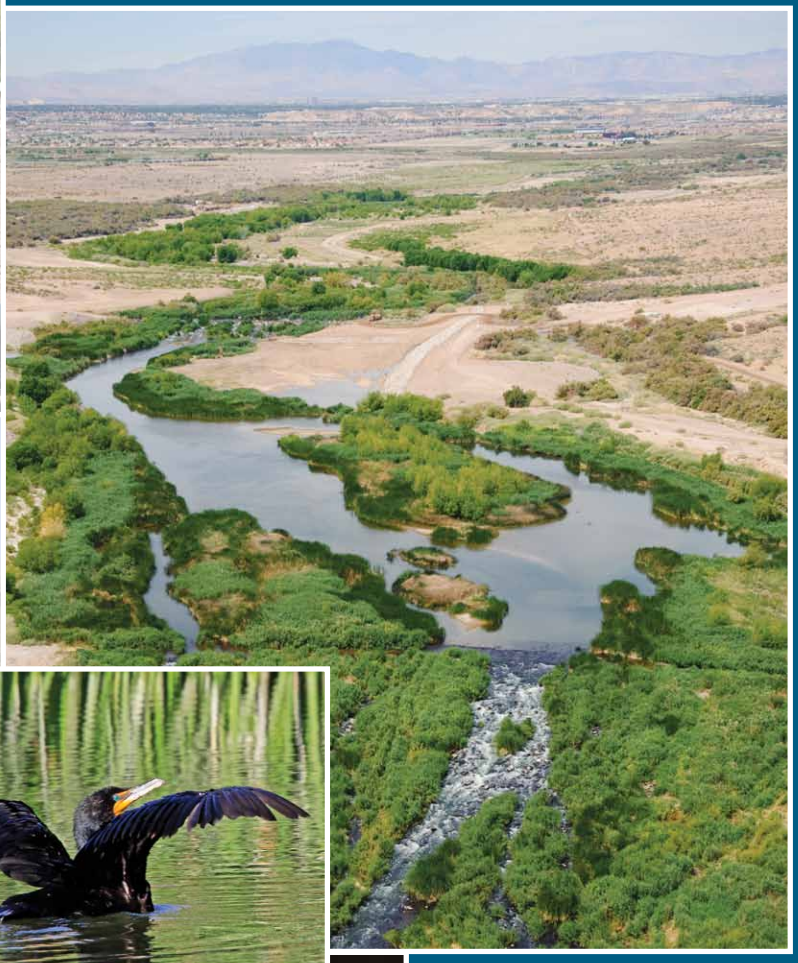
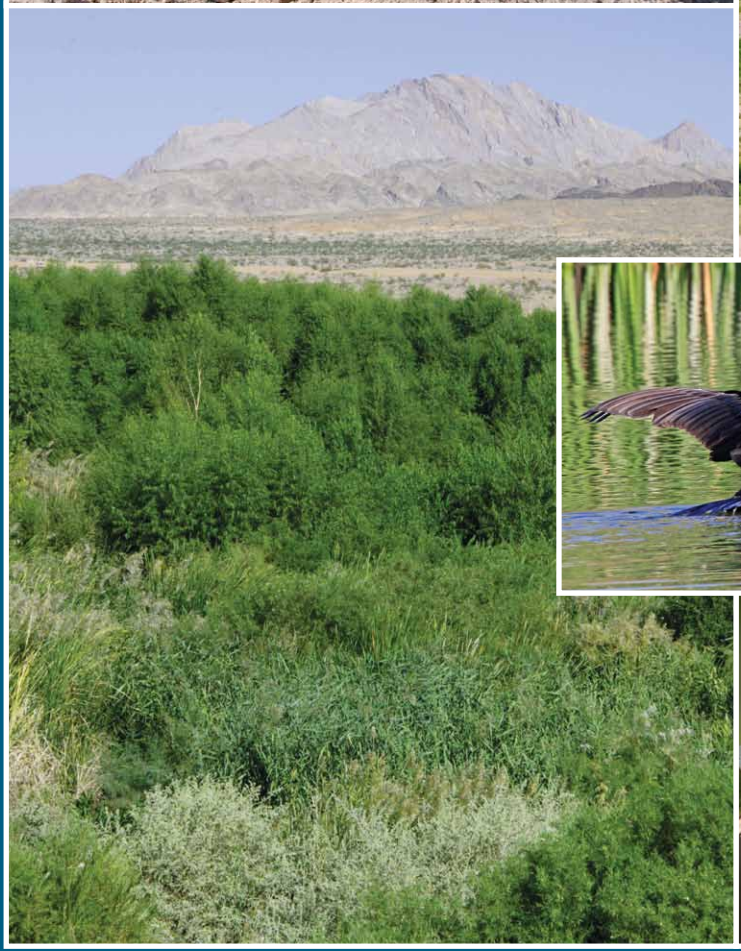
las vegas wash coordination committee

2010 year-end report





Las Vegas Wash Coordination Committee

CAMP action items

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relevance to CAMP

Please note that to the far left of each section's spread, a side bar contains a list of numbers which correspond with the CAMP action items listed here.

On the cover, clockwise from left: volunteers at Green-Up; aerial image of Bostick Weir; salt heliotrope; willows with Frenchman Mountain backdrop; double-crested cormorant

On table of contents page: desert marigold; a young volunteer at Green-Up event

Photography throughout this report is provided by Andy Cattoir, Paul Dacko, the Bureau of Reclamation and members of the Las Vegas Wash Project Coordination Team.

las vegas wash coordination committee

2010 year-end report

contents

Dear Friends:

It has been yet another successful year for the Las Vegas Wash Coordination Committee. The commitment that began 12 years ago to stabilize and enhance the Las Vegas Wash continues. However, we must remember that our success relies heavily on our ability to work cooperatively to meet our common goals and objectives.

Nothing short of remarkable, the transformation of the Las Vegas Wash in recent years is a result of this cooperative effort. Protecting the quality of our community's water resources and achieving regional water quality goals for the Las Vegas Valley watershed remains a top priority. The ongoing engineering activities to stabilize the Las Vegas Wash and minimize erosion will continue to play an important role in protecting our community's drinking-water supply and increase the sustainability of this vital waterway.

This 2010 Year-End Report summarizes activities conducted by the Las Vegas Wash Coordination Committee. Most notably, committee members received the U.S. Department of Interior's Partners in Conservation Award. This is a true testament to the extraordinary collaboration of our efforts. The Las Vegas Wash Coordination Committee will continue to manage and implement action items from our guiding document, the Las Vegas Wash Comprehensive Adaptive Management Plan, necessary to stabilize and enhance the Las Vegas Wash.

Although substantial progress is now complete, we must continue to focus on the path ahead. There remains much work to be done and the partnerships among our stakeholders and between public agencies and the community we serve will help to bring it to fruition.

Sincerely,

Dennis Porter
Chairperson, Las Vegas Valley Watershed Advisory Committee
Las Vegas Wash Coordination Committee

LAS VEGAS WASH COORDINATION COMMITTEE

Basic Management, Inc.
Bureau of Reclamation
Citizen Members
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
Clean Water Coalition
Colorado River Commission
Conservation District of Southern Nevada
Desert Wetlands Conservancy
Lake Las Vegas Resort
Las Vegas Boat Harbor
National Park Service
Natural Resources Conservation 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. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
University of Nevada, Las Vegas

LAS VEGAS VALLEY WATERSHED ADVISORY COMMITTEE

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
Las Vegas Valley Water District
Southern Nevada Water Authority

Ruddy duck

mission

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

The Las Vegas Wash at dusk

background

The Las Vegas Wash (Wash) is the final link in the Las Vegas Valley's water supply. It carries more than 185 million gallons of water a day. Decades ago, the natural drainage of the Wash created vast wetlands, spanning more than 2,000 acres. As population in Southern Nevada increased, so did the base flows. These flows, combined with periodic intense storm events, carved a deep channel through the sandy soil. Plants were swept away and the water supply was cut off to the surrounding wetlands. By the 1990s, less than 200 acres of wetlands remained and erosion along the banks threatened natural wildlife habitat, water quality and our regional storm- and wastewater infrastructure.

In 1998, the Las Vegas Wash Coordination Committee (LVWCC) was formed to restore the suffering waterway. The committee includes representatives from more than two dozen local, state and federal agencies, an environmental group, business owners and concerned citizens. The committee's goal was two-fold: Develop a long-term management plan for the Wash, and oversee implementation of the plan.

PROJECT BUDGET, 2010

Operating Budget[1]:	
Local Agency Contribution	$662,345
Bureau of Reclamation Contribution	$1,026,000
Other Contributions	$1,302,828
Total	**$2,991,173**
Capital Budget[2]	**$15,769,197**

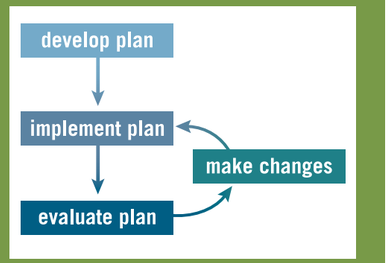
1 Fiscal year: July 2010 - June 2011
2 Calendar year: January 2010 - December 2010

Within two years, the committee completed the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP)—a roadmap that includes 44 specific action items related to water quality, habitat management, erosion control and other key Wash-related issues. The LVWCC also created internal sub-committees and an advisory committee, the Las Vegas Valley Watershed Advisory Committee (LVVWAC). The LVVWAC derives its management authority through its members' boards and councils.

This report is provided by the LVVWAC and offers a close look at the progress of the CAMP action items, and the LVWCC's accomplishments of 2010 and objectives for 2011.

summary and evaluation of CAMP action items

The LVWCC uses an adaptive process to meet its mission. As part of that process, the action items of the CAMP document are evaluated in this section.



Green-Up site

EROSION AND STORMWATER

administered by the Operations Study Team

1 Install erosion control structures

Twelve of the 22 planned erosion control structures (i.e., weirs) have been installed along an approximately 6-mile section of the Wash (11 are permanent structures, and one, the Demonstration Weir, is temporary and will be replaced).

2 Obtain topography and geophysical data

Semi-permanent ground control points were established and topography and geophysical data are collected as needed to facilitate weir design and construction.

3 Conduct sediment transport modeling

Sediment transport models have been developed using standard computer programs. Model runs are conducted as needed to understand system function and to inform weir design.

4 Establish off-stream wetlands with alternate discharge considerations

An off-stream wetland feasibility study was prepared and concluded that wetlands should be established within the active floodplain and not in surrounding upland areas.

5 Evaluate stormwater detention/retention basins

Clark County Regional Flood Control District regularly updates a flood control master plan, which includes an evaluation of stormwater detention/retention basins throughout the valley. Facilities built in the Wash and elsewhere in the valley consider regional stormwater plans.

ALTERNATE DISCHARGE

administered by the Clean Water Coalition (CWC), handled by CWC, action items 6 – 10

During the past decade, wastewater treatment has changed dramatically. In addition to the recent economic downturn, which has resulted in both decreased population projections and wastewater flows, the treatment capacity and technology have increased significantly. This has resulted in an ability to treat wastewater at higher levels and decreased the need to find an alternative discharge location. For these reasons, the region's wastewater dischargers have elected to increase treatment levels rather than use deep water mixing and dilution. This reduces the role of and need for the Clean Water Coalition, which will conclude its operations in June of 2011.

LAND USE

administered by the Environmental Review and Planning Study Team, handled by individual assigned agencies, action items 11 – 15

JURISDICTIONAL AND REGULATORY

administered by the LVVWAC and the LVWCC

16 Further investigate and define structure for local oversight of the Las Vegas Wash Comprehensive Adaptive Management Plan

Local oversight was formally established by an interlocal agreement that created the nine-member LVVWAC. Members act on behalf of their governing boards and councils. Southern Nevada Water Authority (SNWA, **snwa.com**) was appointed the lead agency for implementing CAMP action items.

17 Ensure interagency coordination

Regular meetings are convened by managerial, technical and administrative staff to ensure that interagency coordination is achieved. The Las Vegas Wash Project Coordination Team (Wash Team) hosted a total of 19 such meetings in 2010.

PUBLIC OUTREACH

administered by the Administrative Study Team

18 Establish a method to continue implementation of the public outreach program

Annual funding allocations are provided so that the public outreach program continues to be implemented.

19 Continue implementation of feedback mechanism and measurements of progress and results

Feedback is obtained at various public outreach events and on **lvwash.org**. Progress measurements (e.g., website visitors, event attendees, number of events, etc.) are recorded and reported quarterly to the LVWCC and in annual reports.

20 Provide updates to elected officials

Public outreach events are logged into Speakers Bureau reports, which are then used to update elected officials and stakeholders.

FUNDING

administered by the Administrative Study Team

21 Further investigate potential funding sources identified by the team

Funding sources were identified and include local, state, federal and private contributions. Local contributions come from a portion of a quarter-cent sales tax and direct payments. State, federal and private contributions come from grants.

22 Anticipate future funding needs

Annual budgets detail funding needs for anticipated operating and capital expenditures.

23 Work with the Las Vegas Wash management entity to review funding options

Budgets are reviewed and approved annually by the LVVWAC. Operating expenditures not reimbursed by state, federal or private grants are paid for by the City of Henderson (4%), City of Las Vegas (15.4%), Clark County (10%), Clark County Regional Flood Control District (10%), Clark County Water Reclamation District (20.6%) and SNWA (40%). The LVVWAC members agreed that the City of North Las Vegas will pay a prorated share of the budget when their wastewater treatment plant is fully operational. Capital expenditures not paid for by grants are paid for by a portion of the quarter-cent sales tax and account loans.

24 Develop method to identify specific projects for grant funding

Projects that could be funded by grants are vetted by the study teams and Wash Team. Assessment and prioritization criteria include, but are not limited to, feasibility, cost, need for and importance of information and program benefit.

25 Utilize existing resources and staff, whenever possible

Regular meetings among the LVWCC stakeholders provide a forum for ensuring that existing resources and staff are used to prevent duplication. Partnerships have led to improved efficiencies in water quality and bioassessment monitoring programs.

SHALLOW GROUNDWATER

administered by the Research and Environmental Monitoring Study Team

26 Develop a central database

Completed password-protected website for database, accessible through **lvwash.org**.

27 Locate and inventory existing shallow monitoring wells

Existing data and geospatial technologies were used to locate and inventory existing shallow monitoring wells in the valley. Data are available on **lvwash.org**.

28 Identify issues of concern

Ongoing water quality monitoring programs and stakeholder data sharing forums provide for the early detection of issues of concern.

29 Develop a long-term monitoring program

A project-specific monitoring plan was reviewed to determine if it addressed long-term shallow groundwater concerns. Until a more detailed long-term monitoring plan is prepared, the project-specific plan will be used to address shallow groundwater needs.

30 Develop a method to identify the potential for future contaminant discovery

Regular data assessments are completed to evaluate potential concerns and analyte lists are regularly revised.

31 Develop and implement a notification plan

Managed by outside agencies.

32 Promote interagency coordination

Regular meetings are convened by managerial, technical and administrative staff to ensure that interagency coordination is achieved.

33 Develop a bibliography

A bibliography was completed and is accessible on the members' section of **lvwash.org**.

WETLANDS PARK

administered by Clark County Parks and Recreation (Clark County), handled by Clark County, action items 34 – 39

Verdin

ENVIRONMENTAL RESOURCES

administered by the Research and Environmental Monitoring Study Team

40 Develop long-term management and monitoring plans

Long-term management and monitoring plans have been completed and updates and other activities are on-going to achieve plan goals. Significant re-development of the long-term water quality monitoring plan was achieved and a revised plan is expected to be completed in early 2011.

41 Conduct additional research

Research activities are on-going and are vetted by the study teams and the Wash Team.

42 Preserve and address cultural resource issues

SNWA works with state, federal and tribal stakeholders to preserve cultural resources where feasible and mitigate when infeasible. A programmatic agreement was completed to facilitate the preservation of cultural resources and is expected to be signed by all parties in 2011.

43 Identify funding needs

Funding needs are vetted by the study teams and Wash Team. Assessment and prioritization criteria include, but are not limited to, feasibility, cost, need for and importance of information and program benefit.

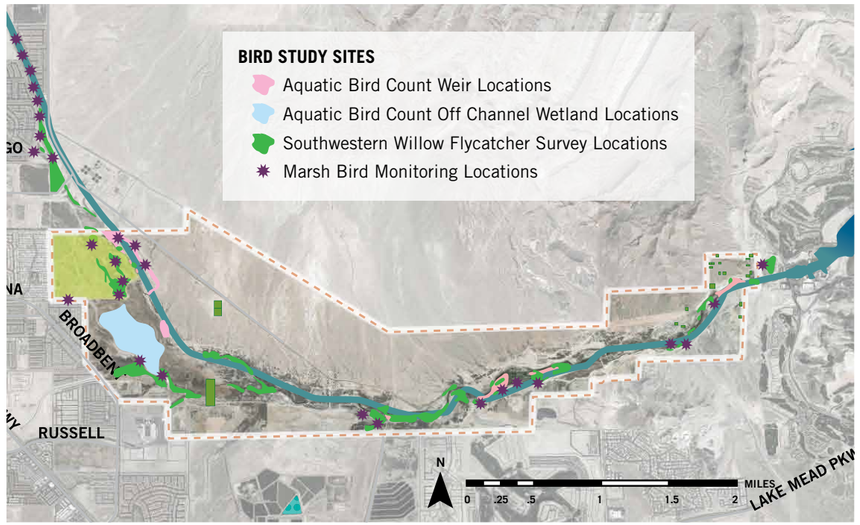
44 Facilitate interagency coordination to ensure projects are implemented

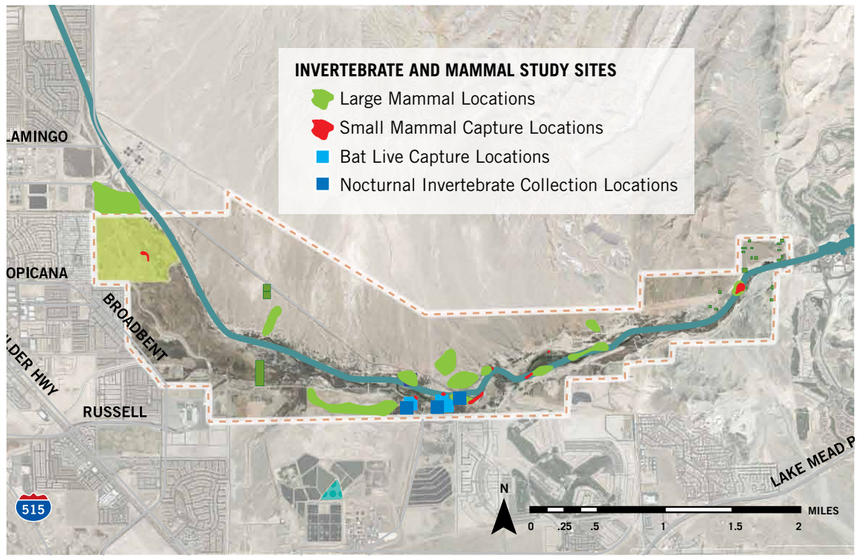
Regular meetings are convened by managerial, technical and administrative staff to ensure that interagency coordination is achieved. The Wash Team organized four meetings of the Research and Environmental Monitoring Study Team in 2010.

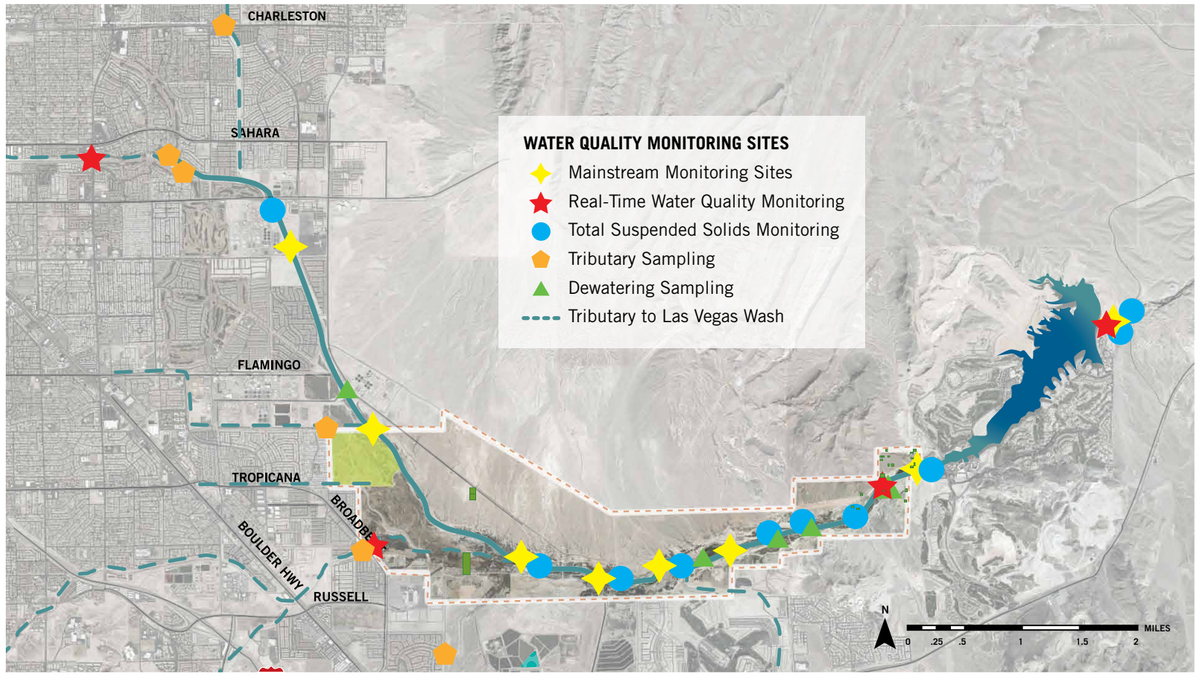
las vegas wash 2010 activities maps*

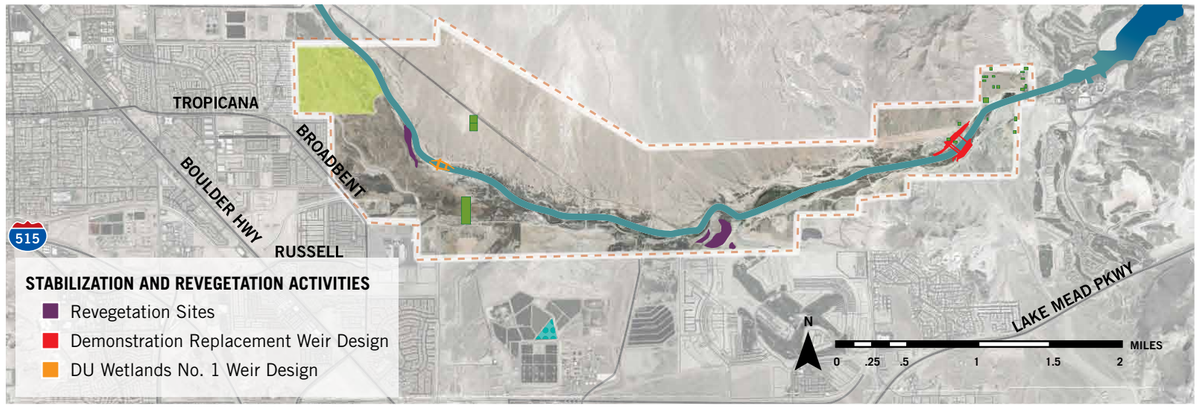
GENERAL LEGEND

- Clark County Nature Preserve
- Clark County Wetlands Park
- Las Vegas Wash
- Lake Las Vegas
- Demonstration Wetland at the City of Henderson WRF
- Privately Owned (not a part of the Clark County Wetlands Park)









*maps illustrate activities completed during 2010

stabilization

2010 AT A GLANCE

- **Began construction on the Lower Narrows and Homestead weirs, with more than 60 percent completed.**
- **Completed designs for the Demonstration Replacement and the DU Wetlands No. 1 weirs and began designs for the Silver Bowl and Archery weirs.**
- **Installed a temporary headcutting protection system downstream of DU Wetlands No. 2 project to limit erosion during DU Wetlands No. 1 Weir construction.**
- **Earned the "Project of the Year" award and was recognized as a 2010 Engineering Excellence Award national finalist for the Upper Diversion Weir by the Nevada Chapter of the American Council of Engineering Companies.**
- **Installed 4,100 lineal feet of bank protection along the Wash.**
- **Received recognition as one of the largest and most successful floodplain stabilization efforts currently under way in the U. S. by the Floodplain Management Association.**

Contractor placing gravel filled 'super sacks' in diversion dam upstream of Lower Narrows Weir

PROJECT SUMMARY

As the population of the Las Vegas Valley grew, so did the discharge of highly-treated wastewater into the Las Vegas Wash. Increasing wastewater discharges and flood events led to increasing rates of erosion of the Wash's channel beds and banks and a steady disappearance of wetland vegetation, which once covered the majority of the Wash floodplain.

Three key efforts comprise the stabilization activities in the Wash: 1) Stop the channel bed from eroding deeper; 2) Protect the channel banks from erosion; and 3) Plant erosion-resistant, native vegetation on barren or eroding surface areas.

Homestead Weir construction

Twenty-two channel bed stabilization dams (weirs) are planned for installation along an approximately 6-mile section of the Wash channel. Weirs act as erosion control structures by slowing the stream flow and providing a stable platform for vegetation establishment. Twelve of these weirs are now fully operational (11 are permanent structures, and one, the Demonstration Weir, is temporary and will be replaced), with an additional two weirs scheduled for completion in mid-2011. Much of the bank protection construction has been accomplished through the efforts of construction crews of the Bureau of Reclamation (Bureau, **usbr.gov**), working in partnership with the LVWCC. In addition, the Federal Highway Administration has installed three weirs near Northshore Road, downstream of Lake Las Vegas, on National Park Service (**nps.gov**) lands. Currently, the Federal Highway Administration is planning for the installation of up to six additional weirs reaching all the way downstream to Lake Mead.

To date, stabilization efforts have resulted in the installation of more than 38,500 lineal feet (7.3 miles) of bank protection along the Wash. The bank protection fortifies the shoreline and prevents further widening and soil loss. A key component in the bank stabilization effort has been the use of recycled concrete and rock rip-rap material, such as waste from casinos along the Las Vegas Strip that have been imploded or remodeled. At present, more than 240,000 cubic yards of recycled concrete has been repurposed as bank protection along the Wash.

2010 MAJOR ACCOMPLISHMENTS

In January, construction funded by $10.4 million in Southern Nevada Public Land Management Act (SNPLMA) grants began on the Lower Narrows and Homestead weirs. More than 60 percent of the construction of these two facilities was completed in 2010, with final completion scheduled for mid-2011.

During 2010, the designs for the Demonstration Replacement Weir and the DU Wetlands No. 1 Weir were completed and are now awaiting construction. By year's end, design efforts were started on the Silver Bowl and Archery weirs.

In March, Bureau crews installed a temporary headcutting protection system downstream of the DU Wetlands No. 2 project, which should stall ongoing channel bed erosion in that area until the DU Wetlands No. 1 Weir is constructed.

Bureau crews also installed an additional 700 linear feet of bank protection at the Duck Creek Confluence within the Wash. By mid-2010, construction crews building the Homestead and Lower Narrows weirs completed the installation of 3,400 lineal feet of bank protection along the north bank of the Wash.

Pabco Road Weir during December storm

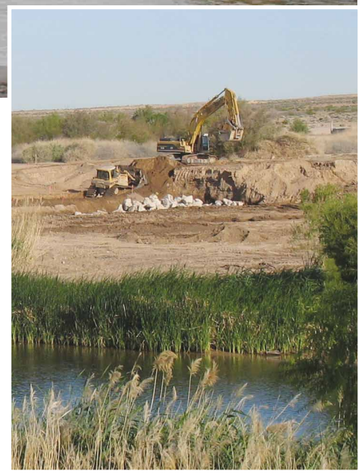
The Upper Diversion Weir received another award. In April, the Nevada Chapter of the American Council of Engineering Companies (ACEC) named it "Project of the Year," and it was recognized as a 2010 Engineering Excellence Award national finalist, one of only two Nevada projects to receive such recognition.

During their annual national conference in November, the Floodplain Management Association toured the Las Vegas Wash stabilization effort and recognized the project as one of the largest and most successful floodplain stabilization efforts currently under way in the United States.

2011 OPERATIONAL OBJECTIVES

Stabilization efforts will steadily progress in 2011, with the completion of the Lower Narrows and Homestead weirs expected in July. Also, crews will begin construction on the DU Wetlands No. 1, the Duck Creek Confluence and the Upper Narrows weirs in mid-2011.

Additionally, 3,400 lineal feet of bank protection is scheduled to be installed on the south bank of the Wash, from the Calico Ridge Weir downstream to the Homestead Weir.



Historic Lateral Weir excavation

Design activities are expected to intensify in 2011. The current schedule calls for the completion of the designs for the Silver Bowl and Archery weirs, the update of the designs for the Duck Creek Confluence and Upper Narrows weirs and the start of design efforts for the Tropicana Extension and D-14 weirs.

bioassessment monitoring

2010 AT A GLANCE

- **Implemented fourth round of bioassessment monitoring as a measure to minimize potential effects of stabilization activities to threatened and endangered species.**
- **Collected 19 bird egg samples from multiple sites in the Las Vegas Valley and simultaneously collected selenium samples.**
- **Collected five whole fish (common carp) in the Wash and 10 in Lake Mead and simultaneously collected selenium samples.**
- **Collected monthly zooplankton samples in Lake Mead (Las Vegas Bay and Overton Arm), which indicated minimal concern for selenium toxicity.**
- **Drafted a summary report for the third round of bioassessment monitoring and submitted report for technical review.**

Bird eggs were collected in 2010 for bioassessment study

PROJECT SUMMARY

Erosion control structures along the Wash have led to some promising water quality improvements and ecosystem enhancements; however, these structures have the potential to change the flow regime. As the slowed waters pool behind the weirs, there is concern contaminants may accumulate and affect both the water and area wildlife. Regular monitoring and oversight of biota helps to prevent potentially harmful contaminant accumulation in the waters and provides background data for future water and wildlife management decisions.

The bioassessment monitoring program tracks the impacts of the weirs and monitors the potential for contaminants in the Wash. The objectives of bioassessment monitoring include determining the presence or absence of contaminants of concern in the Wash and select tributaries; comparing data results to established levels of concern; comparing data results to the same media among sample collection sites; and using the data for future bioassessment studies.

More than 100 samples of fish, bird eggs, water and sediment are typically 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 fish and bird egg samples are collected. Pahranagat has minimal urban influence found in its watershed, and samples from this area serve as a regional reference for baseline comparison.

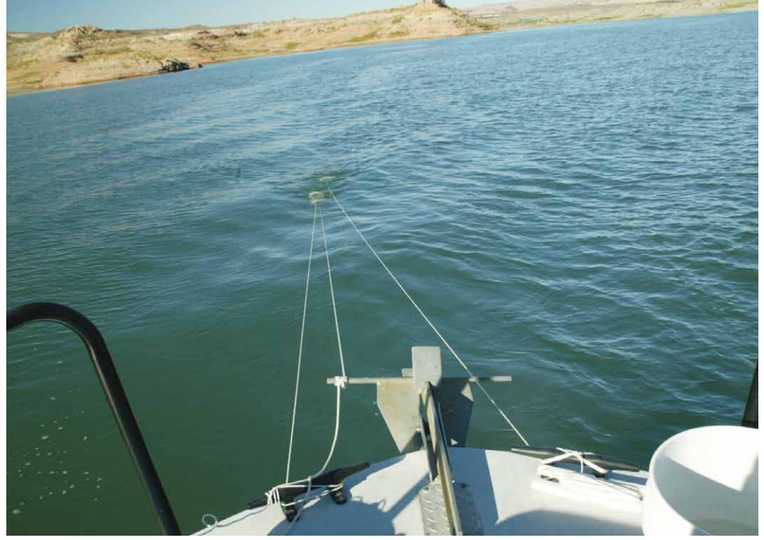
DATE	BACKGROUND SE IN WATER (PPB)	TOTAL DRY ZOOPLANKTON SE (PPM)
6/3/2010	2.12	2.72
7/28/2010	2.25	2.38
8/26/2010	2.05	2.78

Selenium concentrations in water and in zooplankton collected from Lake Mead

In 2003, the Wash Team, aided by the U.S. Fish and Wildlife Service (**fws.gov**), began gathering fish and bird egg samples from the Wash. Water, sediment, fish and bird egg samples have been collected from strategic sites along the Wash, select tributaries and the Clark County Nature Preserve (Nature Preserve). All samples are analyzed by U.S. Environmental Protection Agency (**epa.gov**) certified laboratories for a selected suite of contaminants of potential concern. The studies provide researchers with a snapshot of environmental conditions of the Wash and its tributaries, helping them to isolate issues of concern.

2010 MAJOR ACCOMPLISHMENTS

A draft report titled, "Las Vegas Wash Monitoring and Characterization Study Ecotoxicologic Screening Assessment of Selected Contaminants of Potential Concern in Sediment, Whole Fish, Bird Eggs, and Water, 2007-2008," was submitted for technical review. The report was partially funded by the Bureau. The major findings are that the detected concentration of selenium, polychlorinated biphenyls (PCB's), copper, zinc, and mercury are of potential concern for toxicity to fish and wildlife at various sampling sites.



Zooplankton sampling (dragging nets through the water at Lake Mead)

Bird eggs were collected June-July from three collection sites during 2010 (Las Vegas Wash, Pahranagat and Burns Street Channel). There were nine egg samples collected at the Wash (four red-winged blackbird, four marsh wren and one mallard), six American coot eggs collected at Pahranagat and four killdeer eggs at Burns Street Channel. Water samples were analyzed for selenium for each bird egg collection.

One round of fish collections took place in fall 2010. One of the recommendations from the 2007 bioassessment report was that analysis be limited to a single fish species, as opposed to using a variety of species as previously collected. The common carp was selected in that its lifestyle and diet most resemble the razorback sucker, an endangered fish found in Lake Mead. This round of collection was limited to two collection sites: the Wash (between Pabco Road Weir and Lake Las Vegas) and Lake Mead (Las Vegas Bay). Five common carp were collected from areas near the Calico Ridge Weir and the Bostick Weir and 10 were collected in Lake Mead. Once collected, each fish was measured, weighed, sexed, examined externally and recorded for any abnormalities of the eyes, skin surface, gills and fins. Water samples also were collected at each fish collection site to show selenium concentrations.

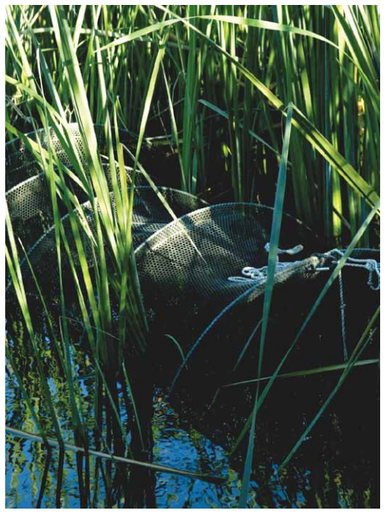
Zooplankton collections were added as an additional parameter in 2010. Zooplankton samples are collected monthly from two areas of Lake Mead: Las Vegas Bay and the Overton Arm near the confluence of the Virgin River and Muddy River. These sites correspond with razorback sucker spawning sites. With critical assistance of the City of Las Vegas (**lasvegasnevada.gov**) and Nevada Department of Wildlife (**ndow.org**), zooplankton are collected just below the water surface using horizontal plankton nets with a 80 micron mesh. Samples are then sent out for a selenium analysis. A background water sample also is collected during each sample event and included in the selenium analysis. Zooplankton collections began in 2010 and will be conducted monthly for 24 months.

To date, data have shown that zooplankton are of minimal concern for selenium toxicity, as selenium concentrations are below the value found by some researchers to cause rapid mortality of razorback sucker larvae.

2011 OPERATIONAL OBJECTIVES

In 2011, the Wash Team will finalize the report for the third round of bioassessment monitoring, as well as submit bird egg and whole fish samples for analysis of contaminants of potential concern identified in previous rounds of the bioassessment program. Additionally, zooplankton collections will continue.

A second round of whole fish collections also will be completed in early 2011 as a winter collection to be compared against the fall collection to determine if there is any seasonal variance in potential contaminants in fish. This round of collections also will include the Wash and Lake Mead, but will add the Pahranagat site to serve as a control sample.



A hoop net set in the Wash for carp collection

water quality

2010 AT A GLANCE

- **Monitored 15 groundwater wells along the Wash to track changes in shallow groundwater quality during construction.**
- **Conducted additional perchlorate sampling per NDEP permit granted for construction of Lower Narrows and Homestead weirs.**
- **Uploaded water quality data from all projects into central database.**
- **Drafted the Surface Water Quality Monitoring and Assessment Plan.**
- **Evaluated progression of invasive quagga mussels in Lake Mead.**
- **Received a grant from the Bureau to partially fund a selenium study in the Whitney Drain watershed.**
- **Completed report based on the results of a 10-year aquatic macroinvertebrate survey.**

Measuring water quality in the Wash

PROJECT SUMMARY

Water quality monitoring provides a comprehensive understanding of the Wash flows and potential impacts on drinking water from Lake Mead. Permanent, real-time water quality stations installed along the Wash and its tributaries continuously monitor water quality data, including temperature, pH, electrical conductance and dissolved oxygen every 20 minutes.

The water quality monitoring efforts conducted on the mainstream Wash are used to evaluate the baseline conditions of the Wash, to demonstrate water quality variations over time, to quantify the effects of increased wetland vegetation on water quality and to provide a long-term history of data that can be used to make watershed-based decisions. The tributary sampling program monitors the effects of urban runoff on the Wash, as well as meets stormwater discharge permit requirements. Samples taken from the tributaries provide important information on non-point sources of contamination to the Wash and Las Vegas Bay in Lake Mead. Data also are used in other applications of water quality monitoring, such as determining mass-flux of contaminants and analyzing seasonal changes in water quality.

Data collected since 2000 shows that the overall water quality of the Wash improves with each year. The positive effects of bank stabilization and revegetation efforts are reflected in the water quality data. Total suspended solids (TSS) in the Wash have been reduced 77 percent at site LW0.8 (below Lake Las Vegas), from an average of 34.5 milligrams per liter (mg/L) in 2001 to an average of 8 mg/L in 2008. TSS averaged 12.7 mg/L for 2010. This increase was due to various construction activities in and upstream of the Wash, which stirred up and released sediment downstream. Wetland systems formed behind weirs constructed in the Wash are very efficient in removing TSS from the Wash water. The TSS monitoring program was designed to determine the efficiency of these structures on the removal of suspended solids.

2010 MAJOR ACCOMPLISHMENTS

A program to monitor 15 groundwater wells along the Wash continued into 2010 to track changes in shallow groundwater quality during the construction of the remaining weirs. The wells were monitored monthly through April when it was decided, based on the data, that quarterly monitoring was sufficient. In August, this program was combined with other shallow groundwater monitoring conducted near Pabco Road Weir to form one monitoring program.

Additional sampling along the Wash also was required in 2010 under two Nevada Division of Environmental Protection (NDEP, **ndep.nv.gov**) permits granted for the construction of the Lower Narrows and Homestead weirs. Daily perchlorate samples were taken at the dewatering pipes while they were discharging to the Wash. Discharging took place from March through June and in December.

During 2010, progress was made on uploading the water quality data from all the projects into a central database that can be accessed via the password-protected members' website accessible at **lvwash.org**. This database allows all the members of the LVWCC to readily access and download the data from any of the water quality monitoring programs.

A draft of the Surface Water Quality Monitoring and Assessment Plan was created in 2010 and consists of several key principles, including the ability to: leverage and integrate partner resources; allow for base of watershed assessments, including input data to calculate water/mass balances; maintain historical records when feasible; detect water quality improvements; and obtain data to help meet future unknown needs. The goal of the plan is to support sound management of the Wash through an integrated, adaptive and robust monitoring network that characterizes the water quality of the Wash and its source water inputs. The network represents primary collaboration among the Bureau, Clark County Regional Flood Control District (**regionalflood.org**), SNWA, U.S. Geological Survey (**usgs.gov**) and the wastewater dischargers.

The invasive quagga mussels have completely colonized Lake Mead according to findings by Lake Mead National Recreation Area in 2010. Abundance data for juvenile mussels (veligers) shows a smaller peak in the spring and early summer and a larger peak in late summer and early fall. Overall, abundances are similar to previous years, potentially representing a stabilization of the population. The only water quality data, which suggests an impact of quagga mussels, is the chlorophyll concentrations (algal biomass). The open water chlorophyll peaks prior to the discovery of quagga mussels were 2-3 mg/L; however, recently these peaks have only risen to 1-2 mg/L.

The interactions between Las Vegas Bay and the Las Vegas Wash waters in 2010 were similar to those seen during 2001. In both years, there was a significant period of time during the spring when the Wash waters entered the lake as an overflow, resulting in the exposure of higher-nutrient Wash waters to sunlight. It was hypothesized that these conditions were one of the contributing factors behind the algal bloom, which developed during the spring and summer of 2001. However, there was not an algal bloom during 2010 despite generally similar conditions. The major changes between these two time periods are the optimized, year-round removal of phosphorus by the wastewater agencies, falling lake levels and colonization by quagga mussels. The reduction of phosphorus concentrations in the wastewater effluent is likely one of the most important factors separating these years. The declining lake levels would tend to increase the likelihood of an algal bloom by reducing dilution. The quagga mussels could have some role in reducing algal biomass through feeding, but the overall impact seems to be small, when all data are considered.

PROGRAM	RANGE	FREQUENCY
Mainstream sampling	8 locations	Bi-monthly
Tributary sampling	8 locations	Quarterly
Real-time monitoring	4 locations	Continuously
Shallow groundwater monitoring wells	5 locations	Quarterly
TSS and perchlorate monitoring	10 locations	Monthly
Extensive selenium sampling	3 tributaries	Quarterly
Tributary stream gaging	7 locations	Monthly
Outfall sampling for NDEP permits	Varies	Daily (while discharging)

Water quality monitoring programs

Extensive selenium monitoring also continued through 2010, sampling three tributaries (Duck Creek, Pittman Wash and Whitney Drain) for selenium at half-mile increments along the entire channel and at all dewatering pipes that discharge into the channel. These three tributaries are the largest contributors of selenium to the Wash.

A grant was received from the Bureau to partially fund a selenium study in the Whitney Drain watershed. Various data were collected in support of the study including, delineating the boundaries of the watershed, identifying existing groundwater wells, mapping flow channels and submitting requests to the City of Henderson (**cityofhenderson.com**) for water use data. The Wash Team expects to use this data to determine the relationship between water use and the fate and transport of selenium to the Whitney Drain. A preliminary scope of work was developed and the University of Nevada, Las Vegas (UNLV) was identified as the primary cooperator on this study.

A report, titled "Stream Macroinvertebrate Assemblages Associated with the Las Vegas Wash Watershed 2000-2009" was completed by the Bureau based on the results of a 10-year aquatic macroinvertebrate survey. Results found that: aquatic invertebrates rely on various water quality variables to establish populations, such as temperature, sedimentation rates, conductivity, flow rates and channel depth and width; aquatic macroinvertebrate sampling provides a measurement of how water quality factors impact the biological community most directly impacted by changes in this area; the conductivity and temperatures of the Wash are limiting the establishment of certain species, while the increased sedimentation rate is increasing the colonization rate of other species; and aquatic invertebrate taxa richness is higher at those sites along the Wash that have had improvements, compared to unimproved sites. Continuing this survey in the future will provide data on how the erosion control program and water quality changes are impacting the biota along the Wash.

2011 OPERATIONAL OBJECTIVES

Water quality monitoring activities in the Wash and tributaries will be modified according to the Surface Water Quality Monitoring and Assessment Plan, which is expected to be finalized in 2011. Anticipated program changes include increased reliance on water quality monitoring data collected by partnering agencies, a reduction to the number of parameters assessed with historical non-detections and modifications in sampling frequency and location.

wetland demonstration projects

2010 AT A GLANCE

- **Began monthly water quality monitoring at the Nature Preserve and in-lieu fee mitigation wetlands; completed 10 months of consecutive monitoring.**
- **Received a grant from the Bureau to partially fund a study evaluating the performance of wetlands along the Wash.**
- **Initiated a draft report for the Pittman Wash Pilot Wetlands and the Demonstration Wetland at the City of Henderson WRF.**
- **Completed two reports, one comparing water quality improvements at different wetland sites and the other describing nutrient uptake by microbes. A portion of the former was accepted for publication by a peer-reviewed journal.**

White-faced ibis at the in-lieu fee mitigation wetlands

PROJECT SUMMARY

Wetland areas offer valuable benefits to the Wash by polishing flows and providing precious habitat for local wildlife. Wetlands are complex systems where biogeochemical processes play an important role in degradation of organic compounds and nutrient cycles. As a result, wetland systems can be beneficial in improving water quality by removing nutrients, contaminants and sediments. Past and current projects have offered scientists the chance to study these areas and conduct water quality, avian and vegetation monitoring activities.

Two multi-year wetland demonstration projects have been completed: The Demonstration Wetland at the City of Henderson's Kurt R. Segler Water Reclamation Facility (WRF) and the Pittman Wash Pilot Wetlands. Scientists studied the former from 2004-2009 to obtain data on the wetland's ability to improve water quality of treated effluent and to identify compatible vegetation. The wetland was created in a pre-existing pond in the WRF and consisted of approximately 80 percent open water and 20 percent wetland vegetation (bulrush) and land surface area. Monitoring included water quality, vegetation and birds. The Pittman Wash Pilot Wetlands primarily examined the impact of wetlands on the water quality of urban runoff by diverting a portion of Pittman Wash into two bulrush-vegetated cells with different flow regimes. Scientists monitored water quality (2007-2009) and vegetation (2007-2008) to determine whether the wetlands were having an impact.

Emergents upstream of Pabco Road Weir

Within the Clark County Wetlands Park, the Nature Preserve and adjacent in-lieu fee mitigation ponds provide an opportunity to study wetlands in both a mature wetland system and a developing wetland. The Nature Preserve was established in 2001 and has been monitored regularly since, while the in-lieu fee mitigation wetlands were only completed in June 2009. Eight sample locations within the Nature Preserve and in-lieu fee mitigation ponds are used to monitor for nutrients, metals and cation/anions. Four sites within the in-lieu fee mitigation ponds are sampled exclusively for selenium.

2010 MAJOR ACCOMPLISHMENTS

In February, in a continuation of work begun by the Harry Reid Center for Environmental Studies (HRC) at UNLV, the Wash Team began conducting monthly water quality monitoring at the Nature Preserve and the in-lieu fee mitigation wetlands. Ten months of consecutive water quality monitoring have been completed, providing the first long-term dataset for the in-lieu fee mitigation wetland ponds.

A grant was received from the Bureau to partially fund a study to evaluate the performance of wetlands along the Wash. A preliminary scope of work was developed.

Analysis of data from the Pittman Wash Pilot Wetlands and Demonstration Wetland at the City of Henderson WRF began, and a draft report for the two projects was initiated. The Pittman Wash Pilot Wetlands were demolished (all plant material had been harvested and transplanted the prior fall) and cleared from the channel.

The Desert Research Institute (DRI, **dri.edu**) completed the report, titled "A Comparison of Water Quality Improvements from Three Different Wetland Types in the Las Vegas Valley Watershed" in May 2010. The study found that plant nutrient uptake was related to water and sediment concentrations, and maximum water quality improvements would require the removal of plant roots. Also, bulrush were more efficient than cattails at removing arsenic and selenium. A version of the report was accepted for publication by the Environmental Monitoring and Assessment Journal, with an alternative title, "Removal of Nutrients and Metals by Constructed and Naturally Created Wetlands in the Las Vegas Valley, Nevada."

Also completed by the DRI was the report, titled "Nitrogen and Phosphorus Uptake by Cultured Microbes Collected from the Las Vegas Wash and Associated Areas." The study documented several microbes within the Wash that take up nitrate and phosphate. To further improve water quality, microbe material removal must be considered as a management option. Without such removal, as is now the case, algae would ultimately die and decay, releasing the absorbed nutrients back to the Wash.

Lush wetlands above Monson Weir

2011 OPERATIONAL OBJECTIVES

The HRC is currently working on a method to calculate flow within the in-lieu fee mitigation wetlands, which will help better understand the hydrology of the system. Flow measurements will complement water quality sampling and help determine any reductions in analytes within the system. Also, in 2011, additional sampling locations may be placed within the in-lieu fee mitigation wetlands to characterize flow patterns within the wetland cells.

Additionally, the Wash Team plans to implement a wetland performance study along the Wash by developing a system dynamics model. A water balance will be constructed as the first step, followed by the incorporation of data that have been collected from previous Wash studies or national studies.

wildlife

2010 AT A GLANCE

- **Continued implementation of the wildlife management plan.**
- **Entered sixth year of the Avian Point Count Survey, bringing the total number of bird species for the study to approximately 180.**
- **Received federal permit and conducted southwestern willow flycatcher surveys and reporting, saving thousands of dollars in consultant fees.**
- **Continued the Marsh Bird Monitoring Study for Yuma clapper rail compliance (none detected).**
- **Finalized "Las Vegas Wash Bird Census, 2000-2006" report.**
- **Captured 71 bats and collected 18,149 individual invertebrates as part of a bat and nocturnal invertebrate study.**
- **Collected first known splendid tamarisk weevil recorded in Nevada.**
- **Completed a marsh-focused small mammal study at eight sites; identified 11 species.**
- **Conducted a large mammal survey at 12 sites; identified eight species.**

Biologist handles western harvest mouse

PROJECT SUMMARY

The diverse and abundant wildlife at the Wash not only emphasizes the importance of the Wash area to Las Vegas residents, but also to the valley's ecosystem. The Wash Team conducts long-term research and monitoring to expand the knowledge and understanding of all wildlife in the Wash. The information collected from their studies was used to develop the Las Vegas Wash Wildlife Management Plan. The plan serves as a guiding document to manage the Wash's diverse wildlife population, and recommends 31 actions to conserve wildlife abundance and diversity, protect and enhance native wildlife habitats and increase environmental awareness of these resources in the community.

Since 1998, biologists have studied vertebrate and invertebrate wildlife inhabiting the Wash. They have since identified more than 260 vertebrate species through this research including: reptiles, large and small mammals (both terrestrial and bats), fishes, amphibians and birds. Aquatic macroinvertebrates and terrestrial invertebrates, including butterflies, also have been documented. In addition, surveys for endangered bird species are conducted as a mitigation measure that allows erosion control activities to continue.

2010 MAJOR ACCOMPLISHMENTS

Progress continued in 2010 with the wildlife management plan. More than 85 percent of the recommended actions have now been implemented. The studies described below involve actions and sub-actions related to the plan's objective of conserving the abundance and diversity of species that have been found along the Wash.

The Avian Point Count Study entered its sixth year.

Hoary bat captured during survey

The study has now identified approximately 180 species along the Wash. The 4-year study report was finalized and is available on **lvwash.org**, and a draft 5-year report was submitted by Great Basin Bird Observatory (**gbbo.org**).

Annual surveys for federally endangered bird species continued, as well. Wash Team biologists surveyed for the Yuma clapper rail as part of the Marsh Bird Monitoring Study in April and May. In 2010, neither Yuma clapper rail nor black rail were detected, while American bittern (a first for the study), least bittern, sora and Virginia rail were. Southwestern willow flycatcher surveys were conducted by permitted Wash Team staff for the first time, saving thousands of dollars in consultant fees. The surveys, conducted in May, June and July, identified one migrant willow flycatcher, but no residents.

Monthly aquatic bird counts continued at weir sites and were initiated at off-channel wetland sites, primarily the in-lieu fee mitigation ponds. More than 35 species have been identified at weir sites and more than 50 at off-channel wetland sites.

The final report for the Las Vegas Wash Bird Census (aka the Bostick Bird Census), conducted from 2000-2006, was completed. Study results found that weir construction, impoundment creation and revegetation increased avian diversity, largely by increasing aquatic and marsh bird richness and abundance and increasing their temporal use of the site.

The Wash Team performed a bat and nocturnal invertebrate survey to determine if revegetation efforts were improving the habitats of the Wash. Bats were captured at three different sites (tamarisk, riparian revegetation and passively-created wetland) using a triple high net (three mist nets stacked on top of each other). Seventy-one bats were captured and six species were identified. The two most frequently caught species were Yuma myotis and pallid bats. Bat calls also were recorded with Anabat SD1 equipment and analyzed with Analook software. Thirteen species were identified, with the two most recorded being the California myotis and Yuma myotis. The Wash Team also conducted a dietary analysis. Bat guano was collected and analyzed to determine their diet. Five orders of invertebrates were found, primarily Coleoptera (beetles) and Lepidoptera (moths).

Invertebrates were collected for the survey using a black light draped over a reflective sheet to attract them. A total of 18,149 individual invertebrates were collected, consisting of 13 orders (see table) and 47 families, making this the largest study of invertebrates along the Wash to date. The final report of the survey is in draft. Preliminary results indicate that the passively created wetland site had the highest number of bat captures, bat calls and insect captures, possibly due to being over a drinking source.

Splendid tamarisk weevil (Coniatus splendidulus)

ORDER	TAMARISK	REVEGETATION	PASSIVE
Hemiptera	531 (28.0%)	4925 (78.4%)	4925 (78.4%)
Diptera	243 (12.8%)	506 (8.1%)	1640 (16.4%)
Lepidoptera	610 (32.1%)	434 (6.9%)	1007 (10.1%)
Unknown	317 (16.7%)	212 (3.4%)	872 (8.7%)
Trichoptera	124 (6.5%)	8 (0.1%)	938 (9.4%)
Coleoptera	47 (2.5%)	160 (2.5%	163 (1.6%)
Neuroptera	6 (0.3%)	20 (0.3%)	45 (0.5%)
Hymenoptera	11 (0.6%)	12 (0.2%)	17 (0.2%)
Orthoptera	4 (0.2%)	2 (<0.1%)	3 (<0.1%)
Odonata	1 (0.1%)	1 (<0.1%)	7 (0.1%)
Aranae	2 (0.1%)	2 (<0.1%)	
Blattodea		2 (<0.1%)	3 (<0.1%)
Mantodea	3 (0.2%)	1 (<0.1%)	
Isopoda			1 (<0.1%)
GRAND TOTAL	1899	6285	9975

Insects collected using UV lights at sites sampled during the bat and nocturnal insect study

During the study, biologists collected the first known splendid tamarisk weevil (*Coniatus splendidulus*) recorded in Nevada, near Pabco Road Weir. The weevil, which is native to the Mediterranean region and feeds on tamarisk, has only been identified in a few states and was not released as part of a tamarisk biocontrol experiment, unlike the tamarisk beetle (*Diorhabda* spp.). Biologists have since found the weevil along Duck Creek and are keeping a lookout for more populations, as well as for signs that the weevil is impacting the tamarisk at the Wash.

A draft report from previous bat studies has been prepared detailing 5 years of acoustic data and 2 years of capture data collected through 2009.

The marsh-focused small mammal survey was completed in 2010. It was conducted at eight sites and used Sherman live traps (a type of live capture trap). The live traps were baited with a mixture of seed, oats and peanut butter. Eleven species were identified, and the target species, western harvest mouse, was found at six sites. Cactus mouse was the only species found at every site.

A large mammal survey was conducted at 12 sites, which were rotated weekly so that each was surveyed once a season, and will conclude in February 2011. Three Moultrie game cameras were set up at each site and recorded video when motion-triggered. Bait was set out at each camera location or trap. One trap was baited with both a scent that mimicked coyote urine and cat food, one trap with just cat food and one with just coyote urine scent. Eight species were identified, with coyotes and cottontail rabbits as the two most frequently recorded animals.

2011 OPERATIONAL OBJECTIVES

In 2011, the Great Basin Bird Observatory will finalize the 5-year report and submit a draft year six report for the Avian Point Count Study. A report also will be prepared for the Aquatic Bird Count Study and breeding season surveys will continue for the endangered southwestern willow flycatcher and Yuma clapper rail (via marsh bird monitoring).

The Wash Team will finalize the 5-year bat study report on the acoustic and capture surveys, and the bat and nocturnal insect study report. The large mammal study will be completed and data analysis and report-writing for both the large and small mammal studies will begin in 2011.

Prasinalia cuneata, another first record for the state

vegetation enhancement and management

2010 AT A GLANCE

- **Revegetated just over 20 total acres at two sites.**
- **Cleared approximately seven acres of tamarisk near the Historic Lateral Weir.**
- **Began using drip irrigation on trees at revegetation sites to allow for more efficient watering.**
- **Finalized the 2009 Las Vegas Wash Vegetation Monitoring Report and the 2009 report to the Army Corps of Engineers and drafted the 2010 reports.**
- **Closed Army Corps of Engineers permits for Upper Diversion Weir and Powerline Crossing Weir.**
- **Eradicated all large infestations of tall whitetop along the Wash.**

Yerba mansa flower

PROJECT SUMMARY

Stabilization activities limit erosion and reinforce the Wash's banks, yet these efforts displace valuable vegetation in the process. When construction ends, the Wash 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, **usace.army.mil**) and stormwater permits issued by NDEP. This work also allows for habitat enhancement, public outreach and bank stabilization benefits.

The health of the vegetation and variety of plant life are important in controlling the animal species that will reside in an area. Plant life also helps control erosion by stabilizing soils, weirs and adjacent banks. The Wash Team diligently works to clear invasive vegetation such as rapid-spreading tamarisk, which increases soil salinity and can degrade habitat quality, and replants these areas with diverse native vegetation. Both new and previously existing revegetation efforts continue to be successful along the Wash. Annual monitoring shows that even sites that are 10 years old are still growing and that these mature sites are a seed source for the system. Germination from older sites is helping newer sites become established faster.

Through research and testing, the Wash Team has created a growing list of native plants for the Wash. A wide variety of native plant material and planting techniques for revegetation projects have been utilized, including a seed collection program and hydroseeding techniques. In addition, ideal

Clearing tamarisk from fall Green-Up site

irrigation practices have been explored and developed to ensure that every area laboriously planted thrives and meets the performance criteria outlined in permits.

To date, the Wash Team has revegetated almost 280 acres of Wash land. Of the completed acres, this includes 69 acres of wetlands, some of which are used to meet Corps permit requirements. All of the non-wetland areas, as well as the remaining wetland acres, are used to meet requirements for other permits or grants provided to the SNWA.

Since 2001, vegetation management activities have consisted of finding innovative and economical ways of removing non-native species from the Wash and ensuring that these species do not return to revegetated sites. Effective invasive weed control helps improve wildlife habitat and allows native plants to thrive. To date, approximately 1,290 acres of tamarisk have been removed from the Clark County Wetlands Park and surrounding areas.

2010 MAJOR ACCOMPLISHMENTS

Revegetation areas in 2010 were selected and implemented using criteria laid out in the Las Vegas Wash Revegetation Master Plan. The master plan also describes the maintenance and monitoring activities generally required on revegetation sites along the Wash to ensure that they are eventually self-sustaining. Just over 20 total acres of the Wash was revegetated in 2010. This included 5.9 non-wetland acres planted at DU Wetlands No. 2 Weir during the spring Green-Up, an additional 0.7 wetland acres at the same site, as well as 13.8 non-wetland acres near Historic Lateral Weir planted during the fall Green-Up. The fall Green-Up area had approximately seven acres of tamarisk cleared by Bureau crews in the spring specifically for this volunteer planting event. The area surrounds a site planted in the spring of 2008.

Also, in 2010, the Wash Team began using drip irrigation on trees at revegetation sites, which allows for deeper watering, as well as watering more efficiently without excess water use across the entire site.

The 2009 Vegetation Monitoring Report, which documents the status of all revegetation sites planted through 2009, was completed, as well as reports to the Corps, which closed out permits for the Upper Diversion Weir and Powerline Crossing Weir. In addition, the 2010 reports were drafted.

Contractor crews sprayed herbicide on tall whitetop within all revegetation sites along the north and south sides of the Wash reducing new infestations. Approximately 175 gross-infested acres were treated. These treatments, coupled with the tamarisk removal, help meet goals outlined in the Integrated Weed Management Plan for the Lower Las Vegas Wash, including, for example, maintaining less than 20 percent cover by invasive plant species in revegetation sites (a success criterion of the 404 permits).

Mature willows provide a seed source for downstream sites like Lower Narrows Weir (visible in distance)

2011 OPERATIONAL OBJECTIVES

The Wash Team plans to plant the area downstream of the Pabco Road Weir for the spring 2011 Green-Up. In the fall, areas near the Lower Narrows and Homestead weirs are expected to be planted. Revegetation sites will continue to be monitored to gauge the success of the program.

Additionally, invasive weed management will continue by reducing new infestations of tall whitetop and removing approximately 10 acres of tamarisk downstream of the Pabco Road Weir in preparation for the spring Green-Up.

archaeological resources

2010 AT A GLANCE

- **Analyzed artifacts procured from the milk house project associated with the Lower Narrows Weir.**
- **Worked with Clark County officials, archaeologists and an engineering firm to create the design for reassembly of the milk house.**
- **Completed analysis associated with the future Sunrise Mountain Weir project.**
- **Tested a third area of potential historic resource significance in association with the future Silver Bowl Weir construction, finding no evidence of significance.**

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Glass fragments dated more than 50 years old are catalogued near future Sunrise Mountain Weir

PROJECT SUMMARY

The Wash has attracted visitors to its banks since as early as 300 B.C. Valuable information about the lifestyle of 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 sustain a life in the harsh Mojave Desert. The Wash Team and archaeologists work to identify potential cultural resource sites and excavate noteworthy areas if needed to ensure that historically significant artifacts are appropriately collected and catalogued.

As one of the most significant concentrations of cultural resources in the area, the Wash contains a number of cultural resource sites that provide significant data about the historic and prehistoric desert culture in Southern Nevada. In 1977, the area was designated as the Las Vegas Wash Archaeological District in an effort to recognize and protect these resources. Also, any feature more than 50 years old discovered in the area may be eligible for listing on the National Register of Historic Places. To date, more than 40 eligible sites have been identified at the Wash.

Almost 10 years ago, the Bureau partnered with the Wash Team to conduct archaeological surveys as a step toward preserving the historically significant area. Today, the Wash Team works to preserve this area and mitigate for impacts from construction-related disturbances.

Archaeological excavations of buried cultural deposits at the Wash have identified pit houses, hearths and food storage pits dating from 300 B.C. to A.D. 1600. These digs have allowed researchers to study artifacts corresponding to different periods of occupation. Archaeological discovery of the foundation of a milk house with an irrigation ditch, a collapsed 4-foot timber wall and a stepping-stone pathway dating from the early 1900s suggest that the Wash was a central lifeline for early inhabitants and explorers of Southern Nevada.

2010 MAJOR ACCOMPLISHMENTS

Although the milk house project associated with the Lower Narrows Weir was excavated in 2008, the analysis of the abundance of artifacts that were procured from the site was completed in 2010. The compiled evidence supports the idea that the establishment was dated to the early 1900s and was part of the Bishop Ranch operation. It likely belonged to one of the Bishop brothers and his family, given that the collected artifacts included broaches and children's toys. A draft report of this project is being prepared and is near completion.

The milk house structure was disassembled and relocated to the Clark County Museum in 2009. Using partial funding from the Bureau, the Wash Team is currently working with Clark County officials, archaeologists and an engineering firm that specializes in historic properties to put together the design of the reassembly site.

Analysis of another site associated with the future Sunrise Mountain Weir project also was completed in 2010. The site featured a scattering of historic artifacts on the ground surface, as well as prehistoric evidence in a bell-shaped storage pit and thermal pit. A draft report on the results of this project is under review.

Archaeologists dig test trenches to determine concentration of subsurface activity

A third area of potential historic resource significance also was tested this year in association with the future Silver Bowl Weir construction. Given the geographic properties of the area, archaeologists felt that the area could potentially be as active as the Larder and Scorpion Knoll sites from several years ago that produced hundreds of storage pits, other signs of habitation and even agriculture. After testing the area further, no evidence was found from the historic or prehistoric time period, hopefully eliminating any potential delays for the future construction.

2011 OPERATIONAL OBJECTIVES

The most significant accomplishment for the upcoming year will be the signature and execution of a Programmatic Agreement for the Clark County Wetlands Park between the Bureau, the Corps, the SNWA, the Nevada State Historic Preservation Office and the Advisory Council on Historic Preservation. The execution of this document in 2010 was delayed due to personnel changes within the Bureau, but the document has been finalized and was presented to the SNWA Board of Directors for signature in February.

The Wash Team also will be busy in 2011 with completing the reassembly of the Lower Narrows milk house at the Clark County Museum, where it will serve as an educational resource. Reports from the excavations near Sunrise Mountain and Silver Bowl weirs are also expected to be finalized in 2011.

Organic stains inspected along the face of test plot cross section

education and outreach

2010 AT A GLANCE

- **Initiated development of an outreach plan.**
- **Adapted field trip for Mabel Hoggard Math and Science Magnet School to include a tour of the valley's water cycle, from drinking-water source to wastewater discharge.**
- **Published the Invasive Weed Field Guide.**
- **Held two Green-Up events, which featured 743 volunteers planting 7,000 plants on 19 acres.**
- **Installed two informative kiosks adjacent to the Upper Diversion Bridge.**
- **Completed CHOLLA membership process.**
- **Hosted or participated in 32 outreach events, reaching more than 13,000 people.**
- **Distributed 4,320 E-mail Updates to valley residents.**
- **Recorded oral history of Norma Cox.**

PROJECT SUMMARY

The Wash plays a critical role in our community's overall ecosystem. As the public's awareness grows, so does their involvement in events at the Wash. Activities offer the community a chance to participate in and understand the unique challenges facing the Wash and challenge citizens, from children to adults, elected officials to Wash stakeholders, to become involved in preserving this vital waterway. Since the first volunteer event in 2001, more than 6,000 people have volunteered to lend a hand in planting more than 53,000 trees, shrubs and emergent grasses that now beautify and strengthen the Wash area. The 17 volunteer Green-Ups completed to date include the largest one-day volunteer planting event in Nevada history and have revegetated more than 137 acres with native plants.

The Wash Team dedicates resources and staff time into providing learning opportunities and educating Southern Nevadans about the importance of the Wash and its water quality, plant and animal species, stabilization activities and archaeological discoveries. The team also attends annual earth fairs and community events across the valley, displaying a booth staffed with knowledgeable personnel. The Summerlin Earth Fair, St. Rose Earth Day, UNLV Earth Day and Alternative Energy Fair are examples of the many events where staff have seized the opportunity to answer questions and increase public awareness and understanding in the community. Since the first community outreach events in 2000, the Wash Team has interacted with nearly 183,000 people.

Each month, the Wash Team creates an informative e-newsletter (referred to as the E-mail Update) to keep the community and stakeholders abreast of activities and accomplishments. Last year, 4,320 E-mail Updates were sent out across the valley. Also, the SNWA's annual WaterSmart 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 to all valley single-family owner-occupied homes.

2010 MAJOR ACCOMPLISHMENTS

In 2010, progress began on an outreach plan to further engage community interest and participation during activities in which staff disseminate messages regarding the Wash. An area of focus was effectiveness monitoring, which primarily consisted of the development of surveys to give to participants before information is presented and after it is received to see how well the information is being relayed and understood.

The partnership with Mabel Hoggard Math and Science Magnet School (since 1999) continued to progress in 2010. The partnership offers students the chance to team up with Wash biologists and hydrologists to become scientists for a day. The Wash Team adapted the field trip experience to include a wastewater treatment tour at the City of Henderson WRF.

Green-Up site supervisor provides planting demonstration to volunteers

Biologist takes students on nature walk

Additionally, approximately 50 plants were grown at Mabel Hoggard's greenhouse and then planted at the Wash.

Also in 2010, the Wash Team completed and published the Invasive Weed Field Guide, which identified approximately 30 species of noxious weeds to help LVWCC partners and users of the Wetlands Park identify and report invasive weeds to the Wash Team. The guide also identifies other potential weed species that may be detected in the future.

Two Green-Ups were conducted during 2010, one in spring and one in fall. The spring event was located on the south side of the Wash adjacent to the DU Wetlands No. 2 Weir. Three-hundred volunteers planted more than five acres with approximately 2,000 trees and shrubs. The fall Green-Up was on the south side of the Wash at the Upstream Historic Lateral South 2 Upper Plateau site, where 443 volunteers planted approximately 5,000 trees and shrubs on nearly 14 acres.

Two informative kiosks were installed at the Upper Diversion Bridge on the north and south banks to educate visitors about water pollution prevention and the Wash. The kiosks were funded by a grant from NDEP.

The membership process to join Connecting Hands Offering Lifelong Learning Adventures (CHOLLA) was completed in 2010. CHOLLA is a consortium of community agencies and the Clark County School District that collaborate to provide opportunities for connecting and extending classroom learning.

The Wash Team reached more than 13,000 people at 32 community outreach events in 2010 and hosted a total of 19 meetings including the LVVWAC, LVWCC and Research and Environmental Monitoring, Administrative and Operations study teams.

The Wash Team also recorded the oral history of Norma Cox, a founding member of the Desert Wetlands Conservancy.

2011 OPERATIONAL OBJECTIVES

In 2011, staff will complete and implement the outreach plan, including effectiveness monitoring. Two Green-Ups will be conducted during 2011, one in spring and one in fall. The Wash Team also plans to participate in or coordinate outreach events for the community including several Earth Day-type events and the Mabel Hoggard program. In 2011, the Wash Team also will host the first World Wetlands Day event in Nevada at the Wetlands Park.

Mabel Hoggard students get up-close view of softshell turtle

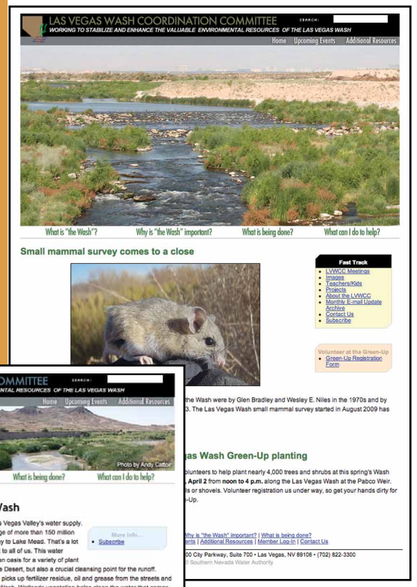
data resources

2010 AT A GLANCE

- **Initiated significant update to streamline the members' website.**
- **Hosted more than 25,000 visits and more than 18,000 unique visitors at lvwash.org.**
- **Responded to 127 information requests.**
- **Processed new digital aerial photography and imagery from two flights.**
- **Incorporated 426,452 lines of water quality sample data into centralized database.**

PROJECT SUMMARY

The Wash Team diligently creates, monitors and maintains a variety of technology-driven projects to support the ongoing research and activity of the LVWCC. From water quality to bioassessment monitoring, the ability to store, access and share data



*The web pages at **lvwash.org***

significantly enhances the ability of the LVWCC members to collaborate efficiently. Data-related projects run the gamut from the public website to specific mapping applications.

A vast amount of information is shared through the website, which provides an avenue for stakeholders and the public to access and request information from the LVWCC and the Wash Team. Two websites were established to support the LVWCC's efforts. The password-protected members' site accessible via **lvwash.org**, helps facilitate communication among the study teams, LVWCC members and the Wash Team. This site includes several applications such as: Project Tracking, the Image Repository, a Water Quality Database and the Contact Request System. The Wash's public website, **lvwash.org**, provides instantaneous information to the community. Designed to inform and energize the public about the LVWCC's efforts, the website features monthly articles and information about upcoming Wash events and provides a multi-faceted look at the Wash's past, present and future. Users can volunteer and request tours or field trips through the site.

Continued maintenance on the sites include: monthly news updates, E-mail Updates and regular updates to both the public website and the members' website. The Wash Team also provides the ever expanding storage, maintenance and processing of high-resolution aerial photographs, which are flown a minimum of every six months. These photographs provide the baseline maps for researchers to use for vegetation analysis, planning, erosion control, water quality and overall documentation of historical changes.

2010 MAJOR ACCOMPLISHMENTS

In 2010, a significant update to the members' website was initiated to streamline the site by removing unused functionality, updating the underlying technology with current standards and increasing overall site usability. The goal was to reduce duplication of effort and increase the efficiency of maintaining the site and its information. With these changes, an increase in usage is expected from partners. In addition to its other benefits, the members' website offers

Changes to the dynamic habitats surrounding Upper Diversion Weir can be tracked over time using aerial imagery

information on all meetings related to the Wash, including agendas, summaries, presentations, upcoming community events, educational events and tours. The site also is a great tool to find any involved agencies and their representatives.

An active year for the Wash Team resulted in more than 25,000 visits to **lvwash.org** by more than 18,000 unique visitors. This averaged more than 1,500 unique visitors per month. Twelve E-mail Updates were sent to more than 360 subscribers.

The Wash Team handles increasingly larger amounts of information each year. In 2010, team members managed and supported:

- 127 contact requests
- 200 documents added to the document library, now holding 7,695 documents
- 706 user accounts
- 4,481 contacts
- 161,028 Hydrolab© readings, totaling more than 1.4 million records since 1998

New digital aerial photography was taken and processed for two flights that occurred in 2010. The flights take place as requested by the researchers, or when needs arise.

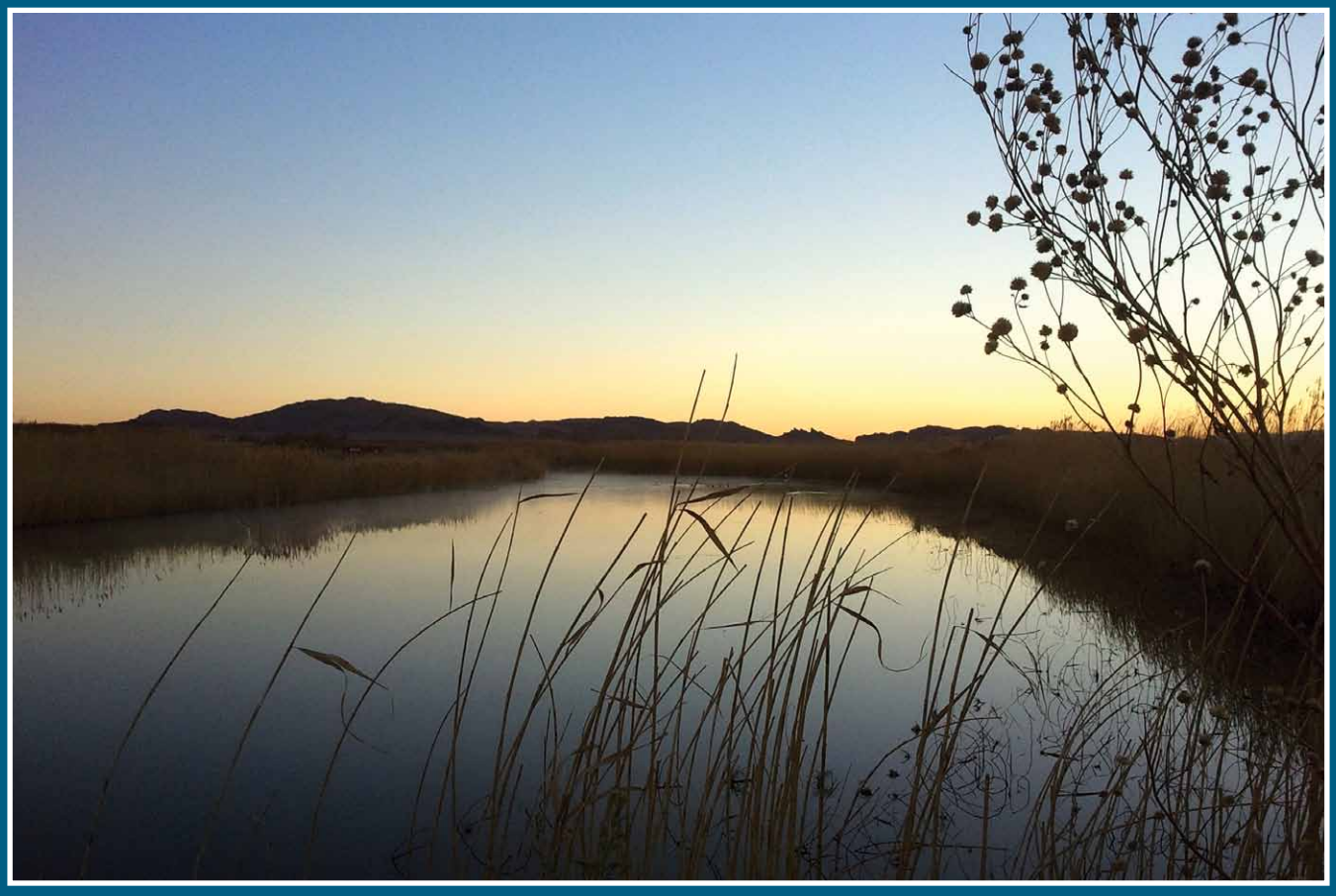
There were 426,452 lines of water quality sample data drawn in 2010. Since the inception of the program in 2008, a total of 2.8 million lines of water quality sample data have been drawn. The centralized database now includes 250 sites, 623 parameters and nine participating agencies.

2011 OPERATIONAL OBJECTIVES

The most significant objective for 2011 is the implementation of the fully updated and enhanced members' website. Other projects will include regular content maintenance of **lvwash.org**. The Wash Team will continue to look for opportunities to improve the website and keep up with industry standards, ensuring timely, concise and relevant applications, databases and repositories. Ongoing research, updates and monthly news articles also will continue. The water quality database will grow as agencies continue to add data. New digital aerial photography will be taken, processed, and stored and new baseline maps will be created.

Because interagency coordination is so critical to long-term management activities of the Wash, the Wash Team will continue to liaison with information technology professionals to facilitate the efficient and accurate transfer of information among participating agencies.

lvwash.org



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

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