Riparian Restoration
Project Number 2001-NPSLM-2-B
Executive Summary

Featured Project:
Riparian Restoration

Species Addressed:
Multiple birds, bats, and amphibians.

Summary Project Description:
National Park Service Exotic Plant Management Team conducted numerous exotic plant control projects in springs and riparian areas throughout Clark County. The removal of tamarisk and other invasive weed plants helps to preserve and maintain these valuable habitats. Active revegetation occurred at some sites to ensure desirable plant recovery for species benefits. Most of this project involved "on-the-ground" restoration activities. A database was established to document all project work according to North American Weed Management Association Standards. The team conducted work across four federal agency lands and county entity boundaries.

Project Status/Accomplishments:
The riparian restoration team completed 64 projects totaling 1,400 acres and planted 650 trees. The team eradicated tamarisk from 30 springs. The team continues an excellent safety record by achieving a, "no loss of work days" due to on the job injuries. In addition to tamarisk the team broadened its scope on weeds by initiating control of tall whitetop, camelthorn, fountain grass, palm trees, arundo and Russian knapweed. The team continues to be a model throughout the United States in coordinating weed control across agency boundaries with multiple partners. Although we accomplished even more than what we proposed there is still more work to be done. Many of the tamarisk control projects completed will need to continue to be maintained and more acres of tall whitetop, camelthorn and fountain grass are targeted for treatment in the next biennium.

Partners: This project has helped facilitate and develop weed control partnerships that are the envy of exotic plant managers throughout the United States.

Partners include:
Clark County, Nevada, MSHCP, Technical Weed Working Group
Partners in Conservation (PIC)
Southern Nevada Inter-agency Restoration Team
National Park Service Lake Mead Exotic Plant Management Team
Lake Mead National Recreation Area
Bureau of Land Management and Red Rock National Conservation Area
U. S. Fish and Wildlife Service, Desert NWR, Moapa NWR, Ash Meadows NWR
U.S. Forest Service, Spring Mountain National Recreation Area
Nevada State Parks, Valley of Fire State Park
Clark County School District
Southern Nevada Water Authority
Las Vegas Wash Coordinating Committee
University of Nevada Cooperative Extension
Natural Resource Conservation Service
United States Geological Service
Nevada Department of Agriculture
Bureau of Reclamation
Nevada Weed Management Association
Clark County Metropolitan Police Department

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Funding Awarded:
$282,500

Funding Spent:
$282,500

Completion Date/Status:
All project deliverables have been completed. Project is on going and more can be accomplished with next biennium funding.

Documents/Information Produced:
Southern Nevada Weed Management Efforts, presentation, Nevada Weed Management Association Annual Meeting, October 15-17, 2002.
Tech Line, Information about Invasive /Exotic Plant Management, Summer 2003, pages 6,7 and 11.
Alien Plant Control and Monitoring Data Base (APCAM)

Riparian Restoration
Project #2001-NPSLM-2-B
Final Report

Introduction

Description of the Project:
Conduct low impact invasive exotic plant control with highly trained and professional field crews that specialize in removing weed plants from sensitive riparian areas. The restoration program is based at Lake Mead National Recreation Area, which is a unit of the National Park Service (NPS). The project partners with the Lake Mead Exotic Plant Management Team (EPMT) that conducts similar work for the NPS in 19 park units in 5 states. Exotic plant control projects were conducted across multiple land management agency boundaries and included entire drainages. The Inter-agency Southern Nevada Restoration Team (SNRT) helped direct, coordinate, and develop project priorities based on a landscape scale approach. Weed management was coordinated on a watershed basis ignoring agency boundaries. Partnerships were also established with local county entities such as the Clark County School District, Southern Nevada Water Authority and the Las Vegas Wash Coordinating Committee. The on-the-ground operations were completed by a crew of 10-15 people capable of splitting into smaller modules in order to meet the needs of each project. The NPS EPMT Alien Plant Control and Monitoring (APCAM) data base was adopted for this project and all data were collected and input into this data base. Most projects were mapped with GPS units and plant population data was collected according to North American Weed Management Association Standards(NAWMA). The weed control projects included initial treatment and follow up weed maintenance and monitoring. Some post treatment revegetation with desirable native plant species occurred at select sites in order to enhance site recovery and to benefit MSHCP covered and evaluation species.

Background and Need for the Project:
Invasive species represent a primary threat to approximately 50% of the US Threatened and Endangered Species (Congressional Testimony presented by Dr. Phyllis N. Windle, Senior Scientist, Union of Concerned Scientists, April 29, 2003). Scientist across the globe and the US Fish and Wildlife Service believe that invasive exotic species are second only to habitat destruction when listing threats to biological diversity. Since habitat destruction of threatened species is occurring in Clark County by allowing development to proceed; it is logical that invasive exotic species management should be a high priority for MSHCP activities in order to protect species and habitats outside of urban development areas. Tamarisk is on nearly every state, county, and federal weed priority list throughout the Western US and has invaded most of the riparian areas throughout Clark County including MSHCP “hot spots” for biological diversity such as spring habitats and the Muddy and Virgin Rivers. Other weed species addressed in this project such as Tall Whitetop, Fountain Grass, and Camelthorn are at much earlier stages of infestation in the county but have shown capabilities elsewhere to cause extensive habitat degradation in MSHCP high value habitats.

MSHCP Management Actions Addressed:

(USFS 102): Secure funding for restoration programs beyond those under the scope of Interagency Agreement # 14-48-0001-94605.

(USFS 103): Wherever possible, select only locally native species for restoration, and where appropriate, use seed from the plant species of concern and endemic butterfly host plants.

(USFS 104): Ensure that restoration projects focus on protection and enhancement of the species of concern and do not inadvertently cause irretrievable damage to the habitats of the species of concern (e.g., open water for bats, mud puddles for butterflies).

(USFS 106): Restore habitat in accordance with Interagency Agreement # 14-48-0001-94605 between the USFS and USFWS for the Spring Mountains NRA. All restoration activities will be designed and implemented in coordination with the Technical Working Group (CA1.6) to avoid inadvertent adverse effects on the species of concern. Priorities identified to date are as follows:

(USFS 132): Where possible, remove obvious exotic plants (dandelions, cheatgrass) in the Wilderness manually.

(USFWS 35): Create new open water resources for bats and other wildlife

(USFWS 37): Enhance mesquite and catclaw stands by removing the competing tamarisk and replacing with native species

(USFWS 38): Implement reseeding with native plant species and other soil stabilization and habitat restoration actions following fires within the DNWR

(BLM 135): Implement reseeding with native plant species and other soil stabilization and habitat restoration actions following wildfires within areas important for the conservation of covered species and where the feasibility of success is reasonably certain.

(BLM 137): Cooperate with NPS, FS, USFWS, Clark County and others on a reclamation program which will include maintaining a seed bank and live plants for rehabilitation of disturbed or burned areas if necessary.

(BLM 142): Control and/or eradicate tamarisk. Rehabilitate the area with native species to help reduce the potential for tamarisk reestablishment and improve ecosystem health.

(BLM 106): Take appropriate protective actions to maintain or improve springsnail habitat, including the reestablishment of populations of springsnails.

(BLM 140): Improve riparian areas, giving priority to areas Functioning at Risk with a downward trend. Implement measures to protect riparian areas, such as fencing and/or alternate water sources away from the riparian area. Insure that the minimum requirement of Proper Functioning Condition on all riparian areas is maintained or achieved.

(BLM 141): Improve approximately 400 acres of aquatic and riparian habitat on the Virgin River, Muddy River, and Meadow Valley Wash from its existing poor to fair condition to good or better condition by replacing tamarisk with native species.

(NPS 33): Protect existing stands of mesquite and catclaw.

(NPS 43): Where appropriate, implement reseeding with native plant species and other soil stabilization and habitat restoration actions following fires within the LMNRA.

(NPS 44): Evaluate the potential for reintroduction of relict leopard frog populations into managed areas (such as Las Vegas Wash Wetlands and Park, Boulder City Wetlands Park, and Big Springs Refugium).

(NPS 45): Where necessary, enhance stands of willow and cottonwood by removing the competing tamarisk and replacing with native species.

(NPS 46): Enhance mesquite and catclaw stands by removing the competing tamarisk and replacing with native species.

(NPS 39): Monitor and protect water sources, including springs, seeps and streams.

(NPS 47): Eliminate exotic fish and plant species in and around springs where appropriate and feasible.

(NPS 49): Coordinate with MRREIAC in tamarisk control

(NPS 53): Cooperate with other federal agencies in action to implement the Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem and the Virgin River Fishes Recovery Plan.

Goals and Objectives of the Project:

- Manage and control exotic plant species that threaten riparian and other high value native habitats.
- Facilitate the recovery and maintenance of biological diversity including MSHCP listed species through exotic plant management.
- Protect, preserve and maintain functioning native plant communities.
- Restore habitats that are degraded by exotic plant species.
- Apply Integrated Pest Management (IPM) throughout the weed management process.
- Provide good service and meet the needs of our clients.
- Provide for employee and environmental safety.

- Apply adaptive management principles throughout program.

Methods and Materials:

Control:

Methods and materials varied according to species and project locations. IPM principles were applied for each species and project site. Low impact control methods were used on all species and chemical application was selective to allow surrounding plants to thrive. Successful tamarisk control methods are well established and many were developed at Lake Mead NRA more than 10 years ago. Tamarisk control methods are described in "Low Impact, Selective Herbicide Application of Saltcedar and Russian Olive" (Parker and Williamson, 2000). Further methods are described by Neill (1997), Deuser (1995), and Young et.al (UNR-1995). Other weed species control methods were determined by evaluation of literature, subject matter experts, consultation with chemical companies and University Cooperative Extension Services and information gathered at weed meetings, workshops and conferences. If no well-established control methods exist for a targeted weed species then small experiments or scientific research was conducted to evaluate effectiveness prior to implementing larger scale control. Here is a list of some common control methods utilized in this project:

- Cut-stump
- Low volume basal bark
- Foliar
- Cut-stubble
- Prescribed fire followed by low volume basal on re-sprouts
- Hand pulling
- Hydraulic tree shear
- Shredder

Methods were developed to control weeds within leopard frog habitat and other sensitive aquatic species. We had direction and on site monitoring of our project activities by frog biologists. Some of these methods include hand pulling or mechanical removal with minimal trampling in aquatic habitats and if we have to use chemicals then we use aquatically approved herbicides. Our crew also uses the minimal amount of herbicide to accomplish effective mortality results. Our methods of application are very target specific and include low volumes, we do not use broadcast foliar applications and we set weather conditions prescriptions for herbicide applications. If we are using untested chemicals or methods on weed species then we set up treatment plots and monitor the effectiveness and results through on site field visits prior to adopting the method on a larger scale.

Prioritization:

Priorities are established according to degree of weed infestation. Generally, the sites with the least amount of weeds are the highest priority and sites with the highest amount of weeds are the lowest priority. Prioritization is guided by "Decision Criteria for Developing Salt Cedar Management Programs", Curt Deuser, Salt Cedar Management Workshop, Palm Springs California 1996. In addition sites were prioritized on potential to benefit habitats of sensitive species. These priorities overlap with the biological hot

spots in the county. Site "restorability" is also assessed which includes the amount of water at the spring, amount of native plants present, amount of anthropogenic related disturbance at the site and if it can be reduced or eliminated. Many of the MSHCP listed species and spring habitats will benefit directly from the implementation of this project. Most of the spring-fed wetlands and other riparian habitats have been adversely impacted from exotic plant invasion. Spring-fed wetlands and desert riparian areas are widely accepted by land managers and scientist's as the most valuable habitats that support the highest amount of bio-diversity.

Project Planning and Scheduling*:*
Project implementation and planning were discussed at SNRT and Weed TWIG meetings. Each partner/client would submit their priority projects and then they would be scheduled by the EPMT. Project reconnaissance would normally occur by host agency staff and the larger projects would also be scouted by the EPMT overhead staff.
Some flexibility existed within the program to allow for priorities to change according to severity of threat on the resources and as new weed species were detected. National Environmental Policy Act (NEPA) and Cultural Resource Compliance would be conducted by the host project agency. Projects would also be evaluated to determine if active follow up restoration was needed. Active restoration was usually determined by the amount of desirable species present on the site. Revegetation species were determined by soil types, hydrologic conditions, benefits to MSHCP species and by using reference sites. SNRT selects project sites that have the highest potential for restoration success and include the most benefits to MSHCP listed species and habitats. The most effective exotic plant control methods are utilized without compromising human health or the environment. Follow up site monitoring is conducted to determine project success. Continuous communications were maintained on project accomplishments with the Clark County Weed TWIG and a representative of this project attended the TWG meetings on a regular basis.

Data Management:
All projects are documented with the Exotic Plant Daily Documentation Form and are input into the Alien Plant Management and Control Database (APCAM) developed by the National Park Service Exotic Plant Management Team Program. This database is multi-layered Access format, which can link to GIS layers and photographic points. Weed mapping treatment data was collected by using North American Weed Management Association (NAWMA) standards. Refer to the MSHCP Implementation Database Website (http://www.brrc.unr.edu/implement/) to access some electronic data bases related to this project.

Equipment:
A variety of materials were utilized according to IPM, species treated, site accessibility and the scale of the project. Here is a list of some equipment utilized during the project:

- Chainsaw
- Backpack sprayer
- 4-Wheel Drive Crew Cab Pick-up truck
- ATV

- Flatbed trailer
- GPS Unit
- Hand-held radio
- 110 gallon tank sprayer mounted on trailer
- 15 gallon portable tank sprayer
- 30 gallon tank sprayer
- Skid steer with hydraulic tree shear
- Power auger
- Tree shredder on heavy equipment
- Power brush cutters
- Weed wands
- Camera

Chemicals Used:
- Garlon 4 (DOW)
- Rodeo (DOW)
- Round-up (Monsanto)
- Aqua Master (Monsanto)
- Escort (Dupont)
- Weedar 64 (Nufarm)
- Weedmaster (BASF)
- Arsenal (BASF)
- Improved JLB Oil Plus (Brewer Intl)
- Kinetic Surfactant (Helena)

Results:
The restoration team has maintained a flawless safety record including thousands of hours of chainsaw operation, driving thousands of miles, hiking hundreds of miles, and applying hundreds of gallons of herbicide mixture without accruing a single lost workday or environmental accident.

Project Accomplishment Highlights:
- Removed weeds from 64 project sites throughout Clark County
- Treated approximately 1,400 acres of weeds
- 12 species of weeds were suppressed
- Committed approximately 10,000 hours of labor to on the ground weed control activities
- Applied 140 gallons of herbicide (spot treatments)
- Hand pulled 25,000 weeds
- Eradicated (and maintained) tamarisk from 30 springs
- Revegetated 3 sites following weed removal
- Transplanted 1,200 native trees (cottonwood, willow, and mesquites)
- Constructed a nursery of riparian trees and built a native grass bed for propagation and revegetation projects

- Initiated camelthorn control study with Dr. Mark Renz, Nevada Department of Agriculture
- Removed 1,000 acres of tamarisk
- Treated 250 acres of tall whitetop in Las Vegas Wash
- Established 4 tall whitetop chemical control plots
- Initiated tamarisk control site recovery study with Northern Arizona University

Site Restoration:
More than 500 acres of riparian vegetation have been restored during the last two bi-enniums. Tamarisk has been eradicated from 30 different springs throughout Clark County. More than 20 linear miles of streams, drainage's and washes have been cleared of exotic vegetation. Approximately 1,200 native trees have been transplanted following tamarisk control. The team constructed native grass beds, as well as cottonwood and willow tree hedgerows at the Lake Mead Nursery for cultivation to support revegetation activities following exotic plant control projects. The team ensures project success by developing a sense of ownership in every project. Success has been achieved because we use the most effective methods of exotic plant control and follow up through post treatment site monitoring. Native plants are consistently recovering naturally after exotic plant control. All of our project partners in SNRT have shown dedication to the success of these MSHCP projects and the agencies have provided matching funds to get the job accomplished. Partners in Conservation (PIC) have provided on-site burro fence monitoring and tamarisk control and revegetation maintenance at Meadow Spring. This relationship with PIC could expand if desired by both organizations.

The team planted hundreds of native plant species following exotic plant removal. The team has extensive experience and knowledge of successful revegetation successes and will continue to focus on transplanting of these species:
- Catclaw
- Screwbean Mesquite
- Honey Mesquite
- Cottonwood
- Coyote Willow
- Goodings Willow

Every one of these tree species form critical habitats for the survival of nearly all of the bird species within the MSHCP. The Lake Mead Nursery and The Nevada Division of Forestry Nursery will continue to supply thousands of native plant species to support our restoration activities.

Monitoring and Site Maintenance:
Riparian restoration crew members and partner agency staff assist with follow-up site monitoring and maintenance of all restoration activities. Most treatment activities include follow up monitoring within 9 months to determine treatment efficacy. We have been successful with our projects because the agencies and the riparian restoration team develop a sense of ownership in all of the projects and monitor them through time. We consistently achieve 90%-98% mortality of tamarisk after initial treatment. Seedling recruitment is hand-pulled on an annual basis and all treatment sites are monitored and

re-treated on an annual basis if needed. Weed maintenance at sites becomes less each year and the level of effort is minimal due to the recovery of native plant communities, preventing weed re-establishment.

We have developed methods to achieve 80%-90% mortality after initial treatment of fountain grass. The team applies Integrated Pest Management (NPS, DO-13) principles to all weed management activities designed to evaluate a variety of control alternatives to reduce dependency on chemical control methods. If treatments are not successful then we apply adaptive management practices and seek other methods to achieve success. Literature reviews were conducted on all weed species we manage and experts are consulted prior to initiating weed control activities. Photo point monitoring occurs at some treatment sites and photos are maintained on regular basis. Biologists assess treatment sites to evaluate effectiveness and monitor native plant responses.

Eighteen long-term vegetation plots have been established to monitor site recovery through time at tamarisk treatment areas. Point intercept and 5 meter belts are used to record data. We have recently recorded 10-year post-treatment data from 9 plots. Standardized monitoring protocols are developed by the National Park Service National Fire Monitoring Handbook, 1992. This monitoring is funded by the NPS and is provided as matching funds. We are also in the planning to conduct 10-year post tamarisk removal wildlife surveys at one of our treatment sites. An avian monitoring proposal is being requested to monitor birds within our treatment sites. A master's thesis is being developed by Northern Arizona University to study the vegetation response of various tamarisk control treatments. This study is funded by the National Invasive Species Council.

Some additional monitoring was conducted by UNLV graduate student Sandra Haigh, "Avian Habitat Use in Southern Nevada Riparian Areas with Varying Amounts of Tamarix Ramosissima, 1997. Sandy's study re-confirmed our priorities and management direction of removing tamarisk to improve biological diversity.

Project Locations:

<u>USFWS:</u>
Desert NWR*:*
-Corn Creek (tamarisk)

<u>BLM</u>
Red Rock NCA Springs:
- Maintain weed free all Springs within the Red Rocks NCA
- Blue Diamond Wash
Gold Butte Springs:
- Red Bluff Spring
- Cataract Spring
- Maintain numerous springs
Virgin River:

- Tamarisk Control Demonstration Site
- Camelthorn
Newberry Mountains Springs:
- Hiko Spring
- Bridge Canyon
-Maintain weed free all springs within the Newberry Mountains
BLM Backcountry Byway:
- Echo Wash

USFS (Spring Mountains NRA):
-Kiup Spring
-Cold Creek
-Younts
-Santa Cruz
-Willow Creek
-Trout Canyon

NPS (Lake Mead NRA)
-Echo Wash
-Lower Rogers Spring
-Lower Blue Pt. Spring
-Valley of Fire Wash
-Las Vegas Wash
-North Pipe Spring
-Lower Grapevine Spring
-Rogers Bay Spring
-Black Canyon Spring
-Lake Mojave fountain grass
-Maintain all springs from previous years work

Valley of Fire State Park
-Fire Wash

Whitney Mesa Nature Preserve
-Spring and wash

Partnering:
The money from this project was leveraged to obtain additional funds created by numerous partnerships (refer to executive summary for a list of partners). The project lead (Curt Deuser) actively participates with the Clark County I&M Technical Weed Working Group, Las Vegas Wash Weed Coordinating Committee, Nevada Weed Management Association, and Southwest Vegetation Managers Association and with the development of a county cooperative weed management area (CWMA).

Evaluation/Discussion:
Although tamarisk is increasing in nearly all counties in the western U.S., it is decreasing

dramatically from MSHCP high value areas here in Clark County due to this project funding. This project not only implemented exotic plant control based on site prioritization from MSHCP "hot spots" but also began initiating control of weeds in high priority areas that could become a threat in future years.

Removal of tamarisk at springs and other areas continues to be very successful. Tamarisk control methods are extremely effective and most areas require minimal follow up work to maintain the areas free of tamarisk after initial removal. Monitoring plots and on-site post treatment observations continue to document the recovery of native vegetation. Natural establishment of native vegetation usually occurs within the first growing season following tamarisk removal. Transplanting with native species is generally successful, usually achieving about 50% survival without supplemental watering. Cottonwood and willow cuttings continue to be a cost effective revegetation method in well-drained, moist to saturated soils. Mesquite plantings require rooted plant material and are more difficult to establish but much success has been achieved.

Tamarisk control site recovery is being scientifically evaluated in a study conducted by the National Park Service and Northern Arizona University. Tamarisk has been eradicated at Red Rock National Conservation Area and Valley of Fire State Park, and it is nearly eradicated from the Newberry Mountains and the Gold Butte Area. Clark County is one of the few counties (if not the only) in the entire western United States were tamarisk acreage is dramatically decreasing each year.

The program began controlling other weed species with high priority such as tall whitetop, camelthorn, fountain grass and Sahara mustard. Effective control methods for these species are being developed and evaluated by experiments and by applying adaptive management from the results. Russian knapweed continues to be suppressed at two springs within the Spring Mountains NRA.

Conclusions:

Exotic plant management has resulted in a decrease in tamarisk infestations in many important habitats in Clark County. Limited success with the control of several other species of weeds has been achieved in some areas. Techniques are being developed to increase effectiveness and efficiency.

Recommendations:

Continue eradicating tamarisk from springs and washes throughout Clark County while managing tamarisk for suppression and containment along the Colorado River (Lake Mead and Mohave), Las Vegas Wash, Muddy and Virgin Rivers. Research and management of Sahara mustard (Brassica tournefortii) which could impact annual flower production in desert tortoise habitat should be a high priority for funding. Early detection and rapid response should be the approach for incipient weed populations in southern Nevada. This project should work closely with the weed sentry program when new infestations of a problem weed are discovered. Field trips to project sites by the Clark County Weed TWG are encouraged and will be planned if desired by the TWG members.

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