

Lower Colorado River Multi-Species Conservation Program



Balancing Resource Use and Conservation

PROGRAM HIGHLIGHTS 2005-2010



Letter from the Program Manager



The Colorado River has often been called the lifeblood of the West. Today the Colorado River supplies vital water and power resources for more than 20 million people in the lower basin states of Arizona, California, and Nevada.

Following the designation of critical habitat for four endangered fish species in the Colorado River basin in 1994, concerns were raised about the reliability of these water and power resources. In response, representatives from the three states, Department of the Interior agencies, and various non-federal stakeholders including water and power agencies along the Lower Colorado River formed a partnership to develop a first-of-its kind multi-species conservation program aimed at protecting endangered, threatened, and sensitive fish and wildlife species and their habitats. The Lower Colorado

River Multi-Species Conservation Program (LCR MSCP) was created to balance the use of Colorado River water resources with the conservation of native species and their habitats.

The LCR MSCP works toward the recovery of species currently listed under the Endangered Species Act (ESA). The program also reduces the likelihood of additional species listings. Implemented over a 50-year period, the program accommodates current water diversions and power production, and will optimize opportunities for future water and power development by providing ESA compliance through the implementation of a Habitat Conservation Plan (HCP).

The Bureau of Reclamation, as implementing agency, has worked closely with the LCR MSCP Steering Committee to implement conservation measures outlined in the HCP. This plan calls for the creation of over 8,100 acres of habitat for fish and wildlife species and the production of over 1.2 million native fish to augment existing populations.

Federal Fiscal Year 2010 marked the fifth year of LCR MSCP implementation. This report will summarize the accomplishments of the LCR MSCP since its inception. The successful implementation of this unique and important program since 2005 has been remarkable, with many success stories already observed. We look forward to working with our LCR MSCP partners to continue progress in implementing the HCP to conserve native species and their habitats while providing the environmental compliance needed to meet society's needs.

**John Swett,
LCR MSCP Program Manager**



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Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
<http://www.lcrmscp.gov>



LCR MSCP Planning Area Map



**Lower Colorado River MSCP
Planning Area**

The mighty Colorado River originates in the Rocky Mountains and flows more than 1,450 miles through the American southwest and the Republic of Mexico. The Colorado River Basin extends over nearly a quarter of a million square miles in seven states, providing water for more than 25 million people and 3.5 million acres of agricultural land.

History of the Lower Colorado River Multi-Species Conservation Program

Overview

The mighty Colorado River originates in the Rocky Mountains and flows more than 1,400 miles through the American southwest and the Republic of Mexico. The Colorado River Basin extends over nearly a quarter of a million square miles in seven states providing water for more than 25 million people and 3.5 million acres of agricultural land. Because much of the demand for Colorado River's water and power—the river provides about 15 million acre-feet of water and 12 billion kilowatt hours of energy annually—stems from cities located far from the river corridor, the river is dotted with dams and diversions. The Colorado River provides recreation opportunities such as swimming, boating and fishing, and natural resources in habitat for aquatic, marsh and riparian species, including both resident and migrant species.

Law of the River

In 1922, the Colorado River Compact divided the Colorado River into Upper and Lower Divisions and Upper and Lower Basins. The Upper Division States include Colorado, New Mexico, Utah, and Wyoming, and the Lower Division states include Arizona, California, and Nevada. The Lower Basin extends from Lee's Ferry below Glen Canyon Dam to the Southerly International Boundary (SIB) with Mexico, and is referred to as the lower Colorado River. Hoover Dam is the northernmost facility on this stretch of river managed by the Bureau of Reclamation. Operations on the lower Colorado River are governed by various laws, treaties, and court decisions collectively referred to as "The Law of the River". The Law of the River covers discretionary and nondiscretionary actions by the Bureau of Reclamation related to operation and

maintenance of the lower Colorado River and names the Secretary of the Interior as water master for the river.

Endangered Species

The Yuma clapper rail, a species native to the lower Colorado River, was listed as endangered in 1967 under the precursor to the Federal Endangered Species Act. In 1980, the native bonytail fish species was listed as endangered under the Endangered Species Act (ESA), and in 1991, the razorback sucker, another of the lower Colorado River's native fish species, was listed as endangered. In 1994, areas of the lower Colorado River were designated as critical habitat for these two endangered fish species. In 1995, the southwestern willow flycatcher was federally listed as endangered. The U.S. Fish and Wildlife Service (USFWS) proposed critical habitat for the southwestern willow flycatcher in October of 2004. With the listing of several species as endangered along the lower Colorado River, and with the prospect of more species becoming



Razorback sucker



Yuma clapper rail



Southwestern willow flycatcher

listed in the future, there was a clear need for a long-term program that would balance the interests of water users with conservation of endangered species.

Lower Colorado River Multi-Species Conservation Program

After critical habitat was listed for the razorback sucker and bonytail in 1994, representatives from agencies responsible for water and power management along the lower Colorado River met to discuss a comprehensive plan to conserve native species and their habitats in compliance with environmental compliance under the Endangered Species Act. In April 1997, the USFWS issued a Biological and Conference Opinion to Reclamation covering routine operations and maintenance activities along the Colorado River from Lake Mead to the SIB. That biological opinion served two purposes: it provided Reclamation with Endangered Species Act compliance through 2002 (it was subsequently extended through 2005) and called for stakeholders along the lower Colorado River to develop and implement the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). On April 4, 2005 Department of the Interior Secretary Gail Norton and representatives from agencies within Arizona, California, and Nevada signed documents to implement the LCR MSCP.

The goals of the 50-year program are to conserve habitat, work toward the recovery of threatened and endangered species, reduce the likelihood of additional species being listed along the lower Colorado River, and accommodate present water diversions and power production while optimizing opportunities for future water and power development. The program also provides Federal and non-federal agencies and organizations ESA compliance for covered actions, such as the delivery of nine million acre-feet of water, the production of power from six main stem dams, and the maintenance of the lower Colorado River, through the implementation of a Habitat Conservation Plan (HCP).

The Bureau of Reclamation is the implementing agency for the LCR MSCP. Partnership involvement occurs primarily through the LCR MSCP Steering Committee, currently representing 56 entities, including state and federal agencies, water and power users, and other interested parties, which provides input and oversight functions in support of LCR MSCP implementation. Program costs are split evenly between the federal government and the nonfederal partners.

The Habitat Conservation Plan

The LCR MSCP planning area begins at the upstream end of Lake Mead and ends at the SIB with Mexico south of Yuma, Arizona. This area is the historic floodplain for the lower Colorado River, defined as all lands that are or have been affected by the meandering or regulated flows of the Colorado River.

Reclamation is responsible for implementing the HCP which divides the planning area into seven discrete reaches. The HCP specifies conservation measures for 26 covered species and five evaluation species. Evaluation species are those that require additional information before being added to the covered species list. Covered species are species that are listed or are candidates for listing under the ESA and species



Riparian and pond areas of Beal Lake

that are protected or listed as sensitive by Arizona, California, or Nevada that could be affected by covered activities. Species covered under the LCR MSCP include four fish, twelve birds, four mammals, two reptiles, one amphibian, one insect and two plants.

The HCP describes general and species-specific conservation measures to be accomplished to conserve covered species and their habitats. Major components of the HCP include native fish population augmentation, species research, species and ecosystem monitoring, conservation area development through the creation of new habitat, protection of existing habitat, and adaptive management. While Reclamation is the lead agency in implementing the program, many individual projects are accomplished through partnerships, especially with state wildlife agencies and other federal land management agencies.



MacNeill's sootywing skipper

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LCR MSCP Covered and Evaluation Species

Threatened and Endangered Species

Yuma clapper rail	<i>Rallus longirostris yumanensis</i>
Southwestern willow flycatcher	<i>Empidonax trailii extimus</i>
Desert tortoise (Mojave population)	<i>Gopherus agassizii</i>
Bonytail	<i>Gila elegans</i>
Humpback chub	<i>Gila cypha</i>
Razorback sucker	<i>Xyrauchen texanus</i>

Other Covered Species

Western red bat	<i>Lasiurus blossevillii</i>
Western yellow bat	<i>Lasiurus xanthinus</i>
Colorado River cotton rat	<i>Sigmodon arizonae plenus</i>
Yuma hispid cotton rat	<i>Sigmodon hispidus eremicus</i>
Western least bittern	<i>Ixobrychus exilis hesperis</i>
California black rail	<i>Laterallus jamaicensis coturniculus</i>
Yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>
Elf owl	<i>Micrathene whitneyi</i>
Gilded flicker	<i>Colaptes chrysoides</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Vermilion flycatcher	<i>Pyrocephalus rubinus</i>
Arizona Bell's vireo	<i>Vireo bellii arizonae</i>
Sonoran yellow warbler	<i>Dendroica petechia sonorana</i>
Summer tanager	<i>Piranga rubra</i>
Flat-tailed horned lizard	<i>Phrynosoma mcalli</i>
Relict leopard frog	<i>Rana onca</i>
Flannelmouth sucker	<i>Catostomus latipinnis</i>
MacNeill's sootywing skipper	<i>Pholisora graciellae</i>
Sticky buckwheat	<i>Eriogonum viscidulum</i>
Threecorner milkvetch	<i>Astragalus geyeri var. triquetrus</i>

Evaluation Species

California leaf-nosed bat	<i>Macrotus californicus</i>
Pale Townsend's big-eared bat	<i>Corynorhinus townsendii pallescens</i>
Desert pocket mouse	<i>Chaetodipus penicillatus sobrinus</i>
Colorado River toad	<i>Bufo alvarius</i>
Lowland leopard frog	<i>Rana yavapaiensis</i>

Fish Augmentation

Overview

The Lower Colorado River Multi-Species Conservation Program is committed to the conservation of federally endangered fish along the Lower Colorado River. The native fish augmentation program goal is to conserve the population of the once flourishing native fish community and contribute to the recovery of the razorback sucker and bonytail. In order to accomplish this, the LCR MSCP will provide the effort necessary to raise and stock approximately 660,000 razorback suckers and 620,000 bonytail greater than 300mm in length.

The extensive fish augmentation program cannot be accomplished without substantial brood stocks of razorback sucker and bonytail. These brood stocks must be of sufficient quantity and quality to sustain program needs for many years. The program currently uses two razorback sucker brood stocks; one maintained by the U.S. Fish and Wildlife Service (USFWS) at Dexter National Fish Hatchery and Technology Center, and the second is the Lake Mohave population of razorback suckers which is recognized as the best genetic stock of this species. For bonytail, the USFWS maintains the only brood stock at Dexter National Fish Hatchery and Technology Center. Since they are the sole provider of bonytail, they are tasked each year with delivering fingerlings to the numerous hatcheries and growout facilities.

Each year tens of thousands of razorback sucker larvae are captured from Lake Mohave. These wild caught larvae along with fish produced from captive brood stock are raised in state and federal

hatcheries throughout the southwest. Once the razorback suckers and the bonytail reach the minimum stocking size, they are released

into the LCR or adjacent floodplain backwaters. Stockings are coordinated with the USFWS, state natural resource agencies, and area landowners to ensure cooperation and coordination of existing management activities and associated research and monitoring.



Razorback sucker

Highlights

Lake Mohave contains the most genetically diverse pool of razorback suckers in the world and maintaining this diversity has been a concern since the 1980s. For this reason, larvae are collected annually from many different locations around the lake from January to April. To date, more than 236,000 razorback sucker larvae were collected from four distinct zones in Lake Mohave (Table 1). A portion of these continue to make their way back to Lake Mohave to maintain this wild brood stock. Through vigorous collections and monitoring, researchers at Arizona State University have confirmed that the effort to collect young larvae from across Lake Mohave is successfully maintaining the genetic diversity crucial to a healthy population.

Through improvements in hatchery infrastructure and rearing processes, fish are now large enough to be released back into the wild. From 2005-2010, approximately 133,000 razorbacks and 40,000 bonytail were returned to the Colorado River and its associated flood plain (Table 2).

The native fish augmentation program is not without challenges. In 2007, the introduction of the highly invasive quagga mussel caused some hatchery facilities to stop accepting fish from infected waters. Quagga mussels grow in such

Table 1. Razorback sucker larvae collected on Lake Mohave from 2005-2010.

Year	North Nine-Mile	Tequila Cove	Yuma Cove	Above Owl Point	TOTAL
2005	18104	27052	14835	521	60512
2006	5949	35400	21729	897	63975
2007	4987	6010	7875	1696	20568
2008	7031	9016	9850	3871	29768
2009	6025	8490	8985	4012	27512
2010	8094	12070	8661	5064	33889
TOTAL FISH	50190	98038	71935	16061	236224

Table 2. Summary of Fish Augmentation

REACH	RASU FY10	RASU PROGRAM	BONY FY10	BONY PROGRAM
2	9,203	47,300	0	6,998
3	7,180	35,908	4,032	21,924
4/5	6,093	50,193	961	12,028
Subtotal	22,476	133,401	4,993	40,950
Grand Total Both Species				174,351

high densities that they hinder water-flow at hatchery facilities, among other negative aquatic effects. As a result, hatcheries that originally raised razorback sucker in areas outside the Lower Colorado were forced to alter their operations accordingly. Efforts to remove quagga mussels from the hatchery setting are underway. Research is focused on developing the best way to filter out these invasive organisms from hatchery operations. Despite this setback, the remaining hatcheries made up the differences in production to ensure high numbers of razorbacks make their way back to the wild.

An annual summary has been written each year since 2006 detailing the accomplishments of the fish augmentation program. The summary includes detailed stocking figures from the previous year, as well as upcoming stocking schedules. This information is available on the LCR MSCP website. The data gathered by so many individuals is critical in assessing the future direction of the program and provides an invaluable tool for tracking the success of the native fish augmentation plan.

Fish Monitoring and Research

Monitoring Overview

A key component in the development of management objectives centers on monitoring the existing populations of razorback sucker, bonytail, and flannelmouth sucker in the Lower Colorado River. Specific techniques were adapted to conditions within the program area. These not only include the fish, but also habitats. Partner agencies are documenting fish locations at specific points in time along the entire Lower River. The program staff compiles and maintains

up-to-date records regarding habitat use, distribution, population status, and general fish health.

Monitoring includes a variety of survey techniques such as the netting and electro-fishing taking place at pre-determined intervals for fish population estimates from Lake Mead, Lake Mohave, Lake Havasu, and other areas along the Lower Colorado River. Technological advances have allowed more diverse and non-invasive methods to track these species. Among some of the more hands-off visual survey tools are aerial and underwater photography, and video recordings to help monitor behavior. The underwater recordings accompany extensive dive surveys to aid in population counts.

Remote sensing is a form of monitoring that is more frequently used as a survey technique because of its efficiency and its ability to survey without repeatedly handling a fish. With this monitoring method, each fish is injected with a unique indentifying tag. When a sensing unit is deployed in the water, it detects the fish as it swims near an antenna connected to an integrated scanner and data logger.

Monitoring Highlights

The information obtained from monitoring efforts sheds much needed light on fish distribution. Some of the more promising observations since 2005 are the success of the flannelmouth sucker just below Davis Dam on the Colorado River, near Laughlin, Nevada. All life stages and multiple year classes were observed in this species on a consistent basis and the population has remained stable without supplemental stockings. In addition, a self sustaining population of razorback suckers and recruitment has been documented for more than a decade in Lake Mead.

Preliminary results using the remote sensing units shows much promise in detecting razorback sucker. The ability to quickly and efficiently record razorback during the spawning season was attributed

The Lower Colorado River Multi-Species Conservation Program is committed to the recovery of the once-flourishing native fish populations of the river.



Humpback chub

to refinement of an antenna that has nearly doubled the number of total contacts between 2008 and 2009. The recent implementation of solar-powered battery chargers further enhanced its usefulness by being able to record data for twice as long, resulting in more unique fish detections. All this success is due in part to the decision in 2006 to use the latest fish tagging technology. More reliable detection ranges made remote sensing a viable alternative to traditional monitoring techniques. The benefits include increased detections of unique fish, which also strengthens the statistical estimation of the population. As an added bonus, this monitoring strategy decreases the amount of handling stress experienced by fish as compared to traditional monitoring methods.

Research Overview

Researchers are hard at work attempting to understand what measures are needed to ensure long-term survivability of the native fish community in the lower Colorado River. This type of research is the cornerstone of sound conservation efforts. Returning stronger, more viable fish to the wild requires knowledge about their habitat needs and the development of new monitoring techniques. The past five years' research focused on gaining insight into the life history of razorback sucker



Flannelmouth sucker

Colorado River Multi-Species Conservation
committed to the conservation of federally
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of the razorback sucker and bonytail.



Bonytail

and bonytail, refining fish rearing and monitoring capabilities, and evaluating past successes and current projects to guide the program into the future.

Research Highlights

Native species were always assumed to have a broad tolerance for water quality thresholds. Since 2009, laboratory tests were conducted to establish these previously undocumented thresholds on egg and larval razorback suckers. With this research, the program staff was able to document the survival of larval razorbacks at salinities three times greater than previously known levels and similar results were found for pH tolerances. These established thresholds can be applied to the creation and management of native fish backwater habitats.

The fish rearing facilities systematically tested numerous rearing techniques in an effort to increase both the quantity and quality of stocked fish. This research focused on rearing densities, development of specialized diets, experimenting with polyculture, and flow conditioning. The quality of fish produced has greatly increased as hatcheries continue to improve upon their rearing capabilities. In a series of experiments at the Lake Mead State Fish Hatchery, flow rates were increased to see how the fish responded. Researchers wanted to know if the benefits of this 'training' made them stronger swimmers and

more efficient feeders. Preliminary results show that flow conditioning has increased swimming performance and growth in hatchery conditions. The desired result of the test is to improve survivability upon return to the natural system.

The program continues to evaluate the successes of past and current stocking programs. The continuous contact of previously stocked fish through remote sensing, netting, and electro-fishing has provided insight into which stocking variables have the greatest impact on post-stocking survival. Parameters such as stocking length, location, and season were often documented as impacting survival. As this program matures, the impacts of these parameters will continue to become clearer and the MSCP fish augmentation program can adjust accordingly.

With the construction of six ponds, totaling eighty acres at the Imperial National Wildlife Refuge, experiments are underway to improve habitat quality for native fish. Since late 2007, these ponds were periodically stocked with razorback sucker and bonytail, and monitored for signs of recruitment and survivability. Since the stocking, remote sensing units were deployed to track movements of tagged fish within each pond. Research to date focused primarily on experimenting with effective habitat structures and suitable spawning areas. Since 2009, a concerted program effort resulted in the addition of aquatic and shoreline habitat to maximize recruitment, provide cover from predatory fish, and minimize sediment load. Both bonytail and razorbacks were observed spawning in the constructed ponds and recruitment for both species was documented on site.

Since 1996, the southwestern flycatcher was monitored on the LCR.

Terrestrial Species Monitoring and Research

Introduction

Terrestrial research and monitoring for the LCR MSCP has been underway for 5 years. Many goals were attained, and many covered species are using the newly created habitat. The following represents some of the accomplishments of the Research and Monitoring portion of the program.

Terrestrial Birds

The LCR MSCP monitors and creates habitat for nine covered terrestrial bird species. These last five years were productive for these species. The system-wide monitoring determined the distribution and population estimates for five species including the Arizona Bell's vireo, Sonoran yellow warbler, summer tanager, vermilion flycatcher, and the Gila woodpecker. Preliminary habitat models were also created for these species.

The elf owl needed a separate monitoring protocol. Call playback surveys were conducted for this species from 2008-2010. Initial results suggest that populations of the elf owl along the mainstream LCR are extremely rare. However, there is a relict population along the Bill Williams River. The initial surveys indicated uncertainty about the effectiveness of the survey monitoring protocol indicating a clear need for a more robust monitoring protocol. A new detectability study was designed and initiated in 2010. The information from this study will be used to determine the best methods for long term elf owl population monitoring within southwest riparian habitats.

Yellow-billed cuckoo monitoring and life history studies continue to be successful. Yellow-billed cuckoos are using several habitat creation sites, and are successfully breeding at the Cibola National Wildlife Refuge Unit #1, Cibola Valley Conservation and Wildlife Area, and the Palo



Yellow-billed cuckoo

Verde Conservation Area. There was also attempted breeding at Beal Lake Restoration area. These birds established breeding territories all along the LCR as far south as the Limnrophe Division near Yuma, AZ and north to the confluence with the Virgin River at Lake Mead. The estimated population in 2009 was 42 breeding pairs.

Since 1996, the southwestern willow flycatcher was studied and monitored along the LCR. Life history and demographic studies are concluding, and population monitoring continues in the Virgin River, the lower Grand Canyon, the lower Bill Williams River, and along the mainstream LCR. Information from the life history and demography studies are being used in habitat credit determinations and to adaptively manage created sites to better meet the breeding requirement of this species. Overall, populations remain steady, although to date, no nests were located at created habitat sites.

The Monitoring Avian Productivity and Survivorship or MAPS stations were used at two habitat creation areas: Beal Lake Restoration Site within Havasu National Wildlife Refuge and the Nature Trail (Unit 1) of Cibola National Wildlife Refuge. This was a successful monitoring program, showing increased productivity of covered terrestrial bird species at both locations. One interesting note is that a Bullock's oriole,

the
willow
studied
along



Townsend's big-eared bat

originally banded as an adult in May 2003 at Cibola NWR, CIBO, was recaptured in May 2010. This bird holds the tie with the oldest Bullock's oriole on record.

A color banding program was initiated in the winter of 2008 to monitor the use of revegetated sites by MSCP covered species in the winter and breeding season. Bell's vireo, yellow warbler and summer tanager were captured and color banded at Beal Lake Restoration Site within Havasu National Wildlife Refuge and the Nature Trail (Unit 1) of Cibola National Wildlife Refuge.

Marsh Birds

Three covered marsh bird species, including the Yuma clapper rail, western least bittern, and California black rail have been monitored since 2006 using a multi-species protocol developed by USGS. Since the inception of the multi-species marsh bird protocol, black rails were located in all



California black rail (USGS)

reaches from Topock Marsh down to Yuma, AZ. Because of these data, the conservation measure for the black rails was

expanded to include reaches 3-7. California black rails and Yuma clapper rails were documented using the created marsh habitat at Imperial National Wildlife Refuge during the breeding season.

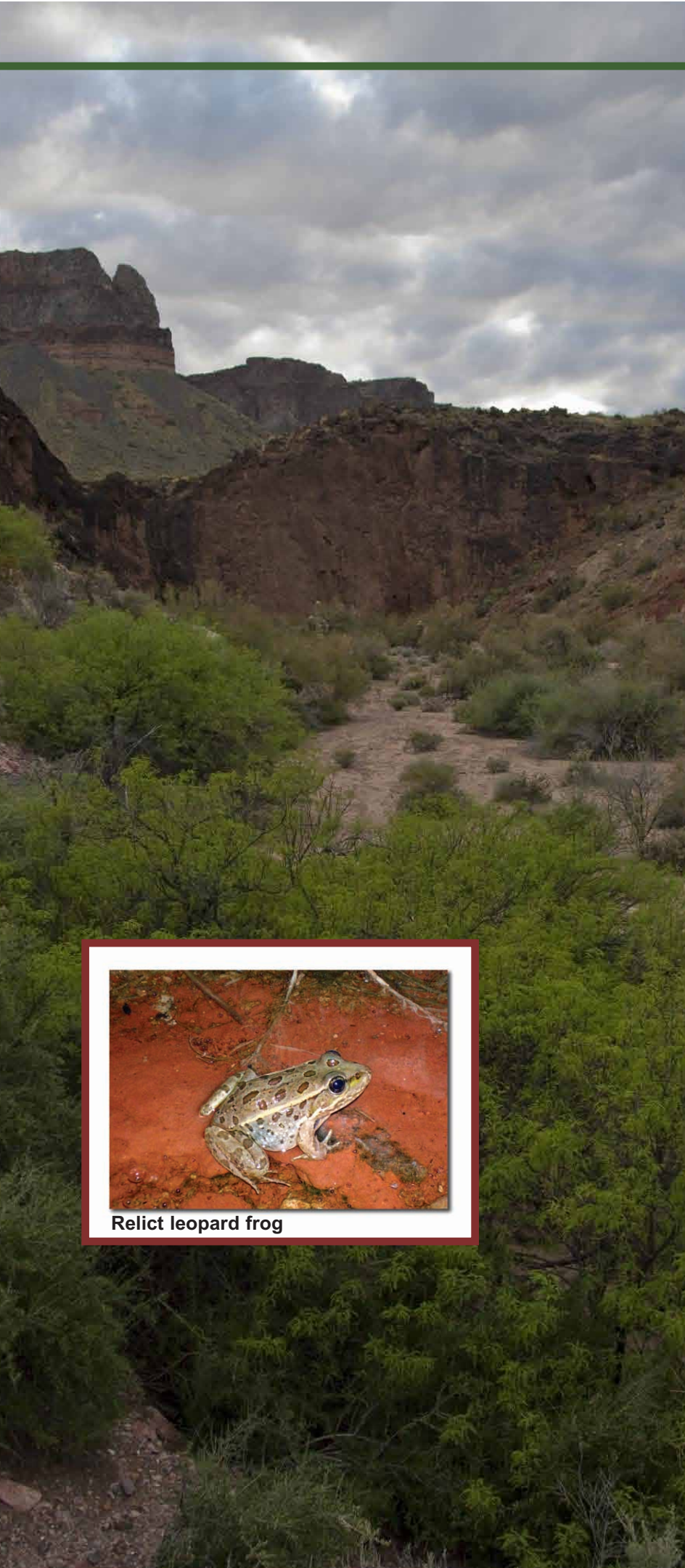
A study on habitat development of planted marsh vegetation and management of water levels started in 2007. The data is being analyzed to determine the preferences of the black rails and clapper rails. This information will help facilitate the creation of marshes for these species, and to adaptively manage already created marsh habitat.

Bats

Several exciting developments took place in the covered species bat world since the inception of the LCR MSCP. A system-wide distribution and occupancy modeling study was conducted for all four LCR MSCP covered and evaluation bat species, including the western red bat, western yellow bat, California leaf-nosed bat, and the Townsend's big-eared bat, and found all four bat species throughout the LCR. The occupancy modeling has interesting results including a high correlation to cottonwood and willow habitat for both the western red and western yellow bats. This strong correlation recognizes the importance of creating this type of habitat for these bats along the LCR.

Prior to 2005, only one western red bat was captured along a tributary to the LCR, the Bill Williams River. As part of this program, both acoustic surveys and capture surveys recorded red bats at three habitat creation or demonstration sites including the 'Ahakhav tribal preserve, Cibola Valley Conservation and Wildlife Area, and the Palo Verde Ecological Reserve.

The first capture of western yellow bats was during exploratory netting at the 'Ahakav Tribal Preserve. 39 yellow bats were subsequently captured at five habitat creation or demonstration sites. Acoustic surveys also confirmed an increase in bat activity for this species at these five sites.



Yuma hispid cotton rat

Cotton Rats

System-wide and created habitat studies and monitoring are occurring for the two cotton rat covered species, the Yuma Hispid cotton rat and the Colorado River cotton rat. A genetics study determining the distribution and separation of the two cotton rats was finalized and determinations of the separation and uniqueness of these two species is complete. The research is now turning to examining habitat use and population trends for these species. Monitoring at the habitat creation sites has documented the Colorado River Cotton rat at three sites, including Palo Verde Ecological Reserve, Cibola Valley Conservation Area, and Beal Lake Riparian Restoration site.

Reptiles and Amphibians

In anticipation of purchasing habitat for preservation, lands within the Chuckwalla Bench in California was surveyed for desert tortoise, a LCR MSCP covered species, Desert tortoise sign or individual tortoise were located on all properties surveyed. These lands are now in the final stages of being purchased. Lands in California will also be surveyed in 2011 for flat-tailed horned lizard, another LCR MSCP covered species in anticipation of purchasing habitat for preservation.



Relict leopard frog

Three amphibians included in the program include the Relict leopard frog, the Colorado River toad, and the lowland leopard frog. Funding was provided to the National Park Service (NPS) for the past five years for Relict leopard frog projects and studies. New surveys for Colorado River toad and lowland leopard frog distribution will begin in 2011.

Insects

MacNeill's sootywing skipper, an LCR MSCP covered insect species, flutters and flies around newly created habitat at Cibola Valley Conservation and Wildlife Area and Palo Verde Ecological Reserve. Monitoring and surveys of sootywing populations were conducted at these two locations during 2008-2010. The largest population (greater than 1000 individuals) was centered on an established 58-acre quailbush and mesquite planting at the Cibola Valley Conservation Area, planted in 2009. This area contains an abundance of quailbush and heliotrope, a source of nectar for the butterfly.

System-wide sootywing surveys were conducted from 2006-2008 and populations were widespread along the river, occurring from the Muddy River inflow at Lake Mead to south of Yuma, Arizona. Large populations were located at Overton Wildlife Management Area in Nevada and at the Lake Havasu and Cibola National Wildlife Refuges in Arizona.

Plants

Vegetation monitoring at restoration sites is critical to learning how the plants develop into habitat. With covered species now using the habitat that includes trees now over five years old and over forty feet high in some locations, the vegetation monitoring program is capturing the parameters needed to ensure a healthy sustainable environment for the covered species into the future. The data from this monitoring program will be used to assist with the future management of each conservation area.

Two covered plant species include the three-corner milk vetch and the sticky buckwheat. These two species were previously monitored by the Clark County Multi-Species Habitat Conservation Plan Rare Plant Workgroup. With the disbanding of this group, the habitat conservation measure was expanded to allow more flexibility in the management of these species by allowing funding to additional plant conservation groups.



Sticky buckwheat

Conclusion

The LCR MSCP covered terrestrial species continue to be surveyed, studied and monitored through system-wide surveys, species specific studies, and monitoring of newly created conservation areas. This ensures that the conservation measures are accomplished in a biologically effective and cost efficient manner while providing habitat for native species into the future.



Aerial view of Hart Mine Marsh a restoration site located on Cibola National Wildlife Refuge.

suitable for the establishment and maintenance of healthy native fish populations define the habitat. Management activities include implementing artificial flooding regimes, reducing fuel loads, and monitoring and removing invasive species.

For the MSCP, habitat creation goals based on species specific conservation measures include establishing a minimum of 5,940 acres of cottonwood-willow, 1,320 acres of honey mesquite, 512 acres of marsh, and 360 acres of backwater. To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters will be restored in proximity to other land cover types creating integrated mosaics of habitat approximating the relationships among aquatic and terrestrial communities historically present along the LCR floodplain.

Restoration Research

Restoration research and implementation of demonstration projects are vital in supplying new information for more effective habitat creation projects to meet species-specific habitat requirements, and more efficiency in terms of overall cost. For example, ten years ago on the LCR the modern planting method for cottonwood and willow was planting one-gallon potted plants or bare root poles by hand in a pre-dug hole. This required a tremendous effort and typically only two hundred trees per day could be planted. After experimenting with various commercially available planters, the program partnered with

local commercial greenhouse facilities and implemented a demonstration of mass transplanting. Mass transplanting is common in the agricultural community for growing produce, but had never been used to establish native riparian trees. After a successful demonstration, the program routinely plants over 50,000 trees per day on twenty acre plots with a small crew at a fraction of the cost of previous methods. Typically over 90% of the plants survive. Another promising technology is establishing native cottonwoods and willow using seed. Existing literature indicates the viability of cottonwood-willow seed is very short limiting its usefulness. Experiments conducted through the program indicated that cottonwood-willow seed could actually maintain viability for over two years simply by freezing the seed. Future research will include testing methods to improve habitat quality such as retaining soil moisture during migratory bird nesting seasons.

Securing Partnerships

In addition, to conducting restoration research, the initial years of the program focused on securing partnerships with resource agencies to ensure adequate land and water resources were available to create habitat and provide for its long term maintenance. Following a logical and standardized method to identify and select areas for restoration, twelve areas are now in the program or being considered for inclusion into the program. Areas selected for restoration are referred to as Conservation Areas and are distributed over 276 river miles from Laughlin, Nevada, to the boundary with Mexico.

The Conservation Areas range from 1,352 acres of a cottonwood-willow-honey mesquite area, to over 200 acres of marsh, and fifteen acres of backwater dedicated to native fish. They are located in Arizona, California, and Nevada and include partnerships with federal Refuges, state resource agencies, Native Tribes, irrigation districts, and local governments.

Other collaboratives formed include research and monitoring projects with universities and local sources of expertise. A unique facet of the program is the farm advisory board that provides technical assistance to the restoration teams, offers local farming experience to the projects and provides a forum to disseminate information about the program.

Accomplishments in Conservation Area Development (2006-2010)

Development and management of Conservation Areas comes in all shapes and sizes. Projects such as the Palo Verde Ecological Reserve and Cibola Valley Wildlife and Conservation Area involved the conversion of agricultural lands to native tree species. These Conservation Areas of created cottonwood-willow-honey mesquite habitat can be actively managed requiring artificial disturbance and flooding regimes to mimic historical conditions. Working with partners in the California Department of Fish and Game and Arizona Department of Fish and Game, and using techniques and methods developed through restoration research, the program planted over 600,000 native riparian trees on 300 acres on these two Conservation Areas in 2010. Since 2006, over 2,000,000 trees were established on 500 acres at these two Conservation Areas.

Other Conservation Areas, such as the Hart Mine Marsh complex located on the Cibola National Wildlife Refuge required removing large stands of non-native salt cedar. Through excavation, re-grading, and managing water levels, large stands of marsh were created through natural plant regeneration that reduced the need for large scale planting.

Efforts in Conservation Areas dedicated to native fish range from protecting an existing backwater or maintaining its natural condition such as those at Big Bend, to creating artificial ponds dug into dry ground which was done at



Artificial Ponds



Palo Verde Ecological Reserve

Imperial Ponds. In partnership with the Southern Nevada Water Authority, the program secured a fifteen acre backwater called Big Bend in southern Nevada where all three native fish exist at various life stages. At Imperial Ponds, located on Imperial National Wildlife Refuge and managed by USFWS, eighty acres of open water was established that is separate from the main stem of the Colorado River where the species can survive with limited non-native fish interaction. Both approaches play a role in the conservation of native fish species.

The following table shows outlines the acreage of habitat created by land cover type and managed by the LCR MSCP through 2010.

	COTTONWOOD-WILLOW	MESQUITE	MARSH	BACKWATERS	TOTAL
ARIZONA	642	129	186	80	1,037
CALIFORNIA	499	10	0	0	509
NEVADA	0	0	0	15	15
TOTAL	1,141	139	186	95	1,561

These Conservation Areas are changing the landscape of the lower Colorado River by providing valuable habitat for many fish and wildlife species. Protection of these areas from wildland fire remains a serious concern. To protect these valuable resources and surrounding communities, MSCP developed comprehensive law enforcement and fire suppression plans for each Conservation Area. Elements included in the documents are integration of fire breaks early into the design process, fuel reduction programs, and funding for local law and fire professionals through interagency agreements.

What's Next?

MSCP is continuing to develop and maintain existing Conservation Areas and implementing adaptive management changes as needed. In addition, several new Conservation Areas are being considered for inclusion into the program.

Planet Ranch comprises over 8,000 acres in the floodplain of the Bill Williams River. The property is directly upstream from the Bill Williams River National Wildlife Refuge which maintains the largest remnant stand of cottonwood-willow on the entire

lower Colorado River. Acquisition of the ranch would allow the program the unique opportunity to create approximately 500 acres of cottonwood-willow on the ranch using a combination of natural flooding processes and mechanized planting. In addition, up to 500 acres of existing cottonwood-willow downstream on the Refuge would be protected.

Laguna Division Conservation Area has the potential to create over 1,000 acres of cottonwood-willow, honey mesquite, and marsh habitat. The project would combine many of the restoration techniques employed at other Conservation Areas to create an artificial riparian river corridor approximately four miles in length between Imperial and Laguna Dams. Planning for the Laguna Division Conservation Area includes representatives from federal and state agencies, and non-governmental organizations. This partnership produced a plan maximizing habitat creation possibilities while ensuring important areas are left undisturbed.

Summary

Conservation Area development and management is ahead of schedule and post-development monitoring is indicating success through the presence of many wildlife and fish species. Moving forward, it is important to remember that not all Conservation Areas are the same and each restoration approach must be tailored to fit the resources available and the needs of the project. MSCP is constantly seeking new restoration techniques to apply, sharing lessons learned with others, and strengthening existing partnerships while developing new ones.

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Adaptive Management Program

The Lower Colorado River Multi-Species Conservation Program is a habitat based conservation program where uncertainty is an unavoidable component of creating and managing species habitats. The LCR MSCP Adaptive Management Program (ADP) addresses such uncertainties. The program is based on the principles of adaptive management by allowing conservation measures to be adjusted over time based on the results of monitoring and research. Adaptive management provides a greater measure of certainty that Habitat Conservation Program (HCP) goals for covered species are achieved over the long-term. The process will gauge the effectiveness of existing conservation measures with the USFWS, propose alternative or modified conservation measures as the need arises, and address changing and unforeseen circumstances. The ADP also ensures conservation measures are implemented in a biologically effective and cost efficient manner.

The program is based on principles of adaptive management by allowing conservation measures to be adjusted over time based on the results of monitoring and research.

Adaptive implementation of the HCP occurs at the project and program levels. The project level adaptive management process starts with the review of completed or interim reports of monitoring and research results from funded proposals developed to meet 5-year cycle priorities. Program level adaptive management provides for

adjustments to HCP implementation requiring more significant adjustments such as LCR MSCP funding levels, revisions to HCP measures, adoption of alternate conservation measures, or other significant changes to the HCP direction. In October 2010, five minor modifications to the HCP were approved by the Steering Committee. These modifications are considered program level adaptive management changes. New research information for the California black rail, razorback sucker, and the bonytail provided the necessary information to

make minor modifications to their respective conservation measures. Threecorner milkvetch and sticky buckwheat's conservation measures were changed to provide broader opportunities to other programs actively involved in conserving these species.

Science Strategy

The HCP provides guidance for ensuring that implementation of the conservation measures will be based on scientific information, methods, principles, and standards. As new information on species and their habitats are developed, the HCP also provides for use of an adaptive management process to review and incorporate this new information as appropriate. Successful implementation of the HCP with scientific rigor, adaptive management, and cost efficiency requires development of a science strategy to provide a structural framework for incorporating these factors into Reclamation's planning, implementation, and decision making processes.

The Science Strategy was developed to address two decision-making functions: Reclamation's implementation decision-making process; and the processes that can be used to identify uncertainties and knowledge gaps, develop monitoring and research priorities and incorporate new knowledge into a transparent process. The Science Strategy provides for an adaptive management process for improving the effectiveness of HCP implementation based on monitoring and research results. Further, the Science Strategy provides a process for identifying monitoring and research priorities using a 5-year planning cycle and a process for annually implementing these 5-year priorities during each planning cycle. The monitoring element of the Science Strategy includes compliance monitoring. Compliance monitoring will be undertaken specifically to provide Reclamation with the information necessary to demonstrate regulatory compliance with the terms of the HCP and incidental take permits.

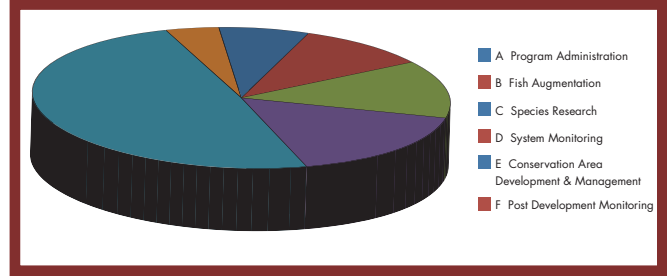
Data Management and Website

In October 2005, a data management team was formed to review existing biological databases to analyze the data and reporting needs of the LCR MSCP, and to provide recommendations for the development of an interdisciplinary Data Management System (DMS). A phased development approach was selected to enable a database system to meet all the identified needs for the program while staying within budgetary constraints. Technological advances in web applications, database development and document management systems will provide for additional data management, analysis and reporting opportunities once the database has been fully developed.

While the LCR MSCP database is being developed, an off-the-shelf Document Management System, Microsoft SharePoint was installed to help with document management. Microsoft SharePoint provides a broad set of document management capabilities that enable LCR MSCP to store, organize and locate documents; ensure the consistency of documents; manage metadata for documents and ensure consistent business processes (workflows) for how documents are handled.

In addition to database development, preliminary work on the new LCR MSCP website was initiated. Web-mapping hardware and software were purchased and initial site design layout was constructed. Web content is currently being compiled and organized for future activation of the new website, scheduled for 2011.

LCR MSCP Funding



The program's estimated cost in 2003 dollars is \$626 million and is annually adjusted for inflation (\$810 million in 2010 dollars). The Federal government pays 50 percent of the program's costs. The participants in the states of Arizona, California, and Nevada pay the remaining 50 percent, with California paying one-half of the non-Federal total, and Arizona and Nevada each paying one-quarter of the non-Federal total. More than \$92 million has been expended during the first five years of program implementation. This included \$8.7 million for fish augmentation, \$32.5 million for research, monitoring, and adaptive management, \$4.8 million for securing land and water, and \$37.5 million for habitat development.



Cottonwood Trees at Palo Verde Ecological

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and
Power District
Unit “B” Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users’ Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Game
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
Arizona Participant Group
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
Arizona Electric Power Cooperative, Inc.
The Metropolitan Water District of
Southern California

Nevada Participant Group

Colorado River Commission of Nevada
Nevada Department of Wildlife
City of Somerton
Southern Nevada Water Authority
Colorado River Commission Power Users
Electrical District No. 3, Pinal County, Arizona
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy

