Department of Defense
Legacy Resource Management Program

Natural Selections

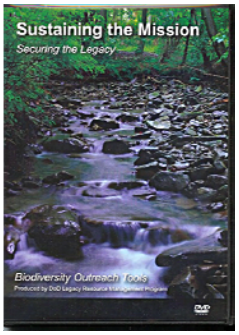
Volume 5, Issue 7 July 2009

Legacy Program Update

FY 2010 Pre-Proposals Due to the Legacy Office no later than Friday, July 31, 2009: The Legacy Program released its Request for Proposals (RFP)! The schedule is as follows:

- **31 July: Preproposals due to Legacy Office**
- 1 Sept: Notification to submit full proposal
- 24 Sept: Full proposals due to Legacy Office

Help Us Increase the Effectiveness of our Outreach Tools! We hope that many of you have been using our Biodiversity Outreach Toolkit (BOT), including our three PowerPoint presentations -- Information for Installation Leaders, Information for Civilian Leaders, and The Military Community.



We currently are developing a companion Invasive Species Toolkit, to include sample posters, fact sheets and brochures. Another potential product we may add -- a PowerPoint presentation similar to those found in the BOT.

We need your help in determining whether we should devote the resources to add this PowerPoint. Please take a minute and send us an email Jane.Mallory.ctr@osd.mil with your BOT experiences. Specifically….

- how often have you used the PowerPoint presentations? which one(s)? The full presentations, or portions?

- to what groups, and how many people?

- did you use the canned narration? the script?

We need your input by July 24th. Your assistance and that of others like you will be extremely valuable as we make crucial short-term decisions about the Invasives toolkit.

And, if you've not yet received your BOT copy, please contact Jane.

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In The News

Protecting the Marine Environment while Enhancing the Military Mission

By Erica Evans
Booz Allen Hamilton

Navy's primary mission is to test, train, and prepare for combat and emergency actions, while at the same time protecting the marine environment and minimizing impacts on marine mammals.

The Navy typically uses two types of sonar – passive and active. Passive sonar uses underwater microphones to listen to sounds that are generated by submarines while active sonar involves introducing sounds into the water that reflect off of various objects and return to a receiver to be analyzed. Over the past few decades, new technology has allowed newer and quieter submarines, reducing the effectiveness of passive sonar; therefore, mid-frequency active sonar is the best method to use for locating potential enemy submarines in the marine environment.

Enhancing the Military Mission, page 5

Inside This Issue

Naturally Speaking

From the Desk of L. Peter Boice,
DoD Conservation Team Leader and Director, Legacy Program

Aquatics and Climate Change

If there is a recurring theme underlying DoD's current natural resource conservation issues it is the potential impact of climate change on these resources and on how they are able to continue to support the military mission. This is as true for aquatic issues as it is for terrestrial-based ones. The range of those impacts is significant, and includes:

- Shorelines. Perhaps more has been written on the potential effects of shoreline change than on any other impact, from wetlands destruction to loss of training beaches to periodic flooding at many coastal installations.
- Aquatic invasives. Large ports (e.g., San Francisco Bay, Honolulu Harbor) will be prone to an increasing range of invasives. Relatively "minor" temperature changes may permit the establishment of a range of new, troublesome species.
- Stream temperature. Both game (e.g., trout) and nongame (e.g., mussels) species may be severely disrupted by changes to key factors such as food distribution, reproductive success, and predator base.
- Vernal pools. Some pools may dry out, others may become wetter. Whatever the instance, irrevocable changes to these microhabitats may ensue.
- Ephemeral and intermittent streams. Changing snow melt and precipitation patterns may severely disrupt stream flows. In arid and semiarid regions, these streams often are the only water source across large landscapes.

There is much to do if we hope to minimize these and other potential impacts to aquatic systems. DoD is already engaged in a range of important national and regional initiatives focusing on adaptation to climate change planning that may benefit all ecosystems, including those that are aquatic-based. Some representative examples of what DoD is doing to contribute to climate change adaptation efforts include:

Office of the Secretary of Defense

- DoD Legacy Resource Management Program (Legacy). The Legacy program is investing in national and regional efforts to help the Department in defining an adaptation strategy that will support the long-term sustainability of its natural and cultural resources. Current initiatives include:
  - A partnership with the National Wildlife Federation, the Association of Fish and Wildlife Agencies, the U.S. Fish and Wildlife Service and other federal agencies to develop a guidance manual that will summarize currently available natural resource-focused vulnerability assessment tools.
  - A Pacific Region workshop in February 2010 to identify and prioritize potential management strategies for listed and at-risk species expected to be adversely affected by climate change.
  - A project to assess sea level rise scenarios on seven North Carolina military installations to aid management of their natural resources and infrastructure.
- DoD's Strategic Environmental Research and Development Program (SERDP) has initiated research activities related to climate change in terms of impact assessment, adaptation and mitigation.
  - During FY09, SERDP initiated four research projects focused on developing the methods, tools, and models necessary for DoD installations to assess the potential impacts of sea level rise and associated storm surge phenomena on installation infrastructure.
  - Also during FY09, SERDP initiated natural resource-related research projects associated with southeastern ecosystems that focus on potential climate change impacts to shoreline bird populations, test adaptation strategies for coastal marsh plant communities, and incorporate climate change into setting recovery objectives for southeastern ecological systems.

Army

- Army Sustainability Program. Installation Sustainability Plans broadly address the physical components of installations (facilities, infrastructure, ranges and ecosystems) and their interactions and interrelations to create a sustainable environment while maintaining an adaptive ability to support current and future missions. These plans are one example of how DoD activities can help adapt to the impacts of climate change while serving other national defense purposes.
- Integrated Training Area Management (ITAM) program. ITAM is a core component of the Army's Sustainable Range program. The ITAM program provides the Army with tools and processes to identify and help adapt to climate change impacts, such as greater soil erosion from more frequent and severe storm events, to maintain the land conditions required for effective soldier training.
- Army Water Sustainability Study. This ongoing study will evaluate the vulnerability of Army installations to potential water shortages in the southeastern and southwestern United States over the next 30 years.

Navy

- Task Force Climate Change. The Navy established Task Force Climate Change (TFCC) in May 2009. TFCC is chartered to develop a roadmap for Navy action regarding the Arctic specifically, and climate change in general.
- Navy Strategy. The Navy incorporated the opening of the Arctic caused by climate change into its "Cooperative Strategy for 21st Century Sea Power," published in 2007, thereby ensuring that the Naval Services' strategic framework would allow for future climate change adaptation activities.

Air Force

- Climate Change On-going Reviews. To better understand both the projected threats posed to Air Force operations by climate change and the type of information that will be needed to inform climate change-related policy decisions, the Air Force has been monitoring public, private sector, and non-governmental organizations to identify relevant studies and analyses. Information gleaned from such analyses will inform future Air Force policy decisions regarding appropriate management and adaptation strategies.
- Understanding the Role of Air Force-Managed Natural Resources in Sequestering Atmospheric Carbon. Air Force stewardship of natural resources will potentially face management challenges due to changing climate conditions. These Air Force resources also represent an important terrestrial carbon sink. Concurrent with the Air Force greenhouse gas inventory initiative, the Air Force also conducted a preliminary biological carbon sequestration assessment of the amount of carbon stored in Air Force-managed natural resources. The assessment utilized Air Force geospatial and natural resource data, U.S. Forest Service forest carbon estimating tools, open source USDA Natural Resources Conservation Service soil data, and peer reviewed soil organic carbon factors to generate a first order approximation of the amount of carbon sequestered in the forests and soils of Air Force-managed natural resources. Assessment results will assist the Air Force in understanding how the expected challenges posed by climate change (such as drought, heat stress, moisture stress, and changes in disease and pest prevalence) might impact land use decisions and natural resources management strategies.

Marine Corps

- Adaptation to Increased Risk of Wildfires. Several climate change models predict an increase in the frequency and severity of wildfires in some geographic regions. USMC is attempting to adapt to this change. In Southern California for example, after increased frequency and severity of wildfires over the past few years, the USMC has initiated replacement of all aboveground communications and utilities lines with underground ones, as much as economically feasible, so that they will not be damaged when fires occur.
- In coordination with many other federal, state and non governmental efforts, I anticipate that DoD will continue and expand its efforts to adapt to and plan for real and anticipated impacts from our changing climate.

2009 Sustaining Military Readiness Conference

An update on the SMRC

2009 Sustaining Military Readiness Conference!: Register now for the Sustaining Military Readiness Conference 2009, to be held 9-14 August, in lovely Phoenix, AZ! To register and for more information, visit: http://www.smrconference.com/.

The SMR kicks off with two days of workshops. Offerings run the gamut of pertinent issues facing DoD's Natural Resource Managers.

Several full and half-day workshops include: Migratory Bird Treaty Act Short Course • Crisis Management • National Environmental Policy Act Overview Training • Communicating with the Media • Readiness and Environmental Protection Initiative Workshop • Forensic Geology and Ground Water Contamination • Range Emerging Contaminants • Developing an Effective Good Map: Sharing GIS Regional Approaches from SERPPAS and the WRP • Sikes Act Short Course • Management of Cooperative Agreements • Authorities and Strategies for Undertaking Off-base Partnerships and Conservation Projects • and more, much more!

Tuesday marks the first of two days of plenary sessions. Conference attendees will hear from two panels of high-level DoD officials including warfighters and civilians. The Military Services have an afternoon opportunity to hold individual break-out sessions before the official networking reception begins.

Between the plenary sessions, which are designed to be of interest to all conference attendees, lies a day of subject-specific tracks—Natural Resources, Heritage Stewardship, Balancing Competing Needs, and Meeting Multiple Missions. The natural resources track, "Natural Resources Management in a Changing World," includes sessions on strategic planning to support natural resources management and mission needs; determining priorities in a changing world; partnering; and new and emerging tools. Thursday, the conference plenary sessions focus on Energy, Partnerships, and Global Climate Change. Military, governments, and individuals from private institutions will speak on these issues of special interest. The afternoon will again allow for Military Service breakout sessions. A day of field-trips rounds out the conference week on Friday. There are field trips for many interests from the Biosphere to Palo Verde Nuclear Site. The Gila River Indian Community welcomes DoD attendees to their new Huhugam Heritage Center to view exhibits and discuss curation and archival issues. The Naval Observatory Flagstaff Station and Camp Navajo will show off their natural splendor and resources during a day-long visit to these two military installations. Luke AFB, the Air Force Research Laboratory, and Phoenix Zoo also will also welcome visitors! Please visit the conference website for more information on the exciting list of field trips. The conference registration is free but mandatory. Online registration at http://www.smrconference.com.

2009 Sustaining Military Readiness Conference Registration now open!

The 2009 Sustaining Military Readiness Conference will be held from Sunday, August 9th through Friday, August 14th at the Sheraton Phoenix Downtown Hotel in Phoenix, Arizona. Online registration is now open through the conference website. Please visit http://www.smrconference.com and register. The conference registration is free but mandatory. DoD personnel and stakeholders in Natural and Cultural Resource Management, Readiness, Sustainability, and Compatible Land Use are invited to join the DoD Legacy Resource Management Program, the Basing Directorate, the Directorate of Readiness and Training, Policy, and Programs, the Test Resource Management Center, the Office of the Director, Operational Test and Evaluation, and the Strategic Environmental Research and Development Program to:

- Exchange lessons learned from the public and private sectors!
- Share results of sustainability programs and projects!
- Participate in a broad spectrum of informative training workshops!

SMRC, page 16

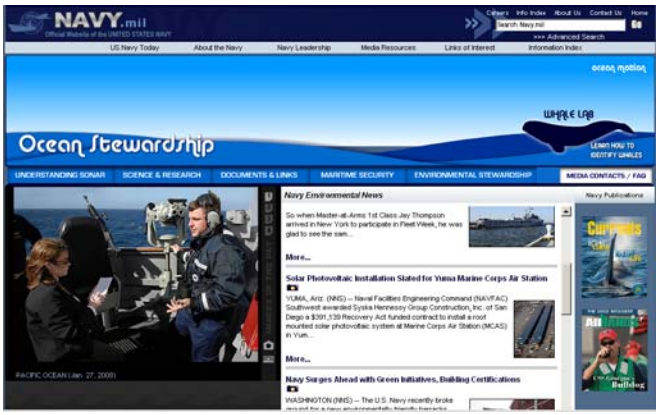
Enhancing the Military Mission, continued from page 1

Protecting the marine environment is also a priority for the Navy. Currently, the Navy complies with 29 protective measures to help alleviate any contact with marine mammals while conducting their training activities. These measures were developed with the help of the National Marine Fisheries Service, and include marine mammal awareness training, having multiple lookouts on sonar-equipped ships, and establishing special operating procedures, including power-downs and reporting requirements. By initiating these protective measures and restrictions, the Navy is able to train with minimum impacts to marine life.

The Strategic Environmental Research and Development Program (SERDP) established a whale monitoring project using the U.S. Navy Integrated Undersea Surveillance System (IUSS).This system is designed to monitor the presence, distribution, and abundance of several endangered and protected marine mammals, assisting the Navy in achieving its conservation and regulatory compliance goals. This process involves collecting, integrating, and assessing IUSS data for the North Atlantic and Northeast Pacific oceans, and incorporating this information into accessible databases to be used for education, research, and database management. This data was transitioned into both Navy and National Oceanic and Atmospheric Administration databases, and are used to analyze potential impacts on endangered and protected marine mammals that result from human activities. To view the SERDP fact sheet on Whale Monitoring Using the U.S. Navy Integrated Undersea Surveillance System, please visit http://www.serdp.org/Research/upload/CS-48.pdf

The Navy also implemented a modeling and simulation program for the Effects of Sound on the Marine Environment (ESME) to help mitigate potential impacts on marine mammals from sonar systems and other sources of ocean noise, such as ship traffic and acoustic sources. The Office of Naval Research appointed the Naval Research Laboratory as the ESME systems integrator to develop the ESME Software Workbench. This model was used to study the interaction between sound, the acoustic environment, and marine mammals and predicts a species-specific Temporary Threshold Shift (TTS) – a temporary decrease in auditory sensitivity – as a function of acoustic exposure by estimating the acoustic time series along an animal's track. This model also can be used to predict an animal's cumulative acoustic exposure.

The ESME workbench models the complete path of sound propagation – from the source of sound, through the water column and sea floor, to the simulated receivers. The workbench uses several predefined data sets for various factors, including acoustic sources and species-specific animal movements. Source movements are simulated to create different scenarios in which sonar-equipped ships using active sonar move along predefined paths.



A great source of information: http://www.navy.mil/oceans/

Sound exposure values are then used to estimate the environmental risk of a sound usage scenario by using user-defined thresholds of risk or metrics that have been defined by legal and regulatory agencies. The ESME workbench also includes a framework for simulating the movement and diving patterns of several different marine mammal species, providing insight on response patterns and avoidance behaviors to acoustic sources.

Although the Navy's primary goal is to support the military mission, they do so in a way that also protects the marine environments they utilize. Through various protective measures and restrictions, models, and programs, the Navy works to minimize their impacts to marine species.

For more information on Navy's efforts towards protecting the marine environment, please visit http://www.navy.mil/oceans/.

The effects of mid-frequency sonar on the larval Blue Crabs

By Adrianna Ortiz
Student Ecologist, Mission Assurance Department, Environmental Office, Surface Combat Systems Center Wallops Island, Virginia

The blue crab, *Callinectes sapidus* is the most valuable fishery in the Chesapeake Bay, valued at $150 million in 2001 alone from Maryland, Virginia and North Carolina. Commercial blue crab fisheries have existed on the East Coast of the United States for at least the past 100 years, if not more. Blue crab populations have been in serious decline since the early 1990's. Historic low catches occurred in 2001 and 2002 of 49.3 million pounds and 52 million

pounds, respectively. Besides the fishery there are many other threats to the blue crab, such as loss of habitat and degraded water. Other factors which are attributed to the declining population include embryo loss during development, disease and parasites, including *Hematodinium perezi*. Although it is not known to what extent these various diseases affect the blue crab populations, there is strong evidence that stressed individuals are more susceptible to the diseases.

The rationale for this research was to determine if the blue crabs were being killed by the very commonly-used mid-frequency sonar systems. These sonar systems are found on U.S. Navy ships, such as the USS Winston Churchill and other surface ships.

Active sonar emits a pulse of energy, which propagates a wave as the energy transfers from particle to particle, creating a sound. Information about the distance, size and composition of the detected object is determined by the echoed response after the sound wave has bounced off the object and returned to the ship. The distance between the ship and the detected object can be calculated quickly by knowing the speed of sound in the water, the water's temperature and the amount of time it took the sound to reach the object and return. Pressure, temperature and salinity are also factors in the speed of a sonar wave as it moves through the water. About half of all U.S. Navy vessels are equipped with active sonar capabilities.

Blue crab (Callinectes sapidus) larvae under the microscope. Photo taken by: Adrianna Ortiz

There are three basic types of active sonar: low-frequency (<1 KHz), mid-frequency (1-10 KHz) and high-frequency (>10 KHz). Low-frequency sonar is primarily used for long-range search and surveillance of submarines to 100 nautical miles. Mid-frequency sonar serves as the primary tool for identifying submarines, and is therefore crucial for anti-submarine warfare (ASW) missions. Mid-frequency can range up to 10 nautical miles. This was the chosen range for this study as it is used on the surface ships, since the sonar wave does not attenuate too quickly to have a broad range of uses, and it is not as controversial as the low frequency range. High-frequency sonar attenuates as it travels through the water, decreasing the range to less than five nautical miles, but can be applied to ocean bottom mapping, mine hunting, torpedo homing, fathometers, communications and under ice navigation.

On August 22, 2008 blue crab larvae at the zoea stage arrived from the University of Maryland Biotechnology Institute (UMBI) and preparation began. This crab-rearing facility provided the blue crab larvae used in this study, in order to ensure that no previous sonar exposure had occurred. Approximately 1,500 blue crab larvae were divided among 30 1 liter sampling bottles, so that each bottle contained approximately 50 blue crab larvae. The 30 bottles allowed for 3 replicates and 1 control for each of the 5 decibel levels tested (220, 216, 212, 208, and 204). There were also 4 replicates for the highest decibel level (230.5 dB) and 1 additional control (0 dB). All samples were placed in a large cooler for the 3 hour drive from the lab to Naval Station Norfolk.

Upon arrival at the USS Winston Churchill (DDG 81), four ropes were tied off from the bow of the ship so that the top of each sample would be at a depth of 30 ft. in the water column. This depth ensured alignment in the middle of the sonar dome on the hull of the ship. Three replicates were tested simultaneously off the bow of the ship (except for the four 230.5 dB treatment and controls with 4 samples at a time): one from port side, one from starboard side and one from the forecastle (foc'sle) (direct front) of the bow. In cooperation with a Navy sonar technician onboard, the sonar was activated with a 300 millisecond pulse length of the 3.3 KHz mid-frequency range. The experimental bottles were each subjected to one of the seven different decibel levels 200, 204, 208, 212, 216, 220 and 230.5 dB of the mid-frequency sonar range. The control samples were not exposed to any sonar (0 dB), but did undergo the same handling as the experimental samples. Once completed all samples were taken back to a laboratory for monitoring of survival.

Back in the lab, the samples were held in aquarium tanks where subsamples were extracted from each level of decibel exposure. The samples for the controls, 220 dB and 216 dB were all placed in 10 gallon tanks, the 230.5 dB samples were placed in a 5 gallon tank, while the remainder (212 dB, 208 dB, 204 dB and 200 dB) were placed in 1.5 gallon aquariums. The number of living organisms was counted and their lowest taxonomic classification was documented. Water quality parameters of salinity, conductivity, dissolved oxygen, and temperature were also monitored. The data analyzed was taken 17 and 23 days after the sonar exposure occurred.

Results showed that more than just the blue crabs were present in the samples: amphipods (*Stenothoe spp*., *Gammarus spp*., *Calliopus spp*.), copepods (*Calinoid spp*., *Macrocylops albidus*), rotifers (*Philodina spp*., *Brachionus rotundiformis*), polychaetes, nematodes and other unidentified nauplii larvae were also found.

Adrianna Ortiz sampling from the tanks in the lab after the sonar exposure testing. Photo taken by: Dr. Jeurel Singleton (of UMES)

Nonparametric statistical tests was used to compare the survival rates based on sonar exposure level, and also survival based on the relative proportion of water to the total volume of the tank. There was no significant difference in survival among the sonar exposure levels. However, there was a significant difference in survival based on the proportion the tank was full of water relative to the total volume of the tank. This means that the size of the tank relative to the sample impacted the survival of the larval blue crabs, while the sonar dB exposure level did not. The larger tanks with the greater surface area had the higher salinities.

The results of this study show that mid-frequency sonar exposure over the range of decibel levels examined and routinely used by the United States Navy vessels does not kill or noticeably affect short-term survival of blue crabs and other marine zooplankton species.

This study was conducted at Naval Station Norfolk, the world's largest naval station. The results of this study are important to the Navy, which routinely tests and uses various sonar frequencies near the south end of the Chesapeake Bay in areas which border some of the best nursery grounds for *Callinectes sapidus*. Therefore, the results of this study indicated that mid-frequency sonar exposure does not present new detrimental impacts to the blue crab fishery of the Chesapeake Bay.

Future studies should try to target long-term results such as potential effects of sonar on the multiple molt stages or if the sonar exposure stresses the crabs and makes them more susceptible to diseases or other causes of death.

Successful Mitigation at Wallops Island, Virginia

By Marilyn Ailes
Marilyn Ailes, Ph.D., Ecologist
Surface Combat Systems Center
Wallops Island, Virginia

In 2004, the Surface Combat Systems Center (SCSC) was searching for a place to build the engineering and test support facility for the new Zumwalt Class destroyers. SCSC is a tenant on Wallops Island, part of NASA's Wallops Flight Facility. SCSC's environmental staff (Marilyn Ailes) and the NASA counterpart (Joel Mitchell) spent many hours pushing through the brambles in search of a location which met all the requirements. The NEPA process was used to sort through the options, considering everything from wetlands to cultural resources to facility support to radar angles. In the end, the site that best met the various requirements was on wetlands. Now we needed a mitigation area. Back to the brambles!

Back side of mitigation area in winter of 2006 showing Phragmites australis leaning over ditch.

The site selected for mitigation was 4.5 acres of lawn, mostly strung along a dirt road in a little-used part of the island. In the spring of 2005, it was bulldozed down to wetland levels and planted with a mixture of seeds from plants known to grow wild on the island. That fall, native bushes were installed.

Wallops Island contains the largest area of *Phragmites australis* in Virginia (according to the Virginia Department of Conservation and Recreation, which tracks this invasive alien species). The Army Corps and the Virginia Department of Environmental Quality, which issued SCSC's wetland permits, required that for the mitigation to be successful, the Phragmites must be maintained at less than 10% for the first five years. We knew this would be a challenge, since the plant was abundant in the area and actually grew in a monoculture along part of the border.

Studies I (SCSC's environmental staff, Marilyn Ailes) had performed on a similar site on the island had shown the futility of control with fire, which increased the cover of Phragmites from 33% before the burn to 75% three years later. Sodium glyphosate had also proven unsuccessful. Though the latter had dropped the percent of Phragmites cover from 79.0% to 17.9% the first year, subsequent years saw the cover rise to 39.5% the second year, returning to 81.5% after seven years. This rise occurred despite repeated sprayings in the second through fourth years. We knew that controlling the Phragmites would require a new approach.

The first year following the bulldozing, I used intensive management. *Phragmites australis* puts up annual shoots, but the perennial part of the plant is the rhizome, safely buried in the wetland soils. My idea was that the rhizomes must use energy to put up sprouts. If those sprouts are then cut down, further energy must be used to put up more sprouts. With repeated removal of these sprouts, eventually the rhizome's energy supply should be depleted, causing death of the rhizome and hence of the plant.

To secure the help necessary for such intense management, a summer intern was hired through the Student Conservation Association (SCA) via Naval Facilities Engineering Command Northwest (Walter Briggs). The first year, the area was sprayed repeatedly where ever Phragmites began to grow.

Student Conservation Association intern, Sarah Sminkey, hand-pulling *Phragmites australis* in July of 2006.

When the plants reached several inches in height, my intern and I used weed-whackers to mow them down to ground level. The SCA interns have been an important element of the success of this project ever since the beginning.

By the second year, other plants were beginning to crowd the site. Since these plants represent competition for the Phragmites, my intern and I switched to hand-pulling the Phragmites to avoid harming the other plants. This has continued even now, in the fifth summer of the project. Since the second summer, every subsequent summer has required fewer hours to control the Phragmites. Last year, the standard vegetative transects did not record any Phragmites at all on the mitigation site.

Both the Army Corps and the State had several requirements for a successful mitigation. To date, we have met every requirement except that there must be 50% cover of perennials. Last year, there was 40% perennial cover; judging from the growth so far this summer, we expect to satisfy the last requirement in July and claim success on this mitigation site.

The U. S. Fish and Wildlife Service Fish Passage Program, Reconnecting Aquatic Species to Historical Habitats

By Laura Henze, National Sikes Act Coordinator
U. S. Fish and Wildlife Service, Arlington, VA

Early in the history of the United States, rivers ran wild, and fish followed them according to their needs. All river fish migrate between feeding and spawning areas and make other seasonal movements to important habitats. In the ensuing years, thousands of culverts, dikes, water diversions, dams, and other artificial barriers were constructed to impound or redirect water for irrigation, flood control, electricity, water supply, and transportation. All of these changed the natural features of countless waterways, blocking the natural migration of fish to historic habitat used for reproduction and growth. As a result, some populations of native fish are gone and others are on the brink of disappearing.

An estimated 2.5 million barriers to fish passage, including dams, culverts, and spillways exist throughout the United States. Many no longer serve their original purpose and were abandoned years ago.

To address this problem, in 1999 the U.S. Fish and Wildlife Service (USFWS) launched the National Fish Passage Program (NFPP), a voluntary, non-regulatory effort that provides financial and technical assistance to remove or bypass artificial barriers that impede the movement of fish and contribute to their decline. The NFPP has become one of the USFWS's most popular programs collaborating with partners from every level of government and a wide range of private and civic conservation groups.

Working with over 700 partners, the NFPP is highly effective at leveraging Federal appropriations, with an average match of $3 in partner funding for each Federal dollar. A recent project, in cooperation with Eglin Air Force Base, removed barriers to improve habitat for the federally listed Okaloosa darter. This is one of many projects that embrace the

USFWS's mission, directly benefiting over 85 federal trust fish and other aquatic species.

Since 1999, NFPP has removed or bypassed 749 barriers across the country. The USFWS, working with local communities and partners, has supported cost-share projects that have re-opened 11,249 miles of river and 80,556 acres of wetlands for fish, contributing to larger and self-sustaining populations of fish and more recreational fishing opportunities. Reestablishment of healthy fish populations not only restores the ecological integrity of the habitat but it benefits other species that directly depend on aquatic ecosystems.

Projects completed through the NFPP include large-scale projects such as the removal of Edwards Dam on Maine's Kennebec River and, in 2008, the removal of the Merrimack Village Dam in New Hampshire, and the construction of fishways. Other smaller projects include the repair or removal of culverts and other water diversions.

Stream before and after dam removal. Photo USFWS

To support the barrier removal process, the USFWS utilizes the Fish Passage Decision Support System (FPDSS), a web-based application with analytical and geospatial capabilities. The FPDSS makes information about barriers to fish passage in the U.S. available to policy makers and the public. The database can be accessed by anyone from the USFWS website to locate watersheds with fish barriers that need to be removed. The database currently identifies 718 unfunded fish passage projects totaling $158 million that, when implemented with the required partnerships, would remove or bypass more than 600 barriers. The USFWS will continue to work closely with its many partners to complete these projects as funding becomes available.

In 2009, the budget for the NFPP is close to $11 million and includes $6 million to support the Administration's Open Rivers Initiative.

Increased funding is being used towards in-the-water fish passage habitat improvement projects that emphasize the removal of small dams, as well as increasing the engineering support and technical assistance capabilities of the USFWS.

Since 1999, the NFPP has become one of the USFWS's most popular programs and is a model for collaborative conservation. Our partners add significant matching funds that maximize taxpayer dollars, and allow citizens at a number of different levels to become directly involved in restoration work that provides important benefits to native aquatic species populations.

For examples of Fish Passage projects in your state or more information about how you can help improve our nation's fish passage, contact one of the US Fish and Wildlife Service Fish Passage Coordinators listed on the website: http://www.fws.gov/fisheries/fwco/fishpassage/.

Legacy, continued from page 1

Legacy Project Highlight of the Month

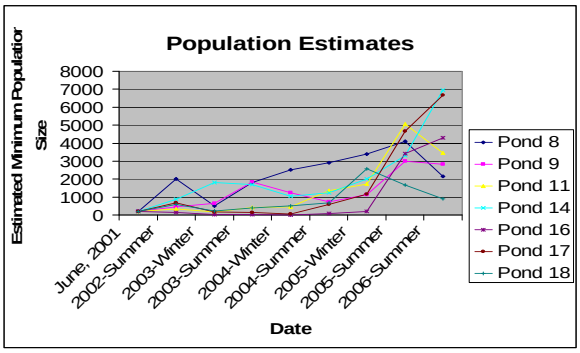
Legacy Project 04-112: Conserving Integral Units of Chihuahuan Desert Biodiversity: The adaptive management of the White Sands pupfish (*Cyprinodon tularosa*) is of particular concern because this New Mexico State listed species is restricted to DoD lands. Three populations of White Sands pupfish occur at Salt Creek, Malpais Spring and Mound Spring on White Sands Missile Range and a fourth population occurs at Lost River on Holloman Air Force Base.

White Sands pupfish serve as an excellent conservation target for aquatic desert ecosystems because they are the only fish in these habitats. Because of their rarity, management plans call for the establishment of refuge populations to serve as genetic replicates. This Legacy-funded research has focused on the biological implications of such translocations. This work has shown that such translocations can result in the loss of genetic variation or rapid evolutionary divergence. The translocation of wild animals to establish or re-establish additional populations has become a common management strategy, and yet such populations are rarely well monitored. This is especially critical during early establishment as such populations may experience un-documented demographic bottlenecks and a loss of genetic variation.

Desert fish have been extensively translocated and many of these transplant attempts have failed, often soon after the initial transplant. The genetic effects of such transplants have been studied for various pupfish species; however, replicated transplants have rarely been conducted offering an opportunity to evaluate the likelihood that such populations diverge from each other as well as from the source population.

On this project, demographic data for seven experimental populations of the White Sands pupfish (*Cyprinodon tularosa*) were reported. These experimental ponds were established to evaluate demographic and evolutionary responses of pupfish to relatively novel habitats. Fish were transplanted from a saline river to a series of brackish ponds.

This experiment was conducted to replicate a historic translocation of fish from Salt Creek to Mound Spring, which had both ecological and evolutionary implications in terms of altered parasite loads and rapid evolutionary divergence.



The estimated minimum estimate based on mark-recapture work for each of the seven populations that were descended from Salt Creek.

For each of the seven experimental Salt Creek ponds, mark-recapture studies were conducted on a bi-annual basis starting during summer of 2002.

Pond population sizes fluctuated widely, but most showed considerable growth beginning in 2005 (Figure 1). Three populations had population sizes below the founding size of 200 individuals (Ponds 11, 16 and 17), and the latter two populations dipped below 50 individuals (Figure 1).

All three of these populations recovered to large sizes. Populations 16 & 17 which both dropped in number also showed signed of a genetic bottleneck as measured by reduced genetic diversity and altered allele frequencies.

The bottlenecks all occurred early in population establishment, and yet the bottlenecked populations subsequently grew to relatively large sizes. This type of un-documented bottleneck is likely to happen with newly created refuge populations calling for managers to closely monitor populations during the early phases of establishment.

Previous work on White Sands pupfish has shown that little genetic variation exists for allozyme markers and that there is only moderate diversity in microsatellite markers. Thus, additional research was conducted to develop and evaluate a new set of molecular markers.

The majority of conservation genetics studies rely on neutral markers to examine the population structure of imperiled species. Neutral, or unexpressed, markers may be more sensitive to changes in population structure; however, they do not necessarily indicate biologically relevant differences between populations. By using expressed markers, the effects of selection can be taken into account, something that is not possible with neutral markers.

These data along with experimental work by North Dakota State University suggests that pupfish populations show considerable population fluctuations and this same pattern has been observed for wild populations of White Sands pupfish by the New Mexico Department of Fish and Game. For more information on this project visit: http://www.ndsu.nodak.edu/ndsu/stockwell/Pupfish%20Website/

The White Sands pupfish (*Cyprinodon Tularosa*) is classified as Threatened by the State of New Mexico and is protected at White Sands Missile Range, and at Holloman Air Force Base.

Ask Legacy

Letters to the Staff of the Legacy Resource Management Program

Dear Legacy,

What's all this fuss about White Nose Syndrome? Personally I find bats unappealing and a little creepy and don't know why I should care about this.

Signed,
Don't get it.

Dear Don't,
Personally we think bats are one of the coolest creatures out there, but you are entitled to your opinion. It's a dangerous practice though to base something's worth on its looks. Unfortunately, that's why "charismatic megafauna" get the preponderance of species and habitat funding.

You should care and here is why. White Nose Syndrome (WNS) is a serious problem that has the makings of an ecological and economic disaster if not stopped. WNS can have a mortality rate of 90 to 100%. A lot is still unknown, WNS doesn't seem to be species-specific and it's spreading like wildfire. The body count is a million or more.

What do bats do for you? Bats perform highly critical services. Bats are important pollinators for up to 1,000 plant species in North America, including a lot of popular fruit trees. Here in the U.S. they are crucial to agave and saguaros. But what our bats really do is eat insects and lots of them. Insects that can damage dozens of crops, including wheat, apples, and cotton. Therefore, a significant decrease in the bat population would have negative ramifications for United States agriculture. They feed on insects that would otherwise damage forests. Bats also feed on mosquitoes and a drop in the bat population would lead to an increase the mosquito population which could well result in more cases of West Nile Virus in humans. One last thing to consider: if many more die, there could be a lot more bats on the Endangered Species list and more challenges for land managers!

DoD cares about bats. In fact a future issue of Natural Selections will highlight bats and the various conservation efforts by DoD to conserve bats and to confront WNS. But we didn't want to wait until then to bring up this question. If you have bat habitat on your lands, no matter where you are, you should be thinking about how to protect them from WNS. Check out Bat Conservation International (http://www.batcon.org) for more information.

Signed,
-L.

Dear Legacy,

I am working on my pre-proposal and know a little while back you had a special issue of your newsletter with a lot of information about the process. Where can I get a copy of that?

Signed,
Submitting a winner!

Dear Submitting,

If you go to the Legacy website (www.DoDLegacy.org) and click on the Newsletters tab on the top of the page, you will find a list of posted newsletters. You want the APRIL issue. It's chocked full of helpful information. If you have any questions that aren't answered in the newsletter or our Guidelines, feel free to call one of the Legacy staff.

Signed,
-L

Training, Announcements & Events of Interest

Workshops, Interagency Training Announcements and Future Events of Interest to the Conservation Community

SPONSORED! **Intensive Plant Conservation Training:** December 7-12, 2009, in Berkeley, CA. This 6-day workshop will include: Legislative Protection and Regulatory obligations for plant recovery, Population Evaluation, Demography, Population Viability Analysis, Plant Conservation Genetics, Restoration and Management (Ex-Situ and In-Situ) Inventory and Monitoring Techniques, Tools and Partnerships, and more. Participants will receive pragmatic tips, information resources, contact lists, and a unique opportunity to get questions answered by experts in the field. Space is limited to 35 attendees so sign up early! For registration and more information contact Anna Strong, Center for Plant Conservation at: Anna.Strong@mobot.org.

SPONSORED! **Strategic Management of Invasive Species in the Southwestern United States:** October 26-30, 2009 in Phoenix, AZ. This five-day invasive species workshop for installation personnel in the southwestern United States (AZ, CA, CO, NM, NV,) is sponsored by the Legacy Program. The workshop will provide participants with knowledge and resources that will enable them to improve land stewardship by building partnerships and effectively addressing invasive species problems. Invasive terrestrial plants of southwestern desert ecosystems will be emphasized but nonnative aquatic nuisance species and insects will also be covered. Science and management experts will address pressing ecological issues and explain key components of an invasive species management strategy. Participants also will learn about local, state, and federal invasive species initiatives and regional partnership opportunities. There is no charge for the workshop. Registration is not open yet; however, please contact Melissa Brown at weedcenter@montana.edu to be placed on a list to receive notices about this workshop, or visit http://www.weedcenter.org/dodworkshop.

SPONSORED! **Strategic Management of Invasive Species in the Southeastern United States:** December 7th-11th, 2009 at the Carolina Inn in Chapel Hill, NC. This five-day invasive species course for installation personnel and their strategic partners in the southeastern United States is sponsored by the Legacy Program. The workshop will provide participants with knowledge and resources that will enable them to improve land stewardship by building partnerships and effectively addressing invasive species problems with an emphasis on terrestrial plants of the southeast. Science and management experts will address pressing ecological issues and explain key components of an invasive species management strategy. Participants also will learn about local, state, and federal invasive species initiatives and regional partnership opportunities. Registration will be available online beginning May 20th, 2009. Please contact Steven Manning at steve@ipc-inc.org to be placed on a list to receive notices about this workshop.

CALL FOR PROPOSALS! **National Fish and Wildlife Foundation Call for Proposals Announcement:** The National Fish and Wildlife Foundation (NFWF) is soliciting proposals for the 2009 Native Plant Conservation Initiative (NPCI) grants cycle. The NPCI grant program is conducted in cooperation with the Plant Conservation Alliance (PCA), a partnership between the Foundation, ten federal agencies, and more than 270 non-governmental organizations. PCA provides a framework and strategy for linking resources and expertise in developing a coordinated national approach to the conservation of native plants. Since 1995, the NPCI grant program has funded multi-stakeholder projects that focus on the conservation of native plants and pollinators under any of the following 6 focal areas: conservation, education, restoration, research, sustainability, and data linkages. For more information please visit www.nfwf.org/npci.

CALL FOR POSTERS! **SERDP/ESTCP Annual Technical Symposium & Workshop:** The Partners in Environmental Technology Technical Symposium & Workshop will take place December 1-3, 2009 in Washington, D.C. This event is sponsored by the Strategic Environmental Research and Development Program (SERDP), DoD's environmental science and technology program, and the Environmental Security Technology Certification Program (ESTCP), DoD's environmental technology demonstration and validation program. The comprehensive technical program will feature 11 technical sessions and five short courses. Technical sessions will highlight research and innovative technologies that assist DoD in addressing increasingly complex environmental and mission sustainability challenges. Short courses on select technologies in the environmental restoration and munitions management areas will offer unique training opportunities on recent advancements in science and technology. All poster abstracts are due July 31, 2009. The hotel room block and a preliminary agenda are also available. Symposium registration will be available in July. For the most up-to-date information about the Symposium, visit www.serdp-estcp.org/symposium. If you have any questions, please e-mail partners@hgl.com or call the Symposium contact line at 703-736-4548. For poster abstract information please follow this link.

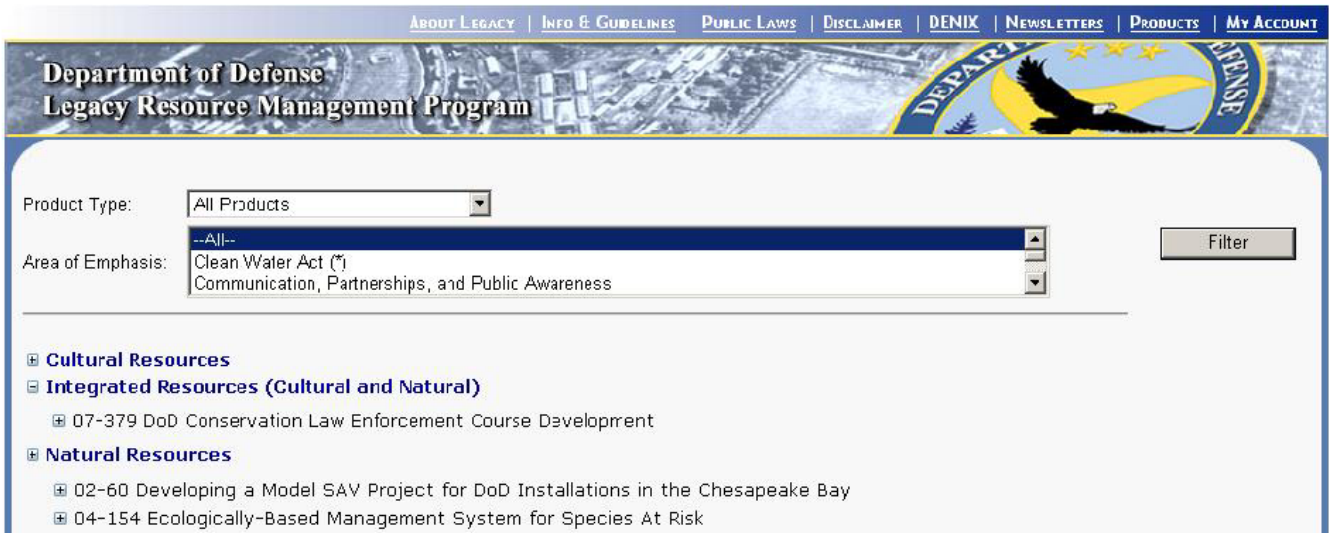
SAVE THE DATE! **9th Annual NAPPC International Conference:** October 21-23, 2009 at the U.S. Environmental Protection Agency, Arlington, Virginia.

Recent Natural Resources Documents On Legacy

Your one stop location for interesting reports and fact sheets

Dear ***Natural Selections*** Reader:

The DoD Legacy Resource Management Program is expanding the Legacy Tracker capability to allow for the download of fact sheets and reports of completed Legacy funded projects. Many project natural and cultural resources fact sheets are now available online with more to come. Over the next few months, Legacy Staff will upload additional final reports and fact sheets to the website. The process of uploading expected products may take several weeks, but it is well worth it. Uploading material to DENIX will resume once that website recovers from its general systems failure.



Now you can view expected products on the Legacy Tracker, with this easy to navigate list.

Here are a few samples of recently uploaded natural resources fact sheets on the Legacy Tracker (project number and title).

05-17 DoD Partners in Flight 2005
05-48 Military Armored Vehicle Reefs
05-86 National Public Lands Day 2005
05-103 Identify Management Strategies for Declining Landbirds
05-158 Grand Bay Banks Lake Stewardship
05-186 Modeling Overwintering Survival of Declining Landbirds
05-213 Strategy for the Cooperative Recovery of Rare Species Affecting Training Ranges
05-232 Demonstration of an acoustic warning system to alert manatees of approaching DoD vessels
05-240 Sikes Act Integrated Natural Resource Management Plan (INRMP) Training
05-242 TER-S Technology Transfer
05-243 Migratory Linkages Burrowing Owls
05-244 Reintroduction of the Eastern Regal Fritillary Butterfly into Gettysburg National Military Park
05-245 Migratory Bird Monitoring Using Automated Acoustic and Internet Technologies
05-247 Biodiversity Hand Book Revision Phase I
05-249 Front Range Ecoregional Partnership
05-252 Reintroduction of Prescribed Fire in Coastal Plain Ecosystems to Reduce Wildland Fire Risk

05-255 Desert Tortoise Head Start Project
05-258 Support of Southwest Strategy T&E Species Program Managers Team
05-264 Multi Species Management Using Modeling and Decision Theory
05-270 Development of Mission Avoidance Zones in the Eglin Gulf Test and Training Range
05-271 Prescribed Burns Effects on Endangered Reptiles and Amphibian Species
05-273 Biodiversity Outreach Toolkit
05-275 Cooperative Conservation National and Regional Conference and Workshop Support
05-276 Technology-based Decision-support Planning Tools
05-278 Southeast Regional Partnership for Planning and Sustainability Mapping Effort
05-279 Compatible Land Use Planning and Stakeholder Engagement Implementation Process
05-280 Actions to Abate Critical Threats Gulf Coastal Plain Ecosystem Partnership (GCPEP)
05-281 State Wildlife Action Plan and INRMP's Workshop
05-282 Engagement with Academia and Research Centers
05-284 Integrating National Environmental Policy Act with Environmental Management System through GIS

06-1717 DoD Partners in Flight 2006
06-86 National Public Lands Day 2006
06-213 Strategy for Cooperative Recovery of Rare Species at Ft Lewis
06-243 Migratory Linkages of Burrowing Owls
06-280 Actions to Abate Critical Threats Gulf Coastal Plain Ecosystem Partnership (GCPEP), Phase II
06-290 Quantifying Impacts Groundwater Withdrawal on Avian Communities in desert riparian woodlands
06-292 Assessing BASH risk potential of migrating and breeding Osprey in the Chesapeake Bay Region, Phase I
06-298 Pacific Islands TER-S Workshop
06-302 Role of DoD Lands for Endangered Species Protection
06-306 Coral Ecosystem and Marine Resource Initiative
06-308 Remote Monitoring of Island Foxes
06-310 Southeast Region TER-S Workshop
06-322 DoD Coordination Conservation Issues with Bureau of Land Management
06-329 Analysis of California Migration Patterns using NEXRAD and On-the-ground Data
06-331 State-wide Conservation Forums to Facilitate Cooperative Conservation

07-86 National Public Lands Day 2007
07-038 Digital Telemetry of Island Foxes
07-1717 DoD Partners in Flight 2007
07-270 Protected Species Habitat Modeling in Eglin Gulf Test and Training Range
07-292 Assessing BASH risk potential of migrating and breeding Osprey in the Chesapeake Bay Region, Phase II
07-305 An Analysis of Forest Riparian Buffer Zones on Military Installations in the Chesapeake Bay Watershed
07-334 North Carolina Sandhills Weed Management Area
07-337 Assessing the value of DoD lands in Alaska to an imperiled species, the Rusty Blackbird
07-341 Legacy Geospatial Data Warehouse
07-346 DoD Strategy to Support a Multi-Agency Bat Conservation Initiative Within the State of Utah
07-371 Natural Resource Assessment of Wake Island After Feral Cat Eradication and Super Typhoon Ioke
07-377 Southwestern TER-S Workshop
08-086 National Public Lands Day 2008

SMRC, continued from page 4

Hotel Info

The 2009 Sustaining Military Readiness Conference is being held at the Sheraton Phoenix Downtown Hotel. Registrants are encouraged to reserve rooms early to ensure their availability. MAKE YOUR HOTEL RESERVATION BY JULY 24TH OR ELSE YOU WILL NOT RECEIVE THE SECURED CONFERENCE RATE. Think about it, is the only way you will secure a room at the best hotel in town, with nice, brand new air conditioned rooms, no need to walk outside in the heat or through sketchy neighborhoods, close to airport train.

Sheraton Phoenix Downtown Hotel (Photo www.peterjordanphoto.com)

To make reservations:

Online: You may make reservations online at the Sheraton reservation site.

By Phone: Please call Phoenix Sheraton Downtown Hotel at 1-800-325-3535 (Toll free number) or (602)262-2500 and ask for reservations with the 2009 Sustaining Military Readiness group. Check-in begins at 3pm and you must check-out by 12pm. If you are departing later in the day, the hotel will hold your luggage at the front desk.

Photo of the Month

Capturing the beauty of our natural resources

July 2009 Photo of the Month Winner!
Skippers on swamp milkweed
Submitted by *Natural Selections* reader: Marilyn Ailes
Surface Combat Systems Center, Wallops Island, VA

Did You Know?

Little Did You Know Conservation Could Be So Much Fun!

Do you believe in the Vernal Pool Fairy Shrimp? It does exist!– Vernal pool fairy shrimp are found in short-lived cool-water vernal pools with low to moderate dissolved solids. At some localities in California's central valley, Skunk Hollow, and Salt Creek, they are associated with alkaline soils. Fairy shrimp are adapted for survival in water bodies that are relatively short lived and their cysts (protected eggs) can withstand long dry periods. Vernal pool fairy shrimp require cool waters, often early in the rainy season for hatching. Fairy shrimp are highly susceptible to contaminants. Vernal pool fairy shrimp are vulnerable to contaminants in runoff waters and watershed quality. The limited genetic information available suggests that there is very little genetic variability within populations. Dispersal of cysts thought to occur by animal vectors, either grazing animals or waterfowl. With the long distance isolation between the few remaining pools, gene flow is greatly if not completely reduced. This species may be difficult to detect in dry years.

Vernal pool fairy shrimp. Photo courtesy of USGS.

Branchinecta lynchi, the Vernal Pool Fairy Shrimp, is a federally listed crustacean endemic to California and Oregon vernal pools. B. lynchi belongs to a group of primitive crustaceans in the class Branchiopoda and order Anostraca. B. lynchi is distinguished from other fairy shrimp by the female's tapered, pear-shaped brooding pouch, its relatively large size (0.75-1 inch), and antenna size and shape. *B. lynchi* inhabits small vernal pools with cool water (10ºC) of moderate alkalinity and conductivity that are less than 1m deep.

Vernal Pool Fairy Shrimp have evolved to survive the ephemeral nature of their habitats. Vernal pools are temporary wetlands that form in depressions of unplowed grasslands over a hardpan clay layer. Pools fill with winter rains and evaporate over time, lasting anywhere from a few weeks to a few months. As a result, *B. lynchi* completes its life cycle in a matter of weeks. Fairy shrimp eggs, called cysts, are encapsulated in a hard shell. Cysts can withstand desiccation and extreme temperatures when pools disappear; they also survive when ingested by animals. Short and long-distance dispersal occurs when cysts "hitch rides" on migrating birds or when consumed by traveling animals. Cysts will only hatch when the right conditions appear again.

The current distribution of *B. lynchi* is limited to Oregon and California. Populations are found in Southern Oregon's Agate Desert and in California's Central Valley and coastal mountains. Just three occurrences of *B. lynchi* are also found in Southern California. Relative to other fairy shrimp, *B. lynchi* has a relatively large distribution, however, it is uncommon within its range. Historic *B. lynchi* data are nonexistent for it was described in 1990. It may be assumed that its distribution or abundance was much greater in the past, since vernal pools are currently an endangered habitat. California's Central Valley has lost 75% of its vernal pool habitat and Oregon's Agate Desert has lost 90%.

The biggest threat to *B. lynchi* is loss of habitat. Vernal pools form in relatively flat grasslands that can be found close to metropolitan areas. This makes them prime targets for urban sprawl and agriculture. As mentioned above, both Oregon and California have already lost a huge portion of their vernal pool wetlands to these threats. Contamination of vernal pools by storm water run-off containing pesticides and other chemical residues is also negatively impacting shrimp populations. Exotic grass species that reduce the longevity of pools may also pose a threat to B. lynchi.

Conservation efforts are in their beginning stages and focus on habitat conservation. *B. lynchi*, among a suite of other vernal pool specialists (invertebrates and plants), were federally listed in 1994. As a wetland species *B. lynchi* is also protected under the Clean Water Act. The Fish and Wildlife Service recently completed designation of critical habitat for the listed vernal pool species in 2003. However, counties where vernal pools might be most threatened were exempt due to economic considerations. One example is the county of Merced where the new University of California is being built. Coalitions among non-profit groups like the Nature Conservancy and government agencies have focused on land acquisitions. Active management, such as prescribed burning and cattle grazing is used in vernal pool grasslands to keep exotic plants at bay. The future success of the Vernal Pool Fairy Shrimp will depend on adequate protection of vernal pool habitats, which may prove to be difficult in a state that is experiencing such rapid growth and development.

Portions of this month's Did You Know? are courtesy of Cornell University.

Contact Us

Who we are and where to find us!

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