

PART III

**ARIZONA WILLOW
CONSERVATION STRATEGY**

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I. INTRODUCTION

The high elevation riparian ecosystems which support Arizona willow in the states of Utah and Arizona have undergone significant changes through habitat loss, degradation, and from the influence of other human-related actions. These impacts have been less severe on Arizona willow populations on Utah's Markagunt Plateau which supports some of the densest and healthiest known stands. The conservation of the Arizona willow will require the restoration of degraded habitats and the natural processes and functions of associated riparian systems. The following strategy establishes conservation unit objectives, standards and criteria, and conservation actions for the long-term management of Arizona willow.

II. PURPOSE

The purpose of this Conservation Strategy is to outline a framework for management actions which will provide for the goal of long-term conservation of Arizona willow and its ecosystems throughout its range. The conservation of Arizona willow will require reducing threats, improving degraded habitat conditions, and restoring many of the natural functions of associated riparian systems. These habitat protection efforts will also benefit many other threatened, endangered, and sensitive plants and animals which share these ecosystems (Appendix F). Ensuring Arizona willow population viability and stability throughout its range may require several decades of intensive efforts. A variety of research projects on the population biology and ecology of Arizona willow will need to be undertaken to fully understand the implications of land management actions. Such studies will help determine appropriate management practices and identify potential areas for expanding and augmenting depauperate populations.

This strategy identifies specific actions that are necessary to reduce threats and provide for the long-term conservation of Arizona willow, and so, listing under the Endangered Species Act (ESA) by the U.S. Fish and Wildlife Service (FWS) would not be warranted. The short-term actions are to stabilize populations of Arizona willow by reducing immediate threats that inhibit

growth, reproduction, and seedling establishment, and contribute to mortality. The accomplishment of many long-term actions will require further National Environmental Policy Act (NEPA) analysis prior to full implementation as part of this Conservation Strategy.

III. CONSERVATION UNITS

The conservation of Arizona willow will depend upon successful management and protection of Arizona willow populations and the unique high elevation communities and ecosystems of which it is a part throughout the range of the species. This will require conservation of abiotic and biotic factors which contribute to genetic diversity at population, community, and ecosystem levels through the maintenance of natural environmental processes. To achieve these objectives across the range of the species and to effectively direct management actions, Arizona willow "conservation units" are identified within its currently known distribution. Conservation units are identified so that characteristic levels of genetic diversity are maintained in representative and extreme populations of Arizona willow, and geographic patterns of genetic diversity and the genetic integrity of representative populations are protected. Protection of each conservation unit will contribute to the maintenance of diversity on a landscape or ecosystem level.

Conservation units for Arizona willow are based on watersheds which feed high elevation riparian ecosystems in Arizona and Utah where plants and potential habitats are known to occur. Eight conservation units are identified: the Black River, Castle Creek, Fremont, Little Colorado River, Mammoth, Parowan, Sevier, and White River watersheds. In Arizona, the conservation units managed by the Apache-Sitgreaves National Forests (NFs) are the Black River watershed and the Little Colorado River watershed (Figure 4). Both the Black River and White River Watershed Conservation Units are on the Fort Apache Indian Reservation and managed by the White Mountain Apache Tribe (Tribe) (Figure 4). Arizona willow conservation units in Utah include the Castle Creek, Mammoth, Parowan, and Sevier watersheds on the Dixie NF (Figure 5), and the Fremont watershed on the Fishlake NF (Figure 6).

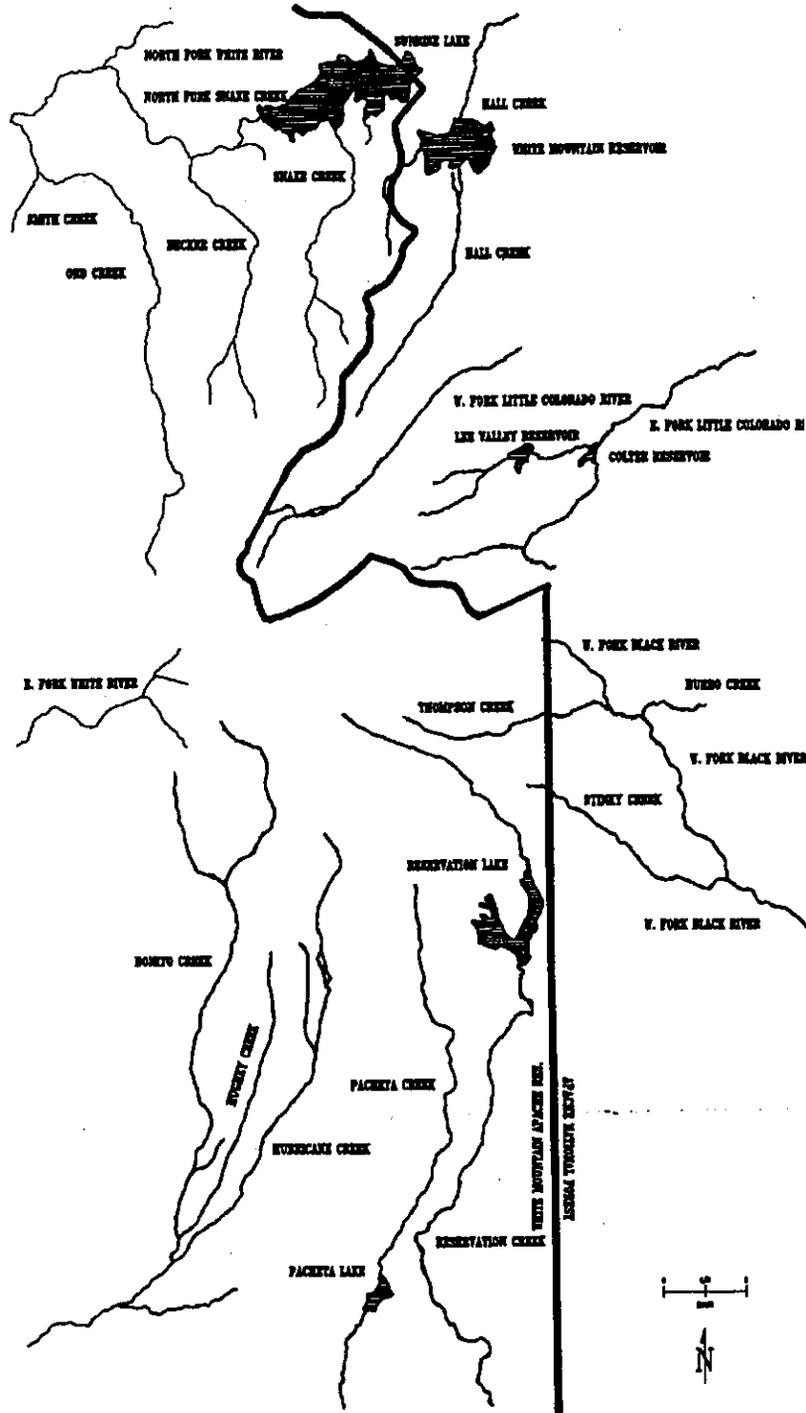


Figure 4. Arizona willow conservation units in the White Mountains of Arizona, on the Apache-Sitgreaves National Forests and the Fort Apache Indian Reservation.

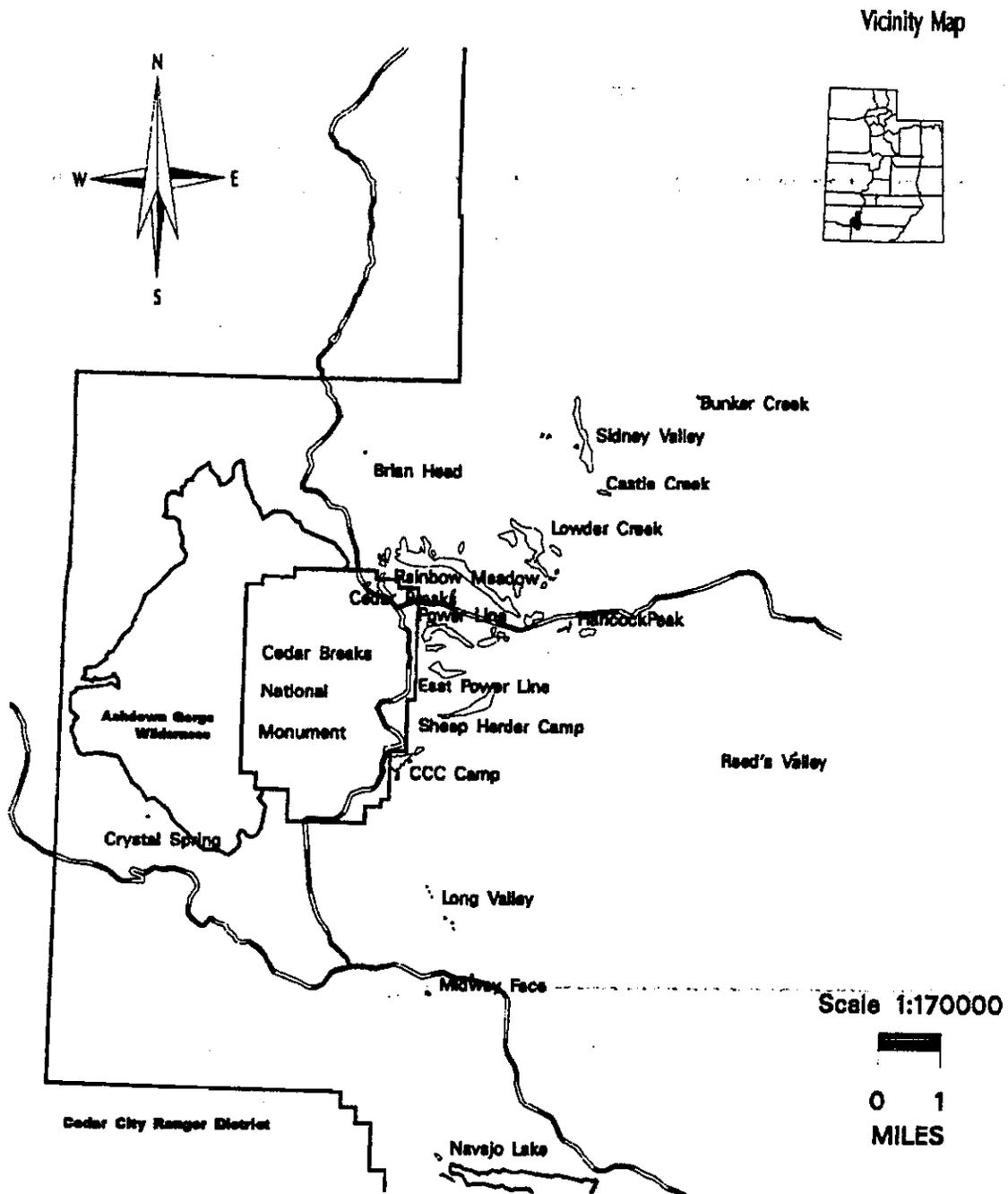


Figure 5. Arizona willow conservation units in the vicinity of Brian Head Peak, Utah, on the Dixie National Forest and Cedar Breaks National Monument.

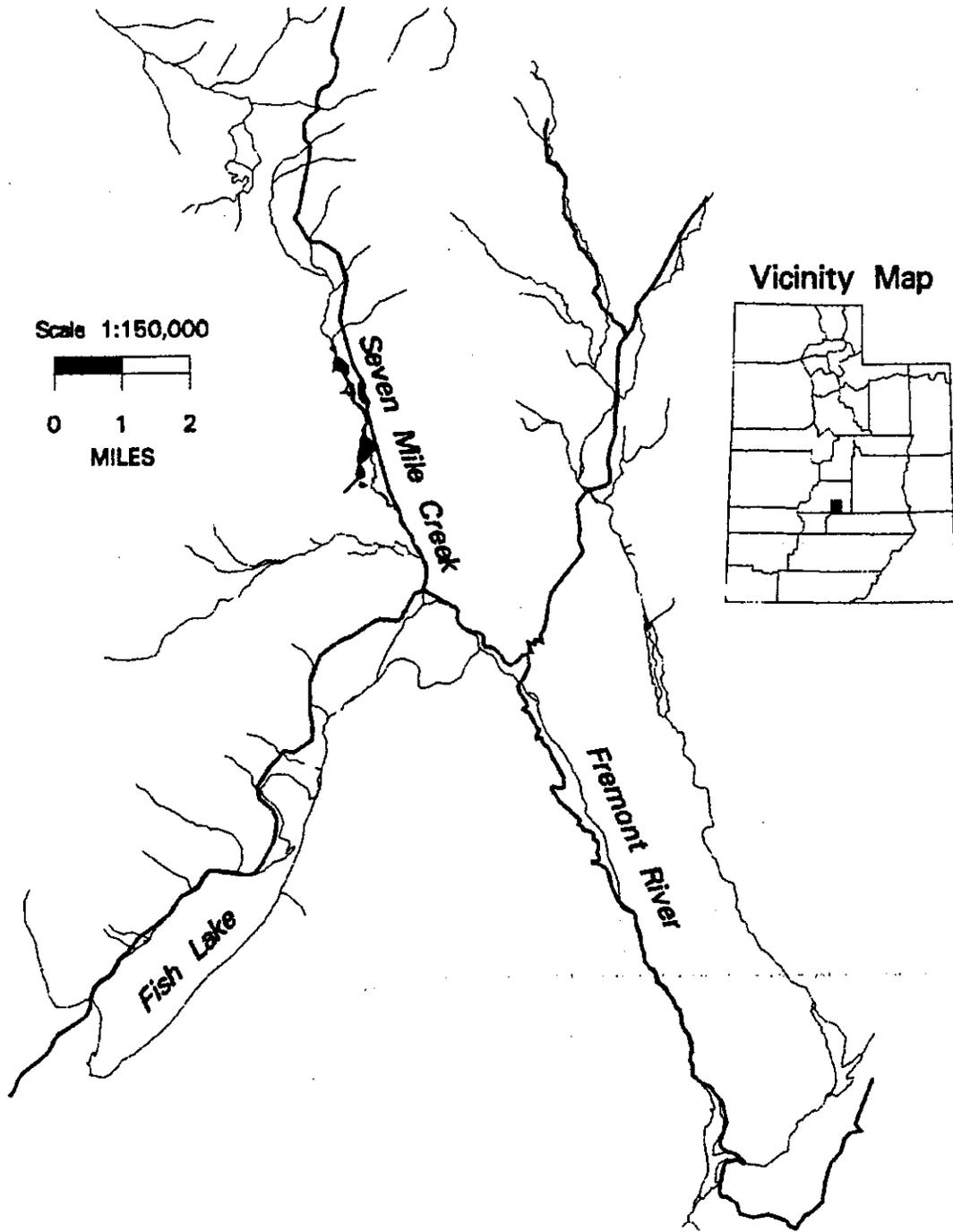


Figure 6. Arizona willow conservation unit on the Fish Lake Plateau, Utah, Fishlake National Forest.

Conservation units are the recovery analysis areas, and specific measures are established for each conservation unit. These criteria often require the assessment of plant vigor and habitat conditions.

To measure individual plant vigor, health, and reproductive viability, the following measures are applied.

1. Quantitatively demonstrate increases in annual leader growth by documenting incremental increases and gains in mean plant size through a five-year period.
2. Quantitatively demonstrate a decrease in vigor and/or mortality, as contributed to by disease factors which manifest in leaf loss, twig dieback, loss of stems, and plant mortality, through a five year period.
3. Quantitatively demonstrate that 25-50% of the lateral shoots of primary stems produce catkins that result in production of seeds from female plants as evaluated over a five year period. The number of male and female plants present in the population must be adequate to ensure cross pollination and genetic diversity.

To measure improvements in habitat conditions, the following measures are applied.

1. Quantitatively demonstrate a decrease in the proportion of exotic plant species and other "nondesirable" species through management programs that control or maintain levels of exotics without compromising native biological diversity.
2. Quantitatively demonstrate natural processes are present in the system to allow for the distribution of various ecological stages within the watershed. These natural processes may be on long-term cycles, and affect ecological succession, forest canopy closure, encroachment of conifers into meadows, and reductions in water (stream, springs, seeps) flow. Hydrologic processes create gravel bars, stream meanders, and effect channel development including bank stabilization and the control of channel downcutting.

The following are specific measurable parameters for the management of Arizona willow within each designated conservation unit.

A. Black River Conservation Unit:

1. On non-Tribal lands, enhance small populations with propagules, cuttings, and/or propagated plants such that small populations increase to at least 100 sexually reproductive individuals that become and remain established for at least ten years.
2. On non-Tribal lands, increases in plant vigor, health, and reproductive viability are demonstrated over a period of five years, such that the total number of reproductively viable individuals within half of the populations increase by at least 25%, and seedlings are established.
3. Refer to the White Mountain Apache Tribe Arizona Willow Management Plan for management objectives on Tribal land.

B. Castle Creek Conservation Unit:

1. Maintain current conditions with protective measures in place.

C. Fremont Conservation Unit:

1. Increases in plant vigor, health, and reproductive viability is demonstrated over a period of five years, such that the total numbers of reproductively viable individuals increase by at least 25%, and seedlings are established.
2. Quantitatively demonstrate improvement in habitat conditions specifically with regard to decreases in sediment loads, and the functioning of ecological processes.

D. Little Colorado River Conservation Unit:

1. Enhance small populations with propagules, cuttings, and/or propagated plants such that small populations increase to at least 100 sexually reproductive individuals that become and remain established for at least ten years.
2. Increases in plant vigor, health, and reproductive viability are demonstrated over a period of five years, such that the total number of reproductively viable individuals within half of the populations increase by at least 25%, and seedlings are established.
3. Quantitatively demonstrate improvement in habitat conditions specifically with regard to decreases in exotic plant species, and the functioning of natural ecological processes.

E. Mammoth Conservation Unit:

1. Maintain current conditions with protective measures in place with the exception of the CCC Camp and Sheep Herder populations.
2. Increases in plant vigor, health, and reproductive viability is demonstrated for the CCC Camp and Sheep Herder populations over a period of five years, and seedlings are established.
3. Quantitatively demonstrate improvement in habitat conditions specifically with regard to sediment loads, increases in native plant species cover, and the functioning of natural ecological processes for the CCC Camp population.
4. Quantitatively demonstrate improvement in habitat conditions specifically with regard to water quality, raised water table, stability of stream banks, and the functioning of natural ecological processes for the Sheep Herder population.

F. Parowan Conservation Unit:

1. Maintain current conditions with protective measures in place.

G. Sevier Conservation Unit:

1. Enhance this small population with propagules, cuttings, and/or propagated plants such that the population increases to at least 100 sexually reproductive individuals that remain established for at least ten years.
2. Increases in plant vigor, health, and reproductive viability are demonstrated over a period of five years, and seedlings are established.
3. Quantitatively demonstrate improvement in habitat conditions specifically with regard to sediment loads and the functioning of ecological processes.

H. White River Conservation Unit:

1. Refer to the White Mountain Apache Tribe Arizona Willow Management Plan for management objectives on Tribal lands.

IV. CONSERVATION STANDARDS AND CRITERIA

The following conservation standards and criteria define those essential components needed to understand the species' biology, ecology, genetics, restoration, and management needs, as well as those specific administrative elements necessary to ensure long-term management continuity and commitment. These will be used, in part, to measure whether the conservation objectives have been accomplished.

- A. Scientific data indicate that each conservation unit sustains populations that are viable or that are on a significant upward trend towards viability that is maintained for at least ten years.

1. Collect and analyze biological and ecological data throughout Arizona willow's natural range to determine reproductive biology, genetic makeup, habitat requirements, ecological relationships, and responses to competition, disease, and predation.
 2. Conduct surveys and inventories to determine the overall distribution and status of Arizona willow, define potential habitat, and quantify density and abundance.
 3. Provide survey data and results of research activities in a timely manner to all interested parties through the Arizona Game and Fish Department (AGFD) and Utah Division of Wildlife Resources (UDWR) Heritage Program databases as the central repository of site-specific information. Tribal information will be managed by the Tribe pursuant to the "Statement of the Relationship between the White Mountain Apache Tribe and the U.S. Fish and Wildlife Service" (December 6, 1994).
- B. Unfragmented and high-quality habitat sufficient to ensure long-term survival and recovery is protected within each conservation unit.
1. Enforce existing laws and regulations for the protection of Arizona willow populations.
 2. Identify and implement actions required to reduce existing and potential threats to known populations of Arizona willow.
 3. Ensure that viable populations and genetic diversity are maintained throughout the species' range.
 4. Retain federal lands containing Arizona willow in federal ownership. Acquisition of significant habitats in private ownership with Arizona willow should be pursued when feasible.

5. Designate special management areas such as Botanical Areas, Research Natural Areas, and essential habitat, where appropriate, for the protection and conservation of Arizona willow within each conservation unit.
6. Implement, through administrative procedures, the Arizona Willow Conservation Agreement and Strategy and incorporate provisions of this strategy into agency planning documents and budgets to ensure consistent implementation.
7. Provide mechanisms to oversee implementation of the Arizona Willow Conservation Agreement and Strategy and evaluate the success of these conservation actions through the Arizona Willow Interagency Technical Team.
8. Increase public awareness, appreciation, and support for the conservation of Arizona willow.

V. OUTLINE OF CONSERVATION ACTIONS

The conservation actions described within this outline need to be implemented so that the conservation objectives for each conservation unit are accomplished. Conservation actions are listed in a step-down form in which the broad categories of the conservation standards and criteria are stepped down to specific conservation actions. Table 1 lists the priority tasks including responsible parties, time frames, and estimated costs.

A. Scientific data indicate that each conservation unit sustains populations that are viable or that are on a significant upward trend towards viability that is maintained for at least ten years.

A1. Collect and analyze biological and ecological data throughout Arizona willow's natural range to determine reproductive biology, genetic makeup, habitat requirements, ecological relationships, and responses to competition, disease, and predation. Best management efforts are guided by

good biological and ecological information. Monitoring, studies, and research are necessary to define and document population viability. Baseline biological and ecological data are essential for evaluation and documentation of species trend and to determine the most appropriate management actions. Accomplishment of these efforts will depend, in part, on the results of research on Arizona willow population biology and ecology. Encourage participation of persons outside of the land management units, such as the Rocky Mountain Forest and Range Experimental Station, Intermountain Forest and Range Experiment Station, AGFD, UDWR, universities, and other interested parties to participate in research related to Arizona willow and its ecosystems.

- 1a. Develop uniform monitoring protocols in cooperation with participating agencies and interested persons which can be consistently applied and used across the range of the species. Monitoring data forms should be developed that will be completed at regular site visits to provide complete documentation.

- 1b. Establish baseline data and implement long-term monitoring programs to gather biological and demographic data to evaluate population and habitat trends, identify site-specific threats, track changes in the status of Arizona willow, determine effectiveness of management strategies, and redirect management priorities where necessary.

- 1c. Determine impacts of cattle and elk herbivory to Arizona willow based on degree of herbivory and season of use; identify other herbivores which may contribute to important levels of herbivory and how various ecological parameters affect selection and use. Reduce herbivore related impacts to Arizona willow and its habitats where necessary. Herbivory reduces the amount of leaves and stems on plants and affects photosynthetic outputs. Field observations indicate that numerous herbivores feed on Arizona willow. Herbivory by cattle and elk are the most prominent, but the impacts of rodent and insect herbivory is

unknown. By using three-way exclosures the additive effects of herbivory from various species can be evaluated (i.e. exposing Arizona willow to herbivory from all herbivores, excluding livestock only, and excluding all large ungulates).

The AGFD and UDWR are committed to actively participate with FS, FWS and other interested parties in the development and implementation of monitoring and research activities to determine the effects of wildlife and livestock herbivory on Arizona willow populations.

- 1c.1. Construct three-way ungulate exclosures on Stinky Creek, Lowder Pond, East Fork of Sevier, Sheep Herder, and Seven Mile populations. This will help determine the impacts of herbivory and the influence of large ungulates on habitat conditions and trends.
- 1c.2. FWS will provide funding to assist in research activities on Arizona willow herbivory (\$22,000 study) supported through 1994 ESA Section 6 funds.
- 1d. Determine the levels of genetic variation among populations and genetic distances between populations. The overall genetic-variation within the species and among populations of Arizona willow is unknown. Patterns in genetic variation can tell much about the genetic health of populations and will help determine population conservation priorities for the species. In addition, knowledge of genetic variation across populations will be beneficial for enhancing small populations in the wild and for building representative *ex situ* gene pools of the species. Studies proposed by Harper et al. (1994) will aid in understanding this question.
- 1e. Study the differences in biology of upright and prostrate growth forms. To date, there is little information about the factors that are responsible

for the variety of growth forms that Arizona willow exhibits. It is unclear whether growth form variation is induced by environmental/external conditions or genetic factors. Propagules and cuttings from each growth type can be grown in a common garden to determine whether growth forms will persist. In addition, the phenology, reproductive potential, and plant responses to herbivores can be assessed based on growth form from common garden experiments. Studies underway at The Arboretum at Flagstaff will help to understand this question.

- 1f. Assess the timing and causes of mortality. Because various abiotic and biotic factors may contribute to Arizona willow deaths, it is important to track timing and determine causes of mortality to help with management decisions. Knowing the timing and causes of mortality is the first step toward eliminating these threats to the species. The demographic studies in progress by Harper and Taylor (1994) will be helpful for determining mortality factors.
- 1g. Determine how Arizona willow is affected by rust infection. Rust conditions should continue to be monitored. Preliminary studies are underway in Utah (Harper and Taylor 1994) and Arizona (Fairweather pers. comm. 1994; Granfelt pers. comm. 1994). The consequences of rust infection to Arizona willow populations may be dependant on population size and various ecological factors which may contribute to stress (Fairweather 1993).
- 1h. Describe Arizona willow pollination biology and ecology and determine the relative role of wind and insect pollination based on the proportion of male and female plants within limited or highly dispersed populations. Insect pollinators of Arizona willow need to be determined and also whether or not production of seed is limited by pollinators.

- 1i. Determine the requirements for seedling recruitment. Arizona willow seedling recruitment has rarely been documented during the past five years. According to Argus (1986), the primary ecological determinants for the establishment and growth of most willows are a moist substrate for seed germination and ample sunlight for subsequent growth. Studies done on another high elevation willow, Bebb willow (*Salix bebbiana*), indicate that soil moisture, timing and availability of water and light, herbivory, and the availability of germination sites free from competition by other plants all effect germination and survival of seedlings (Atchley 1989, Gori 1991, Waring 1991a, 1991b, Maschinski 1991, 1992). Similar factors are likely to influence Arizona willow seedling survival and recruitment. Investigating these requirements will enable managers to create potential patches of habitat that may enhance Arizona willow recruitment. Studies are underway in Utah by Harper and Taylor (1994) and proposed in Arizona (FWS funding proposal through section 6 of the Act).

- 1j. Determine the impacts of disturbance agents, such as fire, scouring, and flooding on seedling recruitment and plant growth. Because little seedling recruitment is occurring and plant growth is stunted in some locations, it is possible that conditions are not optimal for plant growth or seedling establishment and survival. Disturbance agents, such as fire, scouring, and flooding, may play a role in removing organic sediments from stream channels and competitive plants from stream banks so that Arizona willow seeds can reach wet substrates conducive for germination. Plant growth may also be enhanced by disturbance agents through soil aeration and removal of plant competitors.

- 1k. Assess, on an experimental basis, how manually removing sediment, building gravel beds, or introducing varying particle-sized gravel will affect seedling recruitment. Increasing the number of individuals within many of the conservation units is essential for the conservation of the

species. It is likely that, in the presence of altered ecosystem processes, *artificially modifying stream channels* can increase the optimal space available for Arizona willow germination and growth. Experimental stream modifications should be undertaken on a small scale to determine what factors can enhance seedling recruitment. These modifications may be the most effective way to enhance recruitment and genetic diversity in wild populations.

11. Determine the impacts of exotic plant species on the health and function of riparian habitats and Arizona willow. Reduce the numbers of exotic and other non-desirable plants, such as Kentucky bluegrass, within riparian ecosystems where appropriate. The extent to which exotic plant species, such as Kentucky bluegrass (*Poa pratensis*), are affecting the overall quality of Arizona willow habitat is unknown. To determine the degree of detrimental effects of the presence of Kentucky bluegrass on Arizona willow growth and reproduction, studies should be conducted where the grass is removed from treatment plots. Compare Arizona willow growth and recruitment between treated and control plots.

- A2. Conduct surveys and inventories to determine the overall distribution of Arizona willow, define potential habitat, and quantify density and abundance. Arizona willow has been well surveyed within the White Mountains of Arizona. However, efforts in Utah started in late June 1994 on the Dixie NF, and in early August 1994 on the Fishlake NF. Arizona willow was found on both the Dixie and Fishlake NFs, and more surveys are needed. Additional potential habitat may exist in southern Utah, southwestern Colorado, Arizona, and New Mexico. At five year intervals, additional surveys should be undertaken to see if the willow has expanded into previously surveyed potential habitat.

- 2a. Conduct additional surveys for Arizona willow in areas with similar habitat characteristics in New Mexico, Colorado, Utah, and Arizona.

To better understand the distribution of Arizona willow, surveys in high elevation meadows should be continued. It is especially important to survey for Arizona willow in areas that have proposed land management projects.

- 2b. Complete and maintain updated detailed maps of the distribution of individuals/populations using global positioning systems (GPS) and geographic information systems (GIS) technology. Some populations and subpopulations should be inventoried and mapped to quantify existing populations with statistical accuracy and assess habitat quality.
- A3. Provide survey data and results of research activities in a timely manner to all interested parties through the AGFD and UDWR Heritage Program databases as the central repositories of site-specific information. Tribal information will be managed by the Tribe pursuant to the "Statement of the Relationship between the White Mountain Apache Tribe and the U.S. Fish and Wildlife Service" (December 6, 1994).
- 3a. The Dixie and Fishlake NFs will transmit to the UDWR Utah Natural Heritage Program (UTNHP) all positive and negative data collected on Arizona willow by FS field personnel pursuant to its responsibilities under the interagency Memorandum of Understanding (MOU) entitled, Utah Conservation Effort for Sensitive, Candidate and Listed Species. The UTNHP serves as the central repository for site-specific information for sensitive species in Utah pursuant to its responsibilities under the same MOU. The UTNHP assures the FS that sensitive location data will be protected under the provisions of the Government Records Access and Management Act (Utah Code 63-2-101 *et seq.*), and biennial data dumps are provided to the FS pursuant to the MOU.
 - 3b. The Apache-Sitgreaves NFs will provide all site-specific data, both positive and negative, to the AGFD Heritage Data Management System

(HDMS). The HDMS serves as the central repository for site-specific information for sensitive species in Arizona.

- 3c. The Tribe's Game and Fish Department will retain all Arizona willow site-specific data on Tribal lands as proprietary information of a sovereign government.
- 3d. Encourage Rocky Mountain Forest and Range Experiment Station to complete reports for studies undertaken as part of the 1991 Cooperative Agreement.

B. Unfragmented and high-quality habitat sufficient to ensure long-term survival and recovery is protected within each conservation unit.

B1. Enforce existing laws and regulations for the protection of Arizona willow populations.

- 1a. FWS Utah Ecological Services Office, will Notify Corps of Engineers in writing on locations of Arizona willow populations in Utah to ensure Clean Water Act section 404 permits issued for proposed developments in willow habitat within jurisdictional wetlands consider Arizona willow. Important populations of Arizona willow in Utah occur on private lands. Since Arizona willow habitat is within the definition of jurisdictional wetlands, consideration under the Clean Water Act is one of the few protection mechanisms available on non-federal lands.
- 1b. Retain Arizona willow on the Regional Foresters' Sensitive Species lists. Maintain Arizona willow on the USDA Forest Service (FS) Southwestern Region Regional Forester's list of sensitive species (U.S. Forest Service, Southwestern Region, 1992). Add Arizona willow to the sensitive species list for the FS Intermountain Region. FS policy requires that Forests maintain viable populations of sensitive species and to consider

the effects of proposed actions on sensitive species through the preparation of a Biological Evaluation.

1c. Implement Standards and Guidelines from Forest Plans within Arizona willow habitat, especially for riparian areas. Fully implement the Regional Foresters' policy statement of December 19, 1994. Forest Plans have included many specific Standards and Guides to mitigate adverse effects of various actions. Because watercourses are crucial to environmental health and also provide habitats which support many rare and sensitive species, the management of riparian areas are specially addressed in each Forest Plan. Implementing existing management criteria (Appendix A for Apache-Sitgreaves NFs, Appendix B for the Dixie NF, and Appendix C for the Fishlake NF) and fully implementing the Regional Foresters' policy statement (Part IV, A) throughout Arizona willow habitat, will help to manage or restore riparian ecosystems and to achieve a balance of ecological stages which will provide various conditions necessary for growth, reproduction, and long-term survival of Arizona willow and associated species.

B2. Identify and implement actions required to reduce existing and potential threats to known populations of Arizona willow. Populations of Arizona willow should be protected by reducing direct and indirect effects of habitat degradation and reducing damage to plants by herbivores. The reduction of threats to Arizona willow will require a series of immediate actions and additional long-term measures. Some immediate protective actions include fencing, resting or deferring pasture use by livestock, placing cages around individual plants, providing protective buffers from timber harvest activities, and mitigating siltation and other hydrologic effects from roads and water diversions.

The AGFD is committed to pursuing potential funding sources which may be needed to protect and enhance Arizona willow populations in conjunction with

other sensitive stream/riparian species and habitat management activities (see Part IV, D).

2a. Protect populations from cattle herbivory and minimize the degradation of riparian habitats by livestock. Arizona willow is palatable to cattle and can be heavily utilized. Riparian areas supporting Arizona willow populations that have degraded conditions should be protected from cattle herbivory. Indications of degraded habitat conditions which herbivory may be a contributing or causative factor include, high sediment loads, unstable stream banks, channel widening, bank sloughing and erosion, gradual stream channel trenching or braiding with concurrent replacement of riparian vegetation by more xeric plant species, change, reduction, and/or elimination of vegetation (Branson 1975, Platts and Raleigh 1984).

2a.1. Construct two electric fences in Sidney Valley to exclude Arizona willow habitat from cattle grazing.

2a.2. Relocate pasture fence or construct electric fence below Lee Valley Reservoir on the Apache-Sitgreaves NFs to protect Arizona willow from livestock impacts.

2a.3. Construct riparian ecosystem protection fencing along part of the Seven Mile drainage to exclude cattle grazing.

2b. Manage elk for stable or reduced numbers in Arizona conservation units to lessen utilization of Arizona willow and minimize potential impacts to riparian habitats. Some Arizona willow populations in Arizona show indications of high utilization by elk. Because Arizona willow shows signs of stunted growth and hedging in habitats heavily visited by elk (but not cattle) and because elk may contribute to indirect degradation of riparian habitats in ways similar to cattle, elk populations should not be

enhanced above current levels pending the outcome of studies on the impact of elk herbivory on Arizona willow. Portions of Arizona willow populations in sites heavily used by elk should be protected from herbivory by caging and/or fencing. Preference for protection should be given to plants growing near headwaters or in upstream situations. Protection will increase the likelihood that plants will set flower and produce seed. The individual plants that are protected should be changed every five years to increase the probability of diverse genotypes being represented in the population.

The AGFD is committed to aggressively managing elk populations in the elk management units which may affect Arizona willow populations consistent with monitoring and research information. This strategy will include the current stabilization of elk populations in the Greer, Greens Peak, Black River and Milligan Valley elk management units (see Part IV, D).

The AGFD is committed to annually updating and revising the Region I - Elk Operational Plan population management objectives to respond to willow management concerns for elk management units which contain Arizona willow populations (Part IV, D).

Elk populations in Utah conservation units are substantially lower than in Arizona. The UDWR is committed to updating and revising the elk and mule deer management plans' population management objectives in response to willow management concerns, on at least a five-year basis, for units which contain Arizona willow populations (Part IV, F).

The UDWR is committed to managing elk, mule deer, moose, and pronghorn antelope within Management Plan guidelines and consistent with monitoring and research information on Arizona willow populations (Part IV, F).

- 2c. Monitor use on Arizona willow by the moose reported in the Seven Mile drainage. Field observations will be made on any utilization of Arizona willow by moose.
- 2d. Monitor impacts of beaver herbivory and stream damming. Beaver dams can potentially inundate large numbers of Arizona willow plants, or may improve habitat conditions in some drainages (e.g., East Fork Sevier). Beaver impacts will be assessed on a site-specific basis.
- 2e. Minimize the impacts of heavy recreational use in Arizona willow habitat. Manifestations of recreational impacts include trailing by humans and horses along, through, and across streams; soil compaction; sedimentation from trails; fence cutting; bank instability; and facilities (e.g., ski lodges, equipment buildings, campgrounds, and horse corrals). Actions that can alleviate the impacts of recreation include providing crossover steps at fences to prevent fence cutting, bridged stream crossings, rerouting trails, restricting access to sensitive areas, and educating people through signs and special use permits on how to minimize the impacts of their recreational activities. Areas of angler concentrations need to be assessed in cooperation with State and Tribal wildlife agencies to help with future management decisions for certain high use sites (Mount Baldy Wilderness Area, Sheeps Crossing, Phelps Cabin, Reservation Lake, Seven Mile Creek, and East Fork Sevier).
- 2f. Minimize siltation and erosion caused by road building and traffic by closing and obliterating some roads and/or paving or dust-oiling portions of roads near riparian areas where Arizona willow occurs. Roads are the primary source of sediment from forested watersheds (Stednick 1987). Sediment production from roads increases with road gradient and proximity to stream course. Soil type is also an important factor. Because siltation and aggrading base levels are major problems with many

streams in Arizona willow habitat, efforts are needed to minimize siltation from road-related sources.

2f.1. Forest Supervisor will issue a 261 closure order for the East Fork of the Sevier Watershed to eliminate motorized impacts on the Arizona willow habitats. Direction issued will include language about use of vehicles on roads, trails, meadows, and along riparian streams.

2f.2. Investigate the possibility of a road closure for the Powerline population.

2g. Avoid any water diversions including dam construction, ditch building, or rechanneling that could adversely affect Arizona willow populations downstream. Arizona willow requires perennial water and is not capable of withstanding either drought or inundation. Even small water diversions can result in lowering the water table which may stress or desiccate plants. Therefore, new water diversions should be avoided when construction will affect Arizona willow populations.

2h. Minimize or eliminate impacts of timber harvests upstream from Arizona willow populations. Establish a minimum of a 100-foot buffer for riparian areas providing Arizona willow habitat for all timber harvest activities. Timber harvests and associated activities, such as road building and log skidding, contribute to sediment loads in streams. For all timber harvest activities, follow best management practices and special riparian management standards and guidelines as described in the Forest Plans.

B3. Ensure that viable populations and genetic diversity are maintained throughout the species' range. The conservation of Arizona willow will require management of biotic and genetic diversity at population, community,

and ecosystem levels. To achieve this goal and to effectively direct management actions, watershed-based "conservation units" have been designated as the recovery analysis areas.

- 3a. Further the conservation of Arizona willow and other sensitive species by appropriate use of active management tools (e.g. prescribed fire, vegetation manipulation, and water management); manage exotic species to avoid threats to the diversity of native species, natural biological communities, or natural processes. Incorporate the results of research studies into active management of Arizona willow and its habitat as data becomes available to determine appropriate management techniques.

- 3b. Manage and/or restore riparian ecosystems to achieve a mix of ecological stages which will provide various conditions necessary for growth, reproduction, and long-term survival of Arizona willow and associated species. The ecological conditions which favor growth of established Arizona willow plants are expected to be somewhat different from those specific hydrologically-controlled conditions which provide germination and seedling establishment sites. By providing a broad array of naturally occurring riparian and stream habitats within a dynamically functioning system, the potential viability of Arizona willow populations may be greatly enhanced.

- 3c. For populations whose existence is threatened by low numbers of individuals, introduce seeds, cuttings, or individuals to stabilize and maintain a viable population. There are several sites, especially on the Apache-Sitgreaves NFs, where there are 25 or fewer individual plant units. To address the problems potentially encountered by small populations, specific augmentation plans should be developed for small populations within each conservation unit. The augmentation plan should identify the source of propagules for augmentation, a monitoring plan, and criteria for determining success of augmentation. When

genetic (DNA) analysis is completed on Arizona willow populations and degrees of relatedness among populations have been determined, appropriate sites of propagule sources for augmentation can be identified. Until DNA analysis is completed, augmentation should be accomplished with propagules from plants growing within the same drainage whenever possible. Propagules may be from seed (if available) or rooted cuttings. Seeds introduced to the headwaters or sown in moist, coarse-grained soils along the stream may increase recruitment into the population. Any augmentation efforts must be monitored yearly for ten years in order to determine the success of the effort. A successful augmentation will result in a population of greater than 100 individuals which have been established and reproducing for at least ten years.

3d. Establish an *ex situ* population as a precaution against the demise of wild populations. To assure the survival of Arizona willow, genetically representative cultivated populations, as determined from the results of DNA analysis and/or representing over half of the wild populations, should be maintained in botanical gardens. These cultivated populations will be insurance against catastrophic declines of the wild populations. In addition, cultivated populations will provide material for research studies and sources of seed or cuttings for reintroduction efforts. The Arboretum at Flagstaff, a member institution of the Center for Plant Conservation, is already growing cultivated populations of Arizona willow.

B4. Retain federal lands containing Arizona willow in federal ownership. Acquisition of significant habitats in private ownership with Arizona willow should be pursued when feasible.

4a. Continue to pursue land acquisition within the Powerline population.

4b. Continue to pursue acquisition of private properties on the West Fork of the Black River.

B5. Designate special management areas such as Botanical Areas, Research Natural Areas, and essential habitat, where appropriate, for the protection and conservation of Arizona willow within each conservation unit. Special management area designation assures the priority of Arizona willow management within a multiple-use framework. Areas where issues of biodiversity, ecological processes, and/or Arizona willow conservation are the primary management objectives accomplishes the intent of special area designations.

5a. Investigate the need for designation of "essential habitat" under Regional Forester's authority. Forest Service Manual (FSM 2670.5) direction authorizes the Regional Forester to designate "essential habitat" to meet "recovery objectives for endangered, threatened, and proposed species and those necessary to maintain viable populations of sensitive species." The designation of essential habitat requires the evaluation of project-related impacts to these habitats even in the absence of the species in order to provide expansion habitat.

5b. Evaluate the boundary of Phelps Cabin Botanical Area and Goodding Research Natural Area for possible expansion and redesignation.

5c. Investigate opportunities for designating Rainbow Meadows as a Botanical Area or Research Natural Area.

5d. Continue site protection activities on the Cedar Breaks National Monument populations and map known populations.

5e. Develop conservation agreements or easements between FWS and private landowners for populations occurring on private land. A significant

portion of Arizona willow occurs on private lands in Utah on the Markagunt Plateau in the vicinity of Brian Head Peak. An agreement between FWS and private land owners should be developed that reduces threats and contributes to the conservation of Arizona willow. These agreements and the management of these Arizona willow populations should be coordinated with neighboring private landowners and Dixie NF.

- B6. Implement, through administrative procedures, the Arizona Willow Conservation Agreement and Strategy, and incorporate provisions of this strategy into agency planning documents and budgets to ensure consistent implementation. Agency commitments that provide for long-term protection of Arizona willow and its ecosystems must be incorporated into land management planning documents and be adequately budgeted to ensure implementation.
- 6a. Conduct a workload analysis to determine the budgetary and botanical staffing needs for Forests implementing actions for Arizona willow and associated threatened, endangered, and sensitive species in their ecosystems. A workload analysis is necessary to ensure that Forests are able to implement the commitments associated with this Conservation Strategy.
- 6b. Determine costs and time frames for implementing conservation strategies and identify personnel responsible for completing each action.
- 6c. Revise Land and Resource Management Plans as necessary to incorporate conservation strategies and management commitments for Arizona willow. Ensure that budgets are programmed to allow for implementation of the Conservation Strategy.

6d. Revise Allotment Management Plans (AMPs) to minimize or eliminate adverse affects of livestock to Arizona willow populations and its habitats and to be consistent with the provisions of the Arizona Willow Conservation Agreement and Strategy. AMPs that address livestock grazing in Arizona willow habitat should be developed or revised to conform with the provisions of this Conservation Agreement and Strategy.

- Monitoring of Arizona willow and its habitat should occur prior to livestock entering the unit and after livestock have been removed.
- Inspection and maintenance of pasture fences are required.
- Identify locations of protection fencing.
- Define desired future conditions that would enhance Arizona willow populations and its habitats.
- Apply management techniques so that the combined utilization of Arizona willow by livestock and wildlife will avoid moderate to heavy use.
- Livestock mineral supplements and holding facilities will be located away from riparian habitats and at least 0.4 km (0.25 mile) of known Arizona willow populations.
- Utilization and habitat condition and trend should be continually monitored; stocking rates and grazing systems should be adjusted as necessary to meet the intent of the Arizona Willow Conservation Agreement and Strategy.

- Opportunities should be made available to livestock operators to heighten their awareness of Arizona willow and associated management issues.

6d.1. Review the grazing plan for the East Fork of the Sevier population. Address watershed problems and issues of cattle distribution through the allotment management planning and grazing permit administration processes. Adjustments will be made in annual operating plans to meet the standards of this strategy.

6d.2 Revise the Voigt and Greer AMPs within the Little Colorado Ecosystem Planning Unit by October 1996 if the decision is made to stock the allotment.

B7. Provide mechanisms to oversee implementation of the Arizona Willow Conservation Agreement and Strategy and to evaluate the success of these conservation actions through the Arizona Willow Interagency Technical Team.

7a. Representation on the Arizona Willow Interagency Technical Team should include personnel from each land and resource management agency and other interested parties. The responsibilities of the team are to identify and schedule long-term conservation actions; develop monitoring protocols; coordinate studies and research activities; annually review selected projects taken (or not taken) as part of this strategy; distribute annual progress reports; and exchange information on the biology, ecology, monitoring, and management of Arizona willow. The Team will review, consolidate, and report on the status of Arizona willow and the implementation of this Conservation Agreement and Strategy; review new scientific information to identify additional

research needs; consider modifications of the strategies as appropriate; and provide management recommendations. FWS will chair this Team.

- B8. Increase public awareness, appreciation, and support for the conservation of Arizona willow. Public education is an important component in the conservation of a species. The cooperation of the public will be essential for the ultimate success of ongoing conservation actions. Signs informing the public about conservation projects (such as protective fences and cages) should be posted in heavily visited areas. Information articles on Arizona willow's rarity and conservation efforts can be written for local papers by all cooperators. Involving local citizens and Tribal members with conservation efforts will help ensure public support and understanding of the needs of Arizona willow and its ecosystems.
- 8a. Develop a citizen's participation plan to increase public awareness, appreciation, and support for restoration and management of natural riparian ecosystems.
- 8b. FWS will notify and educate private landowners with Arizona willow populations of the presence and importance of the species and determine if there are plans for private actions that may affect Arizona willow (e.g., water pumping, diversions, home/road construction).

Table 1. Summary of Short- and Long-Term Conservation Tasks.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
ARIZONA Reservation Boundary	Pasture Rest and Cages	Greer AMP target 10/96, LCEU plans and NEPA by 10/95	\$850 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
	Pasture Rest	Greer AMP target 10/96, LCEU plans and NEPA by 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
Hall Creek	Pasture Rest	Greer AMP target 10/96, LCEU plans and NEPA by 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
WFLC in Wilderness	Pasture Rest	Greer AMP target 10/96, LCEU plans and NEPA by 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
Sheeps Crossing	Cages	Greer AMP target 10/96, LCEU plans and NEPA by 10/95	\$900 1995 \$500 1996	Short-Categ. Exclus., Long-EA	Apache-Sigreaves NFs	Little Colorado
Above Lee Valley Res.	Pasture Rest	Voigt AMP target 10/96, LCEU plans and NEPA 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
Lee Valley Res. to Colter Res.	New Fencing and Cages	Voigt AMP target 10/96, LCEU plans and NEPA 10/95	\$1,800 1995 \$500 1996	Short-Admin Action and Categ. Exclus., Long-EA	Apache-Sigreaves NFs	Little Colorado
Voigt Cabin	Cages	Voigt AMP target 10/96, LCEU plans and NEPA 10/95	\$950 1995 \$500 1996	Short-Categ. Exclus., Long-EA	Apache-Sigreaves NFs	Little Colorado
South Tributary EFLC above Phelps	Pasture Rest	Voigt AMP target 10/96, LCEU plans and NEPA 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
EFLC above Phelps	Pasture Rest	Voigt AMP target 10/96, LCEU plans and NEPA by 10/95	\$500 1995 \$500 1996	Short-Admin Action, Long-EA	Apache-Sigreaves NFs	Little Colorado
Phelps Botanical Area and Phelps RNA	Maintain existing fencing	LCEU plans and NEPA by 10/95, Voigt AMP target 10/96, re-evaluate RNA bounds 10/95	\$500/year for fence maintenance	Short-no NEPA, maintenance only, Long-EA	Apache-Sigreaves NFs	Little Colorado
EFLC below Phelps to Colter Reservoir	Pasture Rest and/or Cages/Fencing	Voigt AMP target 10/96, LCEU plans and NEPA by 10/95	\$4,100 1995 \$500 1996	Short-Admin. Action and Categ. Exclus., Long-EA	Apache-Sigreaves NFs	Little Colorado
EFLC below Colter Reservoir	Cages	Voigt AMP target 10/96, LCEU plans and NEPA by 10/95	\$1,000 1995 \$500 1996	Short-Categ. Exclus., Long-EA	Apache-Sigreaves NFs	Little Colorado

Table 1. Summary of Short- and Long-Term Conservation Tasks, continued.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
ARIZONA (cont.) Thompson Ranch	Cages and New Fencing	Burro Creek AMP done, implement plans	\$7,000 1995	NEPA done	Apache-Sigreaves NFs	Black River
	Cages and New Fencing	Burro Creek AMP done, implement plans	\$13,650 1995	NEPA done	Apache-Sigreaves NFs	Black River
	Exlosure and New Fencing	Burro Creek AMP done, implement plans, also road crossings hardened-3yrs.	\$5,000 1995	NEPA done	Apache-Sigreaves NFs	Black River
UTAH Brian Head Peak	Site monitoring through 1997	Site monitoring through 1999, then re-evaluate in 2000	\$200/year	Monitoring through range administration.	Dixie NF	Parowan
Brian Head Town	Contract pvt. land owner inform and educate.	Conservation easement, COE 404 permits	\$1,000 in 1995	None, COE 404 permits	Mtn. - Prairie Region: FWS	Parowan
Bunker Creek	Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/yr through 1997. \$100 in 1998. \$100 in 1999. \$500 in 2000, \$200 to re-evaluate. Up to \$8,000.	Monitoring through range administration.	Dixie NF	Panguitch
CCC Camp	100-foot buffer Site monitoring through 1997	Site monitoring through 1999, re-evaluate in 2000. Evaluate all proposed projects in potential habitat.	\$2,000 in 1995 \$1,000 in 1996 \$1,300 in 1997 \$200 in 1998 \$200 in 1999 \$1,000 in 2000	None	NPS/FWS	Mammoth

Table 1. Summary of Short- and Long-Term Conservation Tasks, continued.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
UTAH (cont.) Castle Creek	Site monitoring through 1997	Site monitoring through 1999, re-evaluate in 2000.	\$1,000 in 1995 \$500 in 1996 \$500 in 1997 \$100 in 1998 \$100 in 1999 \$1,000 in 2000 Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth
Cedar Breaks	100-foot buffer	Site monitoring through 1999, re-evaluate in 2000.	\$200/year	None	NPS	Mammoth
Crystal Springs	Repair pole fence around spring, and monitor effectiveness.	Site monitoring through 1999, re-evaluate in 2000.	\$500 in 1995 \$200 in 1996 \$200/year thereafter.	None, Maintenance only	Dixie NF	Coal Creek
East Fork Sevier	Construction of protection/research enclosure. Develop recreation plan to include closure for OHVs & dispersed camping on non-designated trails and camp sites. Implement standards in AMP. 100-foot buffer.	Site monitoring through 1999, re-evaluate in 2000. Enforce OHV travel plan. Implement standards in AMP.	\$10,000 in 1994 for enclosure construction. \$3,000 in 1995 \$2,000 in 1996 \$2,500 in 1997 \$200 in 1998 \$200 in 1999 \$2,000 in 2000 Up to \$8,000	Scope research enclosure project, then implement.	Dixie NF	East Fork of Sevier River
East Power Line	Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year	Monitoring through range administration.	Dixie NF	Mammoth
Hancock Peak	Site monitoring through 1997. 100-foot buffer.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth

Table 1. Summary of Short- and Long-Term Conservation Tasks, continued.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
UTAH (cont.) Long Valley	Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year	Monitoring through range administration.	Dixie NF	Mammoth
Lowder Creek	Construction of protection/research exclosure. Develop recreational plan for ORV use within riparian areas. Implement standards in AMP.	Site monitoring through 1999, re-evaluate in 2000. Enforce ORV travel plan. Implement standards in AMP.	\$10,000 in 1994 for exclosure construction. \$3,000 in 1995 \$2,000 in 1996 \$2,500 in 1997 \$200 in 1998 \$200 in 1999 \$2,000 in 2000 Up to \$8,000	Scope research exclosure project, then implement.	Dixie NF	Mammoth
Midway Face	100-foot buffer. Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year Up to \$8,000	Monitoring through range administration.	Dixie NF	Asay
Navajo Lake	100-foot buffer. Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year Up to \$8,000	Monitoring through range administration.	Dixie NF	Asay
Power Line	Site monitoring through 1997. Check with power company on road easement. Check on land acquisition. 100-foot buffer.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth

Table 1. Summary of Short- and Long-Term Conservation Tasks, continued.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
UTAH (cont.) Rainbow Meadows	Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$2,000 in 1995 \$1,000 in 1996 \$1,000 in 1997 \$1,000 in 1998 \$1,000 in 1999 \$1,500 in 2000 Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth
Reed's Valley	100-foot buffer. Site monitoring through 1997.	Site monitoring through 1999, re-evaluate in 2000.	\$500/year Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth
Seven Mile	Purchase fence materials for protection fence construction of protection/research exclosure. Implement standards in AMP.	Site monitoring through 1999, re-evaluate in 2000. Enforce ORV travel plan. Implement standards in AMP.	\$25,000 1994 \$33,000 1995 \$5,500 in 1996 \$5,000 in 1997 \$2,000 in 1998 \$2,000 in 1999 \$10,000 2000	Protection fence constructed under existing AMP decision. Scope research exclosure project, then implement.	Fishlake NF	Fremont
Sheep Herder	Construction of protection/research exclosure. Develop recreational plan for ORV use within riparian areas. Implement standards in AMP. 100-foot buffer.	Site monitoring through 1999, re-evaluate in 2000. Enforce ORV travel plan. Implement standards in AMP.	\$3,000 in 1995 \$2,000 in 1996 \$2,500 in 1997 \$500 in 1998 \$500 in 1999 \$2,000 in 2000	Scope research exclosure project, then implement.	Dixie NF	Mammoth

Table 1. Summary of Short- and Long-Term Conservation Tasks, continued.

Site	Conservation Actions		Budget by Year	NEPA Compliance	Responsibility	Watershed
	Short Term	Long Term				
UTAH (cont.) Sidney Valley	Site monitoring through 1997. 100-foot buffer.	Site monitoring through 1999, re-evaluate in 2000.	\$2,300 in 1995 \$800 in 1996 \$800 in 1997 \$500 in 1998 \$500 in 1999 \$1,000 in 2000 Up to \$8,000	Monitoring through range administration.	Dixie NF	Mammoth

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GLOSSARY

Abiotic - Non-living.

Adverse Effects - Actions, programs or events which reduce the viability of individuals and/or populations of a species.

Allotment Management Plan (AMP) - A livestock grazing management plan dealing with a specific unit of rangeland and based on multiple use resource management objectives. The AMP considers livestock grazing in relation to other uses of rangelands and in relation to renewable resources--watershed, vegetation, and wildlife. An AMP establishes the seasons of use, the number of livestock to be permitted on rangelands, and the rangeland improvements needed.

AMP - Abbreviation for allotment management plan

Anaerobic Condition - A soil situation where a soil strata is devoid of oxygen.

Arizona Willow - The plant species *Salix arizonica*, a low to medium statured shrub in the family Salicaceae, endemic to high elevation riparian wetlands in eastern Arizona and southern Utah.

Biological - Of or pertaining to biology.

Botanical - Of or related to plants.

Botanist - A journey level biologist trained in the study of plants.

Buffer - A boundary around a special riparian management area to insulate this area from adverse impacts originating from outside the area (e.g. Arizona willow populations adjacent to timber sales in Rainbow Meadows).

Cienega - A spanish term for a native wetland or marsh area of the southwest.

Clean Water Act - Requirement for application for section 404 permits before filling of jurisdictional wetlands. Permits are issued by the U.S. Army Corps of Engineers after an analysis is completed of impacts and mitigation needed to protect rare resources.

Clone - A population of genetically identical individuals which develops through asexual reproduction.

Conservation Action - An action taken to conserve or preserve natural resources (e.g. for Arizona willow plants or its habitat).

Conservation Agreement - A formal, written document agreed to by the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service and another Federal agency, Tribe, State agency, local government, or private agency organization, or individual to achieve the conservation or recovery of threatened or endangered species through voluntary cooperation. A Conservation Agreement documents the specific actions and responsibilities for which each party agrees to be held accountable. The objective of a Conservation Agreement is to achieve the recovery of a threatened, endangered, and/or candidate species.

Conservation Easement - A real estate covenant restricting the use of real property to provide for the protection or enhancement of an environmental value or use of that property.

Conservation Strategy - A written plan of actions or strategies to study, manage, and protect rare species and their habitats based on the best available scientific data.

Conservation Standards or Criteria - A set of standards, criteria, rules, or requirements on which management and protective strategies are made to meet species viability requirements and eliminate the potential loss of a species.

Conservation Objectives - Specific actions necessary for achieving the purpose of the conservation plan for the Arizona willow.

Conservation Plan - A detailed set of documents (a plan) that summarizes current data on Arizona willow, the specific actions needed for protection, restoration and management of the species and its habitat, and a signed conservation agreement with all parties involved to insure implementation.

Conservation Unit - A specific area (watershed or areas within a watershed) where known populations of Arizona willow occur and where specific actions must be implemented to remove threats to the species and restore habitat conditions to potential natural conditions.

Conserve - To protect from loss or depletion, preserve.

Demographic - The study of the characteristics of a population (e.g. for Arizona willow; size, growth, density, distribution, and other biological requirements of the species).

Disjunct - A species or populations of a species separated or disconnected by many miles, such as Arizona willow populations in east-central Arizona and southwestern Utah.

Downward Trend - a reduction in numbers of plants or size of a population based on established scientific baseline data and changes are documented through research monitoring activities.

EA - Abbreviation for environmental analysis report.

Ecology - The science of the relationships between organisms and their environment.

Ecosystem - The integrated sum of plant and animal populations interacting with the abiotic components.

Effectiveness Monitoring - Monitoring designed to determine the effectiveness of conservation structures, measures and/or actions.

EFLCR - Abbreviation for East Fork of the Little Colorado River.

ESA - Abbreviation for Endangered Species Act of 1973, as amended.

Essential Habitat - Those areas which are essential for maintenance of genetic diversity and the continued existence of viable populations of Arizona willow throughout its range. This would include conservation of large populations and small populations adapted to unique soil types, differing hydrological regimes, unique plant communities, conditions at the edge of the species range or unusually diverse local environmental complexes. It may also include portions of unsurveyed adjacent habitat which may be suitable and could provide for natural expansion of the species.

Exotic - Species not native to the place in question (e.g. *Poa pratensis* populations in western North America introduced from another region).

FACA - Abbreviation for Federal Advisory Committee Act.

Forest Service Policy Statement - A Region 3 and Region 4 Regional Forester's policy statement for management and protection of Arizona willow issued December 19, 1994.

Genetic Diversity - The genetic make-up or constitution of an individual, group, or class of organisms. For Arizona willow, the total genetic make-up of the species throughout its natural range within and between populations.

Genotype - The genetic constitution of an organism, especially as distinguished from its physical appearance.

Habitat - The area in which an organism lives. Determined by a combination of factors including biotic and abiotic components of the immediate environment.

Habitat Improvements - Structural or nonstructural activities which are conducted in existing or potential habitat of Arizona willow.

Herbivory - The consumption of Arizona willow plants by animals and insects.

Hybrid - An individual produced from genetically different parents; the offspring produced by breeding plants or animals of different varieties, species, or races.

Individual - A single individual considered separately from its group or clone (e.g. a seedling).

Introgression - The incorporation of genes from one species or subspecies into another related species or subspecies. It arises as a result of successful hybridization and subsequent backcrossing of the hybrids with one of the parental populations.

Inventories - The process of conducting surveys to determine the total distribution and numbers of Arizona willow.

Lead Agency - The agency responsible for ensuring implementation of the Arizona willow conservation agreement and strategy.

LCEU -Abbreviation for Little Colorado Ecosystem Analysis.

LRMP -Abbreviation for Land and Water Management Plan.

NEPA - Abbreviation for National Environmental Policy Act.

NFMA - Abbreviation for National Forest Management Act.

Occupied Habitat - Areas of land occupied, covered or filled by Arizona willow plants or clones.

Out Year - Budget or fiscal year beyond the current year considered in fiscal planning.

Photo Plot - A photograph taken of Arizona willow in a specific area, at a specific time using specific protocol to document existing conditions and any changes.

Population - A local community of potentially interbreeding Arizona willow plants.

Potential Habitat - An area of land exactly like or similar to a known location occupied by Arizona willow.

Propagule - Seed.

Proposed Rule - U.S. Fish and Wildlife Service 57 FR 54747 proposed rulemaking to list Arizona willow as an endangered species.

Restoration - Specific actions taken to improve or restore Arizona willow habitat or associated ecosystems to potential natural conditions.

RNA - Abbreviation for Research Natural Area.

Seedling Recruitment - The natural replacement of Arizona willow plants through germination and establishment in its natural habitat.

Sensitive Species - All species that are under status review, have small or declining populations, or live in unique habitats. May also be any species needing special management. Sensitive species include threatened, endangered, and proposed species as classified by the Fish and Wildlife Service. In the Forest Service, sensitive species are designated by regional foresters for non listed threatened and endangered species.

Short-Term - The removal of threats in order to forestall the need for listing Arizona willow as threatened or endangered.

Stable Population - A population of Arizona willow without significant impacts to the species or its habitat demonstrated by existence of large, healthy, reproducing plants with excellent vigor and leader growth (e.g. Rainbow Meadows, Dixie National Forest).

Standards and Guides - A set of standards, rules, requirements or guidelines developed in FLMPs to manage and protect natural resources to meet the preferred management alternatives for management areas on public lands.

Studies - Studies completed on Arizona willow to answer administration questions for management decisions on the species versus longer-term research efforts.

Surveys - Field surveys completed during the peak flowering periods for Arizona willow, June - August, to determine the species distribution in potential habitat.

Sustainability - The maintenance of a healthy, desired habitat condition for Arizona willow or preferable plant growth requirements to insure reproduction potential for the species.

Technical Team - An interagency team of specialists established by management to develop the Arizona willow conservation agreement and conservation strategy, and act as the Regional Foresters', and Regional Directors' representatives for implementation.

Threats - Ongoing or potential actions having negative or potential negative impacts to Arizona willow or its habitat.

Viable Population - An Arizona willow population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range within a given planning area (paraphrased from FSM 2670.5.22).

Viability - Having the ability to naturally reproduce (sexually or asexually), develop, and produce healthy populations of a species, under potential natural conditions, to insure genetic diversity is maintained through cross pollination and mixing of the gene pool.

Watershed - The total area above a given point on a waterway that contributes runoff water to the streamflow at that point.

WFLCR - Abbreviation for West Fork of the Little Colorado River.

Workload Analysis - Assessment of the personnel and funding needed to accomplish essential components of the general botany and plant conservation program.

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