the Wire

SWCA

News from SWCA Environmental Consultants

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Cover story:

WORLD-CLASS WIND, WORLD-CLASS SCIENCE

FOCUS

By John Thomas, CEO

With this edition of *The Wire* we're pleased to present a collection of articles that showcase SWCA's contributions to protecting the earth's environmental resources while also helping our clients meet the needs for energy and water development.

Our cover story, "**World-class Wind, World-class Science,**" shows how sound science is enabling environmentally responsible energy production in south-central Wyoming, one of the country's windiest locales. Thanks to smart siting and small turbine footprint, Power Company of Wyoming's Chokecherry and Sierra Madre Wind Energy Project will have minimal long-term surface disturbance. When built, the project will reduce CO_2 emissions and generate electricity for markets in several states. I'm particularly proud of the innovative electronic data collection and reporting system our project team has used. The system allows the client, regulatory personnel, and SWCA project staff to remotely view survey information, photos, and maps online, which has greatly reduced regulatory review time. This technique also allows the client to make adjustments to project design to reduce impacts upfront.

The article "**There's No Grousin' 'bout Wind**" takes a more in-depth look at another innovative aspect of SWCA's work on the Chokecherry and Sierra Madre Wind Energy Project — the greater sage-grouse surveys we've been leading for more than five years. PCW has funded a long-term study of sage-grouse behavior and ecology to help site the project in a way that mitigates impacts on the species, to evaluate how sage-grouse behavior and populations respond to the wind project, and to quantify the benefits of conservation measures the company is undertaking. A byproduct of this unprecedented research is a better understanding by scientists, regulatory agencies, and other project developers of how the sage-grouse — a major species of concern in sagebrush country — responds to land and energy development activities.

We have yet another story from sagebrush country — "**Capturing Carbon in Big Sky Country**." Denbury Resources is moving CO_2 from Wyoming via the Greencore Pipeline for enhanced oil recovery in Montana's Bell Creek Field. The project is expected to sequester one million metric tons of CO_2 and recover 40 to 50 million barrels of oil over the next 20+ years. SWCA's tribal engagement, environmental inspection, and probability modeling expertise helped make the Greencore project an example of how to get a pipeline built on schedule.

"**Riders on the Storm**" relates another contribution our scientists are making in efforts to balance human and wildlife needs, this time in the Edwards Aquifer region of drought-stricken Central Texas. This article is the first in a two-part series on our water resources work in the region. SWCA teams are conducting stormwater sampling as part of the Edwards Aquifer Habitat Conservation Plan, a comprehensive strategy to ensure compliance with the Endangered Species Act. The data we are collecting now will help provide an overall picture of how the aquifer systems function. Our work with water policy leaders and planners is helping protect the local water supply and the threatened and endangered species that depend upon the aquifer.

Finally, I'm excited to let you know that our expertise extends south of the border. In "**Mexico's New Energy Landscape**," we discuss how energy reform enacted in 2014 is opening the door for foreign and domestic oil, natural gas, and power generation companies to participate in Mexico's energy market. The reform brings an increased need for environmental compliance during project planning and siting through Mexican regulatory agencies. To help our clients explore energy project possibilities in Mexico, SWCA has a team of planning and permitting experts, natural and cultural resource professionals, and on-the-ground Mexican partners with experience in local environmental policy.

As always, we welcome your feedback. Drop us a line at thewire@swca.com if you'd like to see us cover a particular topic in a future edition of *The Wire*. ■

Front cover sage-grouse image © Pacific Southwest Region U.S. Fish and Wildlife Service. All other images © SWCA unless otherwise noted.

WORLD-CLASS WIND,
WORLD-CLASS SCIENCE

By Jon Kehmeier and Christiana Ferris

The wind blows hard in southern Wyoming's Carbon County. In fact, the high-speed winds here make this one of the best places in the country for developing wind power, and therefore a fitting location for the largest wind project in the country — Power Company of Wyoming LLC's (PCW) proposed Chokecherry and Sierra Madre (CCSM) Wind Energy Project. On the 320,000-acre Overland Trail Ranch where the project will be located, January wind speeds often average 40 to 50 miles per hour, ready for spinning wind turbines to generate carbon-free electricity.

The proposed project will include 1,000 turbines with 3,000 megawatts of capacity. Because of smart siting work and each turbine's small footprint, the project's long-term surface disturbance will be on less than 2,000 acres of the ranch, leaving the remainder of the land available for continued ranching, farming, and wildlife conservation. The ranch consists of private land interspersed with public land in a checkerboard pattern that dates back to the days of the first transcontinental railroad.

Because the project involves public lands, numerous federal, state, and county regulations and permitting processes must be completed.

THE PROJECT'S POSITIVE EFFECTS

The CCSM Project is anticipated to reduce carbon dioxide emissions by 7 to 11 million tons per year and will annually generate roughly 10.5 to 12 million megawatt-hours of clean, renewable electricity. From an economic standpoint, the project will provide thousands of jobs during its construction period and 114 long-term operations and maintenance jobs, a significant number in a sparsely populated state like Wyoming. The project is also estimated to generate about $800 million in state and local property taxes, sales/use taxes, and wind electricity generation taxes over its construction period and first 20 years of operation.

The clean electricity generated in Wyoming will power nearly a million homes in the desert Southwest — Arizona, Nevada, and Southern California are the primary market because of those states' renewable energy standards and the energy demands of their larger populations. Studies by the National Renewable Energy Laboratory and others show that using wind power from Wyoming can be a very cost-effective option due to the unique strength and quality of Wyoming's wind.

continued on next page

> *An innovative electronic data collection and reporting system was critical for SWCA to successfully survey 30,000 acres in five months.*

continued from page 3

PCW anticipates routing the power to one or more of the major transmission lines planned from Wyoming, such as Energy Gateway West, Energy Gateway South, and the TransWest Express Transmission Project, which is being developed by PCW affiliate TransWest Express LLC. All three of those projects are planned to intersect the northern edge of the CCSM Project site.

THE PROJECT'S PROACTIVE APPROACH

In addition to favorable wind conditions for renewable energy, the ranch includes some areas with sagebrush habitat suitable for greater sage-grouse and other wildlife species. PCW hired SWCA in 2009 to gain an understanding of the potential impacts of the wind project on sage-grouse and other wildlife species, and to help determine how best to avoid and minimize potential impacts. Since then, SWCA has been completing extensive monitoring and survey efforts to help PCW identify patterns of wildlife use to inform infrastructure siting decisions and better understand how project development might impact project-area resources. As part of our support efforts for PCW, SWCA is leading the greater sage-grouse monitoring effort for the project and over the past five years has collected one of the largest single datasets ever compiled for the species (see "There's No Grousin' 'bout Wind" on page 6). As a result of these efforts and PCW's science-based siting and permitting approach, much of the highest quality habitat, including Wyoming's sage-grouse core area, will not be impacted by the project.

PROJECT PLANNING AND PERMITTING

Permitting for the project has taken a comprehensive look at potential impacts to resources in addition to the substantial benefits that would be realized when the project is constructed. In August 2012, after four years of National Environmental Policy Act (NEPA) analysis, then-Secretary of the Interior Ken Salazar signed a Record of Decision confirming the suitability of the CCSM Project area for wind energy development. The Record of Decision required that additional NEPA analyses be completed to further evaluate and approve site-specific plans of development.

PCW is constructing the CCSM Project in two phases. Phase I includes 500 turbines in areas with the highest winds as well as a rail distribution facility, aggregate quarry, and an internal haul road. Phase II will include the additional 500 turbines. To minimize long-distance truck traffic for the transport of blades, hubs, nacelles, towers, and other turbine components, PCW will transport the majority of the necessary equipment on existing rail lines. Tying into the existing Union Pacific Railroad main line, PCW's new rail facility will allow materials to be loaded onto trucks for shorter transport to construction sites using the internal haul road to keep traffic off of local roadways. Aggregate from an on-site quarry will be used as a base for surfacing internal roads.

The Bureau of Land Management (BLM) is analyzing the site-specific impacts and benefits for Phase I wind development in two separate Environmental Assessments. The BLM issued a Decision Record and Finding of No Significant Impact for the first Environmental Assessment — which covered the rail facility, haul road, and quarry — in December 2014. At press time the BLM is finalizing the second Environmental Assessment — for Phase I wind turbines — with a decision expected later in 2015.

To complete the Plan of Development for the first 500 turbines and provide data for the BLM's NEPA analyses, site-specific biological, wetland, cultural resource, and paleontological data were required. Using an innovative electronic data collection and reporting system, SWCA completed 30,000 acres of surveys in a five-month period. In addition to the staffing resources at our disposal, our ability to quickly mobilize people on the ground, our resource expertise, and our use of technology greatly increased the efficiency of the survey work necessary for project permitting.

Surveys on this scale required multi-faceted teams led out of SWCA's Denver office with support from the Sheridan, Flagstaff, Salt Lake City, Tucson, Phoenix, Las Vegas, Austin, and Houston offices. With a team of more than 40 resource specialists on the ground, the electronic data collection and reporting system was critical for the success of this survey effort. The system enabled rapid communication of survey area changes, near real-time review of survey data, and immediate communication of any resource concerns to PCW's permitting and project design team. When SWCA field staff identified resource concerns, PCW was able to evaluate the potential for design changes to avoid or minimize impacts and communicate those design changes back to SWCA so that the changes could be surveyed while crews were still in the area.

Following quality assurance reviews, final data were made available on a secure, online Arc-GIS server for use by the BLM, PCW, and SWCA. Team members could log on and remotely view survey information, review photos and GIS files generated by the survey team, and see in real-time where impacts might occur. This online process greatly reduced the review time needed by BLM staff and increased the efficiency of PCW's design changes. In the past, with paper forms and the lag time in data entry, it could take weeks or even months for project managers, the client, and agency personnel to understand what issues might need to be addressed.

This informed siting and survey process facilitated communication between all parties in the project. By identifying resource concerns in the field and developing immediate solutions, our use of technology substantially reduced survey efforts and associated costs.

ADDITIONAL PERMITTING

In addition to the BLM's NEPA processes, several other permitting efforts have been completed or are under way. In August 2014, the Wyoming Industrial Siting Council unanimously approved the state permit to authorize the construction of the CCSM Project. SWCA assisted PCW in preparing substantial portions of the permit application and provided expert witness services for the public hearing. During the hearing, all of the municipalities and counties that were parties spoke in favor of PCW's application. In their approval of the permit, the Council stated that this was the most impressive presentation and application they had ever received.

The final major permit PCW is seeking is a programmatic eagle take permit under the Bald and Golden Eagle Protection Act. The U.S. Fish and Wildlife Service is analyzing PCW's permit application in an Environmental Impact Statement before issuing the take permit, which will specify the number of eagles that may be taken and what the impacts to the local eagle population will be. SWCA has worked with PCW for the past five years to collect necessary baseline information and complete the Eagle Conservation Plan and the Bird and Bat Conservation Strategy being used by the Service to analyze potential impacts. The pre-construction avian surveys completed for the project are some of the most robust and rigorous efforts ever applied to a wind energy project.

In addition to using science to guide permitting and project design processes, a collaborative approach and transparency have been hallmarks of the CCSM Project. With such a broad array of stakeholders, collaboration has been fundamental to the project's permitting success.

The CCSM Project has been lauded as an example of how to develop a project in a manner that is compatible with all the resources on the land. PCW's investments in environmental research and conservation have shaped the design of the project, and the company's collaborative approach with regulatory agencies, non-governmental organizations, adjacent landowners, species experts, and a multi-agency academic team of researchers has minimized the project's impacts. The project's reliance on sound science will enable the production of clean, renewable energy while also conserving and enhancing environmental resources in south-central Wyoming. ■

For more details on the CCSM Project, contact **Jon Kehmeier** at **jkehmeier@swca.com**.

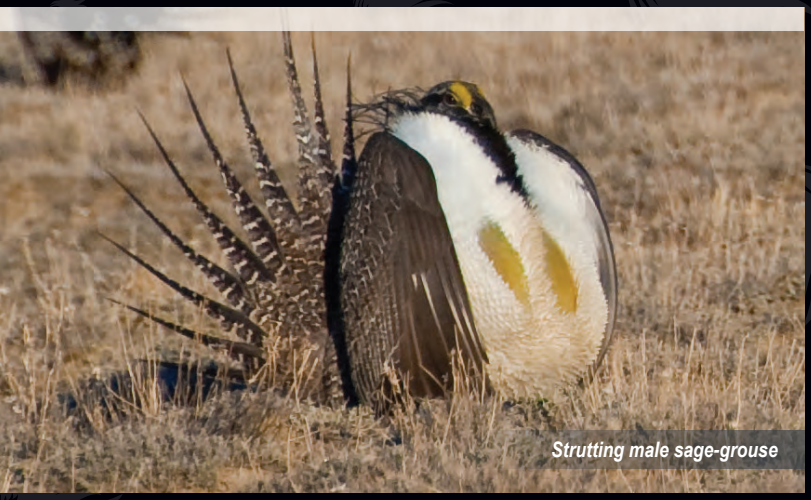
BONUS MATERIALS

To see more images from the Chokecherry project, visit http://youtu.be/jfB2w4ZEv7g or scan the QR code to the left. (Note: You will need a QR code reader application on your smartphone.)

THERE'S NO GROUSIN' 'BOUT WIND

By Jon Kehmeier, Nate Wojcik, and Christiana Ferris

A large, chicken-like bird with spiked-up tail feathers struts about in a dusty patch of sagebrush, inflating two balloon-like air sacs that resemble twin egg yolks on his white, fluffy chest. Zipping and gurgling sounds accompany his bouncing display as he turns and faces his rival males. This bizarre dance is part of the mating ritual designed to perpetuate his species.



Strutting male sage-grouse

This showy ground-dweller is the greater sage-grouse (*Centrocercus urophasianus*), inhabitant of sagebrush country throughout the western United States and two provinces in Canada. According to the U.S. Fish and Wildlife Service, Wyoming is home to 37 percent of all sage-grouse found in the United States. Habitat fragmentation, land development, energy infrastructure, invasive plants, fire, predation, and climate change have been cited as threats to the species and their sagebrush-dominated habitat.

Increasingly, sage-grouse are becoming one of the largest environmental concerns that project developers and management agencies face in sagebrush country throughout the Rocky Mountains, Great Basin, and Pacific Northwest. The reason? The greater sage-grouse's status as a candidate for listing under the Endangered Species Act and the potential implications of such a listing by the U.S. Fish and Wildlife Service. Barring Congressional action that might delay a listing decision, the agency is scheduled to make its ruling in September 2015.

In an effort to preclude the need for listing, states are leading efforts across the range of the species to find conservation approaches and plans that will minimize the impact of development on the bird. Wyoming and Montana have developed core area policies that limit the amount of new surface disturbance in areas identified for sage-grouse conservation. Other states such as Utah, Colorado, Idaho, and Nevada have, or are developing, similar habitat conservation and mitigation approaches. The goal of these efforts is to conserve and protect sage-grouse while balancing the need for activities such as energy development that occur in the species' range.

SAGE-GROUSE MONITORING AND RESEARCH

South-central Wyoming is the site of one energy project where the developer has implemented extensive measures to conserve greater sage-grouse: the proposed Chokecherry and Sierra Madre (CCSM) Wind Energy Project (see "World-class Wind" on page 3). In 2009, SWCA biologists began modeling habitat and monitoring sage-grouse populations to help Power Company of Wyoming LLC (PCW) identify how the birds are using the landscape within the proposed project area. The objectives of this effort are to evaluate the response of sage-grouse behavior and populations to the wind project once it is operational, site the project in an environmentally responsible manner, and quantify the benefits of the many conservation measures that PCW and the landowner are implementing.

To accomplish these objectives, PCW is implementing an unprecedented evaluation of greater sage-grouse behavior and ecology. For more than five years, SWCA crews have been monitoring birds surrounding the CCSM Project area using solar-powered GPS transmitters attached to the backs of female sage-grouse. Between four and eight GPS locations are recorded per bird per day, relayed to the Argos satellite system, and downloaded to SWCA's sage-grouse database management system. The information gained through the female grouse monitoring effort is supplemented by a parallel study of male sage-grouse funded by the National Wind Coordinating Collaborative and Wyoming Game and Fish Department. Partners in the male study include the University of Missouri, U.S. Forest Service Rocky Mountain Research Station, Wyoming Game and Fish Department, PCW, and SWCA.

The monitoring and research efforts were designed as a before-after control-impact study. Data collected prior to project construction will be compared to data collected during project construction and operations to evaluate the response of the species to wind energy activities. We are in the "before" phase at present. Once project construction begins, we will monitor how the birds' behavior may change and use the control-impact groups to evaluate the response of sage-grouse and determine any differences in patterns of habitat use, survival, behavior, and other population characteristics.

Sage-grouse nest under sagebrush canopy

IDENTIFYING PATTERNS OF USE

To date, the monitoring and research program has collected more than 500,000 sage-grouse GPS locations — an unprecedented amount of data that offer great insights into how the birds move about on the land. This is the largest known project-specific research and monitoring effort undertaken to characterize greater sage-grouse response to energy development. The tags provide data that have never been collected before — information that in turn is greatly adding to the scientific body of knowledge about the species. The resulting data over so many years of study are helping to identify important areas used by the birds at different times — lekking, nesting, brood-rearing, and during winter — and even movement corridors between different seasonal habitats.

Monitoring across approximately 750,000 acres has revealed interesting patterns of use by the species. For example, individuals and the entire population revisit the same patches of sagebrush and same movement corridors year after year, providing valuable data to inform project siting decisions and reduce potential impacts to the species. The datasets also enable science-based conservation measures to be implemented in locations that will immediately benefit sage-grouse populations and habitats. Many of these measures have already been put into place. To date, 17 miles of fences have been marked and 10 miles of fences have been removed to prevent potential collisions and mortality of sage-grouse. Additionally, enhanced grazing management, wildfire rehabilitation, and brood-habitat enhancement activities have been completed.

MORE USES FOR THE DATA

The "after" part of the sage-grouse study will occur once project construction and operation commences. The response of sage-grouse to wind energy development activities will be monitored during and after construction to fully understand — and not just predict — the impacts of wind energy development. Without the CCSM Project, this important species research would never have been completed, nor would we have the robust sage-grouse information we now have.

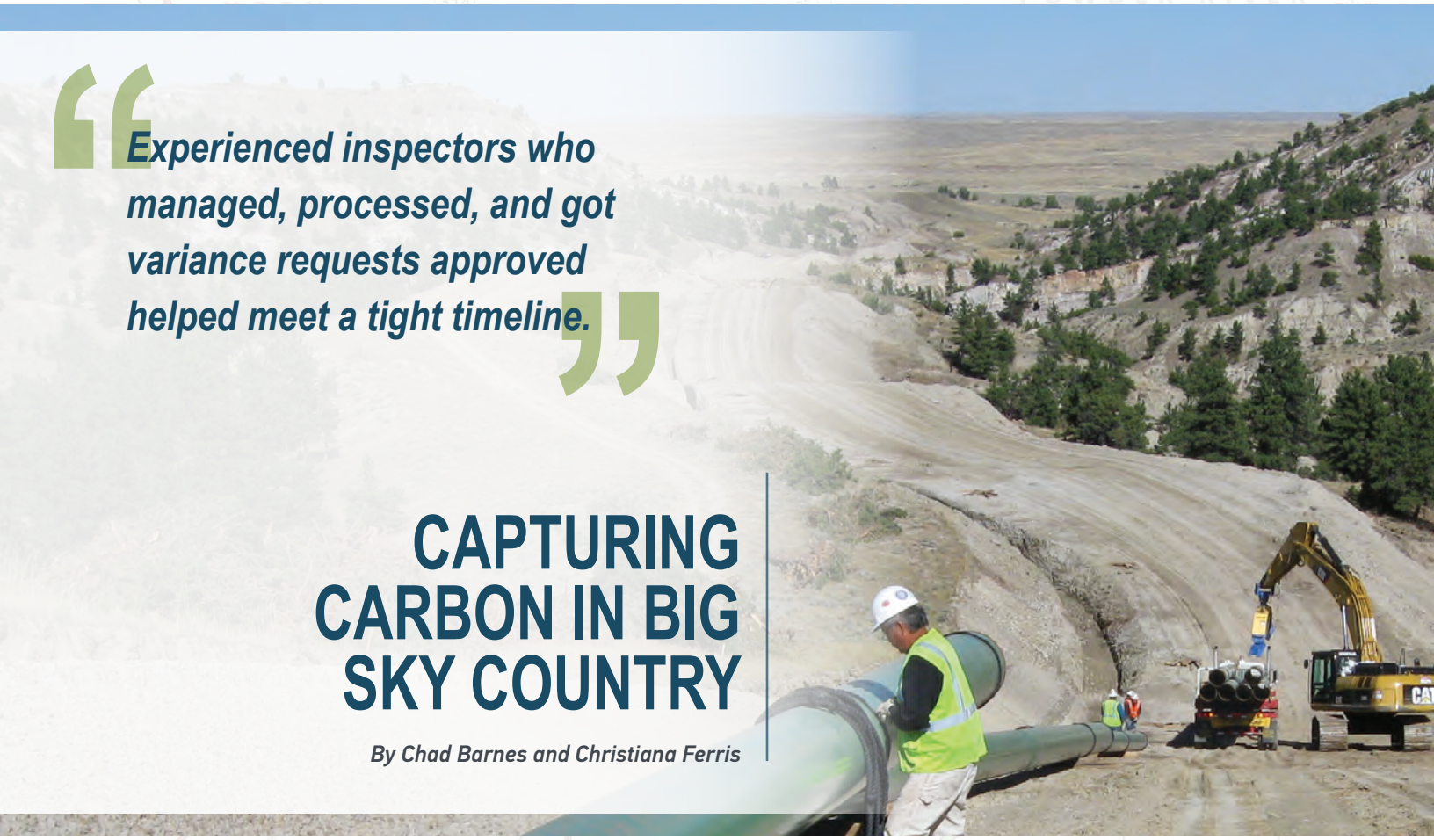
In addition to using science to avoid, minimize, and mitigate impacts to the species from this project, data from these studies will help regulatory agencies and proponents of other land and energy development projects understand how sage-grouse respond to energy development activities. Through its collaborative approaches with agencies, researchers, academics, species experts, landowners, and other stakeholders, the CCSM Project is positive proof of how collaboration, transparency, and sound science can help create a project that is smart from the start.■

For more information on SWCA's sage-grouse studies, contact **Jon Kehmeier** at **jkehmeier@swca.com**.

> ***"PCW is implementing an unprecedented study of greater sage-grouse behavior and ecology."***

Tagged female sage-grouse

> *Experienced inspectors who managed, processed, and got variance requests approved helped meet a tight timeline.*



CAPTURING CARBON IN BIG SKY COUNTRY

By Chad Barnes and Christiana Ferris

Much of the Powder River Basin in Wyoming and Montana is classic Big Sky country — a largely treeless landscape of rolling grassland and sagebrush hills dotted with occasional pine ridges and rugged terrain.

With such a paucity of trees, this is not necessarily a place you would expect to find a project that sequesters carbon dioxide (CO_2). But it is here that Denbury Resources, Inc. is helping reduce the carbon footprint of other activities by piping CO_2 to existing oil fields for enhanced oil recovery (EOR).

CO_2 EOR allows the redevelopment of older, depleted oil fields to recover stranded reserves of oil that cannot otherwise be recovered by conventional methods. Recent U.S. Department of Energy (DOE) estimates point to some 67 billion barrels of oil that can be recovered by EOR at today's prices — tripling current U.S. reserves. EOR by means of CO_2 injection is also recognized as providing an environmentally responsible method of utilizing and ultimately storing large volumes of industrial CO_2 that may otherwise be vented into the atmosphere.

Denbury's 232-mile Greencore Pipeline transports CO_2 from ConocoPhillips' Lost Cabin gas plant in central Wyoming to Denbury's Bell Creek Field just north of the state line in Montana. Since its discovery in 1967, Bell Creek's oil was produced via natural underground pressure in the oil reservoir (i.e., "primary" recovery). Water injection (i.e., "secondary" recovery) was initiated in 1970, which increased production rates to approximately 26,000 barrels per day. Due to declining output of oil over time utilizing these conventional methods, Denbury began CO_2 injection (or CO_2 EOR, i.e.,"tertiary" recovery) at Bell Creek during the second quarter of 2013.

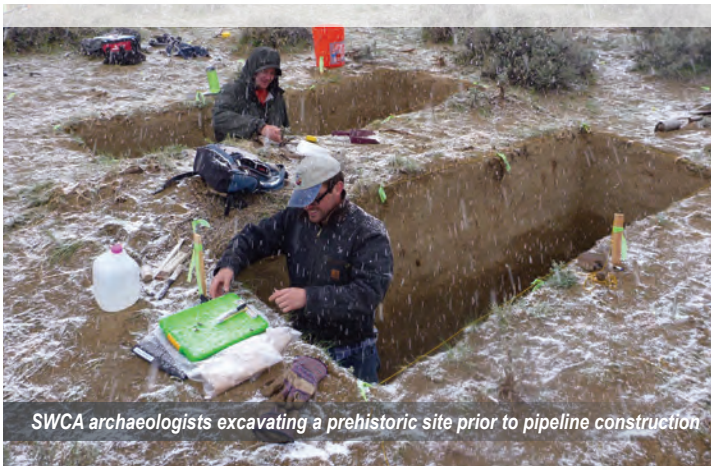
CO_2 provides additional recovery of the more difficult to obtain oil from the field's reserves. The project is expected to recover an estimated 40 to 50 million barrels of oil from the Bell Creek Field over the next 20+ years. An even bigger benefit, however, is the associated carbon sequestration of up to one million metric tons of CO_2. Over time, the DOE estimates that the United States and Canada have the potential to sequester more than 82 billion metric tons of CO_2 via EOR projects, which could have a significant positive impact on reducing greenhouse gasses.

SWCA'S ROLE IN THE PROJECT

The pipeline crosses federal lands managed by the Bureau of Land Management (BLM), triggering compliance with the National Environmental Policy

Pipe stringing operations in the Pine Ridge area between Casper and Gillette, Wyoming

Utilizing a dry flume construction technique across Salt Creek in Johnson County



SWCA archaeologists excavating a prehistoric site prior to pipeline construction

1,500-year-old basin hearth excavated prior to construction

Act that required environmental reviews and permitting before the project could be initiated.

Of the laundry list of environmental services that SWCA provided, the most important contributions to the project were agency consultation, natural and cultural resource clearances, and threatened and endangered species surveying and reporting. SWCA biologists performed field surveys for tree-nesting raptors, burrowing owls, mountain plovers, prairie dogs, wetlands/waterbodies, rare plants, and noxious weeds.

SWCA's cultural resource experts assisted with site avoidance, conducted pre-construction data recovery excavations at two prehistoric archaeological sites, provided monitoring services during construction, and performed post-construction data recovery excavations.

The Environmental Assessment for the Greencore Pipeline was finalized and the BLM issued a Notice to Proceed in August 2011. Construction of the 232-mile segment of the pipeline was completed in 2012, with the pipeline coming online for CO_2 delivery in early 2013.

TRIBAL ENGAGEMENT

One of the most critical and successful components of this project was tribal engagement, which the BLM was required to include as part of the permitting process. While the project did not cross tribal land, 17 tribes were invited to consult on the project, and seven elected to be concurring parties for the Programmatic Agreement. SWCA accompanied tribal representatives to review certain features in the field, including stone circles, cairns, and other cultural resources of significance to tribes. Because SWCA has a great deal of experience in tribal consultation, we acted as a third party liaison between the tribes and the BLM.

Monitors from six of those tribes (the Eastern Shoshone, Fort Peck Assiniboine & Sioux, Northern Arapaho, Northern Cheyenne, Standing Rock Sioux, and Yankton Sioux) participated before, during, and after pipeline construction

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RIDERS ON THE STORM:

STORMWATER SAMPLING AND ENDANGERED SPECIES CONSERVATION IN THE EDWARDS AQUIFER

By Jenna Cantwell

Above left: Stormwater samplers K
Center/right: San Marcos River at t

In drought-stricken Central Texas, rain can be elusive. Hence my surprise when the sound of the rain jolts me awake at midnight. My brain struggles to place my location. Then it hits me. We're stormwater sampling and it's my turn to check the weather and real-time water quality data that determine our ability to collect the appropriate samples.

We've worked out an effective system to check the data in shifts so that only one person each hour has to wake up, and the rest of the team can get a few hours of consecutive sleep. At this point, we have been mobilized at our designated "home base" for 31 hours straight and the rain continues. This has been a long and challenging storm. Any opportunity to sleep is warmly welcome.

What feels like minutes later, I am awoken again, this time by the glowing cell phone light of my teammate, Jen Moreland, who has the data check-in shift after mine. Out of the silence, Jen whispers, "It's time." I can see from the water quality tracking chart on her phone that she is right. "Alright," I say, "let's do this."

THE SAMPLING PROTOCOL

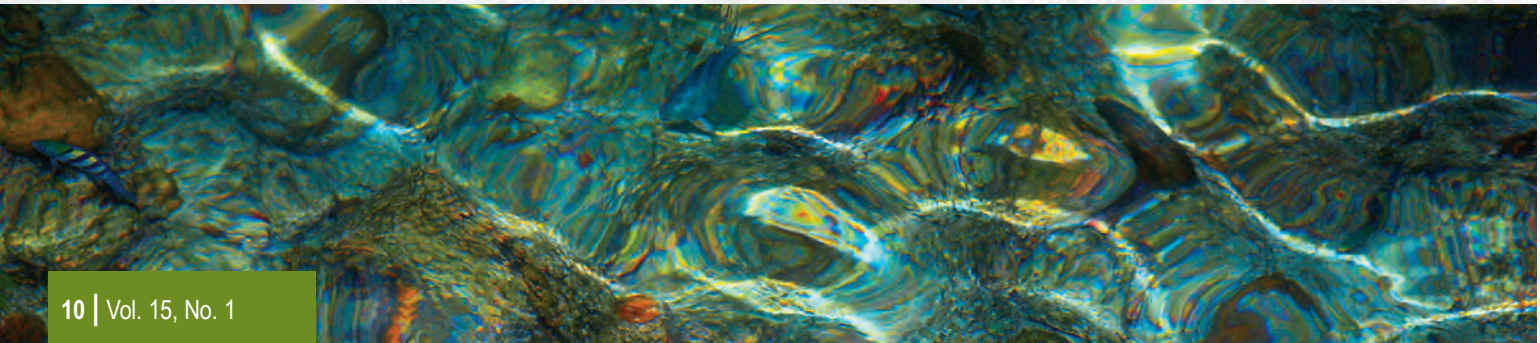
We take samples at three different stages of the storm, at five locations on the Comal River, and at seven locations on the San Marcos River. Our sampling protocols require us to collect grab samples directly from the flowing river into eight containers. This generally involves lying on our bellies in the mud, leaning over the edge of the bank, arms outstretched with vials in hand.

Occasionally, after several hours of regularly tracking the radar, the storm suddenly shifts away from the streams we need to sample, and the minimum springflow increase or water quality changes necessary for sampling do not occur. At that point we must pack up our gear and head home. Driving home, sometimes it seems as though the rain is all around us — everywhere except where we need it to be. On at least one occasion, we checked the weather again after arriving home to see that the storm had once again shifted, creating a sample-worthy event at the location we had just left.

THE NEED FOR STORMWATER SAMPLING

Interestingly, it is not the rain that necessitates stormwater sampling but rather the absence of rain. The Edwards Aquifer is the primary source of drinking, municipal, agricultural, recreational, and industrial water for approximately two million people. An "artesian" aquifer (meaning that the water is confined under pressure) of karst limestone, the Edwards Aquifer is approximately 180 miles long and ranges from five to 40 miles wide. As part of the hydrological cycle, rain water and surface water enter the aquifer through fractures and conduits. Water moves downward under pressure in portions of the aquifer. This pressure forces water upward along geologic faults to the surface at the Comal Springs in Comal County and the San Marcos Springs in Hays County.

In 1956, a significant drought caused aquifer levels to decline to the point that the Comal Springs ceased flowing for 144 consecutive days. During this time, the fountain darter — a small freshwater fish found only in the Comal and San Marcos rivers — was extirpated from the Comal River system. Eventually, this fish, along with seven other aquatic species directly dependent



> *The data we are collecting now will help provide an overall picture of how the aquifer systems function.*

Kevin Cutrera, Philip Pearce, Brittany Rios, and Jen Moreland.
the eastern spillway of Spring Lake Dam. © Edwards Aquifer Authority

upon the Edwards Aquifer for survival, became federally listed as threatened or endangered under the Endangered Species Act. The listing prompted a 1993 lawsuit filed by the Sierra Club against the U.S. Fish and Wildlife Service for failure to sufficiently protect springflows necessary for the survival of these species. The court ruled in favor of the Sierra Club.

REGULATING USE OF THE AQUIFER

This lawsuit resulted in the creation of the Edwards Aquifer Authority — a groundwater management district tasked with regulating use of the aquifer — and a regional recognition that action had to be taken to balance the human and wildlife needs of the aquifer, or risk federal intervention through enforcement actions under the Endangered Species Act.

Recognizing the sensitivity and increasing tension surrounding this issue, in 2006 the U.S. Fish and Wildlife Service organized regional stakeholders to form a voluntary initiative known as the Edwards Aquifer Recovery Implementation Program (EARIP). The EARIP decided to pursue an incidental take permit to ensure compliance with the Endangered Species Act. Such a permit allows the "take" — which is incidental to, rather than the purpose of, an otherwise lawful activity — of federally listed species by non-federal entities.

In order to obtain that permit, the stakeholders negotiated, developed, and ultimately approved by consensus the Edwards Aquifer Habitat Conservation Plan (EAHCP) that would, among other things, mitigate and minimize the effects to listed species. The U.S. Fish and Wildlife Service issued the incidental take permit in March 2013 to five groups representing the efforts of the EARIP — the Edwards Aquifer Authority, the cities of San Marcos and New Braunfels, Texas State University, and the San Antonio Water System.

Thus, the Edwards Aquifer stakeholders, through the EAHCP, have developed a comprehensive strategy to resolve a politically entrenched, decades-long conflict stemming from the challenges presented by the absence of rain.

SWCA AND THE EAHCP

Stormwater sampling is part of the EAHCP's comprehensive water quality monitoring program to ensure that water quality is maintained at a level suitable for the survival of the listed species found in the San Marcos and Comal river systems. Since January 2014, SWCA has been conducting several types of water quality sampling, including the stormwater sampling efforts so bedeviled by the weather.

The EAHCP's stormwater sampling program is far more complex than that for other purposes such as Stormwater Pollution Prevention Plan and Municipal Separate Storm Sewer System programs. Because those programs typically test for fewer water quality parameters, they require less water and are often collected from runoff outfalls (versus the EAHCP's requirement to sample from flowing rivers), and in many cases automated samplers may be used.

The EAHCP's program requires hand-collection of stormwater samples. Such sampling presents a unique suite of safety concerns, as staff must work in tricky conditions to collect the data. SWCA staff members have had the benefit of working with experienced Edwards Aquifer Authority staff and SWCA's expert safety team to identify appropriate safety protocols such as the use of auto-inflating life jackets, strobe lights, swift-water rescue equipment, and general best practices for working in storm conditions.

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MEXICO'S NEW ENERGY LANDSCAPE:

OPPORTUNITIES AND ENVIRONMENTAL COMPLIANCE

By Ricardo Montijo

In late 2013, Mexican President Enrique Peña Nieto introduced constitutional amendments that marked the end of the state's 75-year monopoly in the energy sector and opened the way for foreign investment. The reform and subsequent laws signed into effect in August 2014 promoted capital and resources to increase energy production, decrease energy costs to consumers, and create an estimated 2.5 million jobs over 10 years. Foreign and domestic oil, natural gas, and power generation companies can now participate in Mexico's energy market through a host of contracting opportunities.

Reforming Mexico's energy laws was no minor feat. Mexican state ownership of petroleum and other energy is steeped in history and has served as a symbol of national pride and sovereignty. The proponents and authors understood that a landmark decision such as this needed to include substantial compromises. Key among these is environmental responsibility bolstered by legal and procedural enhancements, increased agency funding, and enforcement.

PETROLEUM AND ELECTRICITY NATIONALIZATION

Petroleum was discovered in Mexico in the early 20th century and production grew quickly. By the 1920s, Mexico was the world's second-largest oil producer. Recognizing the growth and potential loss of control of this resource, Mexico's 1917 constitution made this and other extracted minerals the property of the state. Nevertheless, without enforcement, the oil industry became more than 90% dominated by 17 foreign companies. Worker abuses were rampant, prompting strikes in 1937 and government intervention. This intervention culminated with presidential actions in March 1938 that expropriated foreign oil, barred foreign operations in the country, and created the state-owned *Petróleos Mexicanos* (Pemex).

The electricity sector in Mexico was also organized and codified in the 1930s, but unlike the petroleum industry, it underwent several modifications that led to nationalization in the 1960s, giving control of generation facilities, transmission grids, and distribution primarily to the *Comisión Federal de Electricidad* (CFE).

THE NEED FOR REFORM

The state controlled petroleum and electricity industries for more than 70 years after the reforms of the 1930s. By the early 2000s, Pemex was mired in debt. Dysfunction, corruption, and lack of access to capital for developing new wells kept production and profits low. This was bad news for the Mexican government that then depended on oil tax revenues to fund nearly 40% of the national budget. Despite its petroleum riches, Mexico was on track to being a net oil importer.

Recognizing the need for regulatory overhaul, President Felipe Calderón passed significant energy-sector reforms in 2008 that aimed to modify Pemex's corporate structure, increase its budgetary autonomy, and work with foreign firms to extract oil in the Gulf of Mexico. The reforms were widely criticized as weak, became entangled in legal wrangling, and ultimately accomplished very little.

After taking office in 2013, President Peña Nieto introduced constitutional amendments that reaffirmed Mexico's dominion of underground resources and electrical system while encouraging private and public investment on a level playing field. Through the constitutional amendments, Pemex and CFE were endorsed as productive enterprises that assumed technical, managerial, and budgetary autonomy.

AN ENVIRONMENTAL COMMITMENT

The energy reform has generated dissent from different sectors. Among the most vocal opponents are those concerned about potential social and environmental consequences associated with reform and foreign energy ownership. Critics are concerned that foreign interests will not comply with Mexico's environmental

laws and introduce environmentally incompatible and non-sustainable energy production methods. Mexico's energy reforms, nevertheless, feature a strong environmental commitment that includes a goal of 35% clean energy generation within the next 10 years. Compliance commitments feature regulatory oversight funding for enforcement personnel and penalties for non-compliance.

> ***"Mexican energy reform enacted in 2014 is opening the door for foreign and domestic oil, natural gas, and power generation companies to participate in Mexico's energy market."***

Energy reform will help Mexico meet its commitment to reduce greenhouse gas emissions. Secretary of Energy Pedro Joaquín Coldwell recently set forth an ambitious goal of building more than 10,000 kilometers of natural gas pipelines to boost electricity generation, replace diesel and fuel oil, and reduce carbon emissions.

THE POST-REFORM PERMITTING PROCESS

A critical part of Mexico's commitment to environmental responsibility as part of this reform is careful consideration during project planning and siting. The General Law of Ecological Equilibrium and Environmental Protection (*Ley General de Equilibrio Ecológico y la Protección al Ambiente*, or LGEEPA) is similar to our National Environmental Policy Act, albeit more complex. LGEEPA charges the Secretariat of the Environment and Natural Resources (SEMARNAT) with protection, restoration, and conservation of Mexico's natural resources. It also authorizes SEMARNAT to require project environmental impact statements (*Manifestaciones de Impacto Ambiental*, or MIAs) and to review these for consistency with LGEEPA and other regulatory standards.

LGEEPA states that preventive reports, MIAs, and risk studies may be submitted by interested parties, research institutions, schools, or professional associations, and that the responsibility for the content of the document will correspond to the project proponent. It further requires that entities providing environmental services declare under oath to provide honest and impartial content, incorporate industry-standard methodologies, and consider avoidance before all other mitigation measures.

MIA PREPARATION

SEMARNAT provides guidelines for preparation of MIAs and other documents under LGEEPA, including specific guidance for most business sectors (such as tourism, forestry, communication, land conversion, hazardous waste, fishing, oil and gas, mining, manufacturing, and energy). MIAs are normally filed with the SEMARNAT state office where the project occurs. MIAs for projects that cross multiple states, exceed certain fiscal thresholds, or have specific federal nexus are filed with the federal office in Mexico City.

Most MIAs require consideration of climate, geology and geomorphology, hydrology and groundwater, terrestrial vegetation, wildlife, landscape, socio-economic factors, and environmental waste and hazards. SEMARNAT also consults with the *Comisión Nacional para el Conocimiento y Uso de la Biodiversidad* for biological resources and the *Comisión Nacional del Agua* on issues regarding waters and wetlands. Cultural, historical, and paleontological resources are reviewed and permitted under a separate process overseen by another federal entity, the *Instituto Nacional de Antropología e Historia*.

MIA preparation time includes supporting studies and can vary substantially depending on project and resource complexity. The review process begins with the submittal of the MIA and appropriate fees and is normally completed in two to four months. Upon completion of their review, SEMARNAT can:

A. unconditionally authorize the project or activity in question, as proposed, evaluated, and mitigated in the supporting MIA;

B. conditionally authorize the project or activity with additional measures that avoid, mitigate, or compensate for adverse environmental impacts produced during construction or project implementation; or

C. deny the requested authorization when:

- it contradicts Mexican law;
- the work affects a protected species or can lead to the declaration of a species as threatened or endangered; or
- information provided by the applicants misrepresents the project and its associated impacts.

Although capitalizing on new opportunities in Mexico's energy sector may be a complex undertaking, many of the environmental considerations that are part of the Mexican permitting process mirror environmental concerns and constraints north of the border. SWCA has a team of planning and permitting experts, natural and cultural resource professionals, and on-the-ground Mexican partners with experience in local environmental policy at the federal, state, and municipal levels. If your company is exploring energy project possibilities in Mexico, we can help navigate the environmental landscape with regard to LGEEPA and other environmental regulations. ■

For more information on the environmental permitting process in Mexico, contact **Ricardo Montijo** at **rmontijo@swca.com**.

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and data recovery. Once the Programmatic Agreement was in place — an important milestone for Denbury to keep the project on schedule — members from the tribal historic preservation offices (THPOs) also worked alongside SWCA's archaeologists during pre- and post-construction data recovery, and during pipeline construction monitoring.

SWCA's years of working with tribes and the strong relationships we helped develop among tribal leaders, members, and monitoring staff (including Denbury and BLM project staff) helped make the process smoother. During Greencore tribal monitoring, SWCA assisted the THPOs in training their new employees working alongside experienced monitors. This assistance has strengthened their monitoring programs.

MANAGING VARIANCE REQUESTS

Environmental inspectors processed more than 650 variance requests during the two seasons of construction. Frequently the client needed approval within one day of a variance request to keep construction on schedule. However, many requests required an environmental inspector to research the nature of the request and determine whether an area had been surveyed previously for biological, cultural, or paleontological resources, for example. To respond to these challenges, a system was developed to streamline the approval process for variance requests. We conducted biological and cultural field surveys on the fly and obtained virtually immediate approvals from the BLM, which enabled the contractor to use those areas without costly delays during construction.

Even though more preparation and route refinement ideally should happen before construction begins on a large project such as this one, experienced inspectors who efficiently managed, processed, and got variance requests approved helped meet the project's tight timeline.

A MODEL APPROACH

Paul Burnett, the Greencore principal investigator in our Fort Collins office who specializes in probability modeling, used a combination of known archaeological site information, soils and stream data, and aerial imagery to identify high probability areas for buried cultural material. By using this model, SWCA and the BLM worked together to focus on the areas requiring monitoring during grading operations in a systematic manner. This resulted in significant cost savings to Denbury. The approach has since been recognized by the BLM in both Wyoming and Montana as a preferred method to address construction monitoring.

SWCA also led pre- and post-construction data recovery efforts. Because known significant archaeological deposits at two sites could not be avoided by project design, pre-construction data recovery excavations were required to mitigate the effects that construction would have on these sites. Excavations are costly, and SWCA's team in Fort Collins worked closely with the BLM to achieve an adequate, interpretable sample while not overdoing the effort. By responding to the BLM's needs to correctly address these impacts while minimizing the costs to Denbury, SWCA struck the right balance for all parties involved.

SWCA's performance has been lauded by the BLM's field office manager, project manager, senior wildlife biologist, and lead archaeologist for the excellent environmental and cultural resources management of this project. The trust that SWCA resource experts have built among regulatory and agency staff, based upon our sound science and long-standing professional relationships, made Greencore a shining example of how to get a pipeline built on schedule.

A SPRINGBOARD FOR FURTHER EOR EXPANSION

Prior to this project, much of Denbury's work had been in the U.S. Gulf Coast region. The Greencore Pipeline and Bell Creek CO_2 EOR project represents Denbury's initial foray into the Rocky Mountain region as a national leader in CO_2 EOR projects. The project has already proven successful, with Bell Creek oil production nearly doubling from 2013 to 2014 as a result of CO_2 injection. The project forms the cornerstone of the company's western U.S. presence and is a springboard for future expansion.

One such initiative is the proposed 244-mile Riley Ridge to Natrona Pipeline that will feed into the Greencore Pipeline and bring CO_2 from southwestern Wyoming ultimately into the Cedar Creek Anticline, another oil field owned by Denbury. The Cedar Creek Anticline is an even larger-producing field in Montana (extending into North Dakota) located approximately 120 miles north of the Bell Creek Field.

The Greencore Pipeline has laid a successful foundation for Denbury's CO_2 EOR infrastructure and is contributing to the win-win efforts that are keeping CO_2 out of the atmosphere while allowing important oil and gas production in the United States to continue. ■

For more information on SWCA's work on the Greencore Pipeline, contact **Chad Barnes** at **cbarnes@swca.com**.

BONUS MATERIALS

To see more images from the Greencore Pipeline project, visit http://youtu.be/Ge7hv-d4VN8 or scan the QR code to the left. (Note: You will need a QR code reader application on your smartphone.)

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CREATIVE PROBLEM-SOLVING

In addition to hand-collecting samples from the flowing river during storms, SWCA conducts passive diffusion sampling, which involves leaving a small, shoelace-style device in the river for two weeks. Early on we found that most of the sampling devices were being moved by river users, getting dragged downstream, or being tampered with. To remedy this situation, SWCA staff designed and built containers from stainless steel silverware trays and concrete to hold the sampling devices in place in the river and provide evidence of any tampering, with waterproof tags identifying the monitoring equipment. Since we began using the weighted holders, our passive sampling success rate has significantly increased.

SWCA-designed tamper-resistant sampling device

So far, 2014 results have shown that water quality is generally good. The EAHCP Science Committee is determining how many years of baseline data are necessary before any program adjustments might need to be made. The data we are collecting now will help provide an overall picture of how the aquifer systems function so that the Science Committee can identify patterns and trends. Study results also will feed into ecological models being developed, and over time water quality results may inspire additional research opportunities.

SWCA is honored to be a part of the effort to protect the region's threatened and endangered species and water supply. Our current work with regional water policy leaders and planners is helping protect local water resources and the species that depend upon them. Of course, protecting local ecosystems is often much more complex than one or two activities, and the EAHCP is an example of just how multi-faceted Endangered Species Act compliance can be.

In addition to the water quality program, SWCA has worked on several other projects related to the implementation of the EAHCP. These include an invasive species removal and control program in the Comal system, dissolved oxygen management at Landa Lake (also in New Braunfels), and development of the inaugural annual report documenting compliance with incidental take permit terms and conditions. ■

In the next edition of *The Wire* we will explore SWCA's work on invasive species removal connected to the EAHCP.

For more information on SWCA's involvement with the Edwards Aquifer HCP, contact **Jenna Cantwell** at **jcantwell@swca.com**.

CLIENT PERSPECTIVE

***Rick Illgner, Director of EAA Projects for the HCP Program, shared a few insights on the group's Habitat Conservation Plan with* The Wire.**

The Wire: What advice would you give to groups just starting to address endangered species issues with a Habitat Conservation Plan?

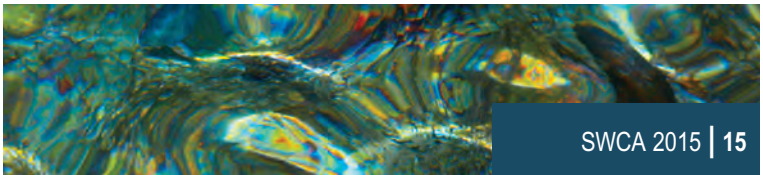
Illgner: Make sure all stakeholders are at the table for discussion, and send negotiators rather than advocates. A Habitat Conservation Plan requires forging decisions that will have a long-term impact, and such decisions are impossible without compromise. The adage "Nobody's right if everybody's wrong" definitely applies here.

The Wire: What lessons can other groups learn from the implementation of the Edwards Aquifer Habitat Conservation Plan?

Illgner: Time spent discussing issues during development of the environmental plan is a good investment in resources. It's much harder to solve problems that result from insufficient planning. On the other hand, it's important to be flexible; even the best plans are likely to require modification. Most importantly, keep the communication lines open to all parties.

The Wire: How are the EAHCP's programs (water quality, invasive species, etc.) benefiting species, the ecosystem, and the region as a whole?

Illgner: In the EAHCP, mitigation measures are broadly divided into habitat improvement, research, and monitoring. Habitat improvement enriches the ecosystem and the species that depend on that ecosystem, allowing survival during times of stress caused by drought. Research is required because of the many environmental questions that must be answered in order to develop a truly successful protection plan. In the EAHCP, not all of those environmental questions were well understood when the plan was initially developed. Finally, the myriad mitigation measures contained in the EAHCP impact local communities, so making those communities aware of the environmental challenges and engaging them to participate in solutions has been important. We're proud that, so far, the EAHCP is serving as a model of regional cooperation and coordination in resolving a deep-seated, complicated problem.



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NEWS BRIEFS

Michael Belvin was promoted to Office Director in San Antonio to manage operations, foster relationships with existing clients, and expand the office's client base and market reach. Formerly San Antonio Office Lead, he joined SWCA in 2014 with more than 20 years of experience in environmental compliance with an emphasis on NEPA, transportation planning, project development, and environmental documentation.

Rick Adam has been elected to serve on SWCA's Board of Directors as an outside director. He has extensive senior-level information technology and human resources experience in the software, aviation, healthcare, and financial services industries. Having founded and led numerous companies and served on a number of corporate boards and governance committees throughout his decades-long career, he brings a high degree of corporate governance expertise to the Board. He also served in the U.S Air Force as a member of the launch crew for Apollo missions.

Matthew Genotte has been named Natural Resources Program Director in Houston. Most recently Natural Resources Program Director in Denver, he has been with SWCA since 2007. With more than 13 years of natural resources and environmental consulting experience, he specializes in natural resource surveys and permitting strategies for Clean Water Act and Endangered Species Act compliance. He has worked with clients on pipeline, wind power, roadway, seismic, residential development, and wetland and stream mitigation and restoration projects.

Michael Murphy is SWCA's new Human Resources Principal based in the Phoenix headquarters. He will oversee SWCA's human resources, recruiting, and training functions. With 15 years of human resources experience in the travel, financial services, and healthcare industries, he has developed and implemented systems for human resource policy development, performance management, compensation planning, talent acquisition, and executive leadership training.