las vegas wash coordination committee

2006 year-end report

phases

las vegas wash comprehensive adaptive management plan (CAMP) action items

	EROSION & STORMWATER, administered by the Operations Study Team	**STATUS**
1	Install erosion control structures	ongoing
2	Obtain topography and geophysical data	complete
3	Conduct sediment transport modeling	ongoing
4	Establish off-stream wetlands with alternate discharge considerations	ongoing
5	Evaluate stormwater detention/retention basins	complete
	ALTERNATE DISCHARGE, administered by the Systems Conveyance and Operations Program (SCOP)	*handled by SCOP*
6	Implement the discharger's scope of services	
7	Incorporate options and selection criteria	
8	Utilize the Alternate Discharge Study Team in process	
9	Integrate work done by other study teams into process	
10	Update public officials and interested parties	
	LAND USE, administered by the Environmental Review and Planning Study Team, completed in 2005	*handled by individual assigned agencies*
11	Focus land use recommendations on a priority zone of influence	
12	Support development and implementation of environmental review process	
13	Develop best management practices	
14	Develop educational materials for developers	
15	Identify opportunities for interagency coordination	
	JURISDICTIONAL & REGULATORY, administered by the Management Advisory Committee and the Las Vegas Wash Coordination Committee	
16	Further investigate/define structure for local oversight of process	complete
17	Ensure interagency coordination	ongoing
	PUBLIC OUTREACH, administered by the Administrative Study Team	
18	Establish method to continue implementation of public outreach	complete
19	Continue implementation of feedback mechanism/progress measure	ongoing
20	Provide updates to elected officials	ongoing
	FUNDING, administered by the Administrative Study Team	
21	Further investigate potential funding sources	ongoing
22	Anticipate future funding needs	complete
23	Work with Management Advisory Committee to review funding options	ongoing
24	Develop method to identify specific projects for grant funding	complete
25	Utilize existing resources and staff whenever possible	ongoing
	SHALLOW GROUNDWATER, administered by the Research and Environmental Monitoring Study Team	
26	Develop a central database	complete
27	Locate and inventory existing shallow monitoring wells	complete
28	Identify issues of concern	ongoing
29	Develop a long-term monitoring plan	complete
30	Develop method to identify the potential for future contaminants	complete
31	Develop and implement a notification plan	*handled by other agencies*
32	Promote interagency coordination	ongoing
33	Develop a bibliography	complete
	WETLANDS PARK, administered by Clark County Parks and Recreation (Clark County)	*handled by Clark County*
34	Identify water resources needed to maintain park	
35	Develop long-term monitoring plan	
36	Develop long-term operations & maintenance plan	
37	Ensure implementation of mitigation measures	
38	Identify funding needs	
39	Ensure interagency coordination	
	ENVIRONMENTAL RESOURCES, administered by the Research and Environmental Monitoring Study Team	
40	Develop long-term management and monitoring plans	ongoing
41	Conduct additional research	ongoing
42	Preserve and address cultural resource issues	ongoing
43	Identify funding needs	ongoing
44	Facilitate interagency coordination to ensure project implementation	ongoing

PHOTO BY GENE HERTZOG

Creosote seeds & flowers

contents

Cover: Catclaw acacia and yerba mansa flower photos by Gene Hertzog; Black-necked stilt photo by Dick Barrett.

Dear Friend:

A succession of phases always marks a journey. The Las Vegas Wash Coordination Committee was formed eight years ago and began a journey of restoration and enhancement along the Las Vegas Wash. More than 135 acres of native vegetation now strengthen land once overrun with invasive weeds like tamarisk and tall whitetop. Ten weirs regulate the ever-growing Wash flows and are making great strides in curbing erosion and improving overall water quality. Scientists have conducted significant research and monitoring of water, wildlife and archaeological features to add to the growing body of knowledge about the Wash's biology, hydrology and history.

This past year marked a phase of significant achievement at the Wash, such as the removal of the lower Wash area from the United States Environmental Protection Agency's impaired waters list, the completion of the six-year Bostick Bird Census which detected 140 bird species at the Bostick Weir, and the creation of a ground-breaking Hydraulic Modeling Project that has advanced the science of weir construction.

This phase also reflects the foundation research has provided as scientists have resourced data and findings to make crucial decisions about the Wash's future management. Two vital documents, the draft "Las Vegas Wash Wildlife Management Plan" and the completed "Las Vegas Wash Revegetation Master Plan," stemmed from this research. These documents will guide future decision making along the Wash.

As you review this report, please note the several before-and-after images that demonstrate the exciting progress we experience daily at the Wash. We proudly display these images to celebrate with you the phases of restoration that are a result of the efforts of the community, local, state and federal agencies and the Management Advisory Committee. We anticipate 2007 to be another inspiring year as we continue to build on each success and past advancement. Thank you for your participation and support that provides such vital groundwork for progress.

Sincerely,

Mike Neher
Chairman, Management Advisory Committee
Las Vegas Wash Coordination Committee

Las Vegas Wash Coordination Committee (LVWCC)

Basic Management, Inc.
City of Henderson
City of Las Vegas
City of North Las Vegas
Clark County Department of Air Quality and Environmental Management
Clark County Parks and Recreation
Clark County Regional Flood Control District
Clark County Water Reclamation District
Colorado River Commission
Conservation District of Southern Nevada
Friends of the Desert Wetlands Park
Lake Las Vegas Resort
Las Vegas Boat Harbor
National Park Service
Nevada Department of Wildlife
Nevada Division of Environmental Protection
Nevada State Health Division
Southern Nevada Health District
Southern Nevada Water Authority
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Natural Resources Conservation Service
University of Nevada, Las Vegas
Water Quality Citizens Advisory Committee (2 members)
Clean Water Coalition

LVWCC Management Advisory Committee (MAC)

City of Henderson
City of Las Vegas
City of North Las Vegas
Clark County
Clark County Regional Flood Control District
Clark County Water Reclamation District
Clean Water Coalition
Southern Nevada Water Authority

Upstream Rainbow Gardens Weir emergent planting area: top, September 2004; bottom, August 2006.

mission

working to stabilize and enhance the valuable environmental resources of the Las Vegas Wash

Upstream Bostick Weir emergent planting area: top, May 2006; bottom, July 2006.

background

The Las Vegas Wash (Wash), once a simple seasonal channel, now drains more than 170 million gallons of water a day into Lake Mead. The increase in flows began causing widespread bank erosion and alarming channel deepening as early as the 1960s. As water-polishing wetlands subsequently declined from approximately 2,000 acres to less than 200, area animals lost valuable habitat and serious water quality questions surfaced.

Rising community concern prompted the creation of the Las Vegas Wash Coordination Committee (LVWCC) in the late 1990s, charging a stakeholder group comprising local, state and federal agencies and citizens with the task of protecting and enhancing the Wash. Once formed, the LVWCC created an internal committee—resourcing several agencies already working closely with local water issues—to serve as a managing arm, the Management Advisory Committee (MAC). Together these community agencies invested their resources to create an aggressive strategy for Wash enhancement in 2000, outlined in the Comprehensive Adaptive Management Plan (CAMP).

This document represents the fifth year-end report provided by the MAC and offers a closer look at the progress of the CAMP action items, focusing on the accomplishments of 2006. Additionally, this report highlights the intrinsic link between the 27 CAMP action items the MAC administers and the resulting activities along the Wash.

grant usage for 2006

GRANT PURPOSE	PROVIDER
Nursery Material (I)	Bureau of Reclamation
Bank Protection (Rock)	Bureau of Reclamation
Fish and Wildlife Management Plan	Bureau of Reclamation
Revegetation Master Plan	Bureau of Reclamation
Water Quality Analysis and Bioassessment	Bureau of Reclamation
Security	Bureau of Reclamation
Site Protection and Controlled Burns	Bureau of Reclamation
Archaeological Investigations	Bureau of Reclamation
Nursery Material (2)	Bureau of Reclamation
Ecological Enhancement Study	Bureau of Reclamation
Landscape Design at Revegetation Sites	Bureau of Reclamation
Revegetation Site Maintenance and Monitoring	Bureau of Reclamation
Biological Monitoring	Bureau of Reclamation
Bird Monitoring	Bureau of Reclamation
Environmental Restoration Project III	Bureau of Land Management
Revegetation	Nevada Division of State Parks

project funding sources

Local Contribution	$1,404,500
Federal Contribution	$1,440,592
Other Grants, Etc.	$2,729,200
TOTAL	**$5,574,292**

Wash Capital Improvement Projects (CIP)	$33,432,000

stabilization

overview

The Wash's rapidly changing topography aroused community concern as early as the 1960s. Ever-increasing water flows gouged away land along the banks, causing wetlands to steadily disappear and dumping thousands of tons of sediment into Lake Mead. In response to the alarming deterioration, the community created the LVWCC and began the massive task of stabilizing the Wash. Stabilization efforts include three key components:

1) Channel bed stabilization
2) Bank protection
3) Revegetation

Channel bed stabilization decreases headcutting—the erosive deepening of the channel—by installing dam-like structures called weirs that slow water flows. Bank protection primarily fortifies the shoreline with concrete and rock rip-rap material to guard against channel widening and subsequent wetland loss. Revegetation activities provide such a vital defense that a separate section and team is devoted to the process of using plants to "bio-armor" the soils immediately adjacent to erosion control structures.

The Operations Study Team oversees the various steps necessary to implement the stabilization project, from design and financing to construction and operation. Funding for these endeavors is provided primarily by 4 percent of a quarter-cent sales tax earmarked for water and wastewater projects in Clark County and augmented by state and federal grants.

action items & relevance to CAMP

Stabilization activities curb the destructive pattern of erosion that endangers wildlife habitats, washes away land and degrades water quality in the Wash and Lake Mead. Constructing erosion control weirs and fortifying banks reduces these dangerous erosion trends and is a major priority of the LVWCC. In addition to designing plans and overseeing construction, engineers work to obtain topography and geophysical data and conduct modeling projects that expand the known boundaries of modern engineering practices. Many subsequent CAMP recommendations hinge on the primary success of stabilization projects.

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progress since inception

The Wash's flow regime changes and improves with each weir that is installed. Ten weirs now dot the 12 miles of waterway, with an additional three constructed by the National Park Service below Northshore Drive. The weirs have substantially strengthened the Wash's ability to weather severe storm events without major damage or flooding. In addition, the Wash has benefited from a 75-80 percent total sediment reduction, improving water quality in both the Wash and Lake Mead.

A pile of "rip-rap" awaits use in future projects.

Bank stabilization activities have progressed steadily, thanks in large part to the efforts of Bureau of Reclamation (Bureau) work crews. Crews have gathered and hauled approximately 18,600 cubic yards of rip-rap material comprised of rock and recycled concrete. The Wash Facilities Team acquires concrete waste from casinos that have been imploded or remodeled such as the Castaways and the historic El Rancho Hotel. Recycled concrete use furthers the LVWCC's ethic of promoting environmental awareness in the community. In addition, Bureau crews have now reinforced approximately 30,000 lineal feet of bank line.

2006 major accomplishments

The Powerline Crossing Weir construction both began and ended in 2006, bringing the total number of weirs in the Wash to 13, including three National Park Service weirs. The 5.8 million-dollar project included an 8-foot high by 320-foot wide weir and a pedestrian bridge which provides the first point where the public can cross the Wash. Both Clark County Parks and Recreation (Clark County) and the Southern Nevada Public Land Management Act (SNPLMA) provided funding for the bridge construction.

Other weir projects were fully designed or began the design process this year. Both the Lower Narrows Weir and Homestead Weir began design. Engineers completed designs for both the Ducks Unlimited 1 and 2 Weirs and initiated geotechnical investigations for the Sunrise Mountain Outfall Weir project. The Upper Diversion Weir design was completed as well, and the Wash Facilities Team began the bid process.

The Wash Facilities Team also negotiated in 2006 to acquire the future concrete remains of the Stardust Resort and Casino for use in remaining bank stabilization projects. This concrete will be mixed with rock material to fortify the Wash bank line in future projects. Bureau work crews dedicated several months of intense work this year to stabilize an additional 4,800 lineal feet of bank line, focusing on the projected Sunrise Mountain Outfall, Tropicana Outfall and Upper Narrows Weir sites, and the Pabco Road Weir.

The Powerline Crossing Weir was completed in 2006 and is the 10th out of 22 planned weirs.

Crews hoist a segment of the pedestrian bridge into place at the newly completed Powerline Crossing Weir.

Seventy percent of the bank stabilization project is now complete.

Additionally, the Wash Facilities Team partnered with Colorado State University to create a Hydraulic Modeling Project. The project featured the creation of a working weir model which will undergo eight separate tests to experiment with design concepts. Engineers created the project to stretch the boundaries of known practices for weir construction, in an attempt to creatively address constraints that cannot be overcome with current weir design concepts. This research is sparking national and international attention, and the preliminary data will become available for analysis in the spring of 2007.

2007 operational objectives

Stabilization projects will steadily progress through the coming year with the assistance of Bureau work crews. Should funding allow, an estimated 4,725 lineal feet of bank will be stabilized, in addition to 11,000 cubic yards of land that will be graded around the Rainbow Gardens Weir for erosion control purposes. At the site designated as S108, located west of the Pabco Road Weir, 20 rock erosion-check structures will be constructed along the channel, also pending funding.

Significant progress in weir construction activities will also continue in 2007. With several projects in design, out to bid, or slated to begin construction, the Wash Facilities Team will have a full schedule. Engineers will complete designs initiated in 2006 for the Lower Narrows and Homestead Weirs.

Construction crews plan to begin work on both Ducks Unlimited 1 and 2 Weirs, as well as the Upper Diversion Weir. The LVWCC has established the Upper Diversion Weir construction as a high priority project that will include two, one-stage Roller Compacted Concrete weirs and provide two diversion channels to direct flows. The project design also features a steel span bridge that will provide access to the area north of the Wash.

The Wash Facilities Team will also begin and complete the design process for Duck Creek Confluence and the Upper Narrows Weirs. The Duck Creek Confluence Weir is of particular interest because of its proximity to the Silver Bowl Sports Complex, Clark County park lands and Wetlands Park scenic drive. Engineers will first conduct a feasibility study, with specific intent to protect these valuable community attractions and stop the problematic headcutting and erosion in the area.

This weir model built at Colorado State University will allow engineers to test new weir design theories.

bioassessment monitoring

action items & relevance to CAMP

The Wash waters gracefully wind their way to Lake Mead, passing stands of cottonwood, willow and mesquite, clusters of American coots and growing habitat for black bullhead, carp and other fish. Ten strategically placed weirs guide and slow the Wash's flows and deter erosion, allowing vibrant wetland habitats to re-emerge along the shores. A variety of wildlife thrives among these burgeoning wetlands, which also filter the water journeying through the lush vegetation. These returning wetlands require regular monitoring and oversight to prevent potentially harmful contaminant accumulation in the slowed waters and to provide background for future water management decisions.

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overview

The Research and Environmental Monitoring (REM) Study Team partners with the Las Vegas Wash Project Coordination Team (Project Team) to facilitate bioassessment monitoring activities. The ongoing studies compile critical information about the water quality and biology of the Wash. More than 100 samples of fish, bird eggs, water and sediment are collected biannually and then analyzed the following year for more than 50 contaminants of concern, such as selenium and mercury. The Pahranagat National Wildlife Refuge (Pahranagat) serves as a reference site where samples are collected for comparison purposes. Biologists and hydrologists rely on bioassessment monitoring data to aid them in understanding the delicate balance of the ecology along the Wash.

progress since inception

The Project Team, aided by the U.S. Fish and Wildlife Service (USFWS), took to the ground in 2003 and began gathering fish tissue and bird egg samples from strategic areas in the Wash. Scientists from the Desert Research Institute and Southern Nevada Water Authority (SNWA) hydrologists handled collection of water and sediment samples. The team also journeyed to Pahranagat to collect bird eggs and fish tissue as reference samples. The wildlife refuge has minimal urban influence found in its watershed, and samples from this area serve as a regional reference for baseline comparison.

This first round of studies provided researchers with a snapshot of environmental conditions within the Wash and its tributaries, helping them to isolate issues of concern. A nationally recognized toxicologist then reviewed the gathered data and compared contaminant levels with the acceptable levels established by the USFWS and U.S. Environmental Protection Agency (USEPA).

American coot nest with chicks

Red-winged blackbird eggs

A 2005 follow-up study repeated the testing to validate findings and establish a baseline of comparison for future projects. Several groups including: the Project Team, USFWS, the Bureau—which also provided grant funding for the studies—the Desert Research Institute, Clark County and the SNWA cooperated to collect samples in 2005. The data generated from these samples is in the process of being analyzed.

2006 major accomplishments

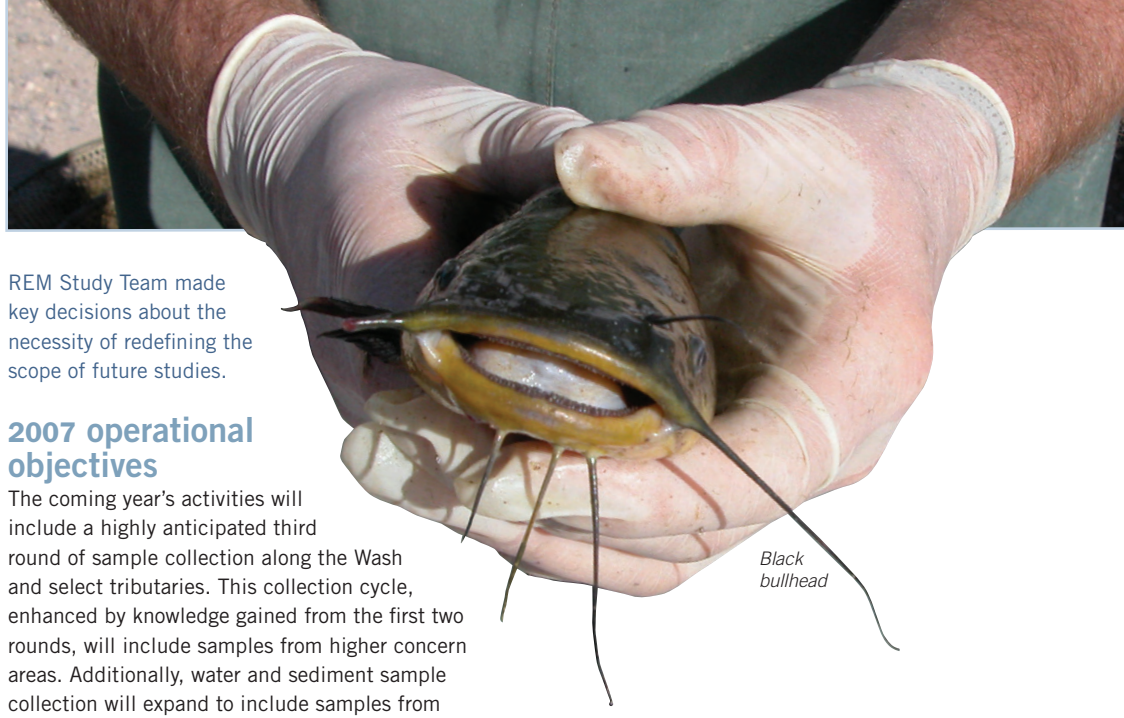
Bioassessment activity in 2006 focused on procuring experts to study and analyze the samples gathered in 2005. Contracted scientists completed water and sediment sample analyses, and substantial portions of the bird egg and fish tissue analyses have also been completed.

The toxicologist reviewing the 2003 samples finalized and delivered the bioassessment report which completed the

first round of bioassessment monitoring studies done at the Wash. Findings from this study will provide highly specific information useful for future decisions regarding contaminants of concern and wildlife management. The report identified several contaminants of concern in the samples that warranted further research. Arsenic, lead, copper, zinc and mercury levels may pose a risk and 2005 bioassessment activities were conducted to validate these findings. Screening of sediment and bird eggs suggest that DDT, DDE and related chemicals should also be monitored. Among the chemicals of potential concern, selenium demonstrated the strongest potential risk in this study. Future studies will further examine these findings.

Staff also learned how to perform sediment sampling this year. Future sediment sampling will now be conducted in-house, allowing for greater efficiency.

In addition, the Project Team partnered with a nationally recognized selenium expert to evaluate the current monitoring and sampling procedures. Using these recommendations, the Project Team and the REM Study Team made key decisions about the necessity of redefining the scope of future studies.



Black bullhead

2007 operational objectives

The coming year's activities will include a highly anticipated third round of sample collection along the Wash and select tributaries. This collection cycle, enhanced by knowledge gained from the first two rounds, will include samples from higher concern areas. Additionally, water and sediment sample collection will expand to include samples from Pahranagat for the first time. This will broaden the understanding of area biology and increase the utility of the data collected at Pahranagat.

Another Project Team focus will be to complete remaining analyses of 2005 samples and to begin subsequent toxicology review for that data.

Emergent wetland vegetation provides ideal nesting habitat for several species of birds.

water quality

action items & relevance to CAMP

Water quality samples provide an unbiased glimpse into the daily conditions of the Wash. Ongoing construction of weirs alters the speed and path of approximately 170 million gallons of water that course through the Wash in a single day, requiring routine monitoring to evaluate the effects on water quality over time. Collected data allows hydrologists to keep an eye on water quality as they work to evaluate watershed and its role in our community's water supply. The Clean Water Coalition's (CWC) Systems Conveyance and Operations Program (SCOP) also utilizes the collected data as they explore viable alternatives to discharging highly treated wastewater in Lake Mead.

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overview

Wash waters originate from four sources: highly treated wastewater, stormwater, urban runoff and shallow groundwater. These waters serve as a final link in the community's water supply, eventually flowing down to join Lake Mead. On the way, wetland vegetation works as a natural filter to polish the water, reducing contaminant levels and improving overall water quality. Hydrologists vigilantly monitor water from a diversity of locations, as changes in water quality can potentially impact the entire region. The Project Team strategically employs several programs to capture a big picture of conditions along the Wash and its tributaries.

PROGRAM	RANGE	FREQUENCY
Tributary sampling	8 locations	Quarterly
Mainstream sampling	8 locations	Monthly
Real-time sampling	5 locations	Continuously
Shallow groundwater monitoring wells	6 locations	Monthly
Total suspended solid assessment (TSS)	7 locations	Monthly
Tributary stream gaging	5 locations	Monthly
Lake Mead sampling	7 locations	Weekly
Lake Mead sampling	12 locations	Monthly

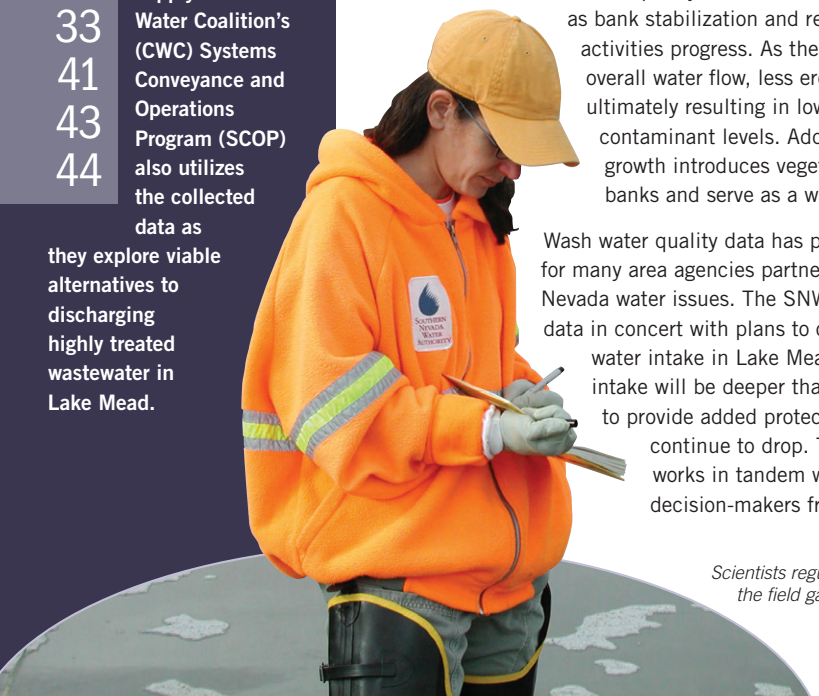
Each of these programs plays a valuable role in creating a comprehensive overview of water quality that is reviewed regularly. Hydrologists use water samples gathered in tributaries and the mainstream channel to evaluate levels of major ions, heavy metal, nutrients, organic contaminants and other potential contaminants such as selenium and perchlorate in these surface waters. Multi-parameter water quality monitoring probes remain in the water continuously to provide hydrologists with real-time data that streams in 24/7. The devices constantly measure for pH, temperature, dissolved oxygen and electrical conductivity.

The Project Team also conducts monthly stream gaging in Wash tributaries to assess their flow rate. As the tributaries mainly comprise urban runoff, stream gaging allows hydrologists to approximate how much urban runoff is entering the Wash. Monitoring wells reveal the role shallow groundwater plays in water quality as hydrologists gather data and water levels at the wells each month. Total suspended solids (TSS) measurements reflect the amount of fine particles that are present in the water, a key factor in water, wildlife and vegetation health. Erosion, storm events, high flow rates and other factors contribute to high TSS levels, and as changes occur along the Wash, hydrologists closely monitor TSS.

progress since inception

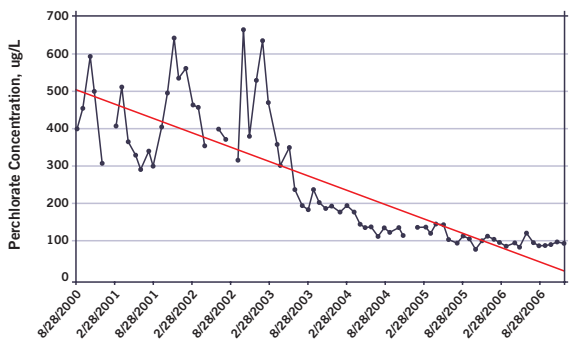
Routine water quality monitoring continues to provide a comprehensive understanding of the Wash's flows. Data reveals that water quality in the Wash generally improves as bank stabilization and revegetation activities progress. As the weirs slow the overall water flow, less erosion occurs ultimately resulting in lower TSS and other contaminant levels. Additionally, wetland growth introduces vegetation to stabilize banks and serve as a water filter.

Wash water quality data has proven valuable for many area agencies partnering in Southern Nevada water issues. The SNWA utilized this data in concert with plans to construct a third water intake in Lake Mead. The planned intake will be deeper than current intakes to provide added protection as lake levels continue to drop. The SNWA also works in tandem with the CWC as decision-makers from both agencies must consider where highly treated wastewater will be discharged, in relation to the drinking intake's locations.



Scientists regularly spend time in the field gathering first-hand data.

Perchlorate concentrations below Lake Las Vegas between 2000 and 2006

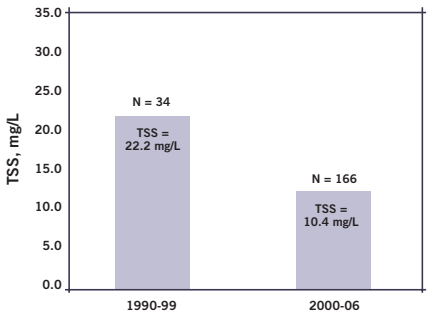


When water quality monitoring began in 2000, Southern Nevada residents held deep concerns about perchlorate—a salt used as an oxidizer for rocket fuel—that was entering the Wash through the shallow groundwater system for decades. Hydrologists vigilantly monitored perchlorate levels in the Wash as remediation efforts by Kerr-McGee, now Tronox LLC, progressed. Today, perchlorate levels in the Wash have decreased by 99 percent.

Wetland growth plays a significant role in water quality improvement.

Hydrologists also have documented reductions in other potential contaminants of concern over the past six years of monitoring. Many trace metals are less prevalent, such as lead, chromium and nickel. TSS concentrations are significantly lower as well. Erosion reduction, invasive vegetation removal and the added filtration emergent wetlands provide have factored into the water quality improvements.

Average TSS concentrations at Historic Lateral Site before and after weir completion



Over time, the Project Team has expanded and shaped water quality activities to meet the evolving needs of the area. Several multi-parameter water quality monitoring probes have been repositioned to minimize loss or damage to the devices during storm events and also to gather specific data in areas of higher concern. Mainstream and tributary monitoring locations are added or adjusted in tandem with changes in flow rate or path due to weir construction activities, grading and wetland growth.

2006 major accomplishments

The Project Team continued to assess and enhance water quality programs in 2006. A sampling location was added at Lake Mead to include the future site of the SNWA's third intake due for completion in 2011. Additionally, two more multi-parameter water quality monitoring probes expanded the reach of the real-time monitoring program to begin gathering data at Duck Creek and Flamingo Wash.

Water quality improvements in the lower reach, which extends approximately 5 miles upstream from Las Vegas Bay, were noted by both the state and the USEPA. The Wash was removed from the NDEP's 303(d) list—a list approved by the USEPA that tracks impaired water bodies. The USEPA also featured the Wash as a "Success Story" on its Web site, chronicling the past eight years of improvements implemented by the LVWCC. The story cited, "weirs, wetland restoration and invasive vegetation removal" as the contributing factors for TSS improvement and declared TSS had "declined significantly" allowing the state "to remove the lower reach from its 303(d) list."

Water quality data, collected by the Project Team in 2005, finished undergoing analysis in 2006. As a result, several reports collating the data were written this year. One significant report presented a comparison of TSS and nutrient levels in the Wash with levels identified at the end of the Las Vegas Bay delta. Hydrologists were able to determine that nutrients and TSS were coming off the delta and not from the Wash itself.

Limnologists began work on another key report, "The Limnological Status of Boulder Basin, Lake Mead, Nevada-Arizona, 2005," that will document research conducted in the Boulder Basin area. A 3-D modeling project of the Boulder Basin area was also continued and will be used in the CWC SCOP project and the SNWA third intake construction.

Hydrologists also began analyzing the collective body of data taken at mainstream and tributary water sampling sites from 2004-2006 and will soon begin writing a summary of the analysis.

2007 operational objectives

The water quality monitoring programs will focus on efficient and consistent sample gathering in the coming year. Currently, the Southern Nevada Water System (SNWS) assists the Project Team with tributary monitoring. In 2007, the team will expand their research by independently conducting routine tributary monitoring. Hydrologists also plan to relocate three mainstream monitoring locations to provide a wider coverage area for data collection. Additionally, the Project Team will write a cumulative water quality summary of mainstream and tributary data in 2007.

wetland demonstration projects

action items & relevance to CAMP

Wetland areas offer valuable benefits in their ability to polish the Wash's flows as well as provide precious habitat for local wildlife. Environmental biologists and hydrologists, with oversight from the REM Study Team, are evaluating wetlands to ascertain the full extent of their effectiveness. Two demonstration projects constructed off-stream are offering scientists the chance to study these areas and conduct water quality, avian and vegetation monitoring. As engineers continue constructing weirs along the Wash, wetlands are now flourishing and discoveries made in the demonstration projects will be increasingly beneficial for future wetland management.

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overview

Both the Henderson Water Reclamation Facility (WRF) and the Pittman Wash host wetland demonstration projects. At the Henderson WRF, the six-year-old wetland project features a 5.75-acre triangular pond, one of 12 wastewater ponds at the WRF, holding 11 submerged planting beds—called hummocks—and three loafing islands that peek up through the water, providing resting spots for birds. This design features about 80 percent open water space and 20 percent area available for emergent vegetation growth, allowing air and water to freely circulate. The 80/20 design was selected because it has the potential to offer water quality improvements while limiting mosquito habitat. Three types of bulrush thrive on the hummocks—hardstem (also known as tules), Olney and California—and help filter water passing through the wetlands.

The Project Team collects five monthly water samples at the inlet, outlet, midpoint and two perimeter sites along the wetland. Samples are then analyzed to evaluate levels of contaminants, trace metals, ammonia, biochemical oxygen demand and total phosphorous, among others. Scientists study this constructed wetland to get a clearer picture of how much water quality improvement can be expected in a combined secondary/tertiary treated wastewater environment. They also conduct bird monitoring as the wetland provides attractive habitat for waterfowl and various bird species drawn to the nutrient-rich waters and protective vegetation. Bird activity and use of the various habitats within the pond are closely tracked.

The Pittman Wash Pilot Wetlands project primarily examines constructed wetland impact on urban runoff. The Pittman Wash, a smaller tributary in Henderson, mainly hosts urban runoff waters. This smaller constructed wetlands area, bordering the Arroyo Grande Sports Complex, diverts Pittman Wash flows first into a diversion channel and then into two adjacent cells planted with bulrush. One cell features subsurface flows, passing water through several feet of gravel and plant roots and back out into Pittman Wash. The other cell is a surface flow structure, which passes water through alternating open-water ponds and bulrush-vegetated beds before returning flows to the main channel. The two vegetated areas are planted with three species of bulrush, and there are three open-water areas. Hydrologists take water samples as they enter and exit the wetlands to compare water quality before and after. The two different flow regimes in the cells

PHOTO BY GENE HERTZOG

Great-tailed grackles perch on thriving vegetation at the Demonstration Wetland, which provides attractive habitat for area species.

Construction crews raised the walls at the Pittman Wash Pilot Wetland to provide protection from rushing storm waters. Top, early July 2006; right, late September 2006.

allow scientists to research the individual effectiveness of each wetland type for the Southern Nevada environment.

Through these ventures, the Project Team evaluates the feasibility and effectiveness of constructed wetlands in both tributaries and the Wash. The Bureau, City of Henderson, the SNWA and the Clark County Regional Flood Control District partnered with the Project Team to carry out these innovative projects.

progress since inception

The Demonstration Wetland at the Henderson WRF hosted 24 different vegetation species when the wetland was first planted more than five years ago. Over time, only three species of bulrush thrived, giving biologists a sound understanding of which vegetation adapts best to the ecological conditions present in the Wash. Benefiting from these findings, the Pittman Wash project and various wetland areas at the Wash have been planted predominantly with these three species and, today, are thriving.

The Demonstration Wetland at the Henderson WRF has also yielded important findings regarding water level and water flow impacts on water quality, wildlife and wetland health. Challenges have arisen due to the wetland's location within a working wastewater treatment facility, including fluctuating water levels and the inability to sustain consistent water flow through the wetland. By studying and evaluating the effect of these challenges, project scientists are learning valuable information that can be applied to future constructed wetland projects.

The Pittman Wash Pilot Wetlands project has given the Project Team opportunities to answer several fundamental questions regarding wetland effectiveness and needs. Initially, the design was intended to encompass an entire acre. Due to rising construction costs, it was scaled back to less than half an acre, raising concerns that water may not spend enough time in the smaller area to be truly affected. Biologists and hydrologists quickly realized the reduced site would serve as a valuable experiment for determining the impact wetland dimensions have on overall water quality. The project progressed with these questions at the forefront and construction began in 2005.

The site was lined first with clay to prevent shallow groundwater from rising up into the wetlands, allowing only the urban runoff flows to enter the site. Low concrete retaining walls surrounded the area to further protect the site, but the Project Team soon discovered a key design flaw. The approximately 2-foot retaining walls were revealed as inadequate protection when two major storm events caused water to roar down a bordering slope, dumping sediment and litter into the wetlands. The fledgling vegetation was also decimated by the rushing water. The Project Team re-examined the design and began brainstorming adjustments to improve and protect the site.

2006 major accomplishments

Efforts in 2006 within the demonstration projects focused on improving and repairing the Pittman Wash site. Construction crews raised the concrete walls on the upstream and channel sides of the site to four feet. The cells were reconstructed and planted once again with alternating bands of three bulrush varieties. The vegetation established and expanded quickly, allowing hydrologists to begin initial baseline water quality monitoring in July. The site weathered a large storm event in October, similar to those that had previously destroyed it. The higher concrete walls proved successful in diverting the majority of the storm's flows around the wetlands and only minor damage occurred.

The Project Team also outlined a monitoring plan this year to guide future activities in the Pittman Wash Pilot Wetlands. Topics addressed by the plan include general site inspections, water quality and vegetation monitoring, maintenance, mosquito control and long-term planning.

As for the Demonstration Wetland at the Henderson WRF, biologists and hydrologists completed two years of successful data collection at the site. The Project Team now possesses a primary baseline of data and can begin thoroughly analyzing water quality, wetland vegetation, wildlife habitats and avian impacts on wetland effectiveness. Additionally, the bird monitoring program at the site has yielded more than 20,000 detections of 95 species at the pond.

2007 operational objectives

The Project Team will create a report summarizing and discussing the two years of biological and water quality data gathered at the Henderson WRF project. This report represents the first opportunity to collate and publish the diverse wetland data in a hard report.

Monthly water sampling and bird surveying activities will continue in the coming year. Consistent monthly monitoring will begin at the Pittman Wash project as outlined by the monitoring plan created in 2006. Biologists will also sample vegetation at each site to assess and evaluate any potential contaminants of concern.

las vegas wash activities map

- Clark County Wetlands Park Boundary
- Clark County Nature Preserve
- Demonstration Wetland at the City of Henderson WRF
- Pittman Wash Pilot Wetlands Project

Water Quality Studies

- Water Quality Sites—Realtime
- Water Quality Sites—Mainstream
- Water Quality Sites—Tributaries

Biological Studies

- Biological Survey Sites—Bats—Ongoing
- Biological Survey Sites—Avian Point Count Survey—Ongoing
- Biological Survey Sites—Reptiles—Complete
- Biological Survey Sites—Bostick Bird Census—Complete
- Biological Survey Sites—Fish—Complete
- Biological Survey Sites—Small Mammals—Complete
- Biological Survey Sites—Amphibians—Complete
- Bioassessment Survey Sites—Ongoing

Erosion Control Structures

- Bostick Weir
- Calico Ridge Weir
- Demonstration Weir
- Fire Station Weir
- Historic Lateral Weir
- Monson Weir
- Pabco Road Weir
- Powerline Crossing Weir
- Rainbow Gardens Weir
- Visitor Center Weir

Revegetation

- Revegetation Sites—Complete
- Revegetation Sites—Planned

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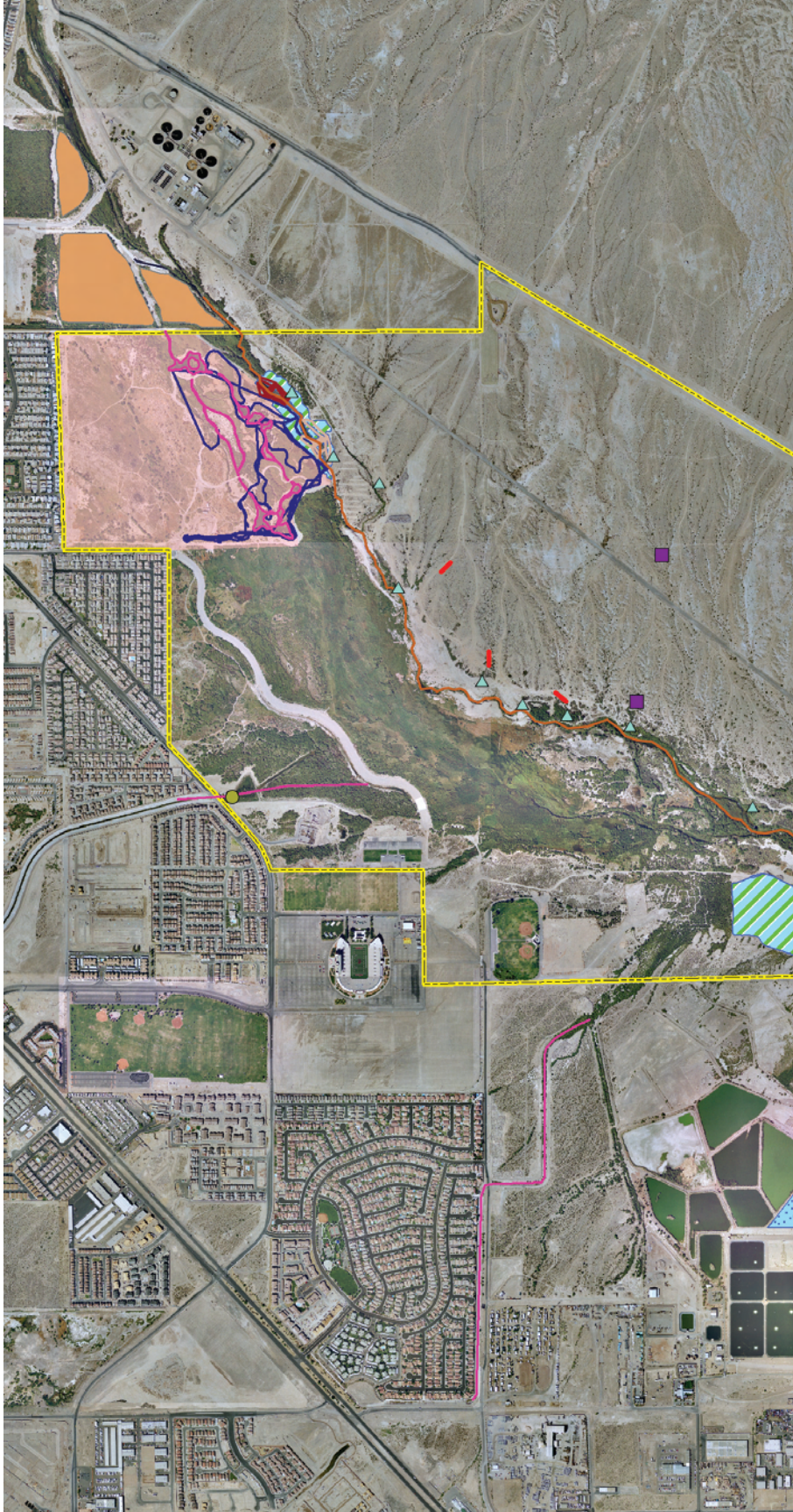

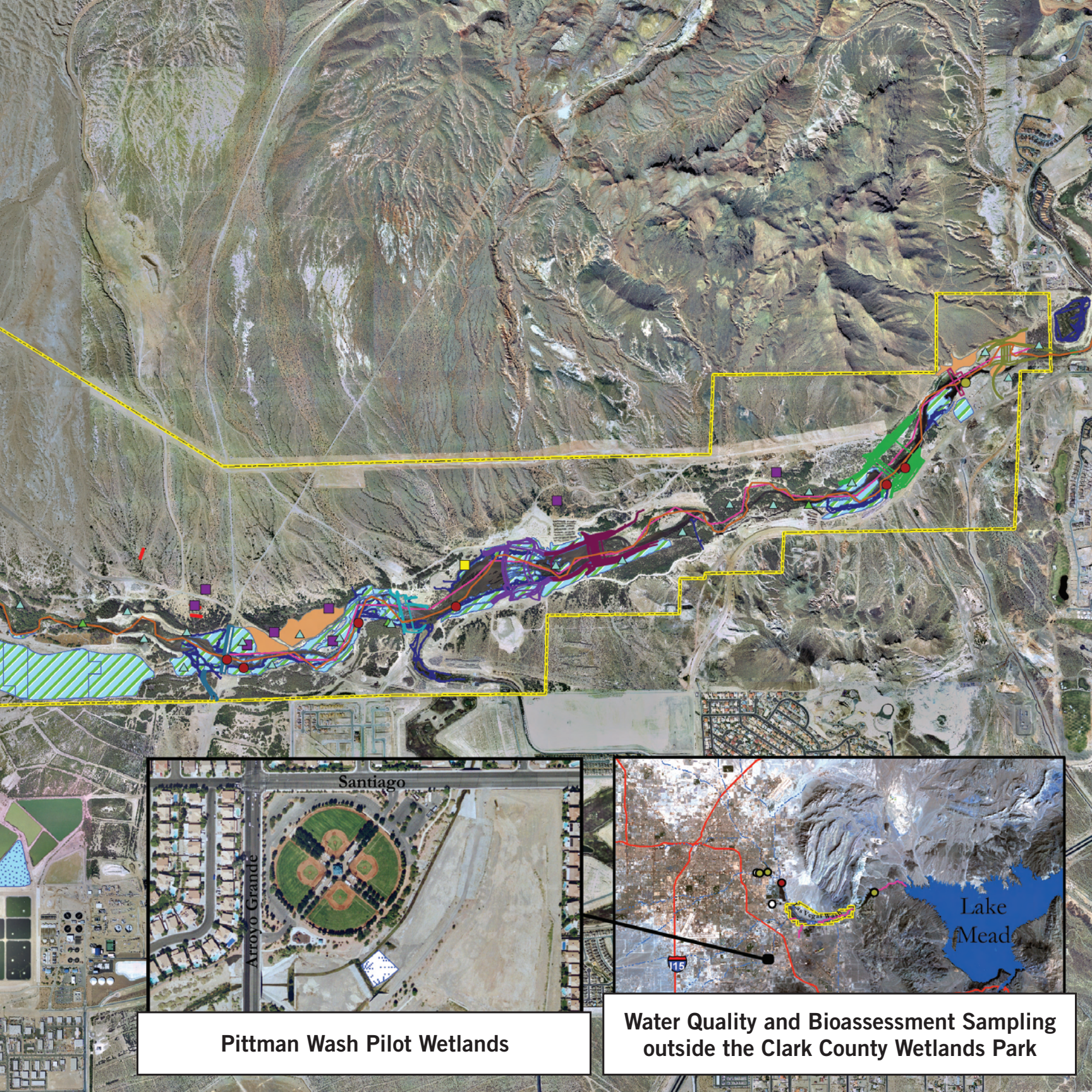

Pittman Wash Pilot Wetlands

Water Quality and Bioassessment Sampling outside the Clark County Wetlands Park

wildlife

overview

The Wash's diverse and abundant wildlife emphasize the importance of the Wash area, not only to Las Vegas residents, but to the valley's ecosystem. The Project Team partners with the REM Study Team to evaluate and implement conservation and monitoring activities. Studies have been completed on small mammals, fish, reptiles and amphibians while bird and bat monitoring programs are ongoing. The Bureau assists by collecting macroinvertebrate and butterfly samples as well.

Prior to the Project Team's latest research, the last comprehensive wildlife survey project occurred three decades ago. The Project Team undertook the weighty task of conducting long-term research and monitoring in order to provide a current working knowledge of all wildlife present in the Wash and further the LVWCC's ability to protect and conserve these species.

action items & relevance to CAMP

The Wash's rugged banks and nutrient-rich waters abound with flourishing wildlife owing to restoration efforts and native vegetation recruitment.

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Evaluating, protecting and responsibly managing the wildlife that call the Wash home expressly supports the mandates of the CAMP. Field studies identify existing wildlife, monitor wildlife changes over time and provide data for long-term management plans. As continuing revegetation efforts and weir construction improves Wash conditions, their greater impact on the ecology surrounding the Wash will also continue to be monitored and assessed.

Though a high percentage of a desert tortoise's life is spent in underground burrows, biologists confirmed their presence at the Wash this year.

progress since inception

A wide variety of field studies, some completed and others ongoing, have validated, altered or expanded upon the existing body of information available about the Wash's wildlife. Currently, biologists have identified 250 wildlife species through this research. These studies continually prove their value as a broader understanding of area wildlife is gained, in addition to documenting the presence of species never before known to exist in the Wash such as the western red bat and the hairy woodpecker.

Sophisticated bat monitoring equipment has provided three years worth of data about the 16 bat species in the Wash. Another significant study on amphibians applied global positioning system technology to locate, record and mark amphibian populations over multiple years. This study located the Woodhouse's toad, a species on the Clark County Multiple Species Habitat Conservation Plan watch list, and the American bullfrog.

Two separate bird studies, the Avian Point Count Survey and the Bostick Bird Census, regularly gather valuable information regarding the bird population. The Avian Point Count Survey, initiated in 2005, monitors bird populations on a bi-weekly basis at more than 30 sites representing a diversity of habitats along the Wash's banks. Vegetation data at these sites is also collected and analyzed each year. The Bostick Bird Census focuses on detecting bird species in and around the Bostick Weir site. The Red Rock

Audubon Society partners with the Project Team to conduct these quarterly surveys that have provided a comprehensive picture of the avian population in this area.

2006 major accomplishments

Biologists drafted the majority of a significant report summarizing the amphibian studies conducted from 2004-2005. Additionally, a two-year report, revealing findings from the bat study, was published and distributed. The report details the presence of 16 species, three known from previous historical records and six of which were not known to exist in the Las Vegas Valley, including a species new to the state.

Biologists also accumulated data from the collective body of monitoring studies to draft the "Las Vegas Wash Wildlife Management Plan." The plan offers a fully integrated look at the history, current state and desired future condition of wildlife in the Wash and states three goals for wildlife management:

- to conserve native wildlife that have been found in the Wash.
- to protect and enhance native wildlife habitats.
- to increase environmental awareness of these resources in the community.

The plan also includes recommended actions regarding initiatives to fulfill these objectives for the Wash's wildlife. The Project Team will use the plan as a guiding document for effectively managing the diverse wildlife population in the Wash.

Avian studies advanced significantly in 2006 as well. The Project Team and Red Rock Audubon Society members completed the Bostick Bird Census after six years of data collection at the Bostick Weir. Together, they detected 140 different bird species as a result of the study. The Project Team is currently compiling a summary report outlining the activity at the Bostick Weir. The Avian Point Count Survey also continued to grow and evolve, adding three additional monitoring points in revegetated areas and discontinuing a previous site, bringing the total to 31. Twelve more bird species were detected for a count of 145 species after two years of monitoring. Together, the Bostick Bird Census and the Avian Point Count Survey have identified approximately 175 species in the Wash, indicating the broad appeal of the area to birdlife.

Biologists continued annual breeding surveys for the southwestern willow flycatcher and the Yuma clapper rail, both species listed as federally endangered. Two migrant willow flycatchers were identified during the surveys this year. A migrant Yuma clapper rail was also identified during fieldwork for the Avian Point Count Survey. These exciting discoveries further demonstrate the value of the Wash as a distinctive wildlife habitat in the desert Southwest.

Additionally, biologists confirmed the presence of the federally-threatened desert tortoise on lands adjacent to the Wash this year. While locating protected species requires special permitting considerations, confirming their presence will help protect these animals and preserve their habitat.

A wide array of butterflies and dragonflies thrive among the Wash's growing vegetation.

On sunny days, side-blotched lizards can be spotted sunbathing along Wash banks.

2007 operational objectives

The Avian Point Count Survey will continue in 2007 as well as annual breeding surveys for the southwestern willow flycatcher and Yuma clapper rail. A survey of secretive marsh birds and an aquatic bird count program are also proposed for the coming year. The acoustic bat monitoring program will continue as well.

The "Las Vegas Wash Wildlife Management Plan" will be extensively reviewed and subsequently produced and distributed this coming year. A Project Team priority will also be to draft a summary report for the Bostick Bird Census as well to complete and distribute the amphibian report.

vegetation enhancement and management

action items & relevance to CAMP

The construction of erosion control weirs ultimately enhances the Wash yet displaces vegetation in the process. When construction ends, the Project Team and volunteers replant disturbed sites with suitable native vegetation. These actions comply with the 404 permits issued by the U.S. Army Corps of Engineers (Corps) and Stormwater permits issued by the Nevada Division of Environmental Protection (NDEP). The 404 permits specify: a one-to-one acre replacement ratio, an 80 percent vegetation survival rate, invasive plant encroachment limits, and species composition and cover guidelines. To fulfill permit requirements, the Project Team created long-term vegetation enhancement and monitoring plans. Vegetation activities further address the CAMP initiatives by utilizing interagency cooperation in controlling weed invasion, obtaining native plants for revegetation and securing funding for the projects while also offering opportunities to involve community volunteers in planting events.

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overview

Monitoring and managing vegetation directly fulfills construction permit requirements. Vegetation activities also reflect the mission of the LVWCC "…to stabilize and enhance the valuable environmental resources of the Las Vegas Wash." The REM Study Team offers regular input and oversight of these vegetation enhancement and monitoring procedures, which play such an integral role in achieving both Wash stabilization and enhancement. The health of vegetation and variety of plant life also dictates the animal species that will occur in an area. Plant life helps control erosion and stabilizes weirs and adjacent banks. In addition, vegetation filters and "polishes" urban water flows helping to improve the water quality in the Wash. The Project Team diligently works to clear invasive vegetation such as rapid-spreading tamarisk and aggressive tall whitetop, both species that degrade habitat quality and increase soil salinity, and replants these areas with diverse native vegetation.

progress since inception

Wash biologists have crafted an extensive body of knowledge for effectively planting and monitoring vegetation. Initially, the Project Team worked to understand the specific needs of the area, such as when planting should occur to optimize survival rates and which plants thrive in the Wash's unique locale. Through research and testing, the team created a list of suitable native plants for the Wash that continues to grow and expand as consistent monitoring yields new information. In addition, ideal irrigation practices have been explored and developed to ensure that every area laboriously planted thrives and meets the performance criteria outlined in permits.

Other exploration includes ongoing research into effective planting methods. The Project Team introduced hydroseeding techniques to the Wash area in 2005, a method that employs a large tank to hold a slurry of plant seeds, fertilizer, cornstarch, mycorrhizae—a fungus that improves nutrient absorption—and usually a dye to visually mark where the mix is sprayed. Hydroseeding methods proved successful in revegetation efforts at the Calico Ridge Weir and again in later projects.

To date, the Project Team has revegetated more than 135 acres of Wash land. The Las Vegas Wash Capital Improvements Plan estimates that 176 acres will require revegetation due to the erosion control program efforts. Of the 135 acres completed, 55 can be applied toward mitigation goals for the erosion control program. The remaining 80 acres satisfy requirements of other permits and grants provided by SNPLMA, NDEP, Nevada Division of State Parks and the Clark County Multiple Species Habitat Conservation Plan.

Further progress in the Wash can be marked by the impressive reduction of invasive weeds. Effective weed control furnishes wildlife with desirable habitat and allows native plants that benefit both water and soil quality to flourish and reduce bank erosion. Currently, no living stands of giant reed—an immense and competitive species that chokes shores and waterways—exist at the Wash thanks to the support of the Las Vegas Wash Weed Partnership, a multi-agency committee created by the LVWCC that coordinates weed management activity in the Wash. The National Park Service continues bi-annual spraying for tall whitetop and other weeds that has significantly reduced the extent of many noxious species. Tamarisk, also known as salt cedar, has been one of the most serious infestation problems at the Wash. With the assistance of the Nevada Division of Forestry and the Bureau, more than 100 acres of tamarisk have been removed to date. Continuing to eliminate invasive plant species is a vital step toward restoring healthy native plant communities along the Wash.

Workers relocate 5-gallon buckets of tules to the Wash.

2006 major accomplishments

The Project Team invested a significant amount of both energy and resources in vegetation enhancement and monitoring initiatives this past year. The 2006 year marked the successful completion of five years of vegetation monitoring. These efforts have produced thriving revegetation sites that are not only meeting but exceeding performance criteria established by permit requirements and staff. Another significant achievement was the completion of the "Las Vegas Wash Revegetation Master Plan" which sets forth a template, including a project timeline, for conducting native plant restoration along the Wash. This document will help guide future management decisions by:

- identifying revegetation sites and prioritizing them.
- recommending restoration methods and presenting options.
- recommending monitoring strategies.

Wash biologists also completed another document intrinsic to vegetation activities. The "Las Vegas Wash Botanical Inventory, 2002-2005" identifies and summarizes 247 plants in the Wash, including rare and endangered species such as sea lavender, tallus phacelia and the state-endangered Las Vegas bearpoppy. Specimens of each plant species found at the Wash were collected and archived in the Project Team's herbarium.

Volunteers and staff planted portions of a 60-acre site, designated S108, with honey and screwbean mesquites, catclaw acacia and a variety of shrubs. Alkali sacaton—an erosion control grass and component of the hydroseed mixture—was also effectively used on the site. The planting completed in 2006 brings the cumulative revegetated acreage to more than 135 acres.

Above, screwbean mesquite; Right, honey mesquite with seed pods.

PHOTO BY GENE HERTZOG

As in years past, partnerships proved valuable to endeavors on the Wash. The Pahranagat National Wildlife Refuge allowed 42,000 5-gallon buckets of hardstem bulrush or "tules" to be relocated to the Wash. Tules, a native marsh plant that grows vertically in water, fare well in the Wash and have become a plant of choice for revegetation efforts. Additionally, excess bulrush was cleared at the wildlife refuge, creating more open-water habitat for waterfowl.

Another partnership was forged with the Clark County Water Reclamation District (CCWRD), allowing the Project Team use of CCWRD land to conduct revegetation. A portion of the revegetation will count towards required wetland mitigation for the CCWRD, and the remainder will be planted with grant funds from SNPLMA as part of the overall Wash native vegetation enhancement effort.

Las Vegas bearpoppy

Sea lavender flowers

The Project Team also continued monitoring to determine which native plant species perform the best in the Wash environment. A spatial database was developed to that end to evaluate the physical and chemical characteristics of Wash soils in revegetation areas. The data provided will guide biologists in planting the most suitable species. Biologists also initiated a groundbreaking vegetation-mapping project in 2006 which utilizes hyperspectral imagery to help classify plant life in and around the Wash. The maps will be used to locate vegetation communities, to track invasive and native species, and for wildlife habitat planning.

Tamarisk removal methods improved in 2006 after biologists conducted a cost-study analysis to research various removal strategies. The study evaluated three different removal methods: excavation and hauling, chipping and hauling, and burning and hauling. Burning the tamarisk and hauling away ash was revealed to be the most cost-efficient strategy for sites larger than 2,500 cubic yards. Excavation and hauling waste with dumpsters proved best in sites less than 2,500 cubic yards. The Project Team presented their research to other scientists at the Tamarisk Research Conference in October.

2007 operational objectives

The weed handbook, drafted through ongoing collaboration with the Las Vegas Wash Weed Partnership, will be finalized and published to serve as a field guide for both volunteers and employees at the Wash. The handbook provides pictures and descriptions of undesirable weeds and steps to take if weeds are found. It will be produced in both English and Spanish, pending grant funding. The Project Team also will work to finish the vegetation-mapping project to begin referencing these maps for future initiatives.

Planting activities will focus on a site near the Powerline Crossing Weir where volunteers will plant more than 14 acres with more than 5,000 plants. In addition, upward of 46 acres of invasive tamarisk will be cleared, and 11 acres of previously cleared material are already on schedule for a controlled burn.

archaeological resources

overview

The Wash once offered natural spring flows and bountiful wetlands as a welcome oasis to various visitors and inhabitants over time. Native Americans gathered local plants as a staple of their diet, travelers along the Spanish Trail stopped for a cool drink of spring water, and early farmers and miners built homes and made a living along the Wash's edges. Reminders of these early occupants can still be found throughout the Wash. Some of these artifacts lurk just beneath the earth's surface while others are buried deep in layers of sediment deposited during floods. The numerous archaeological sites present along the Wash compelled the creation of the Las Vegas Wash Archaeological District in 1977 to better protect and understand the history of the culturally significant Wetlands Park area (outlined in the Wash activities map). The Archaeological District boundaries expanded in 2001 to include additional sites identified during archaeological surveys conducted in 2000. Today, the Project Team works alongside the REM Study Team to preserve this area.

action items & relevance to CAMP

The Wash's stretch of verdant wetlands began attracting visitors to its banks as early as 150 B.C. Valuable information about the lifestyle and influences on Las Vegas' earliest inhabitants lies buried beneath the soil, waiting to reveal the story of a people who long ago used the area's water, plant and animal resources to create a life in the harsh Mojave Desert. These potential cultural resource areas are typically identified and excavated to preserve historic data as directed by the CAMP and to facilitate future construction activities at the Wash.

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progress since inception

The Bureau partnered with the Project Team in 2000 to conduct archaeological surveys as an exciting step toward preserving the historically significant region. This expansive effort was necessary since early surveys had been greatly underfunded and the collected information was incomplete at best. In addition, the topography of the land itself had changed significantly due to extensive erosion, road construction and impacts from off-road vehicles, further justifying the effort.

Prehistoric potsherd found at the Wash.

Above, a trench reveals a bell-shaped storage pit; below, half of the same pit after excavation.

The new surveys identified an assortment of 56 cultural resource sites including prehistoric "potsherds" (broken pottery pieces), rock shelters, food storage pits, masonry structures, irrigation features and mining features. Archaeologists also made an exciting discovery of a primitive spear point, referred to as a Clovis point. This type of weapon was characteristic of the Paleoindian period, 12,000 years before the present, which raises provocative questions about just how far back human utilization of the Wash truly extends.

Another intriguing find occurred in 2001 when a pit house structure's remains and other associated artifacts were unearthed. This site gave researchers hard evidence that the Wash sheltered long-term inhabitants and not just temporary hunters.

Typically, archaeologists excavate sites along the Wash to ensure that historically significant artifacts are catalogued and collected prior to being disturbed by necessary construction activities. In 2005, archaeologists excavated two sites for this reason in the area of a planned weir project. One site resulted in several significant finds including potsherds, a simple house structure and cooking pits. These discoveries indicate that Wash occupants lived in earth lodges, probably stored edible plants and cooked their food in pits.

A second site contained approximately 60 pit features, probably used to store food, potsherds and other various artifacts. It is estimated

that the site boundaries could include up to 600 remaining pit features making this collection of subsurface features unique within the Las Vegas Valley.

2006 major accomplishments

Archaeologists continued analyzing additional artifacts this year collected earlier at two sites on the eastern side of the Wetlands Park. Two historic and two pre-historic sites previously excavated for upcoming weir construction projects are now being further analyzed and studied.

A significant archaeological discovery marked 2006 as a year to remember when results from radiocarbon and pollen sample analysis conclusively revealed that maize was being consumed or processed at the Wash. This data, recovered from the two aforementioned excavation sites, known as the Larder and Scorpion Knoll sites, sheds further light on early farming practices near the Wash, of which archaeologists have known relatively little until this discovery. Both a simple pit house and a pit feature were discovered on the two sites, containing evidence of maize and potsherds that will be further tested to trace the origin of the soils used in the pottery. These features, though not the first found on the Wash, constitute the most substantial evidence found to date of occupation in the Wetlands Park during the Late Archaic period (3000 B.C.-500 A.D.).

Archaeologists dig rows of trenches at the Larder Site to examine multiple soil layers.

The Project Team also supported the creation of a research document in 2006 that details the ethnohistory of the Wetlands Park. This report will serve as an important reference document archiving many years of collected archaeological data and written accounts. This data, representing more than 30 years of research, offers new insights into human habitation in this area. The archaeological discoveries were featured during a special symposium at the 30th Great Basin Anthropological Conference, hosted this year in Las Vegas' historic downtown. Archaeologists presented research chronicling the area's history from as early as 150 B.C. through the 1930s and substantiated the essential role the Wash has played in the evolution of the local ecosystem over thousands of years.

The Project Team also continued working to develop a programmatic agreement that will unify the archaeological work conducted in the Wetlands Park. Negotiations are near completion among the Bureau, the Nevada State Historic Preservation Office, the Advisory Council on Historic Preservation, the Corps, Clark County and the Project Team that will facilitate future archaeological compliance.

2007 operational objectives

The pottery artifacts previously gathered at the eastern sites will likely be sent to an Arizona research lab specializing in identifying pottery styles and conducting ceramic radiocarbon dating, per the acceptance of a proposal to this end. The ceramic fragments will be mapped by soil types to help determine the point of origin for each piece. This information will lend insight into who various Wash inhabitants and visitors were trading with and from what distance.

In addition, two proposed sites will undergo further archaeological activity in the spring. Archaeologists will dig trenches to examine multiple soil layers on both sites.

Scheduled for completion early in the year, the programmatic agreement among groups with archaeological interest in the Wash will be finalized after several years of cooperative effort from the various agencies. The Project Team and archaeologists look forward to this achievement that will streamline future archaeology projects.

education and outreach

overview

Education and outreach activities offer the community a chance to participate in and understand the unique challenges facing the Wash. The Project Team, with the guidance of the Administrative Study Team, invests considerable resources and staff time into providing learning opportunities and educating Southern Nevadans about the Wash and their role in enhancing and protecting it. Each member of the Project Team, from interns to biologists, lends their support and expertise in education and outreach functions. Every year, the team attends or hosts a variety of events designed to involve the community in the Wash's mission, such as tours on land and water, classroom presentations, booth displays at events across the valley, semi-annual Wash Green-Up events and teacher training days.

action items & relevance to CAMP

The Wash plays a critical role in our community's overall ecosystem. An entire CAMP topic has been dedicated to guide the efforts in informing and incorporating Southern Nevadans in the LVWCC's mission. Education and outreach initiatives also rely on interagency coordination and other CAMP directives. These goals can only be achieved with a community that is involved and fully invested in preserving this vital waterway, from children to adults, elected officials to Wash stakeholders.

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progress since inception

As the public's awareness grows, so does their involvement in events at the Wash. Since the first volunteer event in 2001, more than 2,400 people have volunteered to lend a hand in planting the nearly 26,000 trees, shrubs and emergent grasses that now beautify and strengthen the Wash area. Many community groups, such as the Scouts, local sororities and fraternities, and high school service clubs make these events a regular part of their community service projects. To date, 10 Wash Green-Up events have now taken place, including the largest one-day volunteer planting event in Nevada's history.

Students gather around to watch a hydrologist take a water quality sample onboard the Forever Earth boat.

The Project Team also attends annual Earth Fairs and community events across the valley, displaying a booth staffed with knowledgeable personnel and offering fun giveaways like mouse pads, bracelets, temporary tattoos and stress balls. The Summerlin Earth Fair, St. Rose Earth Day, UNLV Earth Day and Alternative Energy Fair are among the many events where staff seize the opportunity to answer questions and increase public awareness and visibility in the community.

The Wash's Web site, lvwash.org, provides instantaneous information to the community around the clock. The Web site features monthly articles and information on upcoming Wash events and provides a multi-faceted look at the Wash's past, present and future. Users can volunteer, request tours or organize field trips through the site.

Each month, the Project Team creates an informative e-newsletter to keep the community and stakeholders abreast of activities and accomplishments. Last year, more than 2,900 e-newslettters were sent out across the valley. The Project Team also utilizes Water Wise, an SNWA newsletter with a circulation of 650,000, to inform the public about Wash-related topics with three editions annually. Also, the SNWA's annual calendar, funded in part by a grant from the NDEP, incorporates tips on protecting the local watershed and reducing nonpoint source pollution and is mailed yearly to all local homeowners.

Many of the education and outreach programs focus on reaching area children. Project Team personnel conduct tours and classroom presentations for interested schools. Students receive a "scientist's backpack" upon arriving at the Wash and use the materials inside on their journey, learning how to take water samples, use a GPS unit and record observations in their field notebooks. The backpacks were also funded by a grant from the NDEP. Teachers have opportunities to learn about the Wash through the H20 University program which provides materials and information educators can use in the classroom and through tours specially designed for teachers.

In particular, a unique partnership with Mabel Hoggard Math & Science Magnet School has offered fifth-grade students the chance to team up with Wash biologists to maintain a greenhouse, view and study herbarium samples—a collection of Wash plant pressings—and tour Lake Mead by boat as they learn about water quality. Many projects that originated through the Mabel Hoggard partnership, such as the scientist's backpacks, have been so successful that they were later included in the overall school outreach program.

Wash biologists also guest lecture each year at UNLV to select classes geared toward the environmental sciences. Additionally,

Below, a new kiosk at the Bostick Weir teaches visitors about water pollution.

Top left, the site prior to construction, February 2006; bottom left, during construction in March 2006, a worker constructs the initial framework for the kiosk's foundation.

staff members give a yearly presentation to participants of Leadership Las Vegas, an intensive leadership program designed to educate community leaders about local issues.

2006 major accomplishments

The 10th Wash Green-Up event in the fall of 2006 featured the largest planting site to date, with more than 400 volunteers arriving to plant approximately 3,300 trees and shrubs on a 10-acre site across from the future Upper Narrows Weir location. Due to the large attendance, the site was planted in a record two hours.

Additionally, the Project Team consistently explores additional avenues for educating the public about watershed-related issues. An exciting educational partnership began in 2006 allowing the team use of a uniquely outfitted houseboat that serves as a "floating classroom" on Lake Mead. Elementary students now have a new method to discover facts about our watershed and water supply. Students travel out to Hemenway Harbor where they spend two hours boating across Lake Mead's waters. A hydrologist and a microbiologist lead discovery sessions where students see a multi-parameter water quality monitoring device in action, learn to take water quality samples and examine macroinvertebrate samples gathered along the Wash.

The Forever Earth program, a component of a comprehensive conservation education strategy funded by the SNPLMA, provides hands-on water and science education for Clark County students and partners with the Project Team to make this exciting field trip possible. The UNLV Public Lands Institute manages the program on behalf of the Bureau of Land Management, National Park Service, USFWS and U.S. Forest Service.

A significant landmark along the Wash opened to the public in May 2006 in the form of an interactive kiosk looking out over the scenic expanse of the Wash's waters and the Rainbow Gardens area. The area, named the Bostick Weir Interpretive Area, offers trails, three native plant gardens, benches, a shade structure and a sunken amphitheater. Eight informational panels under the shade structure describe the wildlife, hydrology and engineering that can be viewed from the platform area, with a focus on nonpoint source water pollution and what visitors can do to help reduce the problem. The area is now used as a stopping point for tours, field trips, nature walks and other recreational activities.

2007 operational objectives

Revegetation efforts will continue with additional Wash Green-Up events scheduled for both spring and fall. The spring event focuses on planting more than 5,000 desert-adapted plants over 14 acres, near the newly completed Powerline Crossing Weir. In addition, the Project Team will host local Cub and Boy Scouts for a community service day planting event near the Historic Lateral Weir.

The Bostick Weir Interpretive Area will also receive a few more enhancements. The Project Team will partner with a local Boy Scout troop to construct a protective split-rail fence around the area, and staff will place plant-identification placards in the gardens. Further grant funding from the NDEP has provided additional resources to construct two more wayside structures along the Wash, offering public education on nonpoint source pollution issues facing the Las Vegas Valley.

At Mabel Hoggard Math & Science Magnet School, the greenhouse project enjoyed by students in previous years will be revived and enhanced for the coming school year. Students employ a school greenhouse to grow native species such as cottonwood that will later be returned to grace the banks of the Wash. This project provides students with a unique opportunity to simultaneously participate in real-life botanical science while also enhancing the Wash.

A local Boy Scout pitches in at the Spring 2006 Wash Green-Up event.

data resources

action items & relevance to CAMP

The Data Resources Team diligently monitors, maintains and creates a variety of technology-driven projects to support the ongoing research and activity of the LVWCC and project staff. Many agendas addressed in the CAMP rely on the skills and resources of this team to organize, maintain and efficiently transmit valuable data. These projects and data management tools also serve the various LVWCC members with reliable data and enhance the interagency collaboration so vital in keeping Wash initiatives on track.

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overview

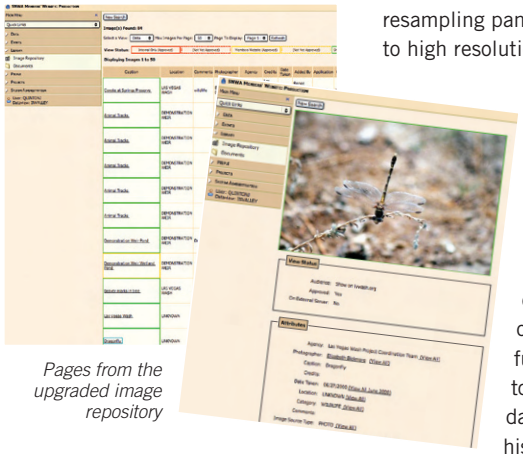
The unique science taking place at the Wash calls for a creative approach in organizing the vast amounts of data collected, such as real-time water quality samples, bird census record entries and hyperspectral aerial imagery. Various databases hold and organize large quantities of information while still allowing members quick access to relevant data. The Data Resources Team also maintains the hundreds of informational pages available on the dynamic lvwash.org site used by the public, community agencies and internal staff. Technology users rely on the team as well for continuous technical support of the databases and Web site.

progress since inception

The lvwash.org site comprises a public area and a password-protected member's area, lvwash.org/members, and constantly evolves to better serve the public, Wash staff and member agencies. Since initial development in 1999, the Data Resources Team has redesigned the original Web site to meet the continually progressing needs of the Project Team and member agencies and to maintain a fresh modern look that successfully conveys an accurate and resonant image of the Wash.

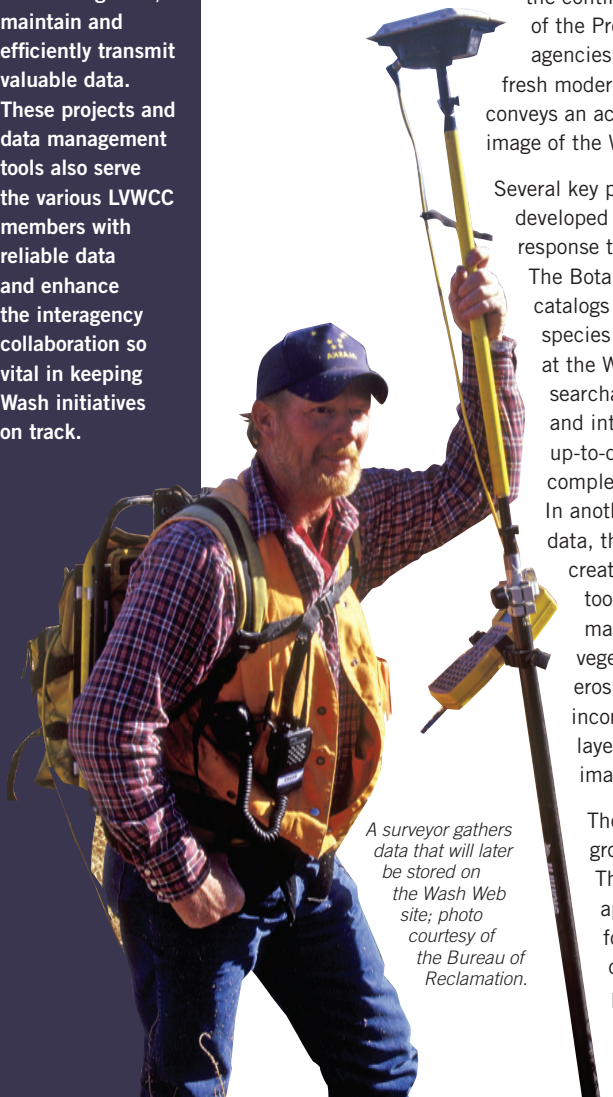
Several key projects have been developed for the Web site in response to developing needs. The Botanical Inventory database catalogs the wide array of plant species currently known to exist at the Wash. This database is searchable by both the public and internal staff and holds up-to-date data sets from completed botanical surveys. In another attempt to streamline data, the Data Resources Team created a "Flash Mapping" tool that provides versatile mapping capabilities to track vegetation communities and erosion developments. The tool incorporates easily managed layers including hyperspectral imagery and aerial photography.

The image repository has grown and developed as well. The databank currently holds approximately 9,000 images for member use, 3,500 of which are available for public viewing. The Data Resources Team has added several upgrades to the repository over time, including streamlining the process for adding images, allowing images to be viewed immediately from either the public or member's Web site and resampling panoramic images to high resolution.



Pages from the upgraded image repository

Another high-traffic database created to house water quality information continues to offer growing functionality to users. The database manages historic water profiles, real-time multi-parameter water quality monitoring probe readings and hand-collected sample data in addition to water quality information provided by member agencies.



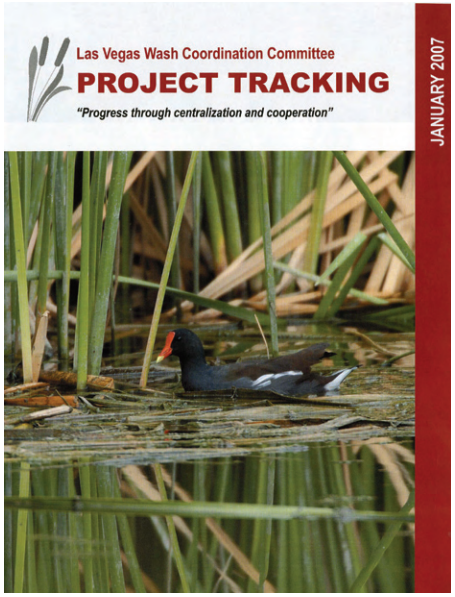
A surveyor gathers data that will later be stored on the Wash Web site; photo courtesy of the Bureau of Reclamation.

2006 major accomplishments

An active year for the Data Resources Team resulted in more than 27,000 unique visitors to the lvwash.org site, a 14.5 percent increase from the previous year. Once connected, users found an enhanced site featuring 278 high-resolution panoramic photos of the Wash, up-to-date monthly articles on Wash activities and sophisticated Flash mapping capabilities.

The Data Resources Team handles increasingly larger amounts of information each year, requiring enhanced efficiency on their part. In 2006, team members managed and supported:

- 748 contact requests
- 1,144 file modifications
- 2,940 e-newsletter distributions
- 3,600 contacts
- 600 user accounts



A revised Project Tracking Report will offer up-to-date information on projects conducted at the Wash.

- 400 new record entries for the Bostick Bird Census
- 177,954 Hydrolab© readings
- 15,463 water sample readings

The sheer volume of data loading handled by the Data Resources Team comprises a significant portion of the team's time and workload.

The water quality database features new enhancements made this year as well. The data repository's exportation function now offers increased flexibility allowing users to display and download data in either a vertical or horizontal format. Water quality sampling analysis results from SNWS Laboratory Information Management System (LIMS) now become available on the member's Web site within a day after initial posting. In addition, the Flash map, which allows participating agencies to search data from a map, has increased efficiency and functionality, allowing users to select an area on the map and view the available data.

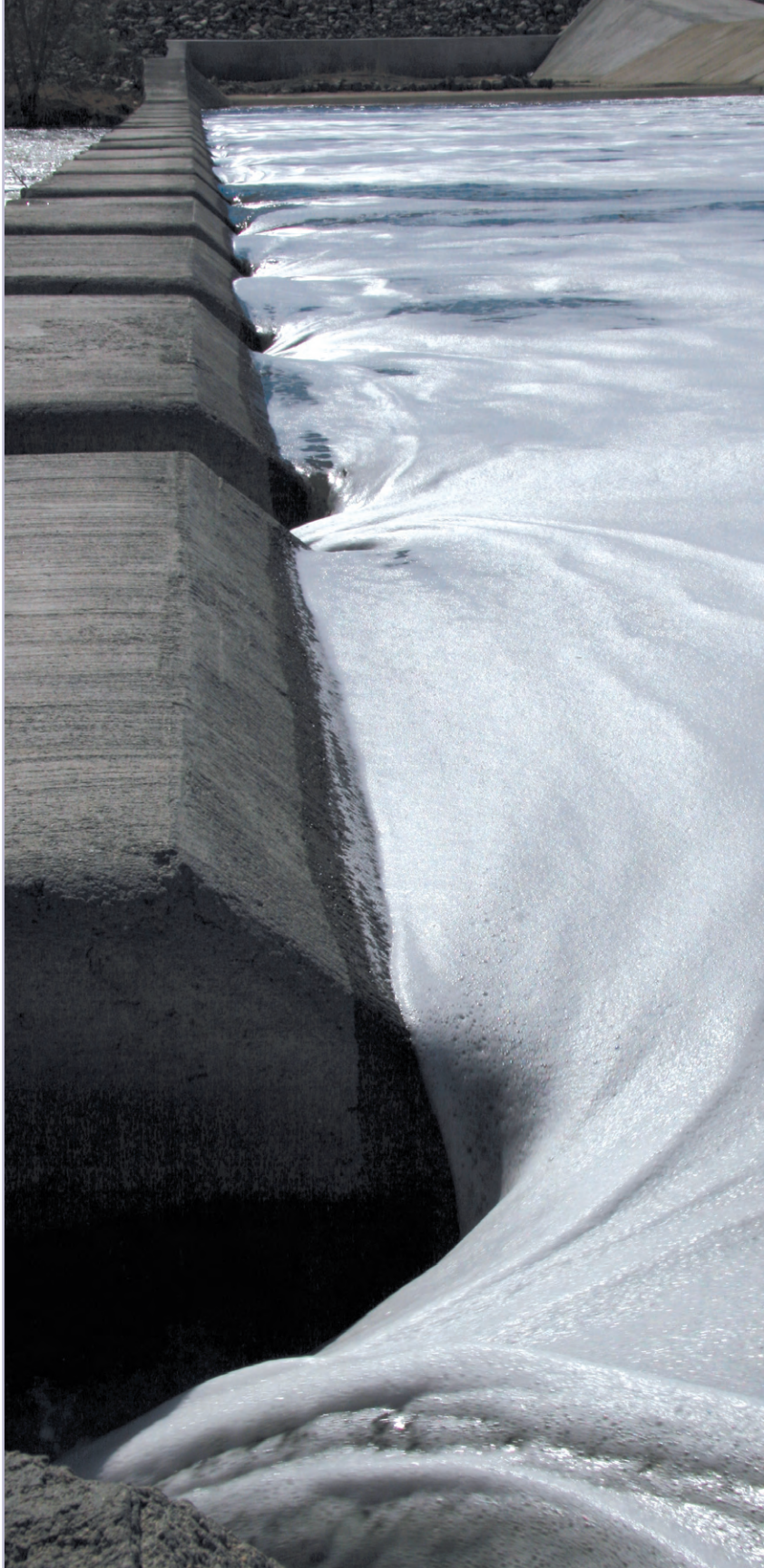
The Data Resources Team partnered with the Project Team to create an updated Project Tracking Report in 2006. The cumulative report features approximately 150 ongoing and historical projects impacting the Wash, conducted by the Project Team and other involved agencies. This enormous undertaking involves compiling and correlating accurate project data from many different groups, some now defunct. The report represents a redesign and enhancement of the original 2001 Project Tracking Report and will be available in 2007 on lvwash.org, in CD format and in hard copy, by request.

2007 operational objectives

Much of the coming year will be dedicated to ongoing maintenance and improvement projects. The Flash map, image repository and aerial imagery capabilities are all areas slated for upcoming analyses and enhancement.

The Data Resources Team will also continue to improve the functionality of the water quality database. New enhancements are expected to deploy in the spring of 2007. The water quality database will soon include instant availability of water sample profile data gathered by the SNWS.

The Data Resources Team has partnered as well with the CWC and the Project Team to create an automated process using standardized templates to import CWC and Bureau data into the water quality database in support of the "Boulder Basin Adaptive Management Plan." This improvement should be completed and put into use in 2007.



The concrete "speed bumps" at Pabco Road Weir slow the flow rate of Wash waters.

2006 progress summary

stabilization

- Completed Powerline Crossing Weir (10th of 22 planned weirs)
- Began design of Lower Narrows Weir and Homestead Weir
- Completed Upper Diversion Weir design
- Made negotiations to recycle Stardust Casino concrete remains
- Stabilized an additional 4,800 lineal feet of bank line
- Created Hydraulic Modeling Project

bioassessment monitoring

- Completed water and sediment analyses and substantial portions of bird egg and fish tissue analyses
- Finalized and delivered first bioassessment toxicology report
- Learned sediment sampling procedures

water quality

- Added sampling location at Lake Mead
- Added multi-parameter water quality monitoring probes at Duck Creek and Flamingo Wash
- NDEP removed the Wash from 303(d) list for TSS
- Completed report comparing TSS and nutrient levels in the Wash and Las Vegas Bay delta
- Drafted "The Limnological Status of Boulder Basin, Lake Mead, Nevada-Arizona, 2005" report
- Began analysis of mainstream and tributary water data from 2004-2006

wetland demonstration projects

- Raised concrete walls at Pittman Wash Pilot Wetland from 2 to 4 feet
- Created a monitoring plan for activities in the Pittman Wash Pilot Wetlands
- Completed two successful years of data collection at Henderson WRF with a total detection of more than 20,000 birds from 95 species

wildlife

- Drafted report summarizing amphibian studies conducted from 2004-2005
- Completed two-year report of bat study
- Drafted the "Las Vegas Wash Wildlife Management Plan"
- Completed the Bostick Bird Census which detected 140 different bird species
- Added three monitoring points to Avian Point Count Survey, bringing total to 31 sites with 145 species detected to date
- Identified two migrant willow flycatchers and a migrant Yuma clapper rail during surveys and fieldwork

PHOTO BY GENE HERTZOG

vegetation enhancement and management

- Successfully completed five years of vegetation monitoring
- Completed the "Las Vegas Wash Revegetation Master Plan"
- Cumulative revegetated acreage now stands at more than 135 acres
- Completed "Las Vegas Wash Botanical Inventory, 2002-2005"
- Relocated 42,000 5-gallon buckets of tules to the Wash
- Forged partnership between CCWRD and Project Team to conduct revegetation
- Developed spatial database of soil characteristics at revegetation sites
- Conducted vegetation-mapping project utilizing hyperspectral imagery to classify plant communities
- Researched and presented tamarisk removal methods at national conference
- Completed 60 acres of revegetation

archaeological resources

- Continued analyzing artifacts collected at two sites in the Wetlands Park
- Radiocarbon and pollen sample analysis confirmed maize use at the Wash
- Supported creation of a research document in 2006 detailing the ethnohistory of the Wetlands Park
- Archaeological discoveries featured during symposium at the 30th Great Basin Anthropological Conference
- Continued developing programmatic agreement to unify archaeological work

PHOTO BY DICK BARRETT

education and outreach

- Tenth Wash Green-Up featured more than 400 volunteers planting approximately 3,300 plants
- Began use of Forever Earth houseboat on Lake Mead to teach elementary students
- Opened Bostick Weir Interpretive Area featuring trails, plant gardens, benches, a shade structure with informative panels and sunken amphitheater
- More than 2,900 e-newsletters sent out to valley residents

data resources

- Hosted more than 27,000 visitors to lvwash.org, a 14.5 percent increase from previous year
- Resampled 278 panoramic photos to higher resolution
- Increased water quality database flexibility and quickened availability of LIMS data
- Increased functionality and usability of flash mapping tool
- Created 2006 Project Tracking Report featuring approximately 150 ongoing and historical projects

lvwash.org

Mission: working to stabilize and enhance the valuable environmental resources of the Las Vegas Wash.