs the proper functioning of the watershed by increasing sedimentation, decreasing infiltration, and lowering the soil moisture of the valley's most productive soils (the old floodplain). Although it is not growing nearly as rapidly as in the first half of the twentieth century, it will not heal on any human time scale without substantial intervention.

Second, mesquite encroachment in upland areas (which is at or above threshold levels across one-third of the watershed) represents a potentially permanent shift in vegetation from grassland to shrubland. This shift is accompanied by higher rates of sheet erosion, run-off, evapo-transpiration and sedimentation, and by correspondingly lower rates of infiltration. It is now recognized as irreversible on human time scales without management intervention *and* restoration of fire to the ecosystem.

WATERSHED GOALS AND OBJECTIVES

Based on the findings of the land use history, the assessment of present conditions, and extensive discussions with Altar Valley landowners and agency personnel, the following long- and short-term management objectives have been developed under this assessment.

Long-term Goals and Objectives

1. To the maximum extent possible, heal the entrenched arroyo of the Altar Wash floodplain.
2. Control the encroachment of mesquite trees in upland areas.
3. Maintain a diversity of native grasses and forbs in the watershed.
4. Utilize prescribed and natural fires to maintain grassland vegetation in the watershed.
5. Collaborate with researchers and the Buenos Aires National Wildlife Refuge to monitor the effects of fire and develop burning methods that encourage native perennial grasses.

Short-term goals and objectives

1. Mitigate the effects of the Altar Wash arroyo on downcutting, erosion, water infiltration, sediment transfer, and floodplain vegetation.
2. Develop adaptive management pilot programs to mitigate the effects of mesquite encroachment on vegetation cover, erosion, forage production, wildlife habitat, and water infiltration.
3. Develop and test strategies to contain or reverse the spread of Lehmann lovegrass.
4. Encourage further implementation of management practices that favor increased cover of native perennial grasses.
5. Utilize prescribed and natural fires to reduce shrub cover, curtail mesquite recruitment, and encourage grasses.
6. Identify and abate areas of acute erosion.

CONSERVATION ACTIONS AND PRIORITIES

Conservation Action Sites (CASs) were identified based on the results of the assessment of present conditions, and discussions with landowners and managers. A method of prioritizing actions was developed based on public input, further discussions with landowners, managers, and range experts, and the principles of rangeland health. The results of this work can be summarized as follows:

High priority actions mitigate current or potential acute erosion, improve managers' ability to cope with drought, and/or prevent the conversion of grasslands to shrublands.

Medium priority actions re-establish grasslands in areas already converted to shrublands, aid the recovery of grasses from disturbance, benefit valued wildlife, and/or benefit native perennial grasses.

All other actions are *low priority*.

Applying these criteria to the identified CASs resulted in 51 high priority actions, 25 medium priority actions, and 5 low priority actions.

A CONSERVATION ACTION PLAN FOR THE ALTAR VALLEY WATERSHED

The CASs identified and prioritized represent an important step in the development of an action plan for resource conservation in the Altar Valley Watershed. They are only one part of a larger picture, however. Other important components include science and monitoring, compliance with regulations, open space issues, institutional capacity, community outreach and education, and funding.

Science and Monitoring

Three crucial sets of resource issues are beyond the scope of the CASs identified in this assessment.

First, additional methods need to be established for monitoring and evaluating the condition of the watershed as a whole. The vegetation, rangeland health, and ecological site information gathered are important components of watershed assessment, but additional indicators of watershed functioning (e.g., sedimentation, run-off, infiltration) are also necessary. Similarly, CASs were identified on a property-by-property basis (as stipulated in the assessment methodology), whereas the overall watershed is greater than the sum of these parts. Efforts should be made to implement monitoring programs at the watershed scale to gauge the effectiveness of range management practices and CASs in realizing watershed goals and objectives.

Second, significant gaps in scientific knowledge limit managers' ability to realize resource goals. These gaps include:

- The role of natural and human-caused disturbances in desert grassland vegetation dynamics. The principal disturbances at issue are grazing, fire, and drought. How the effects of these disturbances vary with intensity, frequency, and timing remains to be understood in detail.
- The relationships among fire, mesquites, Lehmann lovegrass, native perennial grasses, and grazing.
- The current and historic distributions, densities, and habitat requirements of endangered species.
- The effects of disturbances on endangered species.

It is unlikely that all of these gaps can be addressed simultaneously, or that funds sufficient for a comprehensive research program will ever be available. Rather, research will need to be opportunistic to take advantage of varying ecological conditions (droughts, fires, and seasonal rainfall events), available research expertise and funding, and on-the-ground management. For example, a drought may present opportunities to test management practices aimed at reduction of shrub cover, provided that adequate monitoring can be put in place. Similarly, a summer wildfire may allow comparison of the impacts of spring versus summer burning on Lehmann lovegrass. Such efforts will have to be carefully coordinated with ranch managers and flexible enough to react quickly to changing conditions.

Third, scientific monitoring is currently inadequate to address the full array of resource issues in the Altar Valley. Current monitoring is limited to weather data, vegetation transects, hunting, and a small subset of wildlife (major game species and a handful of endangered species). A variety of agencies, institutions, and constituencies are increasingly looking to the Altar Valley (and other rural areas) to satisfy needs such as open space, flood control, clean water, recreation, and the preservation of a wide variety of wildlife. The challenge of meeting these demands will require a greatly expanded and carefully coordinated monitoring program.

To address these issues will require collaboration among Altar Valley landowners, managers, and scientific researchers from Tucson and elsewhere.

Two actions are recommended to address scientific and monitoring needs in the Altar Valley. First, the Altar Valley Conservation Alliance (AVCA) should assemble a scientific advisory team to assist in the development and implementation of a research and monitoring program for the watershed as a whole. Experts in range science, wildlife biology, hydrology, and grassland ecology should be sought to serve on the team. Team members could also advise individual landowners on request. Second, AVCA should develop the capacity to gather and house scientific papers, government reports, research results and selected monitoring data, serving as a clearinghouse or library of scientific information for landowners and managers in the watershed. This recommendation does not extend to range transect data collected by the National Resources Conservation Services (NRCS). Rather, it is aimed at information on topics that are not ranch-specific: wildlife, hydrology, range management research, etc.

Compliance with Regulations

The combined effects of the Endangered Species Act (ESA), National Environmental Policy Act, and Clean Water Act (CWA) result in additional costs and have adverse consequence to the timing of effective response to conservation actions within the valley. Presently, permits and clearances must be secured on a case-by-case basis. This approach can be expensive, not least because it entails redundancy of effort - very similar permits each require an individual landowner's action and the action of a government agency or agencies.

AVCA should work with the relevant agencies to secure watershed-wide permits for actions in each of the CAS categories. Many of these will be permits to do things that did not require permits in the past (e.g., clean stocktanks) or for which permitting requirements have dramatically increased (e.g., clearing mesquite). Permits to remove mesquite, implement the AVCA burn plan, construct erosion control structures, improve and maintain stocktanks, and heal the Altar Wash arroyo would, in one rancher's words, "Give us our tools back."

Securing permits on a watershed basis will require continued research and negotiation regarding endangered species, especially the CFPO and PPC. A variety of avenues for resolving ESA issues have been identified: a Habitat Conservation Plan (HCP) for the watershed; participation in Pima County's Sonoran Desert Conservation Plan (itself an effort to secure a county-wide HCP); other strategies allowed under Section 10 of the ESA (e.g., safe harbor agreements). As with CASs, there are compelling advantages to securing permits as an Alliance rather than as individuals.

Conservation of Open Space and Productive, Rural Landscapes

AVCA recognizes the growth of the Tucson metropolitan area as a major resource issue facing Altar Valley residents now and into the future. Subdivision of private lands and development of residential housing fragments the landscape, increases traffic and demand for services, and impinges on the social and economic bases for ranching. Preservation of open space is a high priority for many urban residents as well as for AVCA members.

AVCA advocates creative, market-based solutions to the economic pressures of landscape fragmentation in the watershed. It will continue to explore and facilitate strategies that conserve resources, protect open space, sustain agricultural communities, and respect private property rights.

Institutional Capacity: AVCA's Role

To fulfill the goals and objectives identified in this assessment, AVCA will need to develop its organizational and institutional capacities. The demands being made on AVCA are increasing beyond the limits of its present, all-volunteer staff. Specifically, AVCA recognizes the need to:

- Strengthen its administrative capacity (staffing, budgeting, development, record-keeping, computer systems);

- Facilitate an expanding flow of communication among members, agencies, outside scientists, and the broader public;
- Mobilize landowners and managers “to think and act as a watershed”; and
- Remain current and act on legal, regulatory, and scientific issues, particularly in regard to public agencies.

AVCA’s officers and members will begin to assess these needs, and means to meet them, in the coming months.

Public Outreach and Education

There is a pressing need to educate the larger public about the history, management, and stewardship of the Altar Valley. The information gathered under this assessment represents an important starting point for such efforts. AVCA will examine a variety of potential programs and projects, including:

- Development of a display or interpretive program, in collaboration with the Buenos Aires Refuge, to educate visitors about valley history, landscape change, management, and ongoing conservation efforts.
- Assembly of resource information into a handbook and other materials for use in outreach efforts, public presentations, and interactions with the media.
- Research and evaluation of public programs (tours, workshops, volunteer opportunities, work projects, website, materials for public distribution, etc.) to increase involvement and understanding of the valley among non-valley residents.
- Design and installation of public signage to educate visitors about the goals and achievements of AVCA.

POTENTIAL FUNDING SOURCES FOR IMPLEMENTATION

NRCS Environmental Quality Incentives Program (EQIP)

EQIP funds are available on a competitive, cost-share basis for fences, waterlines, wells, brush control, fire, reseeding, and stocktank construction. Erosion control projects may also qualify. Under the program, landowners submit proposals for one or more eligible projects to be completed under a five-year contract period. EQIP funds cover up to 75 percent of the costs within a ceiling of \$50,000. No landowner can have more than one contract active at a time. Proposals from each county are evaluated competitively. CASs for fences and water sources, fire, mesquite removal, and perhaps erosion control may qualify for partial funding under this program.

EPA-ADEQ Water Quality Improvement Grant Program

Water Quality Improvement Grants are available on a competitive, cost-share basis through the Arizona Department of Environmental Quality, funded under Section 319(h) of the CWA. The goal of the program is "to implement creative, on-the-ground water quality improvement projects to control non-point source pollution, thereby improving the overall watershed." At least 40 percent of project costs must be covered by non-federal match (cash or in-kind). CASs for erosion control, mesquite removal, and the Altar Valley arroyo may qualify for partial funding under this program. Because all CASs are designed to improve the overall watershed functioning of the Altar Valley, it would be advantageous to utilize other CASs to match funds requested under this program.

Potential Funding Sources for the Altar Wash Sediment Retention Structures

The large, expense and broad array of benefits of the sediment retention structures make it appropriate to build a coalition of funding sources and agencies. Potential partners include the Arizona Department of Transportation (whose bridge on Highway 86 is threatened by flooding of the arroyo), the Army Corps of Engineers, the Pima County Flood Control District (which has bond funds that could be used), the Tohono O'odham Nation, and the Bureau of Reclamation (which may still have funds authorized under the Southern Arizona Water Rights Settlement Act).

North American Wetlands Conservation Act (NAWCA) Funds

Under NAWCA, small grants (up to \$50,000) are available for projects that create, enhance or restore wetlands, and wetlands-associated habitat. CASs that create or improve stocktanks may be eligible if they can be shown to benefit migratory waterfowl and other wetlands-dependent bird species. NAWCA funds must be matched 1:1 with non-federal funds (cash or in-kind).

Private Foundations

An array of public agencies and private foundations might be approached in search of funding for education and outreach projects.