

the Wire

SWCA

News from SWCA Environmental Consultants

Volume 16, Number 1 | 2016

Cover story:

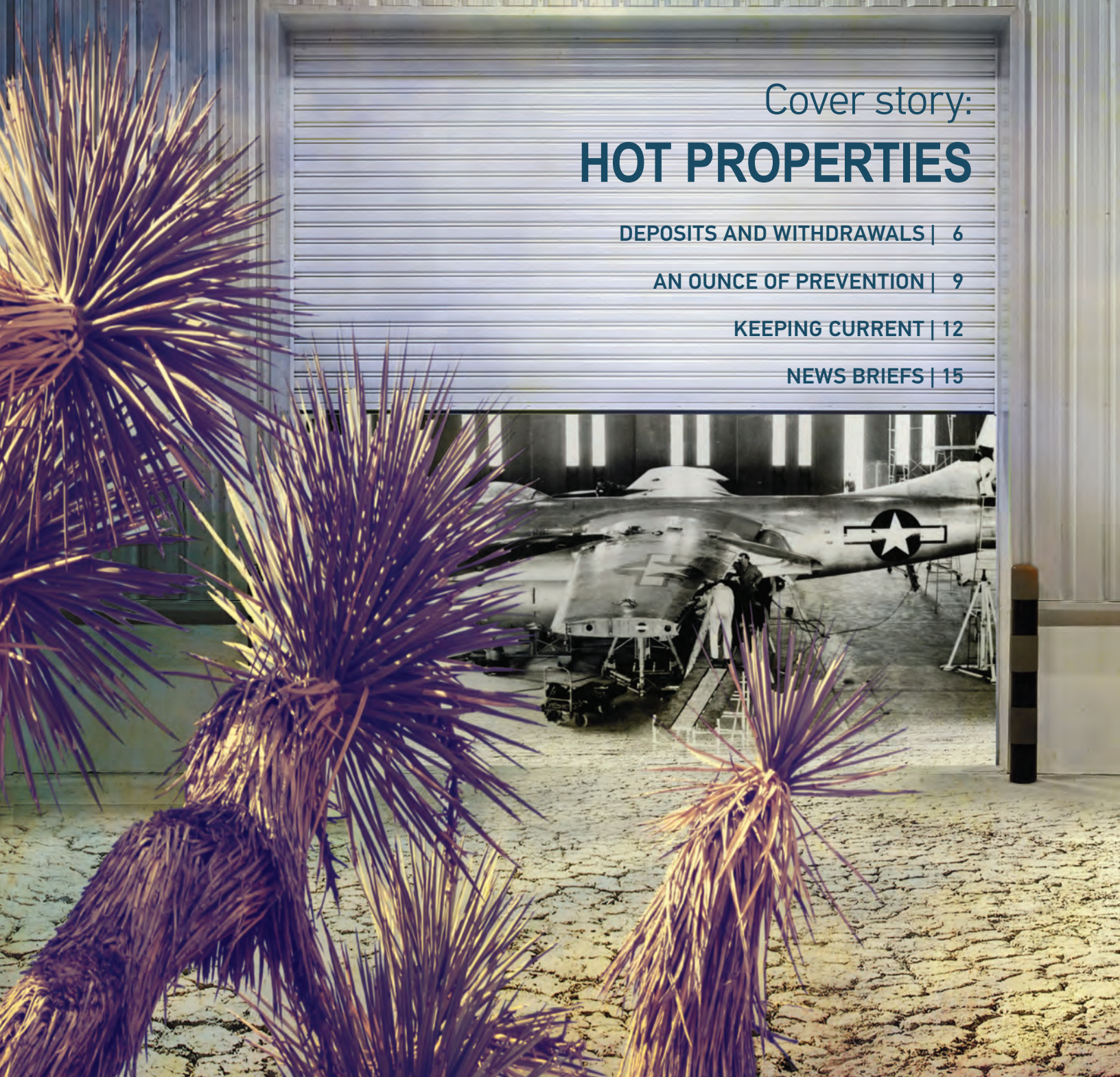
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FOCUS:

MEXICO ENERGY REFORM ENVIRONMENTAL CONFERENCE

By John Thomas, CEO

In October, SWCA partnered with ProMéxico Trade and Investment to present a special conference in Pasadena examining the future of the oil, gas, and electricity sectors in Mexico. With energy reforms in 2014 setting the stage for greater foreign involvement in the sector, we wanted to explore the new regulatory landscape, environmental permitting and compliance requirements, investment opportunities, and challenges that are faced by energy project developers interested in expanding into Mexico. Speakers included officials from Mexican regulatory agencies, policy authorities, and legal and finance experts.

I was extremely pleased with the insights offered by our conference presenters, as well as discussions that took place outside of the formal sessions. Attendees told us how much they appreciated the opportunity to meet with some of the foremost legal, financial, and environmental analysts who are experts in Mexican policy-making and project implementation.

Project opportunities are increasing and regulatory clarity has improved, but one conclusion from the Mexico Energy Reform Environmental Conference is that regulatory nuances will develop over time as the specifics of new programs are established. For example, future projects will depend on the outcome of oil and gas contract tenders taking place in the bidding rounds in 2015-2016, and we will be tracking these closely.

In future editions of *The Wire*, we will feature articles that dive deeper into Mexico's new Social Impact Analysis requirements and how best to work with the country's National Institute for Anthropology and History to comply with cultural resource regulations.

Beyond sharing the latest information on new challenges and opportunities in the energy sector, the Mexico Energy Reform Environmental Conference allowed us to spotlight how SWCA can help U.S.-based clients understand the market and regulatory requirements south of the border. It may not be widely known that SWCA has technical expertise in Mexican environmental regulations, and that we have established outstanding relationships with Mexican regulatory agencies. However, we have already begun to put our expertise to work on behalf of our clients.

Our approach to providing services to clients with projects in Mexico is having SWCA employees in the United States who are authorities on Mexico to lead projects and provide analysis, drawing upon our network of Mexican consulting partners and local providers to conduct on-the-ground planning and studies that feed into regulatory reports and permit applications. We combine that with objectivity about what is required from an environmental, legal, and regulatory standpoint and an understanding of Mexican culture and the key players involved.

I am excited about the possibilities for working in this new strategic market. I invite you to contact **Ricardo Montijo** in our Pasadena office at rmontijo@swca.com if you would like to know more about how we can help you with your own expansion into the Mexican market.



Left to right: Ricardo Montijo, Juan Carlos Briseño with ProMéxico Trade and Investment, John Thomas, and Carlos Gimenez with the Consulate General of Mexico

HOT PROPERTIES: RESEARCHING COLD WAR HISTORY IN THE MOJAVE DESERT

By Steven Treffers

How do you go about managing hundreds of Cold War-era historic resources in arguably one of the most significant military facilities in the United States? You start with a highly qualified and talented team, add in extensive background research, and spend a whole lot of time in the desert armed with tablet computers. The result? A historic context statement and survey approach streamlining the identification, recordation, and management of a diverse group of historic resources representing some of our nation's greatest technological innovations.

Located in Southern California's western Mojave Desert, Edwards Air Force Base is a U.S. Air Force installation with a mission of supporting the research, development, testing, and evaluation of aircraft and weapons systems. Its roots date to the late 1920s when the recently established U.S. Army Air Corps (precursor to the U.S. Air Force) began using the area as a bombing and gunnery range.

Development of the facility increased rapidly following the United States' entry into World War II in 1941, and it soon became a major hub for reconnaissance and bomber groups, with nearly 90 percent of all Pacific Coast patrols flying out of the airfield by the following year.

“Earlier studies of Edwards Air Force Base properties did not cover the Cold War period that is so important to Edwards' history.”

THE IDEAL LOCALE FOR AIRCRAFT INNOVATIONS

However, it wasn't until America entered into the Cold War that the facility would move towards its true calling. Recognizing the area's surrounding natural features, officials took the facility in a new direction. Isolated but still within a few hours' drive of Los Angeles and its burgeoning aeronautical industry, the location of what would become Edwards Air Force Base was determined to be ideal for the development of experimental aircraft. Largely influencing this decision was Rogers Dry Lake, a dry lake bed adjacent to the base that has an extremely flat and hard surface, providing one the finest landing fields conceivable.

In the years following World War II, development of Edwards increased dramatically and it became one of the most influential Research, Development, Test and Evaluation facilities in the country. During its nearly 80-year history, Edwards has been

the location of numerous “firsts.” It was here that Chuck Yeager and the Bell X-1 airplane first broke the sound barrier in 1947, the North American X-15 craft first reached the outer thresholds of the Earth's atmosphere in 1962, and the first space shuttle launched into orbit — Columbia — landed following reentry in 1981.



Test stand for Atlas ICBM



Saturn V test firing

MANAGING HISTORIC RESOURCES

In an active military facility where nearly every building has some association with a significant aircraft, technological advancement, or other “first,” it was not easy to develop a historic resources management strategy in accordance with National Historic Preservation Act, Department of Defense, and U.S. Air Force guidelines while meeting ongoing project objectives. The first step was knowing what resources exist, where they are located, and whether or not they are historically significant. Although numerous cultural resources studies of Edwards had been completed dating to the 1990s, many focused only on specific areas of the base or earlier periods of its development, such as the World War II era. As a result, they did not provide a complete picture of the base's resources relating to the Cold War period from which the majority of Edwards' properties date.

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THE BACKGROUND RESEARCH

SWCA was retained by JT3, LLC in 2012 to develop a comprehensive Cold War historic context statement that would guide the identification and evaluation of Cold War-era properties at Edwards. The first step included a significant amount of background and archival research into institutional knowledge, pertinent studies, and historic contexts. SWCA started by identifying the key themes and property types that exist throughout the base. To accomplish this, SWCA reviewed previous studies and evaluations of properties at Edwards, examined the broad property types previously developed for other Air Force installations, and performed an independent survey and evaluation of select properties across the base. From these efforts SWCA identified themes to provide a focused analytical discussion of historical patterns and significant events. At Edwards, themes such as Advanced Propulsion Development and Aircraft Testing and Training provided a framework for understanding why properties are significant and how they are related to one another.

Next SWCA examined the associated property types conveying the significance of the theme. Property types can be defined as buildings, structures, landscapes, sites, districts, and objects associated with one another by common attributes, including style, design, architectural details, or methods of construction. At Edwards, these included everything from airplane hangars and runways to static test stands and observation bunkers. Even properties as ordinary as administration buildings were considered to determine significant themes. SWCA was then able to develop a list of registration requirements for those properties.

WHERE THE RUBBER MEETS THE ROAD

While SWCA completed the Cold War historic context statement in April 2013, it wasn't until the following year that the project team had the opportunity to apply the historic context statement.

Following a second phase of funding, SWCA was retained to conduct a facility-wide historic resources survey of the Air Force Research Laboratory (AFRL), an independent research facility within Edwards focused on propulsion development. Its roots date to the post-World War II expansion of Edwards. It was here that the elements of the Saturn V rocket engine were developed and tested, huge improvements in liquid and solid fuels were made, and a number of other advancements in propulsion systems were completed that remain top-secret to this day.

Faced with the monumental task of identifying, recording, and evaluating more than 230 properties at the AFRL for historical significance, SWCA first had to put together the right team for the job. This multi-faceted group included qualified architectural historians and other cultural resources and GIS specialists. With backgrounds in context-driven evaluations, Department of Defense regulatory framework, and database development, each of these team members brought unique skills to the effort.

GEARING UP FOR FIELD SURVEYS

The next step was meeting with Edwards' cultural resources staff to identify project objectives and develop work plans. These efforts established a clear communication protocol, timetables, and milestones to ensure the project's success. In addition to completing SWCA's own pre-field safety procedures, the team also met with Edwards staff for base-specific safety and security training.

Armed with GIS-enabled tablet computers — and copious amounts of water and sunscreen — the team then set to work documenting, photographing, and recording the properties. The tablets were preloaded with a customized operating system that allowed for the efficient recordation of a wide variety of properties. Using a single device, buildings and structures were photo-



graphed, tagged with GIS locational data, categorized by property type, and noted for individual characteristics from a pre-populated drop-down menu.

Because the AFRL is an active testing facility with ongoing security concerns, team members were accompanied by a dedicated escort throughout their fieldwork. An AFRL veteran of 40-plus years, this escort not only ensured confidential facilities weren't captured in the background of a photo, but also provided the team with valuable insight into the AFRL and its history over lunch in the cafeteria each day.

PUTTING THE PROPERTIES IN CONTEXT

After returning from the field, the information collected with the tablet computers was offloaded into a database that was developed in line with an existing format used by Edwards personnel. It was then that the previously developed historic context statement was truly able to shine. The team quickly determined if a property was associated with significant themes, and if so, if it possessed and retained the characteristics required for National Register of Historic Places eligibility as outlined in the historic context statement. Buildings were grouped into applicable historic districts based on those significant themes.

Subsequent to these efforts, SWCA summarized the results in a report that provided Edwards staff with a concise rundown of the historic properties and districts — and provided measures for their protection — while still allowing the AFRL to continue its mission as an active research and development facility. The final document was eventually submitted to the California Office of Historic Preservation, where it was reviewed and received concurrence from the State Historic Preservation Officer, confirming the success of the project.

The Cold War historic context statement created a useful framework for evaluating a wide variety of sources consistently and efficiently, as demonstrated by SWCA's work at the AFRL. The historic context statement will continue to be applied in future survey efforts at Edwards and provides an effective model and approach that can easily be replicated at other military installations across the country. SWCA is proud to have contributed to the preservation of an important part of our nation's military and technological history. ■

For more information on SWCA's historic preservation work for Edwards Air Force Base, contact **Steven Treffers** at streffers@swca.com.



X-15 aircraft pilots



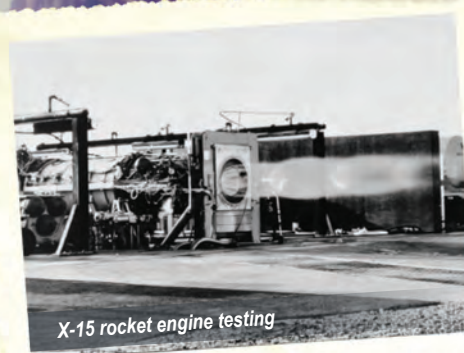
Edwards AFB observation bunker



Tethered Minuteman Missile launch



Test conductors in Edwards control room



X-15 rocket engine testing

DEPOSITS AND WITHDRAWALS: EVALUATING THE IMPACTS OF CURTAILED URANIUM MINING IN NORTHERN ARIZONA

By Charles Coyle

This article is the second of a two-part study of how a surge in uranium prices in the late 2000s led to a huge influx of new mining claims on Bureau of Land Management (BLM) and Forest Service-administered public lands in the vicinity of Grand Canyon National Park. That influx in turn led to concerns about mining harming the Colorado River and threatening air quality, wildlife, Native American and other archaeological resources, and recreational uses of these lands (see part one — “An Altered Landscape” — at bit.ly/SWCAWireUranium).

In 2009 government officials realized that not enough empirical data existed to determine whether perceived threats to the environment as a result of new mining were “real” or merely speculative. On July 20, 2009, then-Secretary of the Interior Ken Salazar ordered a two-year “segregation” (or, as he phrased it at the time, a “time-out”) on new mining activity on more than 1 million acres of public lands in northern Arizona. This two-year pause was intended to give time for five federal agencies — the BLM, Forest Service, National Park Service, Fish and Wildlife Service, and U.S. Geological Survey — to conduct the scientific studies necessary to allow the Secretary to determine whether

a longer halt to new mining in the area was warranted. In accordance with the National Environmental Policy Act (NEPA), the multi-agency effort led by the BLM would include participation by the public, tribes, environmental groups, industry, state and local government, and other stakeholders.

SWCA assisted the BLM in completing the required environmental impact statement (EIS) that would provide the basis for an ultimate decision by the Secretary. We immediately recognized that this project presented unique and potentially daunting challenges. The legal authority under which the Secretary ordered the segregation allowed a maximum of only 24 months to complete the EIS process — far less time than an EIS typically requires. Further, the project area was both massive and complex. The very geological and hydrologic forces that had shaped the Grand Canyon and surrounding landscapes over many millions of years greatly complicated the scientific analysis.

LOCATING THE URANIUM

Perhaps the greatest challenge to the EIS analysis, however, was the fact that no one knew exactly where economically viable uranium deposits existed. While one breccia pipe uranium mine, the “Arizona 1” mine, was already operating in the vicinity of the Grand Canyon, and three others had previously been approved but weren’t being mined, the potential for future uranium mining in the area was not known.

Many thousands of mining claims had been staked throughout the area as uranium prices spiked by late 2007. Based on historical records, less than 1 percent of breccia pipe uranium mining claims typically ever develop into viable mining operations. The question of precisely where within the project area new uranium

deposits might exist — and, therefore, of where environmental impacts could potentially occur — would remain unanswered for the duration of the analysis.

Early in the project, SWCA experts met with managers and resource specialists at the BLM, Forest Service, and other agencies in an effort to develop a management strategy and a scientific rationale for analyzing potential environmental impacts despite the unknowns. What gradually emerged was a carefully researched “Reasonably Foreseeable Development Scenario” that projected how uranium mining in the project area could develop over the next few decades if no withdrawal were imposed. This “RFD Scenario” was based on existing and recently updated U.S. Geological Survey data, on interviews with industry representatives and uranium mining experts in northern Arizona, and on projections of how fluctuating market prices could affect future development in the area. The RFD Scenario formed the basis for all impact analysis contained in the EIS that was to follow.

ADDITIONAL CHALLENGES

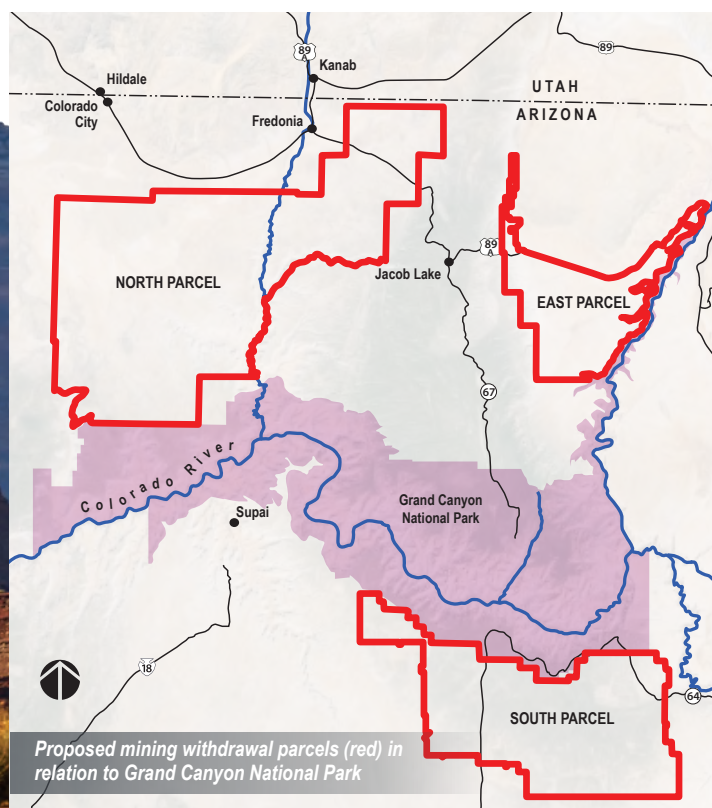
There were two other major challenges to project completion. Due to its proximity to the Grand Canyon, the proposed withdrawal had attracted enormous public and media attention, both within the United States and overseas. The initial scoping process in 2009, which took place prior to the release of the draft EIS, garnered more than 81,000 comment submittals from 92 countries — reflecting the regard many feel for the importance of the Grand Canyon as a heritage resource for the entire world.

More extraordinary still was the response to the release of the public Draft EIS in February 2011. That document generated more than 297,000 comment submittals, each of which had to be carefully reviewed and catalogued for consideration in the Final EIS. Of even greater consequence to project team members was the knowledge that the EIS was almost certain to end up in federal court — either from uranium mining companies who stood to lose potentially billions of dollars in revenue if a full withdrawal occurred, or from Native American tribes and environmental groups if a limited or no withdrawal occurred. Both sides had made their positions known very early in the process.

To meet these various challenges, SWCA quickly mobilized staff from our Phoenix, Tucson, Flagstaff, Las Vegas, and Salt Lake City offices, including highly experienced NEPA experts, geologists, hydrologists, biologists, and many other specialists in their fields. To further bolster the defensibility of our analysis we supplemented our staff with specialists from Errol L. Montgomery and Associates, whose knowledge of the geomorphology and hydrology of the Grand Canyon and surrounding areas is well-known and highly regarded. Air quality analysis was conducted by experts in that field from the Phoenix-based firm of Ninyo & Moore, and assessment of the potential economic and social impacts of any mining withdrawal was conducted by Denver-based BBC Consulting. Public outreach and public involvement efforts were facilitated by Dr. Marty Rozelle.

Exactly one day before the expiration of the 24-month segregation period, SWCA delivered to the BLM the Northern Arizona Proposed Withdrawal Final Environmental Impact Statement.

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A Record of Decision was issued in January 2012 ordering a 20-year withdrawal from all hard-rock mineral exploration and mining within the project area described in the SWCA-authored EIS.

LEGAL CHALLENGES

As expected, a series of lawsuits followed soon after. The plaintiffs in the cases that were filed in the spring and early summer of 2012 in U.S. District Court included the American Exploration & Mining Association, the National Mining Association, the Nuclear Energy Institute, Quaterra Resources Inc., the Arizona-Utah Local Economic Coalition, and one private individual, Gregory Yount, who owned mining claims within the area. These lawsuits were ultimately consolidated into a single case as *Yount v. Salazar* (933 F.Supp.2d 1215 (D. Ariz. 2013)).

The plaintiffs' objections to the withdrawal were based on five principal arguments. In addition to several arguments concerning the constitutionality of the Federal Land Policy and Management Act, the plaintiffs argued:

- The U.S. Geological Survey and BLM had failed to accurately assess the number and scale of mineable ore deposits within the proposed withdrawal area, and thus the analysis in the EIS was based on flawed assumptions.
- The EIS analysis had found no decisive evidence of potential large-scale environmental impacts as a result of breccia pipe uranium mining in the area, but had instead found the impacts were more likely to be negligible or could not be determined.

- By according Native American tribes the right to declare Traditional Cultural Properties, or sacred sites, within the project area, the federal government had unconstitutionally ceded to the tribes religious and property rights above those of all other religions.

Judge David G. Campbell ultimately dismissed each of the plaintiffs' arguments and found in favor of the government in his ruling of Sept. 30, 2014, stating:

“Due to its proximity to the Grand Canyon, the proposed withdrawal attracted enormous public and media attention.”

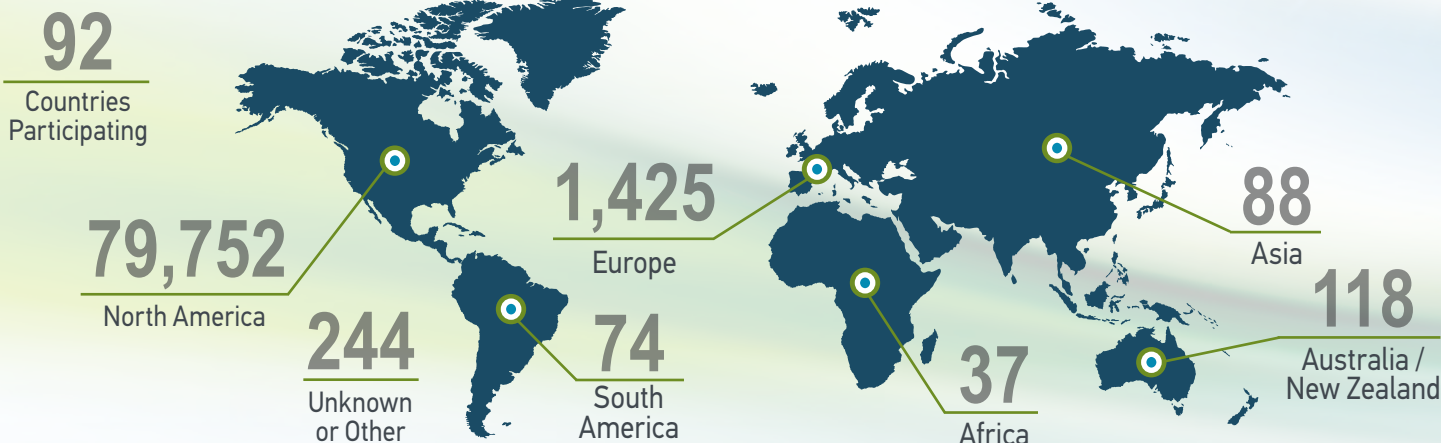
“The Court can find no legal principle that prevents the Department of Interior from acting in the face of uncertainty. Nor can the Court conclude that the Secretary abused his discretion or acted arbitrarily, capriciously, or in violation of law when he chose to err on the side of caution in protecting a national treasure — Grand Canyon National Park.”

While Mr. Yount subsequently withdrew from the case, the remaining plaintiffs have appealed the District Court of Arizona decision. The case of the adequacy of the EIS and the Secretary's decision is now pending before the Ninth Circuit Court of Appeals in San Francisco.

Regardless of the final outcome, SWCA has received high marks from the BLM and Forest Service for mobilizing the experts necessary to deliver an EIS of this complexity within the time frame allowed. ■

For more information on the Northern Arizona Proposed Withdrawal Project, contact **Charles Coyle** at ccoyle@swca.com.

81,720 | Comments from Initial Public Outreach Phase (Worldwide)



AN OUNCE OF PREVENTION: SWPPPS AND SPCC PLANS

Stormwater Pollution Prevention Plans (SWPPPs) and Spill Prevention Control and Countermeasure (SPCC) plans are both authorized under the Clean Water Act to prevent water quality impacts. Wire editor Christiana Ferris sat down with Jim Dawson, a senior environmental specialist and project manager based in SWCA's Bismarck office who creates both types of plans for clients.

Wire: When are SWPPPs required?

Dawson: SWPPPs are meant to prevent the contamination of surface waters as a result of stormwater runoff from construction or industrial sites that may contain polluting materials. Under the Energy Policy Act of 2005, oil, gas, and transmission facilities are exempt from SWPPP requirements in the case of “clean” stormwater runoff. However, even if oil or gas facility owner/operators choose the exemption, they must show how they will protect wetlands using best management practices. And regardless of facility type, a discharge of pollutants of a recordable quantity — such as sediment — or a discharge that contravenes a water quality standard does require an owner/operator to obtain a stormwater permit and prepare a SWPPP.

In fact, we recommend that clients obtain a stormwater permit and develop a SWPPP even if it is not strictly required under the regulations because when there is a discharge, regulators look more favorably upon an owner/operator with a SWPPP than one without a plan.

Wire: What are some of the other stormwater requirements?

Dawson: Stormwater permitting is done at the state level, and therefore requirements vary from state to state. For example, North Dakota requires a SWPPP and stormwater permit application to be filed seven days before construction starts. In contrast, Kansas requires a permit application (also called a Notice of Intent) to be filed 60 days before construction starts, and a Professional Engineer, Professional Geologist, or Certified Professional in Erosion and Sediment Control must review and stamp the plan. In certain situations, such as when a project would require design and construction of a stormwater retention basin, the design would require a Professional Engineer's stamp. Waste disposal facilities and saltwater disposal wells also require an industrial permit and SWPPP.

Wire: What about SPCC plans?

Dawson: SPCC plans are meant to prevent oil from leaving a site and traveling to surface waters of the United States or adjoining shorelines. SPCC plans help a client answer these questions:

1. What equipment, situation, etc., do I have?
2. What is my most likely spill situation?
3. What action steps will I need to put in place to contain a spill?

If a problem arises at a facility, the SPCC plan serves as a guide for first responders to know what to do, where, and when. For example, a responder should be able to tell from the plan that product flows from point A to point B, with a valve at a certain location in between that can be closed to stop the flow of the product. Wherever a spill occurs, the responder will know where inside or outside the facility to begin containment efforts.

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Wire: What are the components of an SPCC plan?

Dawson: SPCC plans have three major components:

1. *Prevention* involves engineering design, corrosion protection, employee training, operational procedures, inspection programs, and monitoring and documentation of the status of on-site equipment so that no releases occur in the first place.
2. In the event of a release, the plan sets forth *controls* to implement, such as a containment berm around a tank, automatic shutdown equipment, or other mechanisms to contain or absorb drainage from the facility.
3. The *countermeasure* component specifies response procedures when a spill is not contained: actions to be taken; who must take those actions; and when, where, and how to implement those actions.

Wire: What are some of the intricacies of SPCC planning?

Dawson: SPCC plans are a federal requirement administered by the EPA; they cannot be delegated to the states. Except for a few exemptions, the SPCC rule applies to any facility with an aggregate total of 1,320 gallons or more of oil in containers of 55 gallons or greater. So whether a facility has one tank with a 1,500-gallon capacity or 24 separate 55-gallon drums, the rule would apply. Even though this is a federal requirement, an SPCC plan must be reviewed, certified, and stamped by a Professional Engineer licensed in the state in which the facility exists.

Part of the SPCC rule is a substantial harm determination, which is tied to the total volume of oil stored on-site and its location relative to sensitive environmental areas or public water supplies. Sites within a certain distance of sensitive resources require a Facility Response Plan, which details how to respond in a worst-case spill situation (see the EPA's web page bit.ly/EPA-FRP for more details).

Wire: What kind of SPCC project experience does SWCA have?


Dawson: We have prepared SPCC plans for several Abraxas Petroleum facilities in Montana, North Dakota, and Wyoming, as well as an SPCC plan and Facility Response Plan for Plains Terminals of North Dakota's terminal facility at Johnsons Corner. We also have prepared SPCC plans for natural gas compressor stations and gas fractionation plants in North Dakota and Texas for ONEOK. And we have conducted SPCC inspections and updated SPCC plans for oil and gas production facilities in New Mexico for Encana Oil & Gas, among others.

Wire: How long does it take to write an SPCC plan?

Dawson: A typical SPCC plan may take a week or two to complete, depending on the complexity of the facility and what fits within the SPCC rule and what doesn't. For simpler facilities with good site drawings and engineering plans, we have produced plans more quickly. One time we got a call at 6 p.m. on a Wednesday with a request to complete an SPCC plan for a railway facility in North Dakota by the following Monday when operations were due to start. We did the site inspection on Thursday, wrote the plan on Friday, sent it to a staff geologist and a staff engineer for review over the weekend, and were able to get it to the client by Sunday night. That was an unbelievably fast turn, but the nature of that facility's design and the solid information available made our job much easier than normal.

Wire: Once an SPCC plan is done, is that the end of it?

Dawson: SPCC plans must be reviewed and recertified every five years and/or within six months of substantial technical changes to a facility that would impact its oil spill potential. Such changes include the manufacture of new products; revised processes at the site; or the addition of tanks, containers, or equipment that would have a material effect.



“Regulators look more favorably upon owner/operators with a SWPPP than those without a plan.”

Wire: What is your philosophical approach to SWPPPs and SPCC plans?

Dawson: Essentially what we do is cost avoidance. The fine can be \$10,000 per day for stormwater infractions, and the penalty can be much higher in the case of SPCC rule infractions if a client undergoes an EPA audit or inspection and is found to be out of compliance. We write our SPCC plans to pass EPA audits by addressing both the letter and the intent of the regulations. We look at a client's circumstances, location, and other factors to determine what measures are required. We also understand the intricacies of the SPCC rule and the complexities of different facilities to create solid plans that will pass EPA muster.

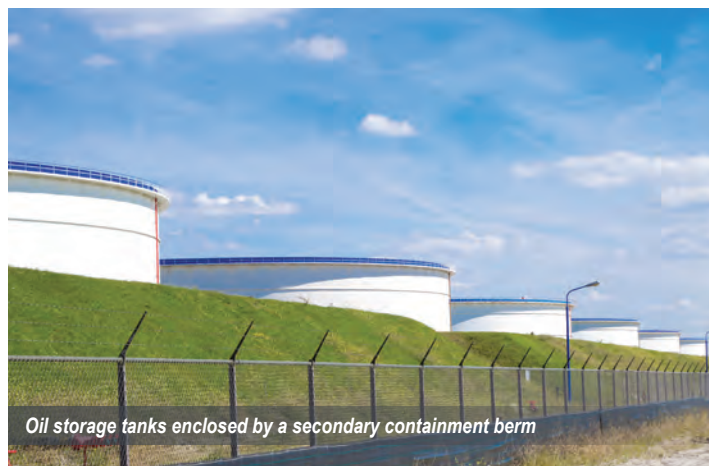
Wire: What advice can you offer to clients?

Dawson: Before having an SPCC plan prepared, provide as much information as possible about your facility. A good description of how the facility functions is important to understand the full processes at work and write an adequate plan. A detailed site layout, thorough process descriptions, and a listing of all the byproducts that may meet the definition of oil (which is a very broad definition, by the way) help with the development of a comprehensive plan that will cover all the bases.

It's equally important at the end of the planning process not to simply put these plans on a shelf and forget about what is in them. Follow through on recommended procedures in the plan, such as conducting regular inspections and keeping adequate records.

In terms of stormwater planning and permits, I advise clients to take their responsibilities under the permit seriously, for example, in regards to inspections, corrective actions, and revegetation efforts. The old adage is true. An ounce of prevention and having a good plan in place can make a big difference in saving costs and regulatory headaches down the road. ■

For more information on SWPPPs and SPCC plans, contact **Jim Dawson** at jdawson@swca.com.



Oil storage tanks enclosed by a secondary containment berm



Gabions (rock-filled wire mesh baskets) used to control riverbank erosion



Wire-reinforced silt fence for erosion control on a construction site



Silt fence used to capture sediment in runoff during pipeline expansion in Nevada

KEEPING CURRENT: MAPPING AN EVER- CHANGING ENVIRONMENT

By Chris Moller and Christiana Ferris

Wetlands: beloved by people who value the natural environment — either for wetlands' own sake or for the ecological benefits they provide — and sometimes the bane of developers and land managers who must work around or protect them. Regardless of the ideas conjured up by the word, wetlands are a major concern for anyone who develops or manages land, and wetlands are critical for the plants, animals, and natural processes that occur there — flood control, water and waste filtration, contributions to the food chain, and recreational opportunities.

About half of all the original wetlands in the United States have been lost since European settlement. Because 40 to 60 percent of all endangered species have some part of their life cycle connected to a wetland, that loss puts species under additional strain. The existing conditions of a wetland, its habitat values, and species of concern are essential components for understanding how land development, restoration, and mitigation activities might impact those species.

THE NATIONAL WETLANDS INVENTORY

To understand how development will impact wetlands — and vice-versa — first you need to know where they are. Wetlands in the United States have been surveyed and inventoried off and on for more than a century. In 1986 Congress tasked the U.S. Fish and Wildlife Service (the Service) with mapping the extent and types of all U.S. wetlands. The National Wetlands Inventory (NWI) mapping of the continental United States and Hawaii was accomplished in 2014 (Alaska is 35% complete) and now serves as one of the largest polygonal GIS datasets in the country. This important national planning dataset must be consulted for siting and approval of numerous federal, state, county, and local agency endeavors, and it serves as a data input for predictive models (sea-level rise, habitat, etc.).

THE IMPORTANCE OF ACCURATE WETLAND DATA

Resource managers need up-to-date information to make adequate decisions about planning priorities. The NWI has mapped most wetlands in the United States, but not all mapping is current or created with updated mapping standards. Some wetlands in the dataset were last inventoried in the 1970s. While protected areas may still be accurately represented by these data, wetlands in non-protected areas — including those in more desirable development locations — may have changed dramatically in size, location, or other characteristics since they were previously documented.

Current wetland maps can help a developer or land manager avoid surprises and save on the cost of unexpected additional field surveys and rerouted engineering work. It is more efficient to make management and planning decisions from a database than it is out in the field, after substantial investments in a project have been made.

WHO USES THE NWI?

Anyone who works on land development projects — from foresters, wildlife refuge managers, and other federal land managers to non-governmental organizations, private developers, and landowners — can benefit from up-to-date GIS data for their planning purposes. Because the NWI is in the public domain, everyone has access to and can use the data. Current information can make an enormous

difference in the planning methodologies of resource managers, energy companies, departments of transportation, and a host of other public and private interests.

A WORK IN PROGRESS

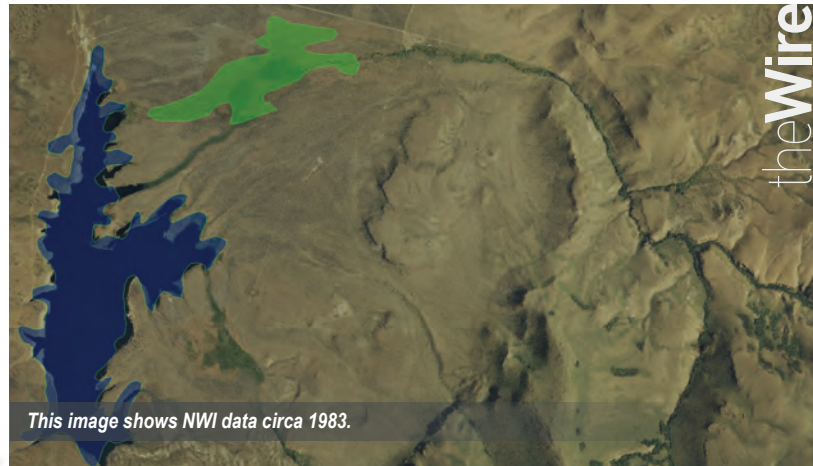
Mapping wetlands for the entire continental United States took 35 years. Although this was a major accomplishment, the need for wetland mapping has not ended. The average year represented in the NWI is 1988 for inland wetlands and 1996 for coastal watersheds. Wetlands are dynamic environments that are altered by many factors. Changes in climate, land development, major storm events, and other hydrologic alterations can create, destroy, modify, and relocate wetlands. These changes to wetlands in turn change the obligations placed on landowners, developers, and managers.

The lack of current wetland data that accurately reflect ground conditions is most obvious in the western United States. Ironically, these western states also hold some of the greatest potential for development and conservation. Development decisions must be made based on current conditions on-site, while regulations are often based on conditions that no longer exist but are represented by outdated data. SWCA's innovative efforts are helping to maintain this work in progress with current, accurate, and timely data at a reasonable cost, thereby reducing the potential conflicts between land managers and regulations.

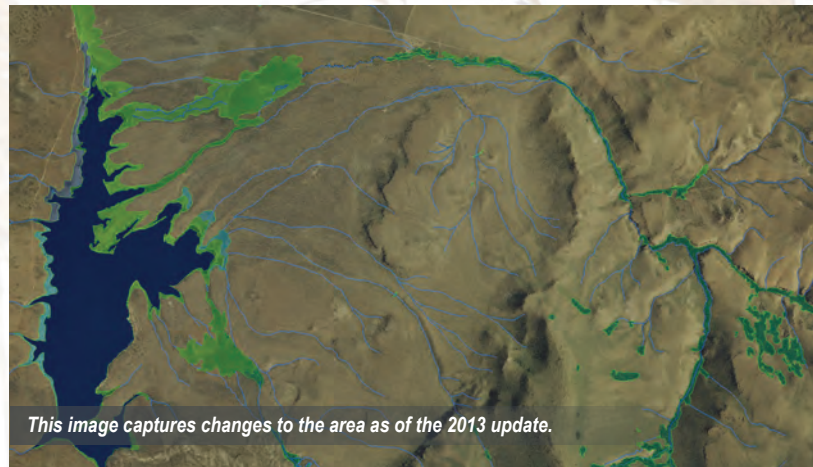
SWCA'S INVOLVEMENT IN THE INVENTORY

In 2003, several SWCA employees began assisting the Service's Pacific and Pacific Southwest regions as hosted workers to update the NWI for those areas. Since then the team has mapped wetlands in California, Oregon, Washington, Idaho, Hawaii, Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico, Oklahoma, Texas, and Arkansas. Additionally, the on-site team has been providing GIS and cartography services to the Service's Refuge Information Branch to assist them in their conservation planning efforts and track refuge-related data. SWCA's experience has led to additional quality assurance and quality control work for the Service in Alaska, Maryland, Minnesota, and Montana, and we have worked for the National Standards and Support Team, which develops and applies digital data functions relating to the agency's wetland maps and habitat data holdings.

Together with the Service, we try to prioritize areas that exhibit a lot of change, such as coastal wetlands; areas around urban zones; and locations identified for transmission corridors, renewable energy generation, or oil and gas exploration. In addition, in the last decade we have begun including buffered perennial and ephemeral streams in the NWI. These data were not previously available in the NWI, but they provide additional insights into jurisdictional stream crossings that field crews and planners must consider for respective state and federal due diligence.



This image shows NWI data circa 1983.



This image captures changes to the area as of the 2013 update.

CREATIVE APPROACHES TO INTEGRATING NEW DATA

Our task is to map incredibly large areas and accurately depict what current wetland conditions are. Updated rivers, streams, and open water bodies — mapped with modern, high-resolution imagery — reveal many wetlands that were incompletely or inconsistently mapped in older NWI data. In some cases we can identify wetlands based on a signature of hydrology, vegetation, and soils. However, a dry season or drought conditions may make it impossible to gauge what normal water conditions are. On the flip side, spotting wetlands beneath a forest canopy is more difficult than identifying a bright, vibrant spring on an otherwise dry desert floor. Aerial imagery may help, but such images are usually captured for purposes other than identifying or delineating wetlands.

Therefore, we often combine older NWI data with information from other datasets and sources, such as the National Hydrography Dataset, U.S. Geological Survey stream gauge stations, soil and precipitation data, multi-date web-based imagery, user-contributed geo-located photos, LiDAR, remote sensing products, and other ancillary data. We also supplement our desktop efforts with field work, visiting areas where it may be problematic to understand the water, vegetation, and/or soil dynamics.

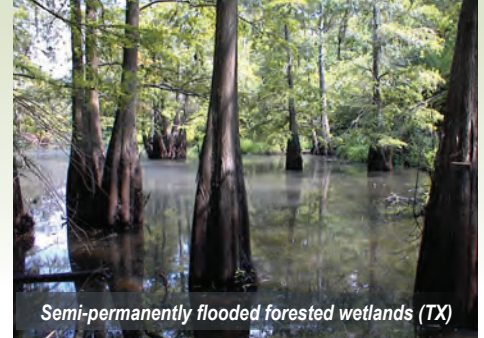
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Tidally influenced estuarine mudflat and adjacent emergent wetlands (CA)



River with adjacent emergent wetlands (CA)



Semi-permanently flooded forested wetlands (TX)

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SWCA has developed innovative and cost-saving approaches to solve GIS challenges. We use partially automated techniques to inform our decision-making and employ tools relevant to the areas in which we work so that we can portray the wetlands accurately and as they exist on the ground. Even with new technologies at our disposal, however, there is no substitute for staff experience to put all the pieces together. Because wetlands are different from place to place, no computer program or automated process can create polygons as accurately as a human. Precise wetland mapping requires a combination of GIS and technological savvy, scientific knowledge of wetlands, occasional sleuthing skills, and knowing when to consult colleagues from the Service or SWCA with wetlands expertise in different geographies.

“Wetlands morph and shift over time, but one thing remains the same: the business need for accurate data about the landscape.”

RECENT APPLICATIONS FOR NWI DATA

Most recently, SWCA's NWI work contributed to several projects spearheaded by the Service and the Bureau of Land Management for which the agencies identified a lack of up-to-date wetland data. SWCA was tapped to make the dataset current for these larger planning efforts:

1.Desert Renewable Energy Conservation Plan

(<http://www.drecp.org/>), an initiative to protect and conserve desert ecosystems while allowing renewable energy development in seven California counties — SWCA mapping helped identify important desert playas, springs, and washes within the Sonoran and Mojave deserts. The updated information contributes to conservation and impact avoidance throughout the area. The wetlands data are available through the DRECP gateway and NWI download page.

2.Great Basin Landscape Conservation Cooperative

(<http://www.greatbasinlcc.org/>), a coalition of stakeholders collaborating on science-based actions that enable regional climate change adaptation — SWCA mapping is helping the Cooperative's mapping, modeling, and endangered species recovery efforts. Because sage-grouse, as well as threatened and endangered species, need wet meadows and access to water throughout their lives, avoiding or mitigating species impacts requires an accurate picture of where wetlands exist in order to meet conservation goals.

3.National Wildlife Refuge System

SWCA has mapped wetlands in Hawaii, Idaho, Oregon, Washington, Texas, Arizona, California, Nevada, Oklahoma, Florida, Nebraska, and New Mexico (see sidebar at right for additional examples of data and mapping support for the refuges).

Currently, our team has Service and partner funding to continue updating wetlands throughout Nevada and portions of California. The team hopes to help the Service with their status and trends mapping and congressional reporting efforts throughout the western United States in the coming years.

Wetlands morph and shift over time, but one thing remains the same: the business need for accurate data about the landscape so that developers and land managers can accommodate the needs of people and nature. Knowing how and where wetlands fit into the landscape makes adequate decision-making and planning possible. ■

For more information on SWCA's National Wetlands Inventory work for the Service, contact **Chris Moller** at cmoller@swca.com.



Seasonal wetlands in drought conditions (CA)



Permanently flooded freshwater pond (NV)



Tidally influenced river and adjacent woody wetlands (MA)

OTHER DATA AND MAPPING SUPPORT FOR THE U.S. FISH AND WILDLIFE SERVICE

In addition to updating the National Wetlands Inventory for the Service's Pacific and Pacific Southwest regions, SWCA GIS experts have been lending their data and mapping talents to the Service in support of the National Wildlife Refuge System since 2006 as on-site contractors. Below is a sampling of the offices and divisions we have assisted:

Lands Division Realty Branch

- inventorying and cataloging land acquisition files
- Land Records System and Land Status Mapper data audits
- working with the National Archives Records Administration and Federal Record Center to help implement the Service's disposition schedule

Fire Management Division

- mapping assistance for fire management staff in Oregon, Washington, Idaho, and Hawaii
- GIS assistance for the Northwest Interagency Coordination Center's logistical and data support for agencies that deal with wildland fire suppression
- database management and analysis for fire monitoring and management systems
- contributing to Burned Area Emergency Response plans on refuges

Refuge Information Branch

- geospatial analysis for conservation planning
- modeling species habitat suitability to identify key breeding areas for monarch butterflies
- climate change vulnerability assessments for fish hatcheries and priority areas in the Columbia Plateau

Engineering Division/Water Resources Branch

- hydrology and GIS services
- water resource inventories and threat assessments for refuges and fish hatcheries
- hydraulic modeling to aid habitat management planning

National Wildlife Refuge System

- GIS support for prioritizing riverine habitat for the Arid Lands Initiative
- website curation using the Data Basin mapping platform
- updating Pacific Region land status maps

Columbia River Fisheries Program Office

- GIS services and database development
- evaluating connectivity, habitat, and passage conditions for Pacific lamprey and bull trout to help the Service prioritize species recovery planning

Inventory and Monitoring Division

- endangered species database services
- Annual Narrative Report and invasive species report data entry

NEWS BRIEFS

Recent Promotions



Scott Phillips was appointed Cultural Resources Program Director in Denver. He joined SWCA in 2001, and prior to his promotion he served as a senior principal investigator in the Denver office. With nearly 25 years of professional experience in cultural resources management, he helped build the cultural resources program in Denver and increase SWCA's

applications in this field. His deep knowledge and keen insight into the regulatory process have brought value to projects and pursuits throughout the company.



Cara Corsetti was promoted to Senior Principal for SWCA's California-Pacific Islands operations. She will oversee SWCA's offices throughout California and Hawaii, as well as support continued growth throughout the region. She has been with SWCA since 2001 in a variety of technical and management roles, most recently serving as California Principal.

She also serves on SWCA's board of directors. With a proven track record managing one of the company's fastest-growing regions, she has more than 20 years of experience in the direction and management of multi-disciplinary technical studies and environmental assessments.



Kenny Carothers was named Southern California Principal to oversee operations and business development for the company's offices in Pasadena and Redlands. Having previously worked for SWCA between 1988 and 2001 in various roles throughout the Southwest and western United States, he returned to SWCA in 2013 as a strategic growth director.

Since rejoining SWCA, he has supported the company's growth through high-level client management, business development, and staff mentoring based in the company's Austin office. He has more than 26 years of experience in environmental consulting, including biological research, mitigation planning/banking, permitting, and regulatory compliance.

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The Wire is published by SWCA, Incorporated. POSTMASTER:
Send address changes to SWCA Environmental Consultants,
3033 North Central Ave., Suite 145, Phoenix, AZ 85012.

To be added to our mailing list, or for editorial comments
or questions, call 1-800-828-8517; email us at thewire@swca.com;
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NEWS BRIEFS

Recent Promotions (continued)



Mike Cannon was promoted to Pacific Northwest Office Director to manage staff, support client needs, and expand business opportunities in the Seattle and Portland offices. He has been with SWCA since 2007, most recently as Salt Lake City Cultural Resources Program Director. He has broad cultural resource management and compliance experience as well as archaeological field and laboratory expertise. Prior to joining SWCA, Dr. Cannon was an assistant professor and principal investigator at California State University, Long Beach, and he has held numerous university teaching posts during his 20-year career.



Norma Crumbley was promoted to Denver Principal, a post that includes business development and operational oversight for SWCA's Denver, Bismarck, and Fort Collins operations. She joined SWCA in 2005 as an archaeological field technician and later became Denver Cultural Resources Program Director, where she led and mentored technical staff and

managed GIS, editing, and administrative functions for the office's cultural resources program. With an in-depth knowledge of the Colorado and North Dakota markets and expertise developing and leading teams, her appointment strengthens SWCA's presence and growth prospects in the Rocky Mountain Plains region.



Judy Cooper is now Principal of SWCA's Midwest operations, which includes offices in Chicago and Pittsburgh. Prior to her promotion, she served as Cultural Resources Program Director in Austin and, before that, Office Director in Bismarck. She has more than 14 years of experience in cultural resources management and archaeology and is an expert in laws and regulations governing cultural resources. Having worked in the Great Plains, Rocky Mountain, and Mid-Atlantic regions, she specializes in energy projects and has worked with multi-disciplinary teams to ensure compliance with the Clean Water Act, Clean Air Act, National Environmental Policy Act, and other regulations. She joined SWCA in 2008.