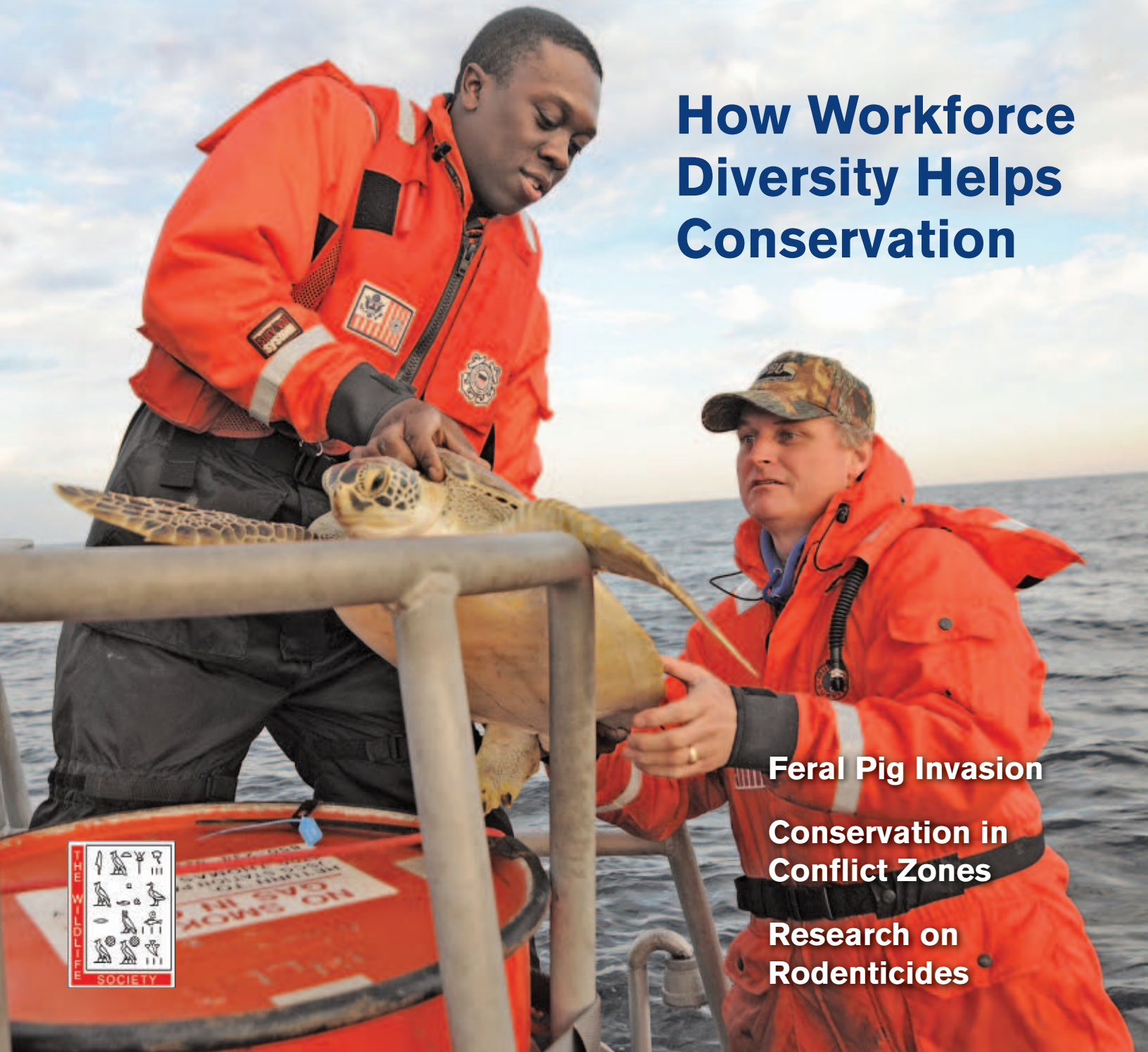


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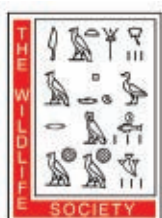
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COVER: Coast Guard Fireman DeJon Williams (left) and research biologist Jeff Gearhart prepare to release a rescued sea turtle into warm Florida waters. (See page 20 for details.)

Credit: Petty Officer 3rd Class Jaclyn Young





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Making Workforce Diversity Work

By Benjamin N. Tuggle, Ph.D.



Credit: Kim Jew/USFWS

Benjamin N. Tuggle, Ph.D., is the Regional Director for the U.S. Fish and Wildlife Service's Southwest Region.

When we think of biological diversity, we are grateful that the natural world has provided us with a broad range of exquisite and unique wildlife and other natural resources. But the task of creating true diversity among the people who manage and care for these precious resources falls to all of us.

As a person of color, creating a diverse work environment has long been one of my professional passions. In the U.S. Fish and Wildlife Service's (FWS') Southwest Region, which includes Arizona, New Mexico, Oklahoma, and Texas, we have taken real steps to achieve that ideal. In 2010, we established the Southwest Region Outreach, Recruitment, and Retention Team, or ORRT, tasked with developing and implementing a plan to meet our workplace diversity goals by identifying and attracting top-notch candidates for employment and becoming the employer of choice in the natural resources management field.

To create a successful outreach and recruitment strategy, the team held to four guiding principles:

Promote Core Values. Diversity in the workplace must be a core organizational value. Here in the Southwest Region, we not only made increasing employment opportunities for underrepresented groups a key feature of our Human Capital strategy, but we put our money where our mouth is—hiring a contractor to help the ORRT work effectively as a multi-disciplinary, diverse team.

Rely on Teamwork. Represented by staff from all programs and organizational levels, the ORRT worked cooperatively to plan outreach, recruitment, and retention activities. For example, the group developed recruitment teams representing the Southwest Region's programs and field offices to attend career fairs at colleges and universities historically associated with minority groups.

Focus on the Future. To boost workplace diversity over the long term, youth must be a part of the effort. ORRT members shared information about the federal Student Career Experience Program (SCEP)—which offers students full or part-time employment related to their area of study at colleges, universities, and technical institutes, including many that serve underrepresented populations. The team also devel-

oped outreach materials specifically for the Internet and social media to reach younger populations.

Encourage Career Development. To attract and hold onto diverse, capable employees, we must foster career skills development. This development includes identifying future skill set needs, encouraging upward mobility by providing career ladder options to all employees, and instilling a broad stewardship ethic in SCEP employees by offering cross-program experiences.

Retaining Diversity

Our strategies to recruit diverse and capable candidates have already begun to pay off: We had over 100 qualified and diverse applicants for 10 summer-fall SCEP positions this year. To help FWS retain this cadre of capable professionals, ORRT members worked with the Region's managers to restructure and fill vacancies as entry-level positions, providing SCEP employees the chance to hone skills needed to advance within FWS through promotional opportunities. The team also carefully reviewed position descriptions and interviewed supervisors to ensure that each SCEP employee would be doing meaningful work to advance career skills.

Equally important to the workforce diversity equation is the effort to ensure that our organization's culture is one of inclusion, where minorities, women, and people of all faiths, ages, and abilities feel supported. Mentoring is a crucial aspect of this support. The ORRT established SCEP positions in offices where managers have a recognized ability to motivate employees and instill a passion for FWS' mission. Every SCEP employee is assigned a liaison to help them understand the agency's administrative requirements, and a mentor who serves as a role model and advisor. This year, SCEP employees will also have opportunities to meet as a group to share experiences and support one another.

As the demographics of the nation change, we must find meaningful ways to make our conservation work relevant to all our citizens, regardless of race, gender, age, religion, marital status, sexual preference, or disability. A workforce that truly reflects the population of our country is one of the best ways to ensure that stewardship of the natural world continues to be a strongly held American value. ■



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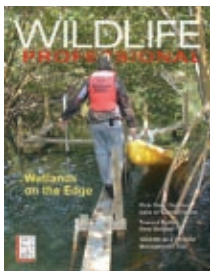
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Spring 2011

Feral Cats: The Controversy ...

Thank you for having the courage to take on the problem of free-ranging domestic cats (Spring 2011). I spent 20 years working for the East Bay Regional Park District in Oakland, California, and was the wildlife manager in charge when the TNR issue hit the fan. Passionate cat lovers forced multiple Board Committee hearings and painful public meetings. Fortunately, after hearing both sides of the argument, the Board stood by staff and scientific evidence and banned TNR in the parks. They recognized that in Bay Area parks, where endangered species habitat was protected by public vote and funds, the responsibility of managing these resources often required unpopular decisions.

Wildlife professionals need to get organized and get this information out to the general public, to members of TWS who own cats and allow them to roam free, and to politicians and regulatory agency personnel so that when (and it is only a matter of time) the issue is before them, they have a support web as prepared and passionate as those who would support the fantasy of TNR. We need to take this beyond the “choir” and start preaching to the pet owners at every level of society including our own members. A lot of lives depend on it.

Joseph DiDonato
Alameda, California

... and the Cost

I'm a retired "wildlifer," formerly with the Pennsylvania Game Commission's Wildlife Diversity Section, and I appreciate the way the cat problem was treated in *The Wildlife Professional*. When I published an article about this problem in 2000, I looked at what we were spending on veterinary cat care versus the total being spent on the care of hundreds of endangered species. According to my research, by 1995 Americans were spending \$2.5 billion annually just on medical bills for cats. This was more money than all 50 state wildlife agencies together had budgeted for the annual conservation needs of hundreds of wild species, including endangered species. More specifically, Americans were spending \$98 on cat medical bills for every \$2 they allocated (through Congress) for the health and welfare of over 600 federally listed endangered species. Talk about a subsidized predator. Next century, let's work at leveling the playing field.

Jerry D. Hassinger
Millersburg, Pennsylvania

Editor's note: To see the author's article titled "Alien Threat: Free-ranging Cats and the Conservation of Wildlife in Pennsylvania," go to www.wildlife.org.

“Extinct” vs. “Extirpate”

I've been reading the series of articles on the impacts of feral cats in the Spring 2011 issue of *The Wildlife Professional*. In several instances, authors talk of predation from cats and other sources leading to “local extinctions” of some wildlife species. I'm a bit confused. When I was in school back in the Stone Age, I was taught that “extinction” referred to the permanent and range-wide loss of a species, and “extirpation” was the term used for local eradications. Is it now standard practice to use space and time modifiers with the term extinction? Is the term “extirpated” no longer in vogue? And if “local” extinctions are possible, how do we define “local”—by state, county, township? To avoid confusing the public, perhaps we should use the term “extinct” only when a species is truly gone, and use the term “extirpated” in all other instances. Or perhaps I'm just getting old.

Dan Dessecker, CWB
Rice Lake, Wisconsin

Wetlands Mitigation Pointers

I noticed the article in the Spring 2011 issue of *The Wildlife Professional* about the Missouri Department of Transportation's efforts to create constructed wetlands as a form of habitat mitigation. The same work has been done by USDA's Natural Resources Conservation Service and evaluated by USDA's Agricultural Research Service in an effort to assist producers while protecting wildlife values to the extent possible. Below I list some of the technical material that NRCS tries to make useable by those in the field. These materials have the science background, but are translated for field staff who are not biologists or engineers.

- Shallow Water Habitat Management: <http://tinyurl.com/3b6ounp>
- Assessing Habitats Created by Installation of Drop Pipes: <http://tinyurl.com/3flw36a>
- Off-stream Dugout Livestock Watering Ponds Offer Habitat for Topeka Shiner: <http://tinyurl.com/3ta82mg>

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Credit: Wiley

A Chytrid Collapse

Tropical mountains, like those in southeastern Peru’s Manu National Park, house a wealth of biodiversity. But these unique ecosystems seem especially vulnerable to the threats of deforestation, climate change, and the invasion of chytrid fungus. To see how chytrid has affected Manu’s endemic amphibians, Alessandro Catenazzi of the University of California-Berkeley and colleagues sampled frogs in 1999 and again in 2008 and 2009. Their findings, published in *Conservation Biology* (v. 25/2), suggest that chytrid has hit the region hard. They found 46 species of frogs in 1999, but only 30 species in 2008 and 2009, a 36 percent decline. In the 2008 and 2009 surveys, the researchers tested more than 1,300 frogs for chytrid, finding a prevalence rate of 10.1 percent. They also observed that prevalence declined as altitude increased in 2008, but not in 2009, when they found infected frogs at higher elevations. The findings are consistent with the idea that chytrid—which arrived in Manu between 1999 and 2007—is traveling much like an epidemic wave up and over Andean mountain ranges. The authors say these results are “grounds for serious concern,” and encourage further study to grasp the dynamics of this devastating disease.



Credit: Public Library of Science

Lead Ban Success

In July 2008, the California Department of Fish and Game banned the use of lead ammunition for hunting in the range of the California condor (*Gymnogyps californianus*). The aim was to protect the critically endangered condors from lead toxicity. Researchers led by Terra Kelly and Christine Johnson of the University of California-Davis School of Veterinary Medicine wanted to know if other carrion-eating birds would also reap protection. To find out, they measured the blood lead concentration in 55 golden eagles, which rely heavily on carrion during winter, and 71 turkey vultures, which are scavengers. Comparing samples taken before and after the ban, the group’s findings, reported in *PloS ONE* (v. 6/4), confirm the ban’s efficacy. The percentage of eagles with elevated blood lead levels (defined as being greater than 10 micrograms per deciliter) fell from 76 percent before the ban to 32 percent after. Non-migratory eagles, which presumably remain in the area of the ban year round, fared the best: None had elevated lead levels post-ban. Researchers saw a similarly dramatic decline for vultures, from 61 percent with elevated lead levels pre-ban to 9 percent post-ban. Not only is this good news for eagles and vultures, it may be auspicious for the area’s condors.



Credit: Ecological Society of America

A Wide Swath

Roads—whether macadam, gravel, or dirt—can be dangerous places for wildlife, and many species avoid them. But how do wildlife react to rarely used routes, like those created by snowmobiles or off-road vehicles (ORVs)? To find an answer and demonstrate an analytic approach, Colin Shanley from the University of Alaska-Fairbanks and Sanjay Pyare from the University of Alaska-Southeast analyzed three years’ worth of data collected from 10 GPS-collared moose (*Alces alces*)—five males and five females—in Yakutat, Alaska. The researchers used previously drawn maps, estimates of off-road vehicle use, and interviews with ORV users (primarily subsistence moose hunters) to account for road use. Next, they developed resource selection function models to determine how moose used certain habitats. Writing in *Ecosphere* (v. 2/2), they report that male moose tended to avoid areas between 500 and 1,000 meters from rural roads, while female moose were displaced even farther: more than 1,000 meters away from roads. The authors say their findings indicate that moose reacted to even very low levels of vehicle traffic—less than 0.25 kilometers traveled per square kilometer per day. Managers must therefore be cautious about impacts of off-road vehicles and expanded road networks.



Credit: Wiley

A Climate-Malaria Connection

Mosquitoes that transmit malarial parasites could benefit from the warming associated with climate change, leading to more infections the world over. To see if this correlation exists for avian malaria, László Garamszegi of Estacion Biológica de Doñana-CSIC in Spain analyzed 43 studies going back to the 1940s that reported on avian malaria prevalence in more than 3,300 bird species worldwide. He then compared these data, sorted by continent, to historic climate records. Reporting in *Global Change Biology* (v. 17/5), Garamszegi found a strong positive relationship between avian malaria prevalence and warm periods: As the global average temperature has increased by 1 degree Celsius, avian malaria rates have nearly tripled. Also, as climate change has accelerated in recent years, avian malaria infection rates also appear to have accelerated. Garamszegi says these trends raise concerns for wildlife, such as Hawaii's native birds, and for humans, as avian malaria may predict how human malaria will respond to a changing climate.



Credit: Elsevier

Two TB Approaches

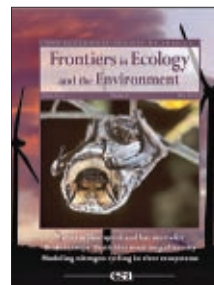
The best way to eliminate bovine tuberculosis (bTB), which can cause respiratory illness in most mammals, is by culling the affected population. But politically, economically, and socially, that's not always possible. In a paper in *Veterinary Microbiology* (in press), Michigan Department of Natural Resources veterinarian Dan O'Brien and colleagues examine two approaches to bTB management. In 1967, New Zealand found bTB in brushtail possums (*Trichosurus vulpecula*). After culling the non-natives, widely seen as pests, infections in cattle and farmed deer fell 94 percent from 1994 to 2009. When bTB struck white-tailed deer (*Odocoileus virginianus*) in Michigan in the 1990s, however, culling was untenable due to the high value that hunters and others placed on deer. Instead, the DNR reduced hunting restrictions and banned baiting and feeding to minimize crowding that can spread disease. These actions stemmed the spread of bTB, though haven't ceased transmission to livestock. The authors encourage further research into human dimensions to devise bTB containment strategies that are politically palatable.



Credit: Allen Press

Have Shrubs, Will Travel

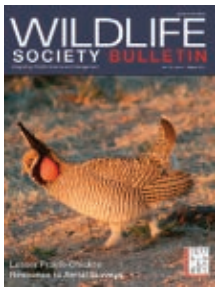
To see how the U.S.'s long history of fire suppression may have impacted a population of Mexican fox squirrels (*Sciurus nayaritensis chiricahuae*) in Arizona, University of Arizona professor John Koprowski and graduate student Bret Pasch tracked 43 radio collared squirrels, recording their locations and estimating distances traveled. They classified each animal as having a core area either in a fire-suppressed area or a fire-prescribed area, where managers set controlled burns between 1980 and 2001. Reporting in the *Journal of Mammalogy* (v. 92/1), the researchers found that, on average, squirrels in fire-suppressed areas had larger core areas and traveled farther daily than those in fire-prescribed areas. The authors note that in fire-suppressed areas, where understory vegetation is more abundant and impedes foraging, squirrels may therefore have to travel farther for food. Individuals that traveled the farthest were more likely to be depredated. To protect fire-dependent species such as Mexican fox squirrels, the authors recommend regular prescribed fires to restore pine-oak forest in native habitats.



Credit: Ecological Society of America

Noisy Waters

Ocean noises, such as those produced by sonar, have been implicated in injuries and deaths of dolphins and whales, whose beached remains raise public outcry. But researchers led by Michel André of Spain's Technical University of Catalonia, wanted to see if less-charismatic sea creatures—such as giant squid and octopi—are likewise impacted by acoustic trauma. In the lab, the team exposed 87 individual cephalopods to low-frequency (50-400 Hertz) sounds, and then observed the invertebrates' statocysts, a sac-like organ used for balance. In *Frontiers in Ecology and the Environment* (e-view), the researchers report that tiny enervated hair cells on the statocysts were damaged after exposure to the sounds, signaling that statocysts are sound-sensing organs. After prolonged exposure, statocysts developed lesions; cephalopods not exposed to sounds had undamaged statocysts. The researchers say that sounds associated with activities such as energy exploration, drilling, cargo ships, and sonar may be impacting these species dramatically.



Credit: TWS

Foxes on the Road

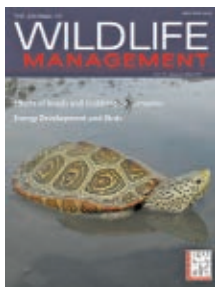
Each year since 2000, about 30 San Clemente Island fox (*Urocyon littoralis clementae*) have been killed by cars. Such deaths raise fears for this federally listed species of concern. Biologists from Colorado State University, led by graduate student Nathan Snow, sought to identify which road features influence where collisions occur, reporting their findings in *WSB* (v. 35/1). From July 2006 to December 2008, the team monitored roads on San Clemente Island (SCI) several times weekly for fox carcasses, also asking residents to report road-killed foxes. At 39 locations where they found road-kills and at 71 control locations, they recorded traffic volume and speed; measured the distance at which a motorist could detect a fox-sized model; measured visual obstructions for motorists, including vegetation height and ditch depth; and noted the presence of features that could attract foxes, such as prickly pear patches, drainages, and culverts. The researchers found, not unexpectedly, that increasing traffic volume led to more fox deaths, even at the relatively low levels of traffic on the island. They also noted that the minimum distance at which a driver could see a fox had some effect on kills, with kill sites having a visual distance 0.86 times the distance of control sites. Visual obstructions also corresponded with more deaths. While reducing traffic flow is impractical on SCI, the authors note that other measures such as signage, speed bumps, and regularly mowed roadsides could all help save foxes from untimely death.



Credit: TWS

When Bears Attack

To reduce a risk, one must understand it. That's why the University of Calgary's Stephen Herrero and colleagues analyzed the circumstances surrounding all known fatal attacks by wild black bears (*Ursus americanus*) in the United States and Canada between 1900 and 2009. Writing in *JWM* (v. 75/3), the authors identified 63 deaths in 59 black bear attacks. Forty-nine fatal attacks took place in either Alaska or Canada. More than 90 percent occurred on small groups (one or two people). Eighty-eight percent of cases showed signs of the bear acting as a predator, as opposed to attacking because the bear felt threatened, and 92 percent of these were carried out by an adult or subadult male bear. These stats suggest that, contrary to popular belief, male bears pose a much greater risk than female bears protecting their young. Despite these findings, the authors emphasize that the risk of being injured or killed by a bear is low: Millions of human-bear encounters occur each year without incident. Still, they say that their analysis may help wildlife managers better understand the risks associated with bear attacks, and in turn educate the public on how to avoid being a victim.



Credit: TWS

Songbirds in the Sage Brush

Many studies have documented how energy development in sage brush-dominated habitats has impacted game species like the greater sage grouse (*Centrocercus urophasianus*). But in *JWM* (v. 75/4), University of Wyoming's Michelle Gilbert and colleagues turn their attention to sage brush-dwelling songbirds, which have also declined in recent years. On one oil and two natural gas fields in Wyoming's Upper Green River Basin, researchers categorized different areas by the number of wells per square kilometer, and did point counts of birds. Their observations revealed that Brewer's (*Spizella breweri*) and sage (*Amphispiza belli*) sparrows, two species considered sage brush obligates, declined as well density increased, as did vesper sparrows (*Poocetes gramineus*). But a grassland-associated species, the horned lark (*Eremophila alpestris*), increased in number with increasing well density in one energy field, perhaps responding to decreasing shrubland. The next step, the authors say, is to determine why energy development causes some songbird populations to decline.

Making Towers Safer

Researchers estimate that four to five million migrating birds collide with communications towers—such as cellular and radio towers—each year. To determine what variables of tower design and height make the structures less lethal to birds, Joelle Gehring of Michigan State University Extension led a team in searching for and collecting bird carcasses found near towers throughout Michigan during the spring and fall migration seasons. The researchers report in *JWM* (v. 75/4) that from 2003 to 2005, 677 bird carcasses were located within a radius from the tower base equal to 90 percent of the tower's height. Ninety-two percent of the dead birds were night-migrating species. Medium towers (116-146 meters above ground level) resulted in 68 to 86 percent fewer fatalities than tall towers (305 meters or more above the ground). Further, researchers found 16 times more carcasses at medium towers with guy wire supports than at medium towers lacking these supports. Tall guyed towers were the worst offenders, with 70 times more carcasses than medium unguyed towers. The authors hope their findings will influence tower design, while acknowledging that one tall tower serving a broad area may be preferable to many small towers.



See this department online at www.wildlife.org for a complete list of articles recommended by TWP's Editorial Advisory Board.



Field Vests



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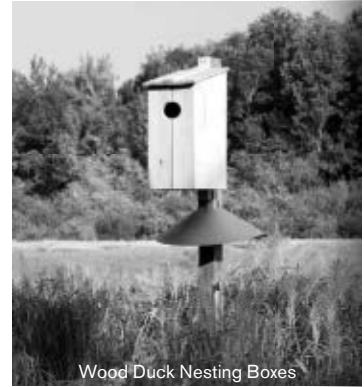
Sampling Squares



Snake Protection



Stealth Boats



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Pesola Hanging Scales



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GPS



Game Cameras

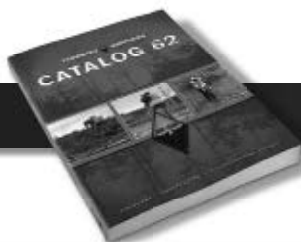
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North America

News and events affecting wildlife and wildlife professionals from across North America

■ Northeast

PENNSYLVANIA—The Pennsylvania Game Commission has lifted restrictions on hunting feral pigs in Bedford County, and issued an updated executive order that allows licensed hunters to incidentally hunt the animals across the state. Feral pigs in Bedford County were protected under a trapping program—the last of the state’s feral-pig trapping programs—which prohibited hunters from killing the animals, accidentally or otherwise, so as not to interfere with trapping activities. In 2010, however, there were no sightings of pigs in the area, and the Commission concluded that the program was no longer justified. Although feral swine are well established across 25 states, Pennsylvania is one of 16 states where the spread of the species is more recent, and populations can still be eradicated. *Source: Pennsylvania Game Commission*

■ Southeastern

VIRGINIA—In March, a federal judge ruled that the U.S. Fish and Wildlife Service (FWS) violated the Endangered Species Act by delisting the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) without adhering to its own recovery plan for the species. The ruling was in response to a 2009 lawsuit filed by several conservation groups—including the Center for Biological Diversity and Friends of Blackwater—that objected to the delisting on grounds that the recovery criteria

for the species had not yet been met. The judge reinstated endangered status for the northern flying squirrel, noting that any revision to a recovery plan is subject to public notice and comment, which the FWS had failed to provide. *Source: Center for Biological Diversity*

TENNESSEE—In April, members of the House General Conservation and Environment Sub-Committee withdrew the White-tailed Deer Breeding and Farming Act, a bill that would have authorized deer farmers to breed and sell white-tailed deer as livestock for canned hunts within high-fenced enclosures. A separate version of the bill in the House Agriculture Committee was also withdrawn. Biologists with the Tennessee Wildlife Federation—largely credited for killing the bill—voiced their concern over potential risks, such as the increased threat of chronic wasting disease, bovine tuberculosis, and other diseases. In addition, other critics of the bill called attention to some ethical concerns over breeding and selling captive animals for canned hunts. *Source: Tennessee Wildlife Federation*

■ Northwest

MONTANA—The Montana-based conservation group Vital Ground Foundation and the Alberta-based Yellowstone to Yukon (Y2Y) Conservation Initiative have joined forces under the Cabinet-Purcell Wildlife Linkage Initiative to protect grizzlies in the Northern Rockies by restoring and protecting their habitat. One of the groups’ first projects is to secure two private properties located in threatened wildlife corridors near two rural Montana communities in northwestern Montana, which will connect isolated grizzly populations in the region. Once purchased, the Vital Ground Foundation will manage the lands to benefit the region’s grizzlies and other wildlife



Credit: Lloyd Glenn Ingles

The West Virginia northern flying squirrel is back on the endangered species list after a federal judge ruled that its delisting violated the Endangered Species Act. Conservation groups hope the ruling will delay U.S. Forest Service plans to allow logging in the Monongahela National Forest—prime habitat for the species.



Credit: Erwin and Peggy Bauer

Cabinet-Purcell grizzlies may soon have more linkage habitat at their disposal. Vital Ground Foundation and Y2Y are working to connect two blocks of land in threatened wildlife corridors for the animals to move back and forth between northwestern Montana and southern British Columbia.

species. Not only will this help with genetic interchange between threatened grizzlies in the U.S.-Canada transborder area, but, according to a recent Y2Y report, protected landscape linkages will also help many species adapt more readily to climate change. Although grizzlies in the Yellowstone and Northern Continental Divide Ecosystems are faring well at approximately 1,100 individuals, that isn't the case for their Cabinet-Purcell counterparts. According to the Interagency Grizzly Bear Committee, there are no more than 40 grizzlies in the entire U.S. portion of the Cabinet-Purcell mountain region. *Source: Vital Ground Foundation*

OREGON—In April, the Oregon House of Representatives voted 51 to 9 in favor of allowing authorities to prohibit people from feeding bears, wolves, and cougars. The bill, which is currently in the state Senate, would allow police to issue warnings to people feeding dangerous wildlife, though it does not specify a penalty if someone doesn't comply. The bill is an effort to keep wildlife from getting habituated to humans, and follows on the heels of an incident in Lincoln County where a woman refused to stop feeding bears at her home. When the woman was away on vacation, the bears, in their quest for food, damaged her neighbor's property and endangered nearby residents. *Source: Oregon State Legislature*

■ North Central

OHIO—White-nose syndrome (WNS) appears to have crept into Ohio, raising the total number of WNS-affected U.S. states to 18. In March, officials with the Ohio Department of Natural Resources' Division of Wildlife confirmed the first case of WNS in hibernating bats in an abandoned mine in the Wayne National Forest of Lawrence County. More than 1,300 bats

were found hibernating in the mine, of which 69 percent are little brown bats (*Myotis lucifugus*), 21 percent are endangered Indiana bats (*Myotis sodalis*), and 10 percent are tri-colored bats (*Perimyotis subflavus*). Smaller numbers of big brown (*Eptesicus fuscus*) and northern (*Eptesicus nilssonii*) bats also use the cave. Authorities will continue to monitor Ohio bats and hibernacula for surveillance of the disease within the state. *Source: Ohio Department of Natural Resources*

■ Western

CALIFORNIA—The Monterey Ranger District of the Los Padres National Forest is seeking public comments over a \$4.2-million project to protect California condors in and around the forest's land. The project—dubbed the Big Sur Condor Retrofit Project—is part of the Pacific Gas and Electric Company's avian protection plan for migratory and threatened and endangered birds in the region. Over the last few years, the company has worked with the U.S. Fish and Wildlife Service and the U.S. Forest Service to identify ways to minimize the impact of its projects on wildlife. If approved, the company will move overhead power lines underground. *Source: U.S. Forest Service*



Credit: USFWS

Power lines in California are the number one cause of death for the California condor. To reduce that threat, Pacific Gas and Electric Company plans to remove overhead power lines installed in and around Los Padres National Forest, and move them underground.



Credit: Jon Sullivan

The orange-fronted parakeet (*Cyanoramphus malherbi*), endemic to New Zealand, is one of 20 foreign species added to the list of candidates for ESA protection. The species faces threats from introduced predators and habitat loss. Roughly 100 to 200 parakeets are left in the wild.

Central Mountains and Plains

COLORADO—The Colorado General Assembly has voted to merge Colorado State Parks and the Colorado Division of Wildlife into one entity: The Colorado Division of Parks and Wildlife. Although the merger is primarily a means to find more efficiency in the state government, the legislation doesn't actually chalk out a concrete plan or set an ideal cost-savings goal for the new agency. The bill has been cleared in the House and Senate and is awaiting the Governor's signature. *Source: Colorado Department of Natural Resources*

SOUTH DAKOTA—The U.S. Fish and Wildlife Service has launched a plan to protect nearly two million acres of native prairie and working lands in an area crossing the North Dakota-South Dakota border in the heart of the Prairie Pothole Region. As part of this \$500-million plan, dubbed the Dakota Grassland Conservation Area, federal officials will work with private landowners and other partners to acquire perpetual conservation easements on 238,000 acres of wetlands and 1.7 million acres of grassland in the region. These easements will restrict commercial development on the land while still allowing some agricultural use. Although the payment for the easement will depend on the land's productivity, payments will range from one-third to one-half of the land's assessed market value. More than 500 private landowners in the project area, many of whom are in South Dakota, are currently waiting to participate in the easement program. *Source: USFWS*

Canada

ALBERTA—In an effort to protect wildlife species and their habitat, the Alberta government has proposed a new regional

plan that would affect a number of oil sands leases in the region. Based on the plan, the government will set aside 20 percent of the Athabasca Region, which includes oil sands, parts of the boreal forest, and Canadian Shield. The plan will affect 14 energy companies and 10 mineral groups that have leases on the soon-to-be protected area. *Source: Government of Alberta*

Southwest

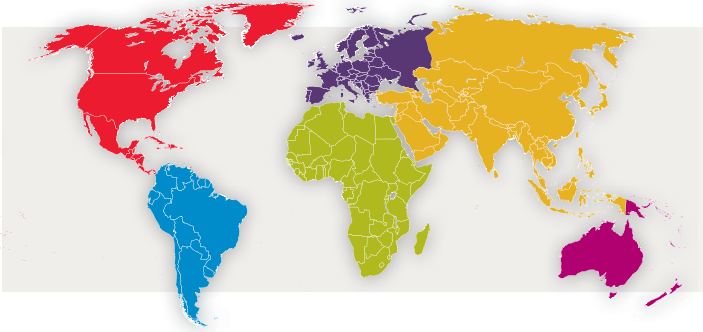
MEXICO—Beginning in March, Mexico's Coahuila State blazed for more than a month after electrical storms triggered wildfires and dry weather exacerbated the disaster. As a result, in April, officials with the Environmental Protection Agency began feeding wildlife across the state. According to government sources, Agency personnel provided 12 tons of nutritionally supplemented animal feed, which contained 12 percent protein and 6 percent fiber, for cattle, sheep, deer, and bears. The feed was discontinued after two weeks to ensure that wildlife did not start to depend solely on the feedings. In all, the fire impacted more than 550,000 acres of pastures and forests. *Source: PROFEPA*

General

The U.S. Fish and Wildlife Service (FWS) recently launched a virtual book club—America's Wild Read—to encourage readers to connect with nature. The club's first pick was E.O. Wilson's *Anthill*, along with a number of essays, including Aldo Leopold's *Thinking Like a Mountain* and *The Once and Future Land Ethic* by Curt Meine, director for Conservation Biology and History at the Center for Humans and Nature. Book club registrants were asked to read the book and essays and post their thoughts and insights on an online forum. The club will culminate the week of July 10, when the Service's National Wildlife Refuge System unveils its new 10-year vision at a conference in Madison, Wisconsin. *Source: USFWS*

General

The U.S. Fish and Wildlife Service (FWS) has released its Annual Notice of Review of Foreign Species—an assessment of foreign plants and animals that determines whether they should receive protection under the Endangered Species Act (ESA). FWS added 20 foreign species, including the Chatham oystercatcher (*Haematopus chathamensis*) found on Chatham Islands in New Zealand and Harris' mimic swallowtail (*Eurytides lysithous harrisianus*) found in Brazil, as candidates for ESA protection. By listing foreign species as threatened or endangered, the FWS hopes not only to raise awareness of the threats these species face, but also to ensure that people under United States jurisdiction do not contribute to the decline of these species. Currently, there are 5,594 foreign species listed under the ESA. *Source: USFWS*



International

News and events affecting wildlife and wildlife professionals around the world

■ Australia

According to a recent study by Australia's Commonwealth Scientific and Industrial Research Organization, a large number of birds, lizards, and mammals found in the remote northwestern Kimberly region run the risk of going extinct. The region's burgeoning population of feral cats is responsible for a large decline in wildlife numbers. In addition, forest fires and wild donkeys and goats have destroyed expanses of native habitat. Nearly 30 percent of the species identified in the study are found almost exclusively in the Kimberly region, while others, such as the golden-backed tree rat (*Mesembriomys macrurus*) and golden bandicoot (*Isodon auratus*), were driven to this region after being extirpated elsewhere in the country. In addition to educating the public on the seriousness of the issue, researchers urge the government to contribute close to \$100 million dollars to launch a wide range of conservation programs, as well as spend an additional \$40 million a year to protect the region's native animals. *Source: Commonwealth Scientific and Industrial Research Organization*

■ Greece

After several weeks of debate and discussion, the Greek Parliament voted in favor of introducing its first national biodiversity law, which has several solid provisions to protect wildlife and habitat. For example, under the new law, authorities will develop a science-based system to identify and maintain protected areas in Greece, as well as adopt urgent conservation measures to address critical habitat degradation and a rapid decline of species. The law not only allows



For comments or suggestions, or to submit news briefs for the State of Wildlife section, contact Divya Abhat, divya@wildlife.org.

authorities to impose sanctions on crimes against biodiversity, it also provides a legal framework for the protection of small island wetlands. In addition, authorities have crafted measures to protect marine species and habitats. *Source: WWF*

■ United Kingdom

A 74-acre bog near Stirling City in Scotland has been declared the first UK reserve for the large heath butterfly (*Coenonympha tullia*). In the UK this rare species is only found in wet, boggy habitats in Northern Ireland and northern Britain. Unfortunately, according to conservation group Butterfly Conservation, in some parts of lowland Scotland 90 percent of the large heath butterfly's habitat has been destroyed by forestry, agriculture, and the extraction of peat, which is used as a soil conditioner for horticulture. In an effort to protect the species, Butterfly Conservation and the Stirling Council will recruit volunteers to improve the recently designated butterfly reserve by blocking ditches and removing self-seeded trees and bushes.

Source: Butterfly Conservation Scotland

■ India

There's some cause for celebration among tiger conservationists in India. According to the latest official census, the number of Bengal tigers (*Panthera tigris tigris*) in the country has increased for the first time in a decade, bringing the total up to around 1,500. This is a welcome change from the 97 percent decline of the species globally in the last century, largely a result of poaching and habitat destruction and urban expansion. In all, there are as few as 3,200 wild tigers in the world.

Source: WWF



Credit: ©Staffan Widstrand/WWF

A Bengal tiger (*Panthera tigris tigris*) rests in Bandhavgarh National Park in central India. Recent population studies show that tigers in India are faring better than their predecessors, largely because of a widespread crackdown on poachers.

One Community at a Time

Biologist *ALEJANDRO JUÁREZ REINA* connects with Mexico's farmers

By Madeleine Thomas



Courtesy of Alejandro Juárez Reina

Alejandro Juárez Reina (left) guides a film production crew from L.L. Bean as they scan the landscape for Coues white-tailed deer (*Odocoileus virginianus couesi*) last January in Sonora, a state in northwest Mexico. The owner of his own environmental consulting firm, Juárez Reina holds contracts for a variety of wildlife management-related projects throughout his native Mexico.

Mexico may be one of the top three most biologically diverse nations on the planet (Valdez *et al.* 2006), yet it lacks an established wildlife management educational curriculum, a result of widespread national debt and frequent environmental policy shifts within its government. This power vacuum means that landowners have few incentives to protect and manage the myriad species, climate zones, and habitat types that exist across the country.

Despite these obstacles, professional wildlife management is gradually taking hold. As a leader in this effort, wildlife biologist Alejandro Juárez Reina is helping to reinvent Mexico's stance toward conservation by engaging stakeholders at all levels, from the top tiers of government to some of Mexico's smallest farming communities.

Originally from Puebla in southern Mexico, Juárez Reina spent two semesters at New Mexico State University (NMSU) before finishing his bachelor's degree in biology at the University of Texas at El Paso in 2006. While he was at NMSU, he met Raul Valdez, a professor in the Department of Fish, Wildlife and Conservation Ecology. Valdez says Juárez Reina's passion for the wildlife profession was evident from the first weeks of his freshman year. "I knew he could develop into a fabulous wildlife

biologist," Valdez says. Valdez took Juárez Reina under his wing, introducing him to graduate students and fellow wildlife professionals, and bringing him along on field trips into northern Mexican states to observe jaguars, mule deer, and bighorn sheep in the wild. Even now, five years after Juárez Reina graduated, he and Valdez still talk frequently, and Valdez travels to Puebla periodically during the year to visit and advise him on his newly founded environmental consulting firm, Colin Consultores en Vida Silvestre.

Many of the firm's projects—a caseload worth more than a quarter million dollars so far—are contracts from the Mexican government, though private landowners and corporations also make use of the firm's services. Most recently, Juárez Reina's company worked in Tlaxcala, a state in east-central Mexico, to compile an illustrated bird watching field guide. Juárez Reina and his team are also helping to draft management plans for the Mearns' quail (*Cyrtonyx montezumae*) and are assessing the ecology and habitat of the Mexican mallard (*Anas platyrhynchos diazi*) in northern Tlaxcala as well.

Hunting Helps Restore a State

Prior to forming his firm last year, Juárez Reina served as state coordinator for Puebla's wildlife program from 2008 to 2010. Puebla's landscape is home to a variety of game mammals including white-tailed deer, pumas, raccoons, coyotes, and doves, yet the majority of the state's poor farming community has traditionally known little about sustainable land management and its link to healthy wildlife populations and habitat. Most ranchlands have been repeatedly and unknowingly overgrazed, says Juárez Reina, an unfortunate consequence of mismanaging livestock such as cattle and sheep. In fact, nearly 80 percent of Mexico's total land area is subject to erosion from agriculture, deforestation, and overgrazing (Valdez *et al.* 2006).

Though many of Puebla's residents had long been subsistence hunters, hunting as an organized industry was virtually unheard of when Juárez Reina arrived on the job in 2008. Even now, it's just starting to take hold as a wildlife management tool in some of Mexico's rural towns. Juárez

Reina quickly saw that hunting—and the revenue it generates—could be an incentive for landowners to manage their livestock and property more sustainably to encourage more wildlife to visit the land. As Puebla's state coordinator, he personally visited a number of small farming communities to explain that if wildlife numbers increased, hunters from other parts of the country—or even other countries altogether—might want to pay landowners for access to hunt.

Juárez Reina taught the farmers basic hunting strategies: how to look for scat or markings, and how to stealthily stalk animals. He also trained many locals as outfitters and guides, encouraging them to invite outside hunters into their communities. His efforts have been so successful that Puebla's recent hunting season was completely booked, with some communities bringing in hunting revenue upwards

of \$10,000 per season. "It changed not only the economy but also their way of thinking," he says.

Eventually, Juárez Reina says he would like to take his consulting firm into the classroom to engage Mexico's next generation of potential wildlife professionals, offering trips into the field to study native species and habitat. He'd also like to earn a doctorate in natural resources management, but until then, he plans to continue garnering support for wildlife management and conservation—at the community level and nationally. It's a task for which this enthusiastic professional seems well qualified. "[Juárez Reina] has all the great qualities of a great wildlife biologist, but he's also a great promoter," says Valdez. "He can deal with people from the richest person to the most rural resident. He's special in that regard." The wildlife profession, in Mexico and elsewhere across the continent, depends on just such an ability to connect. ■

Madeleine Thomas is the Editorial Intern for The Wildlife Society.

To connect with a mentor or mentee, go to <http://mentor.wildlife.org/about>

MENTOR Raul Valdez

Professor, Department of Fish, Wildlife and Conservation Ecology, New Mexico State University

Until the 1990s, fewer than 15 Mexican students had graduated with degrees in wildlife science from American universities, and there's still not one undergraduate program in all of Mexico that offers a degree in wildlife (Valdez *et al.* 2006). New Mexico State University (NMSU) professor Raul Valdez has helped fill that gap by mentoring students from Mexico who aspire to a career in the wildlife profession.

One of those mentees, Alejandro Juárez Reina, fondly remembers an early encounter with Valdez at NMSU. It was Juárez Reina's birthday, and Valdez had invited him to his home for dinner along with a few Ph.D. students from the wildlife department. This was a privilege for Juárez Reina—a freshman undergraduate—and provided an introduction to some promising up-and-coming wildlife professionals. Though he got stuck with washing the dinner dishes (a bit of friendly hazing from Valdez), the evening paid off for Juárez Reina. "I knew there was something special about him," says Valdez. "He wanted to know about the relationship between animals and their environments. He was downright passionate."

The same goes for Valdez. After earning a bachelor's degree in biology in 1965 from Texas Western College (now the University of Texas-El Paso), Valdez became the second Hispanic in the U.S., after A. Starker Leopold, to graduate with a Ph.D. in wildlife biology, earning his degree from Texas A&M University in 1970. From 1971 to 1973, he volunteered with the Peace Corps in northwestern Iran, conducting ecological and behavioral studies of

Anatolian wild sheep. Valdez says he fell in love with the country, and once his Peace Corps tenure was through, it was just too hard to leave. He stayed in Iran until 1975, working for the Department of the Environment in Tehran as the head of the wild sheep unit and as an advisor for the country's wildlife management program.

Valdez then returned to the U.S. to teach at Texas A&M in the Department of Wildlife and Fisheries Sciences. Then, in 1977, he joined the faculty at NMSU, where he currently works as a professor in the Department of Fish, Wildlife and Conservation Ecology. He specializes in game management and community-based wildlife programs, and continues to conduct field research in Asia.

In his nearly 35 years at NMSU, mentoring his students has always been a priority. Also, as the first-generation son of Mexican immigrants, Valdez has a "great interest in promoting wildlife causes in Mexico," he says. In the past, the Mexican government did not see a need to bring wildlife management into government policy or into undergraduate and graduate curricula, but Valdez says this has all changed as demand for wildlife professionals grows. "Now [the state and federal government] see it as a form of rural development, and now more than ever, they're delegating [power] more to the states," Valdez says—a promising sign for the future of wildlife management and education in Mexico.



Courtesy of Aaron Bueno-Cabrera

Raul Valdez shows a peccary skull to a mammalogy class at New Mexico State University.

Why Diversity Matters

Broadening Our Reach Will Sustain Natural Resources



Coast Guard Fireman De'Jon Williams (left) and colleagues help NOAA biologist Jeff Gearhart (right) release endangered sea turtles off the Florida coast, part of an effort to save thousands of turtles that had suffered from unusually frigid temperatures.

Credit: Petty Officer 3rd Class Jaclyn Young



NOTED STATISTICIAN and business consultant W. Edwards Deming was a 20th-century thinker who taught corporations how to adapt and prosper in changing times. Known for his subtle humor, he once wrote, “It is not necessary to change. Survival is not mandatory.”

That wisdom should resonate with all of us in the wildlife profession. We face a simple truth: Unless we diversify our ranks and become more representative of the nation’s changing demographics, our profession and the resources we protect will not survive. This reality doesn’t hinge on a philosophical debate about whether achieving diversity is the “right” thing to do. It’s simply the “smart” thing to do. And it’s consistent with the premise of the North American Model—to conserve our diverse natural resources for the benefit of all.

By the Numbers

We live in a world where change is natural. Just as biological communities continue to evolve, so does the face and size of our nation. According to the recent 2010 national Census, the United States now has close to 309 million people, 51 percent of whom are women ([Census 2010](#)). All segments of our population are growing in number, though as a percentage of the total population, Hispanic, Asian, and multiracial segments are expanding at a greater rate while blacks are holding steady and whites are declining in proportion. Here’s a Census snapshot of our nation today:

- People identifying their race as white make up 72.4 percent of the total population, down from 75.1 in 2000.
- Hispanics or Latinos may be of any race and comprise 16.3 percent of the U.S. population, a jump of 43 percent over 2000. Hispanics are now the largest minority group in the nation, and more than half of the growth in the total population

By Roel Lopez, Ph.D., and Columbus H. Brown

Toiling in southeast Texas, two young volunteers plant a small sapling as part of a project to restore the Anahuac National Wildlife Refuge after damage from Hurricane Ike. Such disasters often spark a sense of ownership and environmentalism, which wildlife professionals can help channel into long-term natural resources stewardship.



Steve Hillebrand/USFWS

ern states, areas where careful wildlife and habitat management is necessary to restore and protect imperiled ecosystems and sustain diverse populations of resident and migratory wildlife species. Nevada, for example, has seen the steepest population increase, up 35 percent in just 10 years, just one of many western states facing mounting challenges with dwindling water supplies.

In light of such challenges, a broad base of stakeholders is essential for the sustainable use and conservation of natural resources. This means that scientists and managers themselves should

Unless we diversify our ranks and become more representative of the nation's changing demographics, our profession and the resources we protect will not survive.



Courtesy of Roel Lopez

Roel Lopez, Ph.D., is Associate Director for the Texas A&M Institute of Renewable Natural Resources.

from 2000 to 2010 was due to the increase in the Hispanic population.

- African Americans make up 12.6 percent of the total population, up slightly from a decade ago.
- Asians comprise only 4.8 percent of the U.S. total, but their absolute numbers have jumped by 43.3 percent, the largest percentage increase for any ethnic group.

When you consider that nine million people identify themselves as “two or more races,” and add in the millions of Native Americans, Alaska Natives, Native Hawaiians, Pacific Islanders, and other ethnic and racial groups, you get a clear sense that the overall population is increasingly multicultural.

In stark contrast, consider the percentages of people with college degrees working in fields related to science, technology, engineering, and math—the STEM professions: 74 percent are male and 73 percent are white. Asian Americans, at 16 percent, are the only ethnic minority in double digits, while African Americans, Hispanics, and other groups are each below 5 percent (NSF 2009).

This matters for wildlife. The vast majority of the nation's growth is occurring in southern and west-

be more representative of the diverse populations they serve (Cuker 2001). Just as ecologists recognize the value of ecosystem biodiversity, natural resource professionals must recognize the value of workforce diversity and its role in sustaining our profession. Diversity will also provide an opportunity to increase engagement with natural resources and ensure their viability. Given that the North American Model mandates a democratic, inclusive approach to natural resource use and management, diversity is also key to ensuring the continued vitality of the Model and its benefits to conservation.

The Economic Equation

It's important to view this issue through an economic lens. Natural resources have become commodities, and their uses are global. Through an intricate international web, nations transport their fruits, grains, spices, hardwoods, oil, coffee, fish, and fur across multiple time zones overnight. In some cases, the increase in Fair Trade products in global markets has helped to protect local economies and promote local conservation efforts in developing countries. Conversely, demand for commodities, such as palm oil from Indonesia or soybeans from Brazil, has led to the rapid defor-



Courtesy of Columbus H. Brown

Columbus H. Brown retired from the U.S. Fish and Wildlife Service in 2008 after 35 years of service as a biologist and administrator.

estation of rainforests (Butler 2008), threatening crucial wildlife habitat and hunter-gatherer cultures. Overall, our natural resources have never been more vulnerable, and never before has garnering financial support and personal commitment from emerging stakeholders been more crucial to sustainable natural resource conservation.

We contend that greater stakeholder participation would result in greater acceptance of management actions, increased support for conservation initiatives and policies and, consequently, greater financial support. Engaging emergent stakeholders is therefore particularly relevant today, given the shrinking budgets for conservation programs across the globe. Indeed, economic theory suggests that we must diversify our “customer base” in order to increase our “market share,” particularly from emergent populations or “consumers.”

Fortune 500 companies seize the opportunity to innovate their product lines to meet the needs of emergent stakeholders. (Consider the rise in sales of salsa as a competitor to ketchup; Bialik 2007). Such companies also recognize the need to hire people from diverse walks of life to tap their specialized insights and knowledge of emerging markets. Similarly, companies or organizations that directly interact with the public are finding it increasingly important to have a workforce that reflects their customer base. Buying power today is represented by people of all genders, races, ages, and ethnic cultures. It’s therefore logical to assume that the more these customers can relate to a company or organization, the more likely they are to support it.

We need to apply such economic thinking to the wildlife profession, a “business” that must adjust to an increasingly urban and multicultural base.

The rapidly growing Latino population, for example, offers us an opportunity to engage a disengaged stakeholder group, and the need to garner more African American support continues to grow. But how do we engage such stakeholders and gain their support for conservation? Is the wildlife profession seizing the opportunity to expand its market share?

Statistics suggest that it’s not. In 2010 we reviewed two common metrics of diversity—gender and ethnicity—to determine our profession’s progress in engaging historically underrepresented or disengaged stakeholders. We found that although the number of women earning bachelor’s-level degrees in natural-resources fields has surpassed men on average for the last 10 years (NSF 2008), women remain underrepresented in the profession. In addi-

Steve Yamashita Northeast Regional Manager, Colorado Division of Wildlife

As a child growing up in the Denver area, Steve Yamashita had a natural affinity for all things wildlife. “When I was young, anytime a Division of Wildlife [television] spot would come up, I’d go running to the TV,” he says. But it wasn’t until the end of college at the University of Colorado-Boulder, when employees from the DOW showed up to find recruits for a six-month internship, that he considered actually working for the agency. Now approaching 30 years of service, the northeast regional manager says that “getting better information out to the people who seek it” may be the way to increase interest in the wildlife profession, and likewise boost the diversity of those working in the field.

A third-generation Japanese-American, Yamashita notes that he may have disappointed his parents a bit by taking a job working for state government, as opposed to pursuing a career as a doctor, dentist, or lawyer. “It’s stereotypical, but it seems Asian-Americans are more inclined to become engineers or something math-oriented,” he says, noting that his own daughter is a math major at Colorado’s Mesa State College. But Yamashita’s son chose to follow in his father’s footsteps, join-



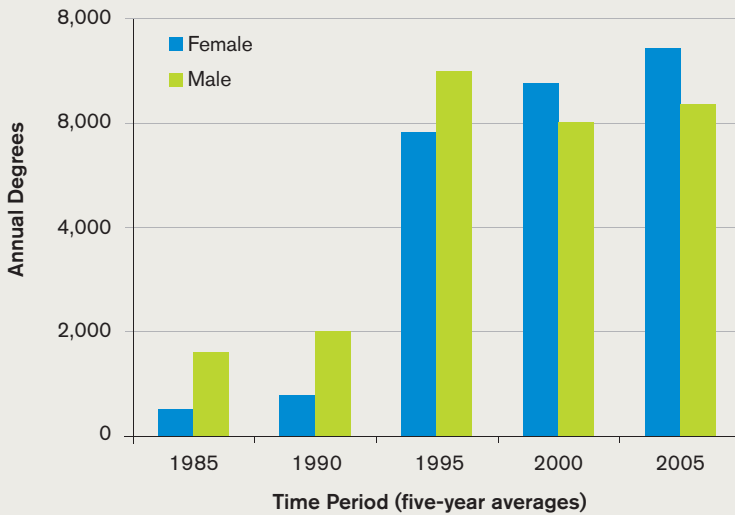
Courtesy of Steve Yamashita

Proud dad Steve Yamashita (right) stands with his son Matt (center) and retired DOW deputy director Mark Konishi at Matt’s graduation ceremony. The three are the only Asian Americans who have served as district wildlife managers for the Colorado agency.

ing the DOW four years ago and now serving as a district wildlife manager.

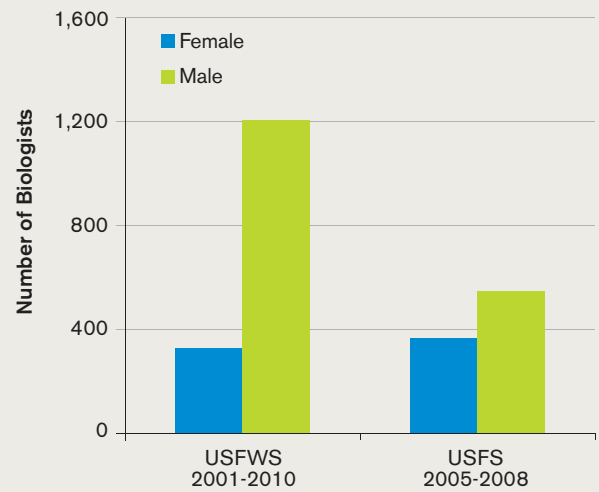
Yamashita believes wildlifers need to work harder to increase the diversity in their ranks. “We haven’t neglected [minority] constituencies, but we haven’t gone out of our way to serve them either.” He’s discussed the issue with the agency’s human resources manager, but acknowledges that it won’t be an easy task. “It’s a cultural thing, and that’s difficult to broach.” As far as he can tell, most people are like himself: They find their passion at an early age. Yamashita says reaching out to students at the junior and high school levels, or even younger, may be the right strategy to spark a latent interest in the natural world.

College Degrees in Natural-Resources Fields by Gender



Credit: National Science Foundation

Gender in the U.S. Fish & Wildlife Service and U.S. Forest Service



Credit: USFWS and USFS

tion, participation by racially and ethnically diverse groups remains minimal. The Wildlife Society (TWS) reflects these trends: Two-thirds of our members are men. The majority (57 percent) identify themselves as Caucasian and 39 percent give no an-

swer about race. The remainder identify themselves as Other (1.2 percent), Hispanic (1.15 percent), Asian (0.92 percent), Native (0.5 percent), and African American (0.37 percent). The bottom line: As a profession we have failed to increase participation of minority stakeholder groups and diversify our market share.



Credit: LaVonda Walton/USFWS

U.S. Fish and Wildlife employees Leslie Pokladnik (left) and Pat Carter give school children information about fishing and aquatic ecosystems at the 2009 River Bass Tournament held at the National Harbor in Baltimore. The annual event—organized by the Living Classrooms Foundation, FWS, and several other partners—gives hundreds of underserved children in the Washington D.C. area an opportunity to fish with professional bass anglers and participate in other outdoor activities.

It is clear that the economic path we are on is not sustainable. Recognizing this, TWS has taken some positive steps to encourage diversity through its Career Center, internships, Leadership Institute, mentoring program, Native American grant program, and other initiatives. In addition, TWS' Southeastern Section and the Southeastern Association of Fish and Wildlife Agencies formed the Minorities in the Natural Resources Committee (MIN-RC), which helps state and federal natural resource agencies to increase the numbers of minorities and women in professional occupations.

Despite such efforts, however, our profession has failed to make much of a dent in the disparity between current demographics and participation of underrepresented groups as stakeholders or employees. We



have a “deficit,” so conducting “business as usual” defies logic. As Albert Einstein reportedly said, the definition of insanity is doing the same thing over and over again and expecting different results. So what can we do differently? We must search for alternative solutions to increase our consumer base. Accordingly, we offer the following thoughts and strategies:

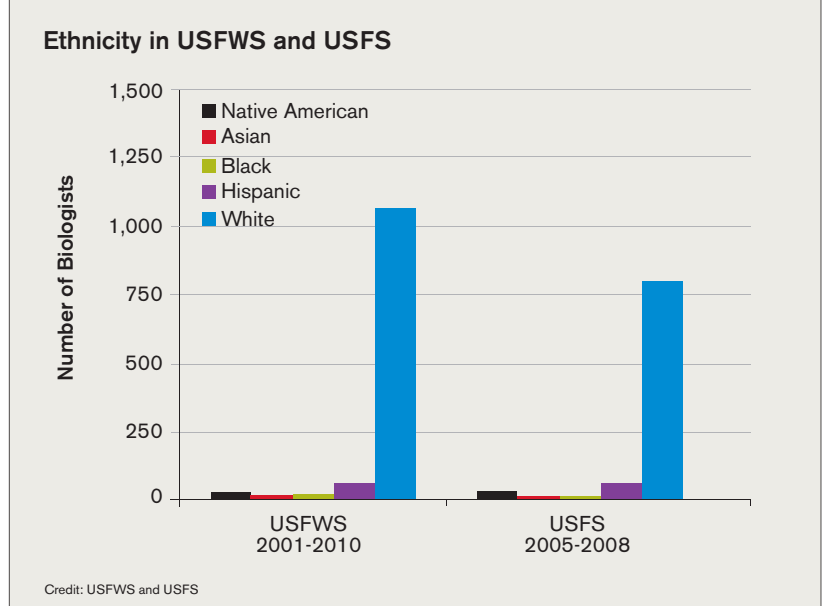
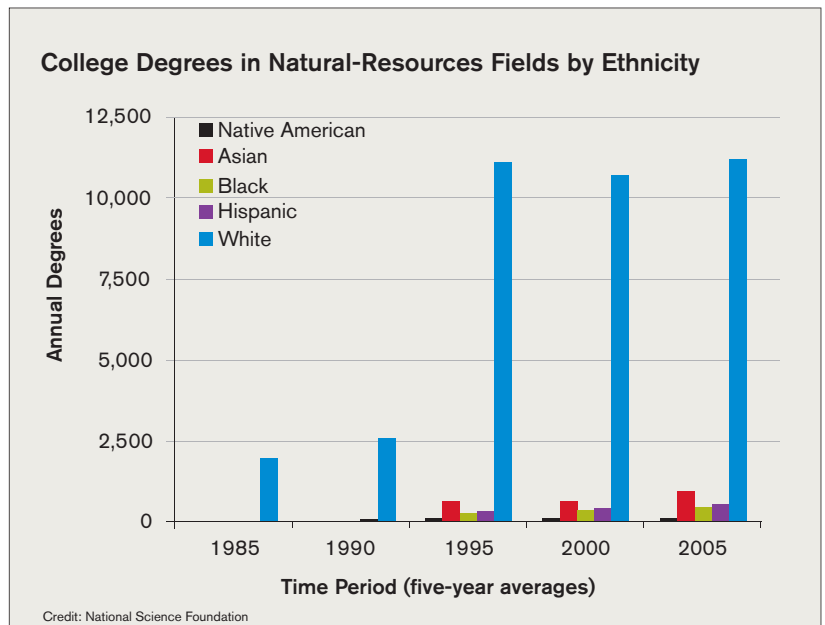
Address the pipeline. The concept of a “limited pool” of potential stakeholders and future employees is a myth. We simply aren’t effectively tapping into all available resources. We must therefore find creative ways to engage diverse groups of people while they are still young, preferably in grade school, and not just wait until career paths have already been chosen. To help address the pipeline issue, the National Science Foundation’s Committee on Equal Opportunities in Science and Engineering (CEOSE) strives to increase the participation of women and underrepresented minorities in the STEM fields by promoting more-effective STEM education at all levels and encouraging employers to offer hands-on experience, grants, mentoring, and programs focused on diversity.

In the wildlife profession, similar efforts will require a long-term strategy. We’ll need to work in partnership not only with well-established wildlife programs in major colleges and universities, but also with Cooperative Wildlife Research Units, Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), tribal colleges, community colleges, and other institutions that serve underrepresented groups. We also need to develop new tools to communicate with youth and young adults, including social networking and “apps” that generate excitement and information about the wildlife profession. Through early positive engagement and exposure to wildlife careers, we can help ensure long-term support for natural resource conservation.

Increase career awareness. The wildlife profession is invisible to many of the kids and their parents whom we’re trying to reach, particularly those in highly urban environments. We’ve been disengaged, offering few role models in local communities and on national media. We therefore need to be smarter about how we market our profession, using TV, the Internet, school programs, and career counselors. We should place new hires in

areas where they can serve as role models, and make diversity outreach a standard part of the job description. We also need to be aware that the new “Millennial” generation wants careers that use technology, make a difference, and provide opportunities for growth—meaning we must show how these goals are achievable in the wildlife profession.

Tap into environmentalism. Public awareness of environmental and natural resource issues is on the rise with the bombardment of news about climate change, oil spills, energy extraction, invasive species, and the like. We



Gillian Bowser
Research Scientist,
Colorado State University

Tapping the Social Network

According to Gillian Bowser, the struggles faced by minorities within the wildlife profession are boundless, spanning across college campuses to the far reaches of some of the nation's most remote National Parks. Now a research scientist at Colorado State University's Natural Resource Ecology Laboratory, Bowser began her career in 1981 with the National Park Service (NPS), moving from Yellowstone and Joshua Tree to become special assistant to the director in Washington, D.C., then assistant chief of resources at Wrangell-St. Elias in Alaska.



Courtesy of Gillian Bowser

One of the biggest obstacles preventing diversity in the profession, she says, is failing to understand the difficulties that minorities may face on the job, especially when students or workers are stationed in environments far away from their peers, families, and social networks. "Even to this day," says Bowser, "the National Park Service will recruit one minority student and place them in a remote park" where there are no similar peers. "We haven't changed that model." Bowser suggests that when making job placements, the NPS and other agencies need to consider social networks and norms that minorities can connect to.

Gillian Bowser had excellent mentors, but many minority students are not as lucky and often feel isolated and alienated. Bowser says mentors, peers, and co-workers must help create an environment where students feel supported.

Unfortunately, racism is still a factor in some communities where professionals work or students attend school. During some of her own stations with the Park Service, Bowser says she experienced racist remarks and behaviors. Even now, it's not uncommon for her minority students to have similar encounters, she says. "Sometimes, the scariest things to run into on the trail are the hikers, not the wildlife, for the chance that they may not be tolerant of racial minorities. And some remote towns are less accepting of minorities—especially those who also happen to be from urban environments."

If colleges, universities, and jobs within the wildlife field would recruit more minorities and establish stronger mentoring and diverse social networks, both students and professionals would feel a greater sense of community, partnership, acceptance, and trust, says Bowser, which would lead to increased involvement and retention in the field. For minority students and young professionals, it's also important that teachers, colleagues, and mentors be sensitive to their needs. That means paying attention to hardships such as overt racism, alienation, and a sense of personal safety, as well as to smaller details such as a town's attitudes toward interracial dating, or the importance of finding a religious community that meets the needs of minority students.

Too many professionals see such mentoring as a chore rather than a privilege, says Bowser. "There's a difference between checking in and caring. You have to have a bigger picture than just a number on the form that says that the department is diverse. ... It should be seen as a critical element, and not as a checked box."

need to capitalize on the growing environmental ethic by linking it to careers in wildlife management and conservation. Critical to this effort is collaboration with colleges, agencies, and organizations engaging in programs that are already achieving some success, such as the Student Conservation Association (SCA) or the Student Career Experience Program (SCEP).

Train our own. Diversity in the workforce is often broadened to include global diversity through the hiring of people from other nations. However, for effective natural resource management in North America, we believe the primary focus should be on diversifying our domestic workforce from within, and reaffirming the dream of the Civil Rights era. Natural resource agencies should explore Intergovernmental Personnel Act (IPA) assignments, which allow temporary placements of targeted employees among federal, state, and local governments, colleges, tribal groups, research centers, and other organizations. We should also work with career counselors and teachers to develop relationships with the "gatekeepers" at local institutions, informing them of the needs, abilities, and ambitions of underrepresented students so these students will be encouraged—rather than dissuaded—from pursuing their goals.

Retention. All of the above recruitment efforts will be meaningless if diverse employees and stakeholders are not retained after they enter the profession. Unfortunately, some members of the wildlife profession express cultural attitudes, beliefs, and biases that may deter the retention of minorities. Likewise, different ethnic groups may have their own biases against the wildlife profession (i.e., that it's low paying or low status). Employers need to be aware of both sides of the equation and promote a positive, culturally respectful work environment with opportunities for meaningful dialogue among diverse groups. By offering supportive mentors who are culturally literate and sensitive to the needs of new recruits, and by providing meaningful opportunities for advancement, employers will go a long way toward increasing diversity.

It's human nature that those who are presently in control often feel the need to remain in control

(Coleman 1994). The success of any diversity strategy therefore hinges on our will to change as a profession. Doing so will uphold the North American Model by ensuring the conservation and sustainability of our natural resources for all. It also makes sense for our “business,” as the future of natural resources will be increasingly tied to diverse stakeholders and their engagement (Floyd 1999, Taylor 2002). Recognizing this is essential for our profession, particularly in light of the substantial numbers of retirements among baby boomers. Ultimately, diversity is the key to the

survival of both natural resources and our profession, so we’d be wise to embrace it. To paraphrase Deming, survival is not mandatory, but it sure beats the alternative. ■



For additional resources about promoting diversity in the wildlife profession, go to www.wildlife.org.

Marisela Moreno

Professor, California State University

Getting a Head Start

Sometimes all it takes is one not-so-wide-eyed student to turn the tables on a teacher and ask the tough question. “If you want us to be such good scientists, how come you didn’t become one?” a middle school student once asked Marisela Moreno. “We all have our epiphanies in life,” says Moreno, and that was hers.

A Texas-born Mexican-American, Moreno had earned a Bachelor’s degree in Educational Curriculum and Instruction from Texas A&M in 1988, and had since been teaching life science at the Lamar Junior High School in Rosenberg, Texas. But after her classroom epiphany, in 1992 Moreno returned to her alma mater to pursue a Master’s in Wildlife and Fisheries Sciences with a focus on Human Dimensions. Then it was her turn to ask the tough questions: What would it take to recruit more individuals into the natural resources track? And what was being done to recruit more women, African-Americans, and other minority groups?

In search of answers, Moreno launched an extensive survey of minority professionals in the entire southeastern United States, only to discover a general lack of awareness and interest in the wildlife profession. “It’s not a profession that most people think of as glamorous,” Moreno says, and as a result tends to take a backseat to more traditional careers, such as medicine and engineer-



Credit: Stephanie Lugo

Science and math teacher Marisela Moreno (seated at left) poses with her 8th grade students at Jefferson Leadership Academies in Long Beach, California, where she has taught for 11 years.

ing. Moreno’s research revealed that the best way to recruit wildlife professionals is to expose them to the career as early as possible. With renewed enthusiasm, Moreno did “what I had been doing all along—exposing young people to science.” Today, she teaches math and science to 6th, 7th, and 8th graders at Jefferson Leadership Academies in Long Beach, CA, and lectures on engineering, math, and science achievement at California State University.

Even as Moreno continues her research at Texas A&M University—this time identifying ways to retain wildlifera in the profession—she notes that things have changed significantly in the last decade. She saw evidence of it at The Wildlife Society’s 2010 Annual Conference in Snowbird, Utah. “The percentage of women was more than half, and there were so many people of color and diversity,” Moreno says. “Walls have been broken,” she notes, “and I’m sure barriers have been crossed.”

Lessons Learned from Life Experience

REFLECTIONS ON MY EARLY DAYS OF SERVICE WITH FWS

By Columbus H. Brown



Courtesy of Columbus H. Brown

Columbus H. Brown retired from the U.S. Fish and Wildlife Service in 2008 after 35 years of service as a biologist and administrator.

On New Year's Day 2011, I awoke in Puerto Rico, where I was vacationing with my wife. The island was familiar: Nearly four decades earlier, I had worked in Puerto Rico and the Virgin Islands at the start of my career as a biologist with the U.S. Fish and Wildlife Service (FWS), which I joined in 1972. On this recent New Year's morning, I reflected on those early days as an African American man working in a Spanish-speaking culture for a federal agency that was predominantly white. I experienced my share of racism in those years. But I also gained some insights about how we as a profession can effectively embrace diversity.

Initial views towards people are based upon stereotypes and inner attitudes about perceived differences or similarities. I was born in the Jim Crow era (post-World War II) and raised in an African American community outside Miami. I attended segregated schools, and experienced the rough road to integration after the Civil Rights Act of 1964. Some people may assume they "know me" through these facts, based on stereotypes. Yet my story is anything but stereotypical.

The small African American community where I grew up had the lowest crime rate of any community in Florida. My all-black elementary and high schools were very nurturing as well as disciplined, and there was an expectation that we students should excel. My high school emphasized the sciences and competed toe-to-toe in integrated science fairs in the Miami-Dade County School System, providing a strong foundation that prepared me for college.

Outside the classroom, I learned to appreciate and respect nature by fishing and spending time outdoors with my family. As a Boy Scout, I participated in an expedition at Philmont Scout Ranch in New Mexico with five others from my local community. So despite my suburban upbringing in the segregated South, I found a way to connect to the natural world. Does my story defy certain stereotypes? Yes. Am I unique? Yes—and everyone else is, too.

After earning a bachelor's of science in zoology at Florida Atlantic University, I pursued a master's in marine biology at Florida State University. I felt respected by my peers and the faculty, who valued what my cultural and ethnic background brought to our discussions. I think my perspectives on the environment caught people off guard. But it was my skin color that occasionally challenged peoples' integrity in the field—a test for me, my peers, and my professor.

Facing a Hostile Environment

The first substantial episode was when my white colleagues and I stopped for breakfast at a restaurant in Milton, Florida. We had been doing fieldwork in Escambia Bay, trying to determine the impacts of dredging on the physiology and ecology of area fishes. When we sat at a table in the restaurant, we were refused service due to my race. My major professor, Robert "Skip" Livingston, expressed his outrage, but the owner's husband told us to leave, "and don't come back—ya hear!" On another trip to the field, a man on shore fired three shots that landed very close to me as I was out in a small boat before dawn, taking water and sediment samples. It was not hunting season. I'll never know the real reason for those shots, but I came to understand that death comes only when your time is up—no sooner, no later. These experiences in Escambia Bay gave me the courage to pursue my dreams despite adversity.

Adversity kept coming. In 1972, I accepted a job as a fisheries biologist with the U.S. Fish and Wildlife Service. The position was in Vero Beach, Florida. At the time, no African Americans lived within the city limits. Though there was ample available housing, every vacancy I pursued evaporated. What made this transition even more complex was that I was finishing up at Florida State in Tallahassee, preparing to get married and go on a honeymoon, and about to start a new job—all within a ten-day timeframe. Help came from the top (though I didn't know it at the time) when Nathaniel P. Reed,

then assistant secretary of the Interior for Fish, Wildlife and Parks, told the mayor of Vero Beach that if I could not find a place to stay, he would move the entire payroll (15 tax-paying employees) out of Vero Beach. The day after my honeymoon, I reported for work and secured a place to stay in town within three miles of the office. I realize now that Reed took a huge gamble on my behalf, a gesture I'll never forget.

The entire staff was warm and welcoming. Early on, I was assigned a mentor, Curt Laffin, who showed me the ins and outs of the office. Staff members invited me into their homes, and we shared respect for each other and the work, which covered a huge slice of territory—ranging from South Carolina to South Florida and also Puerto Rico and the U.S. Virgin Islands (1,100 miles away).

Initially, I worked throughout Florida. Having been raised and educated in the state, I had a reasonable understanding of its cultural landscape. Shortly after I started work, however, a black man killed a white man in St. Croix, part of our field territory. My white peers were less inclined to work in Puerto Rico and the Virgin Islands after that. I began making trips there and eventually became the primary resource person for reviewing and conducting environmental analyses on a host of issues, including projects involving airport expansions, deep-water ports, wetlands development, pollution discharge pipelines, housing developments, and petrochemical plants.

To accomplish these tasks, I had to rely on help from local environmental professionals, officials, and stakeholders—a valuable lesson in the power of collaboration with those of different cultural backgrounds. Local birders and ornithologists helped me identify bird species and learn their local common names and habitats. Area fishermen helped me understand island practices and cultural attitudes about the environment. Whenever possible I also conducted field reviews with permitting officials from federal, state, commonwealth, territorial, or local governments. One of those officials, John Woods of the U.S. Virgin Islands, gave me a valuable cultural insight about 'island time.' "When you are already in paradise," he said, "there is no need to be in a hurry." From then on, I was more flexible in scheduling my project reviews. Such cultural lessons and local collaboration were essential in protecting and conserving wildlife.

I retired from the service in 2008, but over my 35-year career with FWS I witnessed many changes—in American society, in technology, and in the Service itself. Today, FWS is considerably more decentralized, and supervisors have more say in who will work for them. Yet the diversity gap in our profession remains. Part of the reason goes back to false assumptions.

Case in point: While attending the 2010 Southeastern Association of Fish and Wildlife Agencies (SEAFWA) meeting in Biloxi, Mississippi, I had a candid conversation with a colleague from a state agency. He wondered why there was a paucity of viable job candidates from diverse backgrounds in his state, and said that no African Americans would want to work for an agency like his where the pay was so low. I pointed out that SEAFWA's Minorities in the Natural Resources Committee (MINRC) was sponsoring students at that very conference who were actively looking for employment. Within five minutes, two students brought him résumés with the exact type of experience that he sought. Organizations that truly seek a diverse workforce can find qualified personnel to do the job.

Today's Challenge

So what will it take to bring meaningful diversity to the wildlife profession? Drawing from my experience, I can offer two perspectives. Employers must strive to banish stereotypes, offer a welcoming environment, provide mentors, expect excellence, be sensitive to cultural differences, respect employees' unique perspectives, back the staff in times of adversity, and provide opportunities for professional growth. Likewise, employees must embrace who they are, remain open to change, work with dedication, listen to others, build relationships, seek guidance when needed, and express gratitude to those who help along the way.

Despite increased racial and ethnic diversity in this country, progress remains slow. Since 1980, for example, integration in housing has essentially come to a halt ([Logan and Stult 2010](#)). A lack of integration remains conspicuously obvious in our profession, and that needs to change. I'm reminded of a quote from St. Augustine: "Hope has two beautiful daughters. Their names are anger and courage; anger at the way things are, and courage to see that they do not remain the way they are." It is my wish that the membership of The Wildlife Society and all natural-resource agencies will consider workforce diversity as essential and natural as wildlife diversity—and I challenge all of us to work to make this happen. ■

Crossing the Cultural Divide

THE CHALLENGE AND REWARDS OF MESHING CULTURE AND CAREER

By Seafha Blount



Credit: Sky Jacobs

Seafha Blount is studying for a Ph.D. in Natural Resource Studies with a minor in American Indian Studies at the University of Arizona.

In the fall of 2010, I stood at a podium and spoke to a crowd of more than 1,000 people at The Wildlife Society's Annual Conference in Snowbird, Utah—an experience I never fathomed I would have. Months earlier, I had received an email inviting me to be part of a plenary session on diversity. I reread that email several times to be sure that I was really being asked to speak at such a high-profile event.

From that day forward, I have often reflected on my life as a Native American woman and my pursuit of a career in wildlife, a profession where very few people share my cultural background. It can feel pretty isolating. I remember one experience in particular, when I heard a wildlife researcher describe the work he was doing on ancestral tribal lands. He listed all the stakeholders *except* the tribes he was working with. Too often, Native American perspectives come as an afterthought, considered only after a management program has already been set. I hope to address this divide by creating a Native American context for wildlife management, an effort that will help maintain diversity of wildlife, and also increase diversity in our field.

Enriched by Diversity

I am a blend of different cultures. My mother is Yurok and Karuk, and my father is Mexican. I was born in Yurok ancestral territory in California, was raised with my mother, and still identify most with the Yurok culture. My father lives only 30 minutes from the Yurok reservation. For more than a decade, I have spent nearly equal time between my “Mexican world” and my “Indian world,” and I continue to learn both the Spanish and Yurok languages.

My love of wildlife came early in life. My family did not have much money when I was growing up, but my mom provided things I asked for when she could. Instead of Barbies or princess dresses, I wanted educational materials about nature. In elementary school, I received dinosaur information cards, and I loved toting them around and imagining what the dinosaurs looked like and what type of habitat they utilized. I also received a subscription

to *Ranger Rick* magazine, and read each issue cover to cover, enjoying how the hero raccoon and his animal friends helped solve environmental problems.

My curiosity about nature—along with my need to stay connected to my roots—continued as I entered Missouri Southern State University, where I majored in biology with a minor in Spanish. But by entering college, I had to adjust to the world “out there,” one with a whole new reality. Learning and being active in multiple cultures while pursuing education is not simple. It was tremendously testing to be separated from my culture, unable to attend ceremonies, gather traditional foods, practice the language, or connect spiritually to the people and the land. I felt accepted, rejected, sought out, or misunderstood in some form almost every day. Yet facing such challenges has solidified my identity and given me strength, as I have had to learn to move between different worlds and realities.

The Bridge to a Wildlife Career

During college, I earned an internship with the Yurok Tribe Environmental Program to study water quality in the Klamath River. The data were to be used toward developing baseline water quality conditions for salmon and other fish, a critical endeavor after the 2002 Klamath River fish kill, which devastated the Yurok and others. After I received a bachelor's of science, I wanted to continue to build my skills at graduate school. The University of Arizona was my top choice because it has one of the largest Native American student populations in the country, and I longed for that experience. I was blessed to receive a Sloan Indigenous Fellowship to enroll in the university's School of Natural Resources and the Environment. I conducted research on the endangered Mount Graham red squirrel, and earned a master's in wildlife conservation and management in 2009.

While in graduate school, I had struggled with feeling so cut off from my traditions—what some would call the ultimate realization of assimilation. There was no room for culture in science, or so I thought. But the semester before I graduated, I enrolled in a class called Native American Communities and the

Environment. At that moment I began to seriously consider pursuing a Ph.D. I didn't know if I could do it, but I did know that Native Americans with Ph.D.s in science are rare, and that I would be able to more effectively help native communities if I continued my studies. I also loved the idea of using both Western and indigenous science in natural resources management, an idea widely written about but seldom practiced on the ground.

A common approach is for scientists to go into a tribal community, talk to the people, take their information about a species or habitat, and then apply those data to a typical Western model for analysis and action. Although beneficial for wildlife research, some Native American scholars feel that this approach shows little sensitivity to how wildlife monitoring or management might be done in a native cultural context. Over the years, tribal people have spoken frequently about their needs and wants in regards to natural resource management, but their message often hasn't come across. Science is what most people pay attention to—science, money, and politics. I hope to provide scientific data in a way that will help native communities as well as conserve natural resources.

So here I am, in my second year of a Ph.D. program, working with multiple stakeholders on Yurok ancestral lands in northern California and trying to design culturally sensitive wildlife monitoring techniques that weave Western science with a Yurok world-view. For example, in Yurok culture, there are some distinctions between genders in regards to gathering certain natural resources. I will help develop a framework that will take such cultural considerations into account.

Inclusion takes many forms. As I prepared for my speech at the podium, I chose to draw on the facial tattoo that is traditional among the Yurok people. Though I perceive it as both culturally significant and beautiful, I knew some of my colleagues in the audience would find it foreign, perhaps even unacceptable. But it is important to realize that many changes come with our goal of increasing diversity, and we will need to be accepting of the ways people think and look. We all have lands and species of common interest, so we'll have to find a way to work together. If we're successful, maybe wildlife students from a wide diversity of backgrounds will be inspired to pursue careers in the wildlife field. ■



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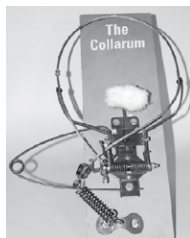


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A Sense of Belonging

JOHN ROBINSON HELPS ALL FEEL AT HOME IN NATURE

By Katherine Unger

In the spring of 1983, John Robinson, then an assistant refuge manager at the Crab Orchard National Wildlife Refuge in Illinois, learned that he'd be spending four weeks near Beckley, West Virginia, for a training course. An avid birdwatcher, Robinson grabbed a copy of *American Birds*—the 1981 Christmas Bird Count issue—to look up some of the birders who lived near Beckley. “I found this guy named Gary Worthington, called him up on the phone, and asked if we could go bird watching,” says Robinson. “Absolutely,” said Worthington.

Pulling into Worthington's driveway, Robinson realized that he hadn't mentioned that he was African American. He feared that his host, a denizen of “the hill country” of West Virginia, might be entirely shocked to see a black face in his driveway. By that point, of course, it was too late.

Worthington and his birding companion, Don Kodak, later admitted they were indeed surprised that Robinson was African American. But what truly stood out for them that day was not his skin color, but his ears—ears for identifying bird calls, that is. In the day's climax, Robinson helped his two companions identify a pine warbler (*Dendroica pinus*), a species that had been eluding the two West Virginians. Later, in a letter to Robinson, Worthington wrote, “Don and I fancied ourselves decent

birders and knew our area well, but here you were, coming from southern Illinois, and you could pick out the sounds as well as we could, and even better with the migrants.” He added, “You became one of our legends.”

Robinson recently related this story to a room of nearly 1,000 mostly white faces at the 2011 Ohio Wildlife Diversity Conference in Columbus. He explained that, before his West Virginia outing, he had had a vague sense that as an African American, he needed to ask permission, or needed a specific invitation in order to enjoy the outdoors. “Maybe because when I looked around I didn't see anyone who looked like me,” he said. “I was always searching for a sense of belonging until the day that I met this pine warbler.” At that point, Robinson realized he “was in a position to contribute and, more importantly, I was in a position to give back to people who needed my help.” He explained, “I've been on that mission ever since.”

A Colorful Exception

For some 26 years, Robinson worked as a biologist for the U.S. Fish and Wildlife Service (FWS) and then the U.S. Forest Service, carving out some ‘spare time’ in 1994 to launch LANIUS Software, to sell his books and software he coded. He changed the name to [On My Mountain](#) in 2003, when he began to offer birding and wildlife-watching tours. During all these years, he's often heard variations of, “I've never seen a black birdwatcher before.” Hoping to change that experience, Robinson took early retirement in 2005 to devote himself to his mission of expanding the pool of minorities who enjoy nature, wildlife, and wild places. How does he hope to do this? By encouraging children to go outside to observe, study, and enjoy birds.

In 2008, Robinson wrote *Birding for Everyone*, a book that is geared toward anyone interested in increasing their own or others' participation in birding and the study of nature—children of color in particular. In it, Robinson explores reasons why minorities are so underrepresented in the outdoors, including issues of cultural tradition, socioeconomics, and a lack of role models of similar background.

Birdwatchers turn to ornithologist John Robinson (at center) to learn about a species of bird they just spotted on a walk in California's Briones Regional Park in 2006. This loyal group attended Robinson's monthly bird walk “like clockwork” for more than 10 years, says Robinson. He's now hoping to extend that sense of wonder at birds and nature to a wider audience.



Credit: Dennis Galloway

Even as the United States grows ever more diverse, the people outside enjoying nature remain overwhelmingly white. According to FWS' 2006 National Survey of Fishing, Hunting, and Wildlife-associated Recreation, 96 percent of hunters, 93 percent of wildlife watchers, and 92 percent of anglers were white (FWS 2007).

While researching for his book, Robinson helped develop questions for the National Survey on Recreation and Environment. In a portion sent specifically to African Americans, the survey asked individuals who identified themselves as not being birdwatchers what their reasons were for their lack of participation. The top two responses were “not enough time” and “no interest in birds.” Robinson attributes such responses to minorities getting stuck in what he calls the “don't loop” when it comes to nature. “Minorities *don't* have the opportunity to meet people who are involved in nature and the outdoors so they *don't* learn that this is something that they could do and therefore they *don't* do it,” he says.

Yet spending time in nature can serve as an antidote to illness, stress, and violence—ills that strike some minority groups at higher rates than whites. In his book *Last Child in the Woods*, Richard Louv discusses the concept of biophilia—the notion that humans have an innate emotional connection to other living things and can benefit from exposure to something as small as the sight of a fish in an aquarium to as grand as spending time in a magnificent natural space like Yosemite National Park. Ample research supports this claim:

- In a study of patients recovering from gall bladder surgery, those with a view of a tree from their hospital window went home sooner than those with a view of a brick wall (Ulrich 1984).
- Prisoners whose cell looked over the prison courtyard reported 24 percent more illnesses than those facing farmland (Moore 1981).
- Children living in homes with less development and more natural elements nearby scored lower when assessed for anxiety, depression, and behavioral problems than children with less nature around their homes (Wells and Evans 2003).
- Adolescents in treatment for substance abuse and emotional adjustment problems showed improvements on measures of cooperation and trust following a wilderness experience, while controls did not improve (Witman 1987).
- Individuals in neighborhoods they perceived as highly green and leafy had 1.37 better odds of

physical health and 1.6 better odds of mental health than those who live in neighborhoods they perceived as the least green (Sugiyama 2008).

Breaking the “Don't Loop”

Efforts like the [No Child Left Inside Coalition](#), [Outward Bound](#), the National Wildlife Federation's [Be Out There](#) campaign, and [National Environmental Education Week](#) all aim to combat what Louv deemed “nature-deficit disorder” by encouraging children of all colors, as well as their parents, teachers, and communities, to carve out time to spend outdoors.

Through his book, nature tours, and speaking engagements, Robinson hopes to do his part in this effort by encouraging young people to experience nature through bird watching. Robinson himself began birding during his sophomore year at Iowa State University while taking an ornithology course. Blessed with a natural ear for bird song, he soon realized he had found his calling. “What's so attractive about birds is that they're all around us, they're so visible, and they're so readily observed,” says Robinson. That accessibility makes birds a great entry point into the study of nature.

But for children of color to actually immerse themselves in that study, Robinson says, they must receive consistent and repeated encouragement—at home, in schools, and in their communities. In *Birding for Everyone* he cites the work of the San Antonio-based Youth With High Potential Program, which involves minority children from high-risk communities in a variety of after-school activities—including bird watching. After lots of practice observing the diverse avian fauna of the area, the group entered the renowned Texas Coastal Birding Classic. The students won their division two years in a row.

Robinson also points to national-level organizations that are making a difference in outreach to minority communities. The National Audubon Society, for one, has established Audubon Centers near population centers—not just in placid suburbs or rural areas—to engage urban dwellers right in their own neighborhoods. The [Audubon Center at Debs Park](#) in northeast Los Angeles, for example, offers monthly nature walks presented in both English and Spanish as well as bilingual film festivals and family nature programs to attract residents of the surrounding neighborhoods, which are predominantly Latino.

(Continued on page 87)

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A Person of Vision

ONE WOMAN'S QUEST TO ENGAGE PEOPLE WITH NATURE

By Lisa Moore LaRoe

When she was in her early 20s, Rue Mapp found herself stuck on the side of a mountain. She was doing a climb with Outward Bound in Sequoia National Forest, and was half way to the summit when she froze. Her instructor said, “Rue, just trust your feet.” Mapp’s uncertainty melted away. “At that moment,” she says, “I realized how powerful nature is as a teacher. It can make people feel more confident.” In the two decades since that

day, Mapp has devoted her life to helping connect people with nature—particularly those from minority backgrounds.

An African American woman raised in northern California, Mapp gained an early passion for the outdoors by spending summers and weekends at her family’s ranch, raising pigs and cows, growing vegetables, fishing, and hunting. “I spent unstructured time exploring nature on its

own terms,” she says. “My mom and dad taught me respect for the natural world at a young age.”

The experience formed Mapp’s philosophy that people must be engaged with nature over time in order to develop a commitment to stewardship. “You don’t go on one date and decide to get married,” says Mapp. Likewise, “a relationship with nature can’t come about as a result of a one-time experience. Once people feel that the outdoors is theirs, they begin to care. The important thing is to reach people when they’re young and make all people feel welcomed.”

Two years ago Mapp took a leap toward extending that welcome by creating a website called OutdoorAfro.com with the tag line, “Where black people and nature meet.” This networking site helps connect African Americans with outdoor recreation and environmental activities in their own communities and across the country. An avid

outdoorswoman herself, Mapp rarely saw other black people out hiking, fishing, or enjoying nature, so she founded the site to encourage more minority participation.

“We all know about the demographic shifts in this country, so pursuing diversity is no longer in the domain of choice,” says Mapp. “If we don’t grow a new generation of people who love the outdoors, we won’t have protection of the wildlife we enjoy today. The issue isn’t about race; it’s about parks and public lands representing America.”

Sometimes the most powerful—and practical—connection to nature starts close to home. Taking that to heart, Mapp works with the [Pacific Forest and Watershed Lands Stewardship Council](#) in California, overseeing its Youth Investment Program, which connects urban youth with outdoor activities and open spaces. Mapp also leads her own trips, and plans quarterly Outdoor Afro community excursions. One memorable effort involved a bike ride from the disadvantaged Richmond neighborhood to a nearby wetland, where the group observed about 20 different bird species and learned about watershed issues. “It blew them away,” says Mapp. “Some people had no idea that this area was right in their own backyard.”

J. Phoenix Smith went on that bike ride because she was “excited to go on a ride with mainly people of color.” Smith spent little time in nature as a child, and had her first camping experience as an adult, in West Virginia. Though she found it beautiful, she also got some “cold stares” and felt unwelcome. “Stories we grew up with about the woods being unsafe are not very far from our consciousness,” she says. But on the ride in California, Smith felt a “beautiful connection with the community.” “The land is for everybody,” she says. “If you’re marginalized, you’re less likely to engage in a healthy relationship with place.”

Mapp’s efforts with Outdoor Afro earned her an invitation to the White House in 2010 for a conference about the [America’s Great Outdoors](#) initiative. The invitation was an honor, but Mapp stresses that “no one organization can do it alone. We’ll all need to work together to bring about lasting change.” Small steps can make huge inroads. “Sometimes,” says Mapp, “a friendly ‘hello’ is all it takes to get started.” ■



Courtesy of Outdoor Afro

Rue Mapp (standing, third from left) helped organize this group of beginning campers at a regional park in Livermore, California, in the fall of 2010. They hold the banner of Outdoor Afro, the online networking site Mapp founded to help connect African Americans with nature, their communities, and each other.

Lisa Moore LaRoe is Editor-in-Chief of *The Wildlife Professional*.



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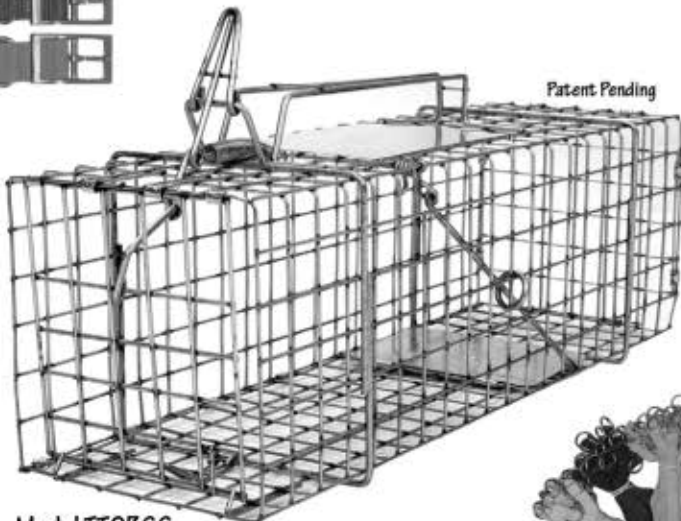
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Plowing through North America

WILD PIGS LEAVE A TRAIL OF DEPREDATION AND DISEASE

By Jessica Tegt, Ph.D., John Mayer, Ph.D., John Dunlap, and Stephen Ditchkoff, Ph.D.



Courtesy of Jessica Tegt

Jessica Tegt, Ph.D., is an Assistant Extension Professor with the Department of Wildlife, Fisheries, and Aquaculture at Mississippi State University.

In March of this year, attendees at the annual meeting of the Michigan Milk Producers Association focused on an increasingly critical issue that is posing a serious threat to the state’s dairy industry: the burgeoning population of feral pigs (*Sus scrofa*). Some 5,000 feral pigs now run loose in more than 65 of Michigan’s 83 counties. Causing extensive property damage by rooting and wallowing, feral pigs devour food and feed crops and can spread disease to humans, livestock, and native wildlife.

Increasingly frustrated with the situation, delegates at the Michigan meeting unanimously passed a resolution in support of a recent state order that will declare feral pigs an invasive species and make it illegal to possess the animals in the state. That order will go into effect on July 8, 2011 unless state legislators develop a viable plan to control feral pig breeding and hunting facilities (Michigan DNR).

As a growing number of states can attest, controlling feral pigs is no easy task. Averaging

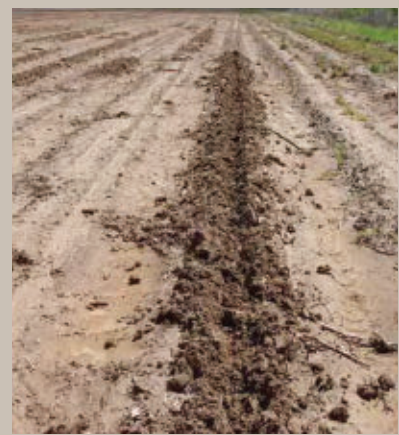
150 pounds in size—with the largest “trophy” hogs hitting about 500 pounds—wild pigs are one of the most prolific, adaptable wildlife species in the world. They reach sexual maturity at a young age, are capable of producing several litters per year, have few natural predators, and will consume a wide variety of plant and animal species (West *et al.* 2009). “Feral pigs are an ecological train wreck,” said Texas’s Director of Wildlife Services Michael Bodenchuk, interviewed in a Mississippi State University video on feral pigs. “[They] are competitors for native wildlife, they’re nest predators for anything that lays an egg on the ground, and they’re a significant source of mortality for sensitive species and endangered species.” If left unchecked, wild pig damage could cause mass economic and ecological destruction.

Imperiling Invaders

Wild pigs are not native to North America. Spanish explorers first brought the animals to the continent in the 1500s and, as was a common practice,

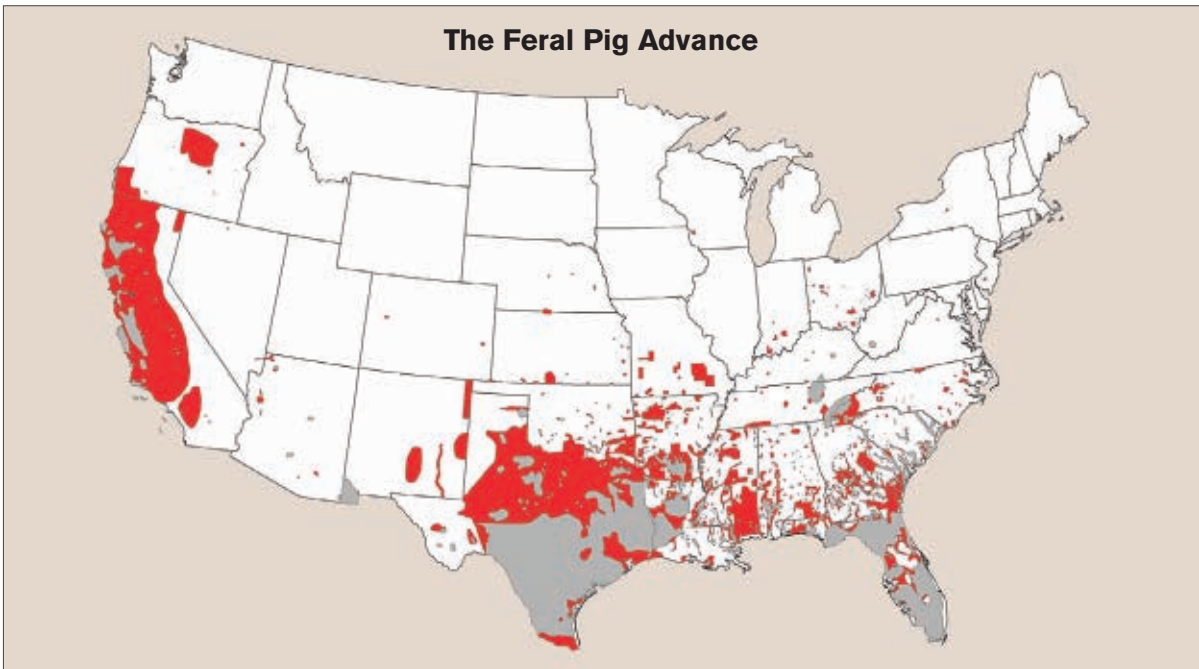


Credit: John Campos/Stockphoto.com



Credit: Rachel Spaulding, AR Game & Fish Commission

Four wild hogs bury their snouts into the ground in search of food (left). On a similar quest for nutrition, wild hogs dug a sizeable trough through a corn field in Arkansas (right), leaving a long strip of damaged land. Experts estimate that the cost of wild hog damage to agriculture and the environment in the United States adds up to at least \$1.5 billion annually.



Courtesy of Bronson Strickland, MS State University Extension Service

On the Move. Gray areas on this map represent feral pig distribution in 1988, while red areas show range expansion by 2009. In the late 1980s, 23 U.S. states reported having feral pig problems; today feral populations exist in at least 37 states. In several states in the Midwest, including Michigan, Ohio, and Nebraska, feral pig populations arrived within the last decade.

allowed them to range freely with other domestic livestock. Over time, many free-ranging domestic swine went wild, or feral. The problem increased when North Americans began importing Eurasian wild boar to serve as either huntable big game or a novel species of commercial livestock. Boar that were released or escaped started more populations or interbred with wild domestic stock. Today, wild pig is a collective term that refers to Eurasian boar, feral domestic pigs, and the hybrid that result from interbreeding of the two.

and a favorite among pigs—as well as fruits, flowers, grasses, and roots. To date, researchers estimate that wild pigs’ diets may consist of more than 200 different native plant species (Ditchkoff and Mayer 2009). Not only are native plants damaged by this extensive consumption, but soil integrity is also compromised when hogs root and wallow, which in turn tends to alter nutrient cycling and create niches where invasive plant species can establish themselves. In addition, wallows can cause muddied ponds and wetlands,

Once found primarily in the southeastern United States, wild pigs have significantly expanded their range over the past few decades. Today, there are an estimated four to six million wild pigs in North America, spread across more than 37 U.S. states and at least four Canadian Provinces (National Feral Swine Mapping System). Last April, experts at the 2010 International Wild Pig Conference—a biannual event created to address this growing problem around the world—suggested that wild pigs could be North America’s most threatening invasive mammal species in terms of agriculture damage, disease transmission, native plant survival, and water quality. The list of pig-related threats is sobering.



Credit: Jeremy Hemus/iStockphoto.com

Threats to Native Plants. Wild pigs are omnivorous and gain energy and body mass from eating a wide assortment of plants including longleaf pine seedlings—high in carbohydrates

Nine hungry piglets suckle their mother. Sows can begin breeding as early as six months of age, and typically produce up to four litters per year, with each litter containing four to 12 piglets. Today there are more than four million wild pigs in North America.



causing algal blooms and destroying aquatic vegetation. Wild pigs generally prefer to feed in moist habitats, such as riparian zones, seepage slopes, and steep head ravines—easily some of the most “high value” plant habitats within their home range. Often these habitats are also home to some of the most rare native plants and animals in a given area. In Florida, for example, 22 rare plants and herpetofauna—such as hydric hammocks—have felt the impact of wild pigs’ destructive eating habits.

Threats to Wildlife. Wild pigs compete for resources with native wildlife and common game species. For example, they compete with squirrels, deer, turkey, and black bears for hard and soft mast such as acorns and berries. Such consumption can eventually impact wildlife species that heavily rely on mast production during winter months. In fact, feral pigs are thought to be a contributing factor for a decline in populations of northern bobwhite quail and wild turkey in several U.S. states, including Texas and Oklahoma ([Jolley *et al.* 2010](#)).

Threats to Watersheds. Wild pigs root, wallow, and trample vegetation, which can destroy pastures, crops, and native plants, and leave areas susceptible to soil erosion. In turn, soil erosion increases sediment loads in watersheds, thus reducing water quality. In the Kaua’i watershed in Hawaii, for example, officials are concerned about extensive feral pig contamination of the watershed, which is the island’s main outlet for freshwater.

Threats to Livestock. Wild pigs cause significant damage to livestock, including through direct predation. In 1991, for example, livestock producers in Texas and California submitted reports to the USDA stating that wild hogs that year killed 1,473 sheep, goats, and exotic game animals ([United Wildlife Control](#)). In addition, wild pigs can transmit viral, bacterial, or parasitic infections to both wild and domestic mammals. Some of the more serious diseases spread by feral hogs are pseudorabies, swine brucellosis, and a group of highly contagious foreign animal diseases (FADs) including foot and mouth disease, hog cholera, and African swine fever (Davidson 2006a,b). To date, pseudorabies has been reported in 11 states and swine brucellosis has been found in 14 states ([USDA-APHIS 2005](#)). Because of this prevalence, especially in states with large pork production, officials spend millions of dollars each year on surveillance for these diseases.

Threats to Human Health. Occasionally pigs can infect humans as well. Some common zoonotic diseases—transmissible from pigs to humans—include leptospirosis, brucellosis, salmonellosis, and trichinosis. Although these diseases are rarely fatal in humans, they can cause fever with chills, weakness, and a loss of appetite. Hunters who handle feral pigs are encouraged to wear disposable gloves while dressing and cleaning the animals and should avoid direct contact with blood and reproductive organs ([USDA](#)).



Credit: John Campos/Stockphoto.com

A cluster of wild pigs root in the mud, a skill they develop when they’re only a few days old. Rooting along roadsides and levees can damage vehicles and equipment and lead to costly infrastructure repair. Near a small house on a ranch in Texas (below), pig-churned soil shows evidence of the widespread landscape destruction that wild pigs can cause.



Credit: Billy Higginbotham/Texas Agrilife Extension Service

Structural Damage. Wild pigs can topple fences, weaken levees, uproot lawns, and leave deep holes in cropland and pastures that, if unnoticed, can cause significant damage to farm equipment. Feral pigs have also been known to shred the finely-pruned turf of golf courses and destroy costly sprinkler systems. Last year at a municipal course in Sebastian, Florida, for example, pigs in search of earthworms left the 14th green looking bulldozed.

All of these impacts bear a huge financial cost. Texas, for example, has more than two million wild pigs, the nation's largest feral pig population. A conservative estimate of damage to the state's agriculture hovers around \$52 million annually, with an additional \$7 million spent by landowners on feral-pig control efforts and repair of property damage (Higginbotham *et al.* 2008). Nationwide, wild pig damage to agriculture and the environment is conservatively estimated to run \$1.5 billion every year (Pimentel 2007).

Finding Profit in Pigs

Some hunting enthusiasts are quick to note that recreational hunting of feral pigs does generate some economic benefit to individuals and states—not to mention helping to reduce the pig population. Many ranches cater exclusively to hog hunters year-round, while others offer hog hunts at times of the year when hunting seasons for native game species—such as white-tailed deer, wild turkey, and northern bobwhite quail—are closed.

In Texas, a second source of pig-related income is derived when landowners sell live-trapped pigs to processing facilities and licensed hunting preserves. A survey of Texas landowners indicates that 13 percent of those impacted by wild pigs trap and sell the pests, averaging \$4,466 in annual income (Higginbotham 2010). Various buying stations scattered across Texas pay landowners for live pigs on a per-pound basis, with the largest pigs bringing the highest price per pound. The pigs are then transported to a processing facility, with the products destined for restaurants in the U.S. and for export to Europe and Asia. From 2004 to 2009, a total of 460,911 wild pigs were processed at locations requiring a federal permit in Texas (Rene Caldwell-USDA personal communication). At a conservative value of just \$30 per pig, landowners realized an income of almost \$14 million during that six-year reporting period.

Although the revenue derived from recreational hunting and live-trapping is a small percentage of the agricultural and environmental damage that feral pigs cause each year, it does help to partially offset the overall destruction, as well as help finance ongoing control efforts. As long as millions of pigs roam free across North America, wildlife professionals will have to continue to explore ways to undo the damage caused by these age-old invaders. ■

This article has been reviewed by subject-matter experts.

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Managing an Invasion

EFFECTIVE MEASURES TO CONTROL WILD PIGS

By Bill Hamrick, Tyler Campbell, Ph.D., Billy Higginbotham, Ph.D., and Steven Lapidge, Ph.D.

A few years back, wild pigs ran mostly unchecked on Ossabaw Island, a 25,000-acre barrier island of maritime forests and marshlands just off the coast of Savannah, Georgia. Pigs wreaked havoc on island wildlife, feasting on the eggs of snowy plovers and eating turtle hatchlings as they made their way from the beaches to the water. Managers estimated that hogs were depredated over 30 percent of Ossabaw Island's sea turtle nests each year ([Mississippi State University 2011](#)). Something had to be done.

In 2001, the Georgia Department of Natural Resources launched the Wild Pig Removal Program on Ossabaw Island, an intensive, ongoing effort to hunt and trap wild pigs. The Department conducts seven hunts each year, including five deer-and-hog hunts and two hog-only hunts. "We remove between 2,500 and 3,000 hogs annually," says David Mixon, game management regional supervisor with the Department. "Removing wild pigs and constantly keeping pressure on them, we've seen vegetation rebound, increases in deer body weights, and very few sea turtle nests depredated by wild hogs." In fact, sea turtle nest depredation on Ossabaw Island is now less than 5 percent per year.

The Case for Control

Wildlife damage management experts throughout the United States are exploring the use of various lethal and nonlethal methods for managing the nation's growing populations of wild hogs. Most nonlethal methods—such as habitat manipulation and the use of frightening devices and guard animals—fail to provide a permanent solution to the problem, and are therefore largely ineffective. As a result, most effective management approaches for wild pigs are lethal.

Wildlife professionals typically use hunting and trapping to curb wild hog populations, but "to remove populations as a whole is very expensive and a very large-scale effort," Michael Bodenchuk, director of Wildlife Services in Texas, said in a Mississippi State University video on feral pigs. For

lethal removal to be effective on a population scale, it must take into account wild pig reproductive biology and ensure that removal tactics are accompanied by continual population surveys. In areas with limited food resources and no supplemental feeding, for example, wildlife damage managers will generally remove only adult hogs because their mortality has a greater impact on the overall population than does the mortality of non-breeding juvenile sows ([West et al. 2009](#)). Under more favorable habitat conditions where high-quality foods are readily available, removal of both juvenile and adult pigs is necessary.

Shooting can be an effective method for controlling individual or small groups of nuisance wild pigs. Hunting methods include still hunting, shooting at night, or hunting with dogs, but these methods are rarely effective at substantially reducing wild pig numbers because they do not remove large enough numbers of animals ([Hamrick et al. 2011](#)).



Courtesy of Bill Hamrick

Bill Hamrick is an Extension Associate II in the Department of Wildlife, Fisheries, and Aquaculture at Mississippi State University.



Credit: Texas Parks and Wildlife Department

Landowners prepare a sizeable trap for feral hogs. Rounded cages without corners reduce potential footholds, making escape more difficult. Most traps have natural flooring because hogs—which are highly intelligent—are quick to recognize and avoid an artificial floor. One of the most critical steps: Prebait traps with a trail of corn or other grains to lure in foraging pigs.



This captured hog has little chance of escape from its sturdy trap. To be effective, traps must be made of solid materials such as steel livestock panels and fence posts. Traps must also be heavy enough that even the largest, most-aggressive hogs can't root under the sides or use their heads to tip over the traps.



Credit: Texas Parks and Wildlife Department

In addition, hunting at night is illegal in many states, and most night-shooting is done by professional sharpshooters.

Some of the most efficient methods of lethal control include aerial control and live trapping followed by euthanasia. The best traps are constructed from sturdy materials such as steel livestock panels and pressure treated lumber. Landowners have multiple options to choose from, such as the most commonly used cage trap, which comes with a drop door that makes the trap inescapable, or the box trap, a rectangular or square structure made of wood-fence panels. Another favorite is the corral trap, generally most effective for trapping large groups of pigs.

To bait traps and enclosures, managers typically use shelled corn—the “gold standard” for baiting pig traps. Other baits commonly used in some areas are sweet potatoes, rotten or over-ripened fruit, dry dog food, wheat, and other grains.

Before building or placing a pig trap, a little research is necessary. Wild pigs usually travel in family groups called sounders—a social unit of nine to 12 pigs. As a result, managers often use remote-sensing game cameras to determine how many pigs are causing damage and what size trap will be necessary to capture all the pigs. Once the trap is in place, they wire the door open and begin baiting, all the while monitoring the trap with a game camera. When all of the pigs have entered the trap and are feeding, the trap is ready to trigger.

Wildlife professionals in the U.S. are not yet permitted to use toxicants to manage pigs, in part because of the risk of accidental poisonings of non-target species. Yet these chemicals have been shown to be cost effective (Coblentz and Baber 1987, Choquenot *et al.* 1996), and many have been investigated for wild pig control, including warfarin in Australia (Cowled *et al.* 2008), cyanide and cholecalciferol in New Zealand (Cowled *et al.* 2004), and zinc phosphide in Pakistan (Brooks 1985, Khokhar and Rizvi 1998). More recently, researchers have been looking into using sodium nitrite (a food preservative) as a wild pig toxicant (Cowled *et al.* 2008, Lapidge *et al.* 2008).

The Politics of Pigs

In recent years, the subject of wild pig damage has come before many state and federal lawmakers. Agricultural producers who have felt the harsh impacts of wild pigs, and wildlife experts who understand the ecological ramifications of the species, have testified at many House and Senate Agriculture Committee hearings, asking for increased management measures to control wild pigs. In hard-hit areas such as Texas—with over two million wild pigs—legislators have allocated special funding for pig control. Some states, including Michigan, have passed legislation encouraging the eradication of wild pig populations while they are still relatively small.

The Wildlife Society (TWS) has also weighed in on the issue of wild pigs. In April of this year TWS released a [draft position statement](#) encouraging state, federal, and provincial agencies to share information and technical data—such as maps of local wild pig populations—for management purposes. TWS also encourages collaboration between agencies and private landowners to develop and support educational programs and materials that highlight the issue.

Wildlife damage managers everywhere are working tirelessly to expand efforts to every state affected by wild pigs through public education, communication with stakeholders, and support from political entities. They know that bringing people on board to discuss the situation is critical in curbing the spread of this hoofed biological threat. ■

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For additional information on the impact of feral pigs as well as resources on feral pig management, go to www.wildlife.org.

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Shedding Light on an Epidemic

HOW WHITE-NOSE SYNDROME MAY IMPACT BAT REPRODUCTION

By Karen E. Francl, Ph.D.



Courtesy of Karen E. Francl

Karen E. Francl, Ph.D., is Associate Professor of Biology at Radford University in Virginia.

On a cold day in March of 2011, I joined Wil Orndoff, a geologist with the Virginia Natural Heritage Program, and a small team of volunteers on an expedition to track the impact of white-nose syndrome (WNS) on Virginia's bats. We were in a WNS-positive cave in southwestern Virginia, completing counts of bats by species to determine the number of live bats remaining in the cave. At one point, Orndoff picked up a deceased tri-colored bat (*Perimyotis subflavus*) and held it up for us to see. "Look at this bat," he said. "His wings look perfect."

That was a surprise. WNS has been plaguing entire populations of bats since its discovery in 2006, leaving behind a legacy of dead or infected bats. Although researchers can only confirm the presence of WNS through extensive lab tests, white fungus on the muzzle or the wings of a bat typically points to the disease. Our discovery of a dead bat with perfect wings was therefore puzzling, but researchers have

a theory: The fungus, *Geomyces destructans*, attacks bats only during hibernation, when their body temperature is near cave ambient. In most caves in Virginia, that's about five to 10 degrees Celsius. If the bat does not awaken from its hibernation to clean off the fungus, its tissues can become necrotic. Unfortunately, this is a Catch-22 for the bat: Each time it rouses from hibernation to clean off the fungus, it uses up valuable stored fat reserves. Multiple winter arousals deplete energy stores causing bats to starve long before hibernation is over. We believe this was the fate of the tri-colored bat.

Conjecture and Collaboration

Since WNS was first discovered in a cave near Albany, New York, it has spread rapidly to several species of hibernating bats in 18 states, including Vermont, Massachusetts, Oklahoma, and Kentucky. Although the northeastern United States has been the worst hit—with millions of bats reportedly afflicted with WNS—states in the southeast show growing evidence of the disease. In April 2009, the Virginia Department of Game and Inland Fisheries reported the spread of WNS to three more counties in the Commonwealth, bringing the total number of affected counties up to 10, in addition to two more that are listed as "suspected." And last year the Department reported evidence of WNS in the southeastern myotis (*Myotis austroriparius*) bat, a rare species found in only a few counties in southeast Virginia.

Because WNS is a relatively new disease, researchers rely heavily on conjecture and working hypotheses, with professionals working to understand the histopathology, genetics, routes of transmission, and possible biological control of *Geomyces*. In 2009, for example, the U.S. Fish and Wildlife Service issued a grant to survey as many of the known hibernacula in western Virginia as possible and determine the impact of the disease on the region's bats. In the fall of 2009, I joined this effort—led by Rick Reynolds, wildlife biologist with the Virginia Department of Game and Inland Fisheries—and worked with Orndoff, cavers, educators,



Credit: Karen E. Francl

Geologist Wil Orndoff examines the immaculate wings of a deceased tri-colored bat. Although the bat was a victim of the deadly white-nose syndrome, researchers were surprised to find that it was missing the familiar signs of a white fungus, which tends to settle on the muzzle and wings of infected individuals.



state biologists, and some of my students from Radford University. I soon learned a valuable lesson: A picture may be worth a thousand words, but to feel the real effects of WNS, holding a single infected bat has a greater impact than a thousand pictures.

WNS Impact on Reproduction

As we researched WNS in the region, we recorded steep bat population declines—as high as 40 to 90 percent from one year to the next in some species. We also began exploring how the survivors of this disease were faring during summer months. Bats mate during the swarming period in autumn, but pregnancy does not begin until spring. Bearing in mind this delayed fertilization, we asked the following questions:

- How would a bat's reproduction be impacted if it left the cave in poor shape?
- Would pregnancy in a weak female fail or be delayed?
- Would lactation be shortened?
- How would a female's compromised health in the summer impact survival and recruitment of juveniles?

I had already begun to explore these and other similar questions in the summer of 2010, when I joined researchers from the environmental consulting firm, Environmental Solutions and Innovations, Inc., on a seven-week survey of the endangered Indiana bat (*Myotis sodalis*) in northern West Virginia. In addition to our own data, we examined records collected by other crews working in the state. By the end of the summer we had 1,300 capture records—a substantial dataset that constituted a “post-WNS” category.

During the fall of 2010, I obtained more than 10,000 capture records from 1997 to 2008. Culled from a variety of sources, these records provided a pre-WNS dataset for West Virginia. We then compared the two data sets, and the preliminary results were startling:

- We found that two WNS-affected bat species—the little brown bat (*M. lucifugus*) and the northern long-eared bat (*M. septentrionalis*)—had narrower windows for pregnancy and lactation. Historically, northern long-eared bats began lactating around June 10 and continued through August 10. Our 2010 data, however, revealed not



Credit: Wil Omdoff

only that a smaller percentage of bats were captured in lactation, but that lactating bats were not detected after July 10.

- Capture rates for these two species declined by more than 60 percent, and capture rates for juveniles late in the season declined by more than 50 percent, which means that long-term recruitment is failing and, as a result, could spell trouble for the myotids.
- Simple back-of-the-envelope calculations indicate that juvenile recruitment of all *Myotis* spp. is down to about one-tenth of historical numbers. This not only means that the adults are succumbing to the effects of WNS, but also that the survivors are unsuccessful at replacing these losses during the hibernation period. Given that cave bats only give birth to one offspring per year, these recruitment failures are catastrophic.

An Unexpected Upside

Amidst all this loss, our research shows that two species in West Virginia appear to be unharmed by WNS—the red bat (*Lasiurus borealis*) and the big brown bat (*Eptesicus fuscus*). Populations of the red bat have held steady both before and after the spread of the disease, perhaps because this “tree bat” does not hibernate in caves. In addition, the big brown bat appears to be doing better than ever. During our research, we noted an increase in the capture of big brown bats and found that the proportion of juveniles in the population is actually higher than historically recorded.

Author Karen E. Franci (standing, second from right) works with colleagues to measure, band, and weigh endangered grey bats near Bristol, Virginia. Although this species has not been hit by WNS, researchers continue to track the bats' health and monitor their numbers.



This result could be because of the greater body mass of the big brown, which may make it more tolerant to weight loss than the smaller myotome species. In addition, the big brown bat's strategy of hibernating alone, rather than in tight clusters, could mean that bat-to-bat transmission of the fungus is substantially lower. Also, as a result of it hibernating more often in "non-caves" such as buildings and rock crevices, or simply spending less time in caves, its exposure to the fungus is possibly reduced. Scientists also believe that the big browns could be experiencing a sort of ecological release—stepping in to fill a niche previously held by formerly numerically dominant little browns. As with WNS in general, several of these hypotheses are possibilities that researchers will have to examine thoroughly.

As we face challenges in testing the effects of WNS on bat communities, scientists continue to study the bat capture data from West Virginia and determine pre- versus post-WNS trends, as well as continue the spring and autumn hibernaculum

surveys to monitor the health of the region's winter bats. Some bat researchers also are taking an active role in implementing the [National WNS Plan](#)—a large-scale collaboration among state, tribal, and federal wildlife management agencies and conservation organizations to address the problem. Several bat biologists in the eastern U.S. are tracking the fungus' advancement south and west, while others continue to collect data, band bats, write to their congressional representatives, publish their work, share their findings with the research community, and educate the general public about the seriousness of the issue. Perhaps through such efforts we'll find a way to actively combat the WNS fungus and give our bats a chance to recover. ■



To see an online photo gallery of Radford University students in the field researching the impact of WNS on the region's bats, go to www.wildlife.org.

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Wildlife Detection Dogs

SPECIALY TRAINED, THESE CANINES WORK HARD FOR CONSERVATION

By Megan Parker, Ph.D.

Pepin's nose twitches and his head snaps to the right, his body following as he swiftly changes direction. His feet are wet with morning dew from the grasses of southwestern Montana's Centennial Valley. A Belgian shepherd, Pepin ducks his head to catch a stronger stream of scent, the humid air helping odor molecules rise a few feet off the ground, the perfect height for a dog's nose. His mouth opens, gulping air and scent, then closes, taking in this information. His tail begins to circle, telling me that he is on a target scent—in this case, wolverine scat, which we're seeking for a population survey of the rarely seen carnivores.

Finally, Pepin spots the target, throws his body to the ground, and stares at me, willing me to approach. I scramble over rocks and through brush to get near him, but can't see the scat, which is hidden beneath vegetation. I ask him to show me, and he half-rises to point his nose directly toward the small, dried scat, then he plops down again, staring hard. I finally see it, then pull a tug toy out of my backpack as another researcher gathers data around the site and collects the scat. I watch Pepin's eyes dilate wildly, his body quivering in anticipation of play, his paycheck for hard work.

Scenes like this are playing out more frequently across the nation and the globe as wildlife researchers harness dogs' unique abilities to detect scent, a talent that has elevated them to a status as crucial conservation tools.

Special Skill Fills a Need

Since humans began the process of domesticating wolves roughly 15,000 years ago, we have helped give rise to hundreds of dog breeds, each with specialized traits. We rely upon our dogs' superior ability to run fast, guard us and our livestock, retrieve hunted game, and act as faithful companions. More recently, we have also learned how to train dogs to detect a phenomenal range of scents, including bombs, narcotics, bed bugs, and cancer cells. And in the last two decades, humans have taken the finely tuned noses of dogs and put them

to work to help conserve rare and elusive wildlife species by seeking out, of all things, feces.

Thanks to advances in laboratory genetics in the 1990s, wildlife scat has become a sought-after, data-rich commodity. It is now commonplace for scientists to use scat to extract DNA, measure hormone levels, and acquire disease and diet information—in other words, obtain much of the same information as from a blood sample, with less disturbance to wildlife, less risk to biologists handling animals, and often lower costs. Furthermore, scat is collected and mapped at locations where animals naturally occur without baiting, providing unbiased information on habitat use.

Since the mid-1990s, dogs have served as natural assistants to scientists seeking scat samples in the field. Dogs have also been called upon to locate invasive species, from plants to snails to snakes. Seeing a growing need for these specially trained animals, in 2000 I worked with Deborah Smith, Aimee Hurt, and Alice Whitelaw to establish Wor-



Credit: Jeff Burrell

Megan Parker, Ph.D., (shown here with her dog Pepin) is Co-founder and Executive Director of Working Dogs for Conservation, based in Three Forks, Montana.



Credit: Tyler Roady

Traversing the scenic Centennial Valley of Montana, Working Dogs for Conservation co-founder and associate director Aimee Hurt and her black lab mix Wicket survey the landscape for signs of grizzly bear, black bear, wolf, and mountain lion.



ing Dogs for Conservation (WDC), a nonprofit organization that provides human-canine teams to support a host of scientific investigations. Since then, our dogs and others have proven themselves indispensable on hundreds of projects around the



Credit: Chad Hardy

Detection dog Wicket displays the “pinpointing” behavior, using her sensitive nose to indicate a rosy wolf snail for her handler. Invasive species like this snail—which has driven three-quarters of native Hawaiian snails to extinction since being introduced to the islands in the 1930s—are just one of the quarries of specially trained dogs.

globe, in every conceivable habitat, working to find target odors, discriminate among species, and even differentiate individual animals.

How do we convince dogs to do this? The best working dogs have an over-the-top obsession with a certain toy or treat, like Pepin, who can’t get enough of playing tug-o-war with a rope toy. The kinds of dogs that make good candidates for detection work may be too high-energy and hyper-focused to be easy family pets and therefore often end up in animal shel-

ters. Shelters and rescues are where we find most of WDC’s dogs, which (besides Pepin) include German shepherds and Labrador and border collie mixes.

Once we find a dog that we think will meet our needs, we use basic operant conditioning so the animal learns that locating a target odor will result in getting its favorite toy or treat. Once a dog locates its target, it is taught to alert the handler by sitting or lying down, then staring at the handler while awaiting its reward. The intensity of training increases over time until a dog can work in highly distracting field environments for long days while maintaining a focus on finding the target scents.

Dogs have an even greater ability than chimpanzees (our closest relatives) to understand human intention from vocal and body language (Hare *et al.* 2002). Even so, training is a time-consuming process, taking up to two months and costing roughly \$15,000 from the time a dog is selected to being ready for field work. Handlers learn how to use well-timed body language and verbal commands to cue the dogs to search methodically for the target scent. For instance, if a handler has trouble finding a scat—perhaps it’s small or camouflaged by vegeta-

tion—she may shrug her shoulders and ask the dog to “pinpoint” the sample, pointing with its nose but not touching the scat. Likewise, handlers must learn how to “read” the dog’s behavior, figuring out when to make small corrections to keep the dog on track.

Canine Contributions

A dog’s value in the field extends far beyond its ability to sniff out a pile of feces. Among the many strengths and advantages that dogs provide:

Accuracy. Though difficult to measure, we know that dogs have a sense of smell magnitudes greater than our own. This acute ability has been used since the late 1990s in California’s Central Valley, where trained dogs have been detecting scat of the endangered San Joaquin kit fox (*Vulpes macrotis mutica*, Smith *et al.* 2003, 2005). From these scat samples researchers have gathered DNA that has yielded information about kit fox presence, sex ratios, relatedness, movement patterns, scent-marking behavior, and home range. These scientists also confirmed the remarkable ability of dogs to discriminate among sympatric predator scats: Of the 1,298 scats that dogs signaled as belonging to kit fox, every one was confirmed accurate through DNA analyses (Smith *et al.* 2003).

Range. Dogs can search for multiple odors simultaneously and can pick up scents from a great distance. For a study in the mountains and valleys between Yellowstone National Park and central Idaho’s wilderness, for example, dogs were trained to find scats of wolves (*Canis lupus*), mountain lions (*Felis concolor*), black bears (*Ursus americanus*), and grizzly bears (*Ursus arctos horribilis*). The aim of the study was to reveal how large carnivores travel across various land jurisdictions, primarily public cattle- and sheep-grazing allotments. Covering hundreds of square miles over several years, researchers turned piles of scat into mountains of information and produced predictive models that are now being used to advise land planners and managers on development options to reduce disturbance to these four species (Beckmann unpublished data). And recently, researchers at the University of California-Berkeley, who worked with WDC to train dogs to find carnivore scats, published a study in *The Journal of Wildlife Management* indicating that dogs could detect scat up to 33 feet off their transects, while human



searchers visually located scats only three to five feet away (Reed *et al.* 2011).

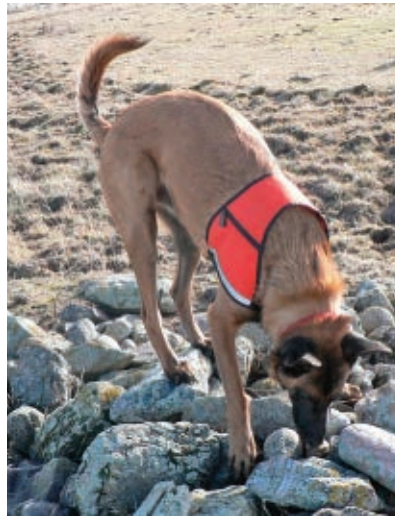
Efficiency. In Vermont in 2003 and 2004, researchers pitted dog handler teams against camera traps and hair snares to survey for black bears (*Ursus americanus*), bobcats (*Lynx rufus*), and fishers (*Martes pennanti*) across the state. Detection dogs proved 13 times more effective on average at finding signs of these elusive animals (Long *et al.* 2007). The same study also noted that while using dogs requires a larger up-front cost than the other methods—a leased detection dog costs \$316 per site compared to \$214 for camera traps and \$157 for hair snares—it often entails visiting a site just one time to gather information on a wide range of species.

Durability. Trainers have asked dogs to perform increasingly difficult work for conservation in a variety of habitats. Dogs have beat through Guam’s thick jungles to find invasive brown tree snakes (*Boiga irregularis*, WDC, USGS), dodged cacti to find the burrows of desert tortoises (*Gopherus agassizii*) and black-footed ferrets (*Mustela nigripes*, Cabl and Heaton 2006), and stood on the bow of a small boat in the Atlantic Ocean to sniff out the scat of northern right whales (*Eubalaena glacialis*, Rolland *et al.* 2006).

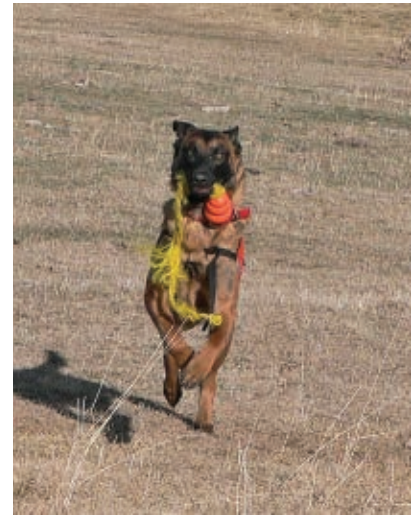
Noses to the Ground

In just the past two years, dogs have worked on species as diverse as Javan rhinoceros (*Rhinoceros sondaicus*), gila monsters (*Heloderma suspectum*) in Nevada, and a suite of species on gas and oil lands in Canada (Wasser in press). In the Russian Far East, Russian scientists trained dogs to identify individual Amur tigers (*Panthera tigris altaica*) from scats picked up during snow tracking surveys (Kerley and Salkina 2007). The dogs’ ability to identify individual tigers helps researchers map individual tiger movements and territory use. With such critically endangered species, knowing where individuals move in relation to threats can determine how to manage them.

Plants are likewise part of our dogs’ expanding repertoire, in part because the dogs’ olfactory abilities help them locate young plants that are too small to be seen by humans. In New Zealand, dogs are seeking an unusual parasitic plant, the wood rose (*Dactylanthus taylorii*), as well as rare



Credit: Megan Parker



Credit: Megan Parker

As part of a training session, working dog Pepin searches a rock pile for bear scat (left). Successful detection dogs aren’t deterred by distracting field conditions or foreign objects and scents, and work hard for the promise of a reward. For Pepin, that means a tug on his favorite rope (right)—a toy he has since destroyed with passionate chewing.

skinks and tuatara (*Sphenodon* spp.). In the United States, dogs have sniffed out invasive Chinese clover (*Lespedeza* spp.) on a refuge in Iowa (Morse and Leggett 2010), and they’re being trained out West to detect rare native plants and invasive weeds. In Oregon, one such plant under study is a rare native lupine flower, *Lupinus oregonus kincaidii*, host to the endangered Fender’s blue butterfly (*Icaricia icarioides fenderi*, Vesely 2008). By finding and eventually protecting lupines, conservationists hope that Fender’s blue butterflies will also be saved.

Dogs contribute to field work with their agility, stamina, and uncanny olfactory senses. They can cover far more ground than humans on a survey, increase sample sizes, reduce human observer bias, and decrease labor costs. The mounting pile of peer-reviewed publications about the value of scent-detecting dogs is a testament to the successes of dogs over the past 15 years for surveying and monitoring elusive species. Clearly for conservationists, working with dogs is not just an art, it’s also good science. ■



Read this article online at www.wildlife.org for additional photos of conservation dogs at work and for a full bibliography.



The Facts about Rodenticides

UNDERSTANDING A VALUABLE TOOL IN INTEGRATED PEST MANAGEMENT

By Roger A. Baldwin, Ph.D., and Terrell P. Salmon, Ph.D.



Courtesy of Roger A. Baldwin

Roger A. Baldwin, Ph.D., is Wildlife Pest Management Advisor for the University of California's Integrated Pest Management Program.



Courtesy of Terrell P. Salmon

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New labeling requirements for rodenticides, scheduled to go into effect this year, may have significant implications for pest-control management and the health of non-target species and the environment. Because rodenticides are so fundamentally important to controlling rodent pests—and because there is much misinformation out there about these materials—it's vital that pest-control managers and other wildlife professionals understand the facts.

In many cases, some form of lethal control is necessary to limit the extensive and costly damage that rodents and other pest species can cause, particularly to agricultural croplands. For example, in 2009 in California—a state that produces more than 400 different agricultural commodities—rodent and bird damage to 22 crops across 10 counties resulted in revenue losses ranging from \$168 million to \$504 million (Shwiff *et al.* 2009). These figures do not account for additional damage to structures (such as loss of structural integrity of irrigation canals caused by ground squirrels), ecological damage (such as nesting failures for song birds), and rodent transmission of diseases (such as bubonic plague, hanta virus, and leptospirosis). Nationwide, rats alone can cause an estimated \$19 billion in damage each year (Pimentel *et al.* 2005).

The best way to limit such widespread damage is through an integrated pest management (IPM) approach. An IPM strategy incorporates multiple methods—including habitat modification, trapping, fumigants, and rodenticides—to provide an ecologically sound basis for controlling rodent pests. This multi-pronged approach is considered more effective than relying on any single tactic (Engeman and Witmer 2000, Sterner 2008). However, because any form of lethal control can be controversial or potentially have unintended consequences, it's important for pest-control managers to have accurate information, particularly about rodenticides.

California's Case in Point

The California ground squirrel (*Spermophilus beecheyi*) is one of the most destructive rodent pests in California. One study found that this species was blamed for financial damages estimated at \$20 million to \$28 million in one year (Marsh 1998). Ground squirrels can cause a wide variety of problems including direct consumption of agricultural fruits, nuts, and forage; girdling of trees and vines resulting in lower production and/or death; loss of nuts down burrows during harvest; damage to irrigation sprinkler systems; loss of irrigation water resulting in higher water usage, lower production, and increased erosion; and injury or damage to farm laborers and equipment from extensive burrow systems.

“Ground squirrels can be a major problem in our vineyards,” says Jeff Lyon, senior viticulturist with Gallo Family Vineyards. “In mid-spring, I have seen them climb vines and completely consume developing shoots. The other major damage they cause is with mounding and associated danger to equipment and field workers. If left uncontrolled, the populations build over the years until they are at very high levels.”

The unsightly scrapings of ground squirrel teeth mar an avocado in California, where ground squirrels and other pests destroy fruit, nut, and other agricultural crops worth hundreds of millions of dollars each year. Integrated pest management involving rodenticides can significantly reduce pest populations—and save substantial harvests.



Credit: Roger A. Baldwin

Clearly some form of control is needed in such situations. When formulating an IPM program to control ground squirrels, the first step is to determine whether habitat modifications can be made to reduce the attractiveness of the area to these pests. For example, removal of brush and pruning piles from fields will reduce preferred burrow locations for ground squirrels,



thereby reducing the habitat potential of a particular field. This eliminates or cuts the cost of more direct control measures such as rodenticides and fumigants.

Unfortunately, only in rare cases is habitat modification enough to control ground squirrel populations to an acceptable level. Effective long-term control of rodent species typically requires a minimum reduction in population size of 70 percent and preferably closer to 90 to 95 percent to counteract repopulation from reproduction and immigration (Salmon *et al.* 1982). Therefore, more direct forms of control—such as trapping, fumigation, and rodenticides—will likely be needed to further reduce populations. The efficacy and appropriateness of each of these methods is influenced by a number of factors including cost, time to implement, presence of endangered species at control sites, and seasonal activity patterns and preferred foods of ground squirrels (see chart on page 53).

Burrow fumigation is one control method for which timing of the application is critical. This approach involves deploying gas cartridges (which emit carbon dioxide and carbon monoxide) or tablets of aluminum phosphide (which emit phosphine gas). Fumigation works best in spring when soil moisture is high because moist soils hold the emitted toxic gases in the burrow system. Likewise, soil moisture is required to evolve phosphine from the tablets. Later in the year, when soil moisture content is low, fumigation is less effective.

Alternatively, rodenticide baits—which are typically seed based—are less effective in spring, when ground squirrels are foraging on green vegetation, and more effective in early summer and autumn, when squirrels are feeding on seeds. Trapping may control small populations, but it is often too labor intensive and costly to implement on a large scale. No methods are effective when ground squirrels are hibernating (winter) or estivating (summer).

Acute Toxicants vs. Anticoagulants

Rodenticides are one of the most efficacious and cost-effective methods for controlling many rodent pests, and as such are clearly a necessary tool in developing an IPM program. These chemicals typically fall into one of two main categories: acute toxicants and anticoagulants.

Acute toxicants—such as zinc phosphide, strychnine, bromethalin, and cholecalciferol—are compounds that kill the target animal after a single feeding, often



Credit: Jack Kelly Clark



Credit: Roger A. Baldwin

within a few hours. Due to their highly toxic nature, acute toxicants are usually restricted-use materials, and therefore require a state-issued applicator's certificate or license to purchase and/or apply. Because of such restrictions, acute toxicants are not used as frequently as anticoagulant rodenticides. In fact, zinc phosphide is currently the only acute toxicant registered for aboveground use for controlling rodents in agricultural fields in California.

As pointed out in a recent article in *The Wildlife Professional* (Abhat 2010), zinc phosphide poses less risk for secondary exposure of nontarget species—exposure from consuming carcasses containing residual rodenticides—than anticoagulants. This is because phosphine gas, the killing agent in zinc phosphide, does not accumulate in body tissues following consumption, but rapidly dissipates from the body after death (Erickson and Urban 2004). This is certainly a positive attribute of zinc phosphide.

Unfortunately, there are also some significant pitfalls of zinc phosphide that were not noted in the Abhat article. For example, bait acceptance is often

The California ground squirrel (*Spermophilus beecheyi*) is a burrowing rodent whose extensive tunnel systems plague California's farmers. Damage in a pistachio grove (above) shows how the squirrels' burrows can weaken tree roots, cause erosion, and leave hazardous holes that pose a threat to farm workers and equipment.



RESTRICTED USE PESTICIDE

Due to Hazards to Nontarget Organisms

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

Credit: California Dept. of Food & Agriculture



Credit: University of California Dept. of Agriculture and Natural Resources

Grain treated with first-generation anticoagulants is poured into a standard inverted-T bait station, which allows easy access to California ground squirrels while reducing the exposure risk for many non-target wildlife species. New labeling restrictions will restrict the use of these materials for field applications, a move the authors fear could jeopardize effective rodent control.

low with zinc phosphide because of its distinctively strong garlic-like odor and taste, although pre-baiting with nontoxic oats can improve bait acceptance in some cases. Bait shyness is also a real problem with this product, as rodents that consume a sub-lethal dose will become sick and will then associate sickness with the zinc phosphide bait. Because of this bait-shyness issue, applications of zinc phosphide are typically only recommended for one or two treatments per year, meaning that some alternative form of control will be needed if the zinc phosphide application does not result in the desired reduction in population size.

Additionally, even though zinc phosphide poses little risk of secondary exposure, one study showed that it had the highest risk of primary exposure through direct ingestion among non-target species of any of nine rodenticides studied (Erickson and Urban 2004). Likewise, if non-target animals consume zinc phosphide, there is no known antidote, whereas vitamin K is a known antidote for anticoagulants. For these reasons, anticoagulants are more commonly used and often more suitable for rodent control in both agricultural and urban/suburban settings.

Two Generations of Anticoagulants

Anticoagulants are rodenticides that limit the blood's ability to clot and thereby kill through internal hemorrhaging. A wide variety of anticoagulants

are currently registered for use in the U.S., although they all fall into two categories: first generation or second generation. The first-generation materials, developed in the late 1940s to early 1970s, include warfarin, chlorophacinone, and diphacinone. These rodenticides generally require multiple feedings over the course of three to five days to be effective. Because of this multiple feeding requirement, first-generation anticoagulants are considered to have the least impact on non-target vertebrates. As such, they are the only anticoagulants registered for use in field settings.

In contrast, second-generation anticoagulants—such as brodifacoum, bromadiolone, and difethialone—were developed more recently (beginning in late 1970s) and require only a single feeding to kill target rodents. However, the time to death is four to five days, which is essentially the same as with first-generation, multiple-feeding anticoagulants (Erickson and Urban 2004). Because of this, rodent pests can continue to consume bait over several days, potentially resulting in high anticoagulant build-up in muscle tissue given the higher toxicity and longer half-lives associated with the second-generation materials. It is this potential for bioaccumulation that prohibits second-generation use in agricultural fields and rangelands, and limits use primarily to non-field settings such as residential areas and agricultural buildings.

This is important to note, as it refutes what was implied in *The Wildlife Professional* article last year, which stressed the potential secondary risks of first-generation anticoagulants. In fact, second-generation anticoagulants have a much higher risk of harmful secondary exposure because of their greater potential for bioaccumulation (Erickson and Urban 2004). For example, one study found that 82 of 96 dead raptors collected in California exhibited probable secondary exposure from second-generation anticoagulants versus only one raptor with exposure from a first-generation compound (Lima and Salmon 2010).

Likewise, another study found that 27 of 30 kit foxes in California exhibited probable secondary exposure from second-generation anticoagulants versus only two affected by a first-generation material (McMillan *et al.* 2008). In reality, the potential for secondary exposure from first-generation anticoagulants appears to be quite low when used according to label requirements (e.g., amount applied per area for specific land-cover types and



species, method of application, timing of application), and poses little risk to populations of non-target scavengers (Silberhorn *et al.* 2006).

Changes in Labeling

This year's new labeling restrictions, set forth by the Environmental Protection Agency, are designed to address concerns regarding potential risks to human health and the environment. The restrictions will apply to both first- and second-generation anticoagulants, and could be problematic for both (Hornbaker and Baldwin 2010). First-generation materials will become restricted-use rodenticides for field applications, meaning that only certified users will be able to purchase and use these materials for controlling rodents in agricultural fields. Because smaller, private growers may not be certified to apply restricted use materials, this change may result in lower usage of safer first-generation anticoagulants, which could have negative ramifications on rodent control, the ag industry, and the environment.

Second-generation anticoagulants will *not* become restricted-use rodenticides, but they will no longer be available for purchase in consumer-size packages at retail stores. Rather, they will be available for sale to non-certified users only in farm-supply stores and only in packages of eight pounds or more, a measure to discourage homeowner use. However, this does not preclude a homeowner or farmer from purchasing second-generation materials and using them in a manner inconsistent with the label. For example, they may decide to use second-generation anticoagulants for ground squirrel control around their property, even though such use is clearly not allowed.

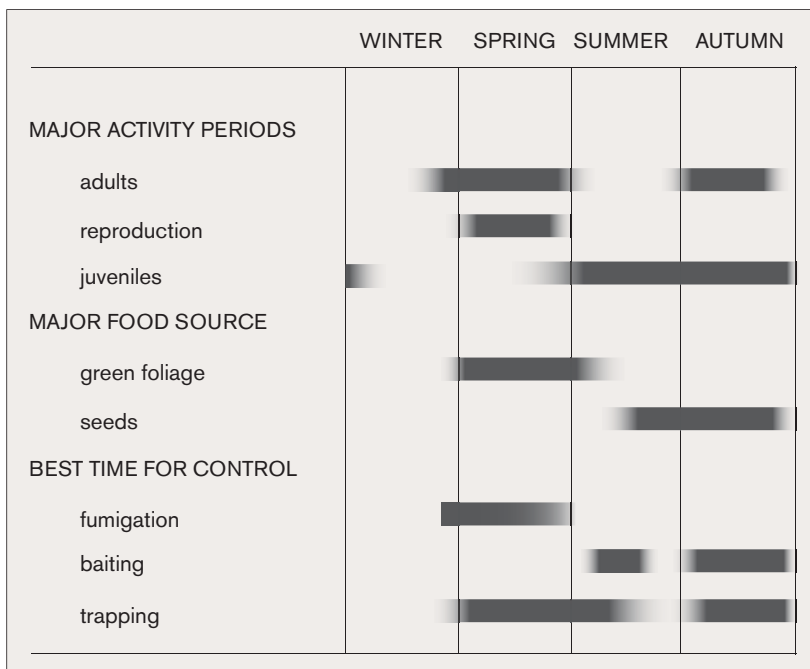
We are concerned that these anticoagulant label changes could result in one of several negative consequences. For example:

- Rodent pest populations could increase given the potential reduction in field-use of effective first-generation anticoagulants as a pest-management tool.
- There may be greater use of second-generation anticoagulants in an unlawful manner given the relative unavailability of the safer first-generation materials for non-certified users attempting pest control in agricultural fields.
- Some people may resort to using registered pesticides in a manner inconsistent with their labels, or attempting pest control with other non-registered materials such as household chemicals or anti-freeze. This would likely pose a much greater threat to the environment.

In short, we feel that the new restrictions on first-generation anticoagulants may lead to greater environmental problems than would the potential decrease in availability of second-generation anticoagulants.

The Need to Get it Right

Controlling rodent pests is a difficult yet necessary action in many agricultural and urban/suburban settings throughout the world. These control actions need to be administered in a manner that is safe not only for humans but also for non-target wildlife and the environment. Today, this typically means developing



Credit: University of California Dept. of Agriculture and Natural Resources

an IPM program, of which rodenticides are often an important component. Unfortunately, a lot of misinformation is out there about rodenticides, which can lead to negative feelings and reactions about this valuable tool. It is incumbent upon us as wildlife professionals to ensure that the most current and accurate information is disseminated so that our expertise can be used to help address and solve many of the problems that abound from human-wildlife interaction. ■

Basic tools of Integrated Pest Management—including fumigation, baiting, and trapping—will be most effective when applied at the optimal time of year and stage in the life of the target species.

This article has been reviewed by a subject-matter expert.



For a complete bibliography and more information about rodenticide use, go to www.wildlife.org.



Garnering Goodwill for Conservation

HOW TO RALLY LOCAL SUPPORT FOR ENDANGERED SPECIES

By Bill E. Van Pelt



Credit: George Andrejko/Arizona Game and Fish Department

Bill E. Van Pelt is the Western Association of Fish and Wildlife Agencies Grassland Coordinator and a biologist for the Arizona Game and Fish Department.

Sixty-six ferrets. That is how many federally endangered black-footed ferrets (*Mustela nigripes*) biologists found in Arizona's Aubrey Valley in October 2010. From a recovery standpoint that number represents a self-sustaining population, and one more notch toward down-listing the species from endangered to threatened. From my perspective, however, other numbers are equally important to the success of this conservation effort—like the 84 volunteers who spent 686 hours searching for ferrets at night in the prairie dog towns west of Seligman, Arizona.

Though most Americans support endangered species recovery efforts, it is often difficult to find local support when you are looking for a reintroduction area. Residents give lots of reasons not to cooperate: They fear that having endangered species on or near their property will bring about land-use restrictions, cause economic depression, or lead to wasteful government spending.

This perception is difficult to overcome. But from the 20 years I've spent working on the black-footed ferret reintroduction program in northern Arizona,



Credit: Nanci Harlin

A painting by artist Nanci Harlin of Seligman, Arizona, portrays the black-footed ferrets that were released into Gunnison's prairie dog colonies in the grasslands of Arizona's Aubrey Valley. Sales of limited-edition prints of this work raised money for Seligman's art program and the ferret reintroduction effort.

I know it's possible to show the public that the Endangered Species Act (ESA) is not to be feared, and is more flexible than they might imagine. To send this message home, we must directly connect the public to the effort—not by producing a brochure with a cute picture and thanking them for their tax dollars or donations, but by having citizens strap on a 25-pound backpack with a spotlight and battery, sending them off under a full moon or drizzling rain, and having them look for one of the most endangered mammals in the world.

Establishing Common Ground

Arizona began dabbling in black-footed ferret conservation efforts in the mid-1980s. Though efforts by Arizona Game and Fish Department (AZGFD) biologists to find possible remnant populations of ferrets were fruitless, the state housed large blocks of potential ferret habitat within the range of the Gunnison's prairie dog (*Cynomys gunnisoni*)—the ferrets' main prey. It seemed that reintroduction could be a possibility, so in 1990 AZGFD began looking for a potential reintroduction site.

By 1994 biologists identified the Aubrey Valley, located approximately eight miles west of Seligman, as having the highest potential for reintroduction success. The 221,950-acre reintroduction area was comprised of 28 percent private land, 51 percent tribal land, and 21 percent state trust land. This checkered land-ownership pattern presented a unique opportunity for the partners—Arizona State Land Department, Navajo and Hualapai Indian Nations, Cholla Cattle Company, Phoenix Zoo, U.S. Fish and Wildlife Service (FWS), and AZGFD—to contribute toward recovering an endangered species on a working landscape.

The primary private landowner, the Navajo Nation, soon informed the partners that the only way they could support ferret reintroduction was to designate the population as "nonessential experimental" under Section 10j of the ESA. This designation allows a population of an endangered species to be down-listed to threatened for a given geographical area



and have special rules drafted for their management. If a ferret in the nonessential experimental population began using a burrow in a cattle corral, for instance, managers could relocate the animal—a big no-no if the animal were listed as endangered.

In spite of this flexibility, those of us working on the reintroduction constantly heard grumbling from locals that the 10j regulation was a backdoor approach for the federal government to gain control of private land. We began to fear the effort was beginning to slip away before it even began.

To alleviate the community's concerns, we began holding coffee-table meetings at the homes of prominent local citizens and individuals who would have ferrets on or near their land. We explained that the 10j designation gave us flexibility in managing the ferrets, and reassured them that we had no intention of taking over their land. After months of such informal chats, when a public hearing was held in Seligman in December 1995, there was no voiced opposition. A final rule designating the Aubrey Valley Experimental Population Area (AVEPA) was published in the Federal Register on March 20, 1996.

Trust Through Involvement

Though the public hearing was a success, acceptance into the Seligman community was a long, slow process. We gained trust with baby steps. Early on, we asked Cholla Cattle Company's ranch manager, Tip Tipton, to accompany us to select release pen locations to ensure that the reintroduction efforts would not compromise his cattle operations. Within one month, we obtained all clearances and permits and built 10 one-acre pens. We placed the first four ferrets in two pens on March 27, 1996, and released an additional 31 ferrets that year.

Next we established a field station within the Seligman community, where the crew could live while taking care of ferrets prior to their release. We felt it was important to show that we weren't going to dash out of town after only a year or two, leaving the community with the ferrets to deal with. We were there for the long haul.

But the crew needed help to maintain ferrets in pens year-round. We began recruiting county prison crews, community restitution individuals, special interest groups, and college students to fix pens, string electrical wires, and install monofilament to deter raptors. Hunting groups and interested

sportsmen also got involved, coordinating with AZGFD to collect shot prairie dogs for ferret food and take tissue samples from coyotes to test for canine distemper and sylvatic plague—diseases that can kill ferrets. Even today, I receive Christmas cards and notes from people I have never met who helped with these important tasks.

As the ferret program gained momentum, we took steps to involve Seligman's youth. In 2005, the project teamed with the Northern Arizona Council of Governments (NACOG), which provides job skills to young people in rural communities, to develop an internship program for juniors and seniors at the Seligman high school. Some interns chose to work on the ferret reintroduction project, and one was even hired as a field team member after graduation.

The community and the project also benefitted from the generosity of a local artist, Nanci Harlin. To commemorate the 10-year anniversary of black-footed ferret reintroduction in Arizona, Harlin painted a scene depicting a ferret release, accurately portraying the area's grasslands. Proceeds from sales of the print are split between the reintroduction effort and the Seligman schools' art program.

Boots on the Ground

The most far-reaching element of our outreach was and continues to be our volunteer spotlighting event. Our main way of monitoring ferrets, which are nocturnal, is by searching for them at night using powerful spotlights to reveal their glowing green eyes. After we spot an animal at a burrow, we place a trap at the burrow entrance, then wait for the door to snap shut. We weigh, sex, and age the captured animals, measure parasite loads, vaccinate them against distemper and plague, and insert a PIT tag for future identification if they haven't received one yet. We spotlight each year in March to determine the adult population size, and in October to assess the recruitment of young.



Credit: Dave Dundas

Black-footed ferret recovery team supervisor Jeffrey Corcoran prepares to take standard measurements of an anesthetized ferret, as the children who helped trap the animal during a nighttime survey look on. By the time they return the ferret to its hole, it will be alert and ready to dash out of sight.



Credit: Bill Van Pelt

Emma, Meagan, and Ariel Van Pelt (left to right)—daughters of author Bill Van Pelt—lift a piece of burlap to reveal a black-footed ferret caught in a trap at its burrow. Scout troops, science classes, and other young people from northern Arizona volunteer each March and October to find, trap, and study ferrets from this reintroduced population.

In 2004, we realized that these spotlighting surveys were a great way to give the public a taste of what the reintroduction was all about, so we began having members of the public help us with the surveys. Two years later, Boy and Girl Scouts began volunteering to spotlight and help process captured ferrets—earning merit badges for their hard work. Similarly, we encouraged college professors to give class credit to students who participated in a spotlighting event.

As word got out about our projects, volunteers increasingly came to us. For the October 2010 event, 61 volunteers showed up in one night. One of those was my daughter's fifth-grade teacher, Dave Dundas, from Phoenix's Desert Cove Elementary School. "For the most part, people only see the glorified element of working with wildlife on the Discovery Channel," Dave said during the long night. "It is great for me and others to experience this work and know we too can contribute to saving our wildlife heritage for others to enjoy in the future."

The Seligman Chamber of Commerce—thankful that ferret volunteers patronized area hotels, restaurants, and other retailers during spotlighting events—invited a member of the black-footed ferret field crew to sit on the Chamber. In a grateful letter to the recovery team, the Chamber president wrote: "The reintroduction of the black-footed ferret has

helped instill a sense of pride in the community because this endangered species is being released in their own 'backyard.'"

Building upon Success

While it would be nice to pat ourselves on the back for how well we integrated the ferret project into the community, the reality of it was luck. Other reintroduction projects implemented at the same time, using the same model, have struggled with acceptance. My best guess as to the reason for our success traces back to the first conversations we had with members of the public and landowners. We gave them assurances that we would respond to their concerns about the project—and we did.

Our good relationships helped us build new ones. In 2007, for instance, we worked with Babbitt Ranches—a large horse and cattle ranching company that owns more than a million acres in northern Arizona—to develop the state's second ferret reintroduction site. But because Babbitt didn't want to wait four or five years to go through the Section 10j process, we instead applied for an experimental permit under the seldom-used section 10(a)1A of the ESA. Under this permit, the reintroduced animals would still be fully endangered—unlike the non-essential experimental designation used in the Aubrey Valley. But like that rule, the permit provides greater flexibility to managers to deal with human-wildlife conflict and other concerns.

From developing the application to receiving the permit took just 77 days, including a 30-day public review. On October 28, 2007 six ferrets from Aubrey Valley were transported to Babbitt's Espee Ranch and released by the rancher and his family. After an absence of more than 75 years, black-footed ferrets once again roamed the Coconino Plateau.

Most people genuinely want to conserve wildlife and the habitats they rely upon, but as wildlife professionals, we have to smooth the path to allow this to happen. Time, patience, and relationship-building are easily forgotten in this world of instant communication. Yet if these elements can be harnessed, our public will continue to have the opportunity to find a jaguar track in the Coronado National Forest, hear a Mexican wolf howl in the White Mountains, see a California condor soar over the Grand Canyon, or watch a black-footed ferret dance across Arizona's northern grasslands. ■



Critiquing the North American Model

DEBATE AND OPEN MINDS KEEP THE MODEL DYNAMIC

By Daniel J. Decker, Ph.D., CWB

Wildlife conservation and the wildlife profession in North America have changed in many important ways over the last 100 years. Change has been influenced by science and technology, economic conditions and land uses, and socio-cultural and demographic trends, all of which have been synthesized in politics and policy. Change often involved struggle within our profession, because the people most deeply involved felt they had much to lose or to gain. Struggle in the face of change is natural. Yet a measure of the maturity and durability of a profession is how it debates issues and deals with internal discord when under pressure to make fundamental change. We now face just such pressure.

Over the last 10 years, several highly regarded wildlife professionals—including Valerius Geist, John Organ, Shane Mahoney, and Ron Regan—have described the basic tenets of wildlife conservation in North America, defining these as the North American Model of Wildlife Conservation (the Model). Many recognize that the Model's story is well worth trumpeting. Indeed, *The Wildlife Professional* devoted its entire Fall 2010 issue to a largely celebratory look at the accomplishments of the Model. Not surprisingly, that issue generated many positive comments and requests for extra copies.

Pride in our profession's accomplishments as described in narratives about the Model is important, but unfortunately, many people feel that the Model is sacrosanct and should not be tampered with. To some, disagreeing with tenets of the Model or even critiquing it has been regarded as akin to blasphemy. Now *that's* a problem.

Retrospective in nature, the Model interprets our wildlife conservation history and the values that undergird it—nothing more and nothing less. It was never proposed as a description of perfection or intended to be accepted unquestioningly. Rather, it's meant to catalyze discussion and stimulate questions. Just reiterating the Model and singing its praises therefore does not do justice to the work of those who articulated it in the first place. Its ideas and assertions

should be scrutinized and polished. Looking forward, some aspects may even need to be retired as we consider questions like: How durable will the Model be as we move through the next century, and how might our approach to wildlife conservation be improved given the threats we face today?

Differing Views

The following two articles critiquing the North American Model challenge us to consider such questions and to think harder about how we interpret the past and look to the future. The authors urge critical reflection on our approach to wildlife conservation, and question the Model as an entirely valid, adequate, and useful presentation of wildlife conservation. Some readers will be discomforted by these critiques. But by publishing these articles, TWP does what a professional communication vehicle should do: Provide an opportunity for the professional discourse that those who first described the Model hoped would occur.

Agree with them or not, these two critiques remind us that our professional community is not monolithic, but instead is very much pluralistic. We share many values and norms, but we also differ in our perspectives. Happily, we also question our science and philosophy, and in doing so maintain the potential to be resilient as a profession. This trait of our profession is nurtured by constant reflection about, and reconsideration of, our philosophies and practices, as the never-ending changes in wildlife conservation knowledge and context require.

It is an exciting time for our profession as we ask questions about how to transform what we do and how we do it in order to remain vital and relevant to society. The asking is just as important as the answers. A vibrant profession needs to understand where it came from, but, more important, it needs to strive for clarity in where it is heading. So, just as we applaud those who have defined the Model, we also need to applaud colleagues who constructively question it so that we all consider possible changes that may serve wildlife conservation well in the future. ■



Courtesy of Cornell University

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An Inadequate Construct?

NORTH AMERICAN MODEL: WHAT'S FLAWED, WHAT'S MISSING, WHAT'S NEEDED

By Michael P. Nelson, Ph.D., John A. Vucetich, Ph.D., Paul C. Paquet, Ph.D., and Joseph K. Bump, Ph.D.



Credit: Heather Varco

Michael P. Nelson, Ph.D., is an Associate Professor of Environmental Ethics and Philosophy in the Lyman Briggs College, the Department of Fisheries and Wildlife, and the Department of Philosophy at Michigan State University.

The North American Model of Wildlife Conservation has seen a meteoric rise in acceptance and influence among wildlife professionals in the past decade. Since the first articulation of the Model appeared in 2001 (Geist *et al.* 2001), literature about it has grown, professional organizations have endorsed it, institutions have developed curricula to teach it, state agencies have built it into their strategic plans, sessions at professional meetings have focused on explaining it, and an entire issue of *The Wildlife Professional* was devoted to it (TWP 2010).

But what exactly have so many been writing about, endorsing, teaching, explaining, and celebrating? The North American Model is expressed as two related (sometimes conflated) endeavors: a description of the history of conservation in North America, and an ethical prescription for how conservation should proceed. That is, the word “model” is sometimes employed to describe the way wildlife was or is managed in North America, and sometimes the word “model” is used in a congratulatory sense to praise the past and to prescribe how future wildlife conservation ought to be conducted in North America and elsewhere. Yet the rise in the Model’s popularity is worrisome in both its descriptive and prescriptive modes: One rests upon an inadequate account of history and the other on an inadequate ethic.

Inadequate History

When “Model” is used descriptively, it presents a narrative explaining how North Americans came to embrace wildlife conservation. According to this narrative, market or commercial hunting villainously

ravaged North American wildlife populations until the late 1800s. The rise of sport or recreational hunting, however, acted as the salve to wildlife exploitation, eventually saving wildlife populations. Recreational hunting was the critical means by which we grew to care for wildlife, and the fundamental motivation to lobby and pay for conservation.

Yet a broader interpretation of history indicates that recreational hunting was only one of several important factors that led to improved conservation in North America. Beginning in the 1960s, for example, conservation was dominated by non-hunters whose legacy includes key legislation such as the U.S. Wilderness Act, Endangered Species Act, Clean Air and Water Acts, and similar acts in Canada. In addition, what are commonly referred to as “non-consumptive” uses of nature—such as national park visitation and bird watching—have also been important for motivating conservation action (Duffus and Dearden 1990, Balmford *et al.* 2009). These perspectives on the history of conservation do not stand in opposition to hunting, yet they show how other forces also shaped North American wildlife conservation, and how hunting is not *necessary* for conservation.

The two main sources that advocates of the Model cite to support their historical hunter-conservationist narrative include John F. Reiger’s *American Sportsmen and the Origin of Conservation* (Reiger 2000) and James B. Trefethan’s *An American Crusade for Wildlife* (Trefethan 1975, published by the Boone and Crockett Club). Yet other wildlife histories suggest a dramatically different narrative.

According to Thomas R. Dunlap’s *Saving America’s Wildlife: Ecology and the American Mind, 1850-1990* (Dunlap 1990), a variety of nature enthusiasts strove to save North American wildlife and support conservation. Dunlap also shows that while recreational hunters worked to save wildlife deemed “game species,” some actively worked against the conservation of non-game species under the guise of eradicating “varmints and vermin”—and some still do. Moreover, the historical narrative dominating current literature on the Model

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focuses almost exclusively on the ideas and actions of Theodore Roosevelt, Gifford Pinchot, and others with a narrowly utilitarian focus, while downplaying the contributions of individuals such as John Muir and Aldo Leopold, who motivated broad-based conservation without focusing on hunting as its primary tool.

While the Model's selective historical narrative serves the conclusion that recreational hunting is (or at least was) necessary for conservation, a more complete historical narrative does not support that conclusion. Developing a historical narrative to serve the justification of a specific ethical prescription is not uncommon. It is troublesome, however, if that history is so selective that it ignores historical elements contradicting the ethical prescription. Because the Model ignores historical evidence contrary to its ethical prescription, it is based on an inadequate accounting of history.

Inadequate Ethics

The North American Model also represents inadequate ethical reasoning and a misguided prescription for the future of conservation for three main reasons. First, it relies too heavily on the principle that past behavior is an appropriate justification for future behavior. To suggest that a historical episode can justify an ethical prescription is to commit a logical fallacy known as *argumentum ad antiquitatem* (the argument from antiquity or from tradition). One would not argue that society should perpetuate child slave labor or gender discrimination simply because such practices are part of our history. Likewise, it is wrong to conclude that hunting should play a central role in future conservation simply because it had in the past.

Second, if conservation is best served by a multi-pronged approach, then why do advocates of the Model focus almost exclusively on the role of hunting, especially since participation in hunting is on the decline? If one's primary concern were conservation in general, then to focus on hunting as the means to conservation would seem an obviously inadequate strategy. This raises the concern that advocates of the Model are not primarily motivated by conservation, but rather by defending hunting. We do not object to advocating for either. However, these concerns make us wonder if Model advocates have obfuscated motivations, a hallmark of inadequate ethical reasoning.

A third reason to wonder whether the Model's primary interest is hunting rather than conservation is its neglect to address important contemporary instances where the interests of recreational hunters conflict with conservation. For example, hunter interest is

often an important influence behind management leading to overabundance of ungulates and the diminution of ecosystem services provided by predators, both of which compromise ecosystem health. Indeed, some important Model advocates are not allies in efforts to restore and maintain the ecosystem services that predators provide (e.g., [Geist 2008](#)).

The "Seven Sisters" of the Model

The seven basic tenets of the North American Model help illustrate its inadequate historical and ethical reasoning. While each tenet may capture a fine principle, it is far from obvious why together these principles represent an adequate or insightful basis for conservation in general, or for wildlife conservation in particular. A great deal of scholarship ([Callicott 2005](#), [Jamieson 2008](#), [Speth 2005](#), [Meine 2004](#)) suggests that the future of conservation will depend much more on principles that address complex questions such as: Are non-human creatures and ecological collectives valuable for their own sake or only for their value to humans? Do people living in developed countries have an obligation to reduce

... it is wrong to conclude that hunting should play a central role in future conservation simply because it had in the past.

resource consumption? How do we define ecosystem health, and how can it be maintained while, at the same time, maximizing values such as human liberty and social justice? The seven tenets of the Model do not reflect these important issues.

Even if the seven tenets represent appropriate principles in and of themselves, several of them seem characterized more by the questions they raise than by the conservation insight they provide. For example, one tenet asserts that *Wildlife Can Only Be Killed for a Legitimate Purpose*. This principle is as basic and appropriate as it is void of useful insight about defining a legitimate purpose.

Another tenet asserts that *Science is the Proper Tool for Discharge of Wildlife Policy*. This is mistaken for equating a desire for policies informed by science with science discharging or determining, by itself, what policies ought to be adopted—a serious, but very common, error in ethical reasoning. Scientific facts about nature cannot, by themselves, determine how we ought to relate to nature or which policies are most appropriate ([Moore and Nelson 2010](#)). This tenet is also inadequate because, while



it notes the relationship between science and policy, it fails to recognize the most important obstacle in understanding that relationship. Specifically, understanding how ecological, sociological, economic, political, and ethical knowledge should be synthesized for the purpose of policy development, especially when scientific knowledge is often characterized by an inability to make precise predictions about how policies will affect natural systems.

Several of the seven tenets touch on how natural resource management is related to social justice and human liberty (i.e., *Wildlife are Considered an International Resource*, *Allocation of Wildlife by Law*, *Democracy of Hunting*, and *Wildlife as a Public Trust Resource*). However, these principles are not useful without also acknowledging questions like: In practice, when is it wrong to prevent the over-exploitation of a resource by local people who have no other means to satisfy their short-term needs? And, is it wrong to preclude a rural population from hunting a wildlife population because urban citizens think that is an inappropriate use of the resource? The challenge in a democracy is to know when the interests of the majority are relevant or trivial and whether they should be honored if they represent a serious infringement on the interests of the minority.

Another problematic tenet asserts that the *Elimination of Markets for Wildlife* is necessary for conservation. Yet wildlife resources are commercialized and privatized in many parts of the world, including Europe, where conservation seems as well developed as in North America. In addition, “wildlife” such as aquatic organisms, marine organisms, and plants are often commercially harvested. In many of these cases, the concern is for developing a sustainable commercial harvest, not elimination of the market. The Model fails to explain why conserving terrestrial vertebrates in North America ought to be so exceptional to conservation elsewhere.

Moreover, to believe that North American hunting no longer remains a highly commercial and market-driven activity is to fail to recognize the commercial interests at stake. Many companies, like hunters themselves, profit from overabundant game populations and wildlife consumption. Consider catalogs from companies like Cabela’s or Bass Pro Shops. The consumption that such “wildlife” markets promote represents a threat to wildlife and conservation. Finally, forms of wildlife management such as the harvest of furbearers perpetuate markets for wildlife. Perhaps *Elimination of Markets for Wildlife* should

be replaced with *Eliminate or Transform Markets that Threaten Conservation*. This would make it clear that the goal is not merely the elimination of markets that threaten recreational hunting.

Even if the North American Model’s primary motivation *was* to promote hunting, and even if it did so transparently, the Model would still fall short. The problem is not that hunting is an unworthy or indefensible activity, but rather that the Model gives an inadequate defense of hunting; misapprehends the relationships among hunting, conservation, and the seven tenets; and ignores the most potent criticism against hunting (i.e., that some hunts are inconsistent with the tenet that *Wildlife Can Only Be Killed for a Legitimate Purpose*).

A More-Inclusive Construct

The ethics of hunting is a complex and easily misunderstood topic requiring far more attention than can be offered here. Ultimately, we doubt the claims of proponents that the North American Model is “probably the greatest environmental achievement of the 20th century ... [and] may be one of the greatest achievements of North American culture” (Geist 2006). Further, it is unclear how the Model is useful for understanding or evaluating what the role of recreational hunting should be in developed countries of the 21st century.

Perhaps the greatest value of the Model, however, is that it highlights the need to confront a more basic question: What is conservation? All of us should explore whether wildlife management and conservation are the same, as implied by Model advocates, or whether the two disciplines represent different, occasionally conflicting, ambitions. The latter view led to the founding of the Society for Conservation Biology, which views wildlife management and conservation as different ambitions (Soulé 1985, Aplet *et al.* 1992).

The future of conservation will require an adequate understanding of these and other issues that are both essential and under-treated (Vucetich and Nelson 2010, Vucetich and Nelson in press). We need to ask: What does it mean for a population or ecosystem to be healthy? Do populations and ecosystems deserve direct moral consideration? How does conservation relate to or conflict with other legitimate values in life, such as social justice, human liberty, and concern for the welfare of individuals? Resolving these and other questions and conflicts could provide a truly meaningful conservation model worth celebrating. ■



Moving Beyond the Model

OUR ETHICAL RESPONSIBILITY AS THE TOP TROPHIC PREDATORS

By Peter Dratch, Ph.D., and Rick Kahn

At a time when wildlife conservation has seen so many successes—from the abundance of game animals, to the restoration of bald eagles and other endangered species, to the return of predators to their dynamic role in ecosystems—the profession of wildlife management sees a crisis coming. The number of hunters has sharply declined along with the revenue that they provide. However, it is not only revenue and political clout that are at risk. Hunters, by pursuing game, contribute to keeping wildlife wild, and we would argue that wild wildlife is the key to long-term public support of species and their habitats.

One of the central problems we face today is too many animals too close to people. To address it will require that both the utilization and preservation camps of the conservation community come together. It will ultimately take a change in public attitude, where we all recognize our ethical responsibility as the top predators in human-altered ecosystems.

Retrospectives of the North American Model of Wildlife Conservation written in the last decade celebrate the Model's successes in restoring some wildlife species (Geist *et al.* 2001, Organ *et al.* 2010). One limitation of the Model, however—made particularly apparent in the articles of the Fall 2010 issue of *The Wildlife Professional*—is that it is essentially a hunter-conservation construct. Public hunting of wildlife is central to most of its seven pillars. And while utilization has been one aspect of the conservation movement since its early days, preservation has been an equally important part. For every hunter who wanted to see abundant quarry, there was another person who wanted the prospect of seeing wildlife outside of town in natural settings. With less than one in 20 citizens now hunting, a conservation model relying on hunters can't succeed in this century.

The crisis we face today is a result of the success of both conservation camps. The preservationists wanted animals that wouldn't immediately flee, and the utilitarians wanted abundant animals. Both got what they wanted. However, scarcity is a powerful

tool that impacts how people view resources. Today, white-tailed deer in some eastern suburban areas are not even considered wildlife by some members of the public (Leong 2010). When the public perceives wildlife as more common and less wild, it will become increasingly devalued.

Aldo Leopold wasn't wrong when he wrote, "Babes do not tremble when shown a golf ball, but I should not like to own the boy whose hair does not lift his hat when he sees his first deer" (Leopold 1953). For all his vision that conservation must be based in ethics, Leopold could not anticipate a time when deer would be so common that a youngster would rather play virtual golf and shoot virtual deer.

While we have spent our careers working for the two different conservation camps, it is important to recognize that the utilitarians and preservationists were not always so distinct. When wildlife populations were decimated by habitat loss due to homesteading and then by market hunting, political forces joined to protect some species from extinction, but also to produce others in abundance for the benefit of hunters. Conservation groups such as the Audubon Society, Camp Fire Club, Sierra Club, and New York Zoological Society worked with hunting groups like Boone and Crockett and the League of American Sportsmen to improve laws and secure lands for wildlife (Brown 2010). Out of this dual desire for a richer future, the federal wildlife refuge system was born in 1903, when President Theodore Roosevelt designated Pelican Island as the first protected refuge for at-risk wildlife. Describing that moment, Roosevelt biographer David Brinkley wrote, "With one sweeping 'I So Declare It,' President Roosevelt, the big game hunter, had entered John Muir's aesthetic preservation domain" (Brinkley 2009).

The States Control the Game

Though the federal government had primary responsibility for migratory birds, the rebuilding of most wildlife populations became the responsibility of the states. By creating hunting licenses, establishing hunting seasons and bag limits, transplanting



Credit: Greg Herman

Peter Dratch, Ph.D., is Senior Biologist of the U.S. Fish and Wildlife Service Inventory and Monitoring Program.



Courtesy of Rick Kahn

Rick Kahn recently retired after 32 years with the Colorado Division of Wildlife.



animals to start new populations, and restoring habitat, the state game departments were successful at bringing back to prior abundance animals that hunters wanted such as white-tailed deer, elk, and wild turkey. The passage of the Pittman-Robertson Act in 1937 established a user-pays system that helped fund those game departments differently than other state programs or federal wildlife and land agencies, which relied upon general tax funds.

The success of state wildlife agencies at managing certain wildlife species for hunters came at a cost: Non-hunters were marginalized, leading to an erosion of political power, particularly in urban states. This “iron triangle” relationship between wildlife agencies, hunters, and policymakers limits access

of individuals who do not share similar viewpoints on resource management (Gill 2004). State regulations, in combination with land use changes, were successful at bringing back wildlife species such as deer to levels higher than previously recorded, but the price was this “duality” between “hunters and everyone else” (Decker *et al.* 2009).

Wildlife science initiated by states, universities, or Co-op Units reinforced the trend of tracking and counting hunted species, providing the wildlife profession with the tools and technology to better manage populations (White and Bishop 2010). However, accurate numbers and trends may be less important in the future as traditional hunting declines as an effective tool in manipulating populations. For the problems we face today, it may be more important to understand the behavioral responses of individual animals and locally adapted populations to various forms of predation than it is to know the size and distribution of a population.

It has only been in the recent past that state wildlife departments have widened their focus beyond animals for utilization. But the new emphasis on more diverse species management and a wider constituency is a work in progress, and the rate at which the agencies are adapting may not be fast enough to ensure solid public support in the future. States are still relying primarily on hunters’ licenses and federal aid from excise taxes to fund their wildlife agencies, which see and portray themselves as the primary drivers of wildlife conservation.

**We are responsible
for all wildlife, not only
ensuring that viable
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but that animals
remain wild.**

Parks for Wildlife Watching

From the time the Army was sent to Yellowstone in 1872 to guard the last free-ranging bison herd, the national parks have been sanctuaries for wildlife and provided source populations for the restoration of wildlife species. The mandate of the new national parks was no less utilitarian than that of the state agencies: They proved their value by drawing visitors, and wildlife was a big draw.

All species were not equal in the eyes of early park managers. Historian Thomas Dunlap describes it this way: “[F]or park officials wildlife meant only those creatures that added to the parks’ appeal. The ideal animal was large and stood around in groups in the open—posing nobly in the middle distance against a background of moun-

tain peaks—or entertained tourists with its ‘cute’ antics. ‘Management’ meant encouraging these species, killing their ‘enemies’ and ignoring the others. Yellowstone superintendents, for example, kept the buffalo near the roads and stampeded them to show prominent visitors the ‘thundering herd.’ They fed elk through the winter and set up feeding stations for bears at the park’s garbage dumps—with bleachers for the tourists. They shot, trapped, and poisoned wolves, coyotes, and mountain lions” (Dunlap 1990).

For decades, parks have sustained an overabundance of wildlife that the public wanted to watch—to the detriment of other species. Rather than being fed and food-conditioned, some species are now habituated, exhibiting a range of normal behavior and largely ignoring the humans who are watching. Habituation not only makes for happy visitors, it is also adaptive, enabling wildlife to utilize habitats where roads and associated development occur. To live safely with habituated wildlife, however, rigorous management is necessary to remove those individuals that cross the behavioral barrier and start to pose a threat to humans.

Park managers also must now manage parks as sanctuaries for biodiversity—protecting native plants, insect pollinators, raptors, small mammals, and other diverse species. After years of relying first on removal and then natural regulation of game species, some parks are beginning to accept the role of the human predator in taking overabundant



herbivores, and that this can be done while still protecting the tranquility of the place. Recent elk herd reductions at Rocky Mountain and Theodore Roosevelt National Parks, conducted with the help of the state wildlife agencies after extensive public input, have shown a way forward.

The return to relative abundance of large predators—mountain lions, bears, and especially wolves—and their regular interaction with prey puts a whole new dimension on parks as sanctuaries. Human appreciation of predators, valued when they were scarce and scared, now needs to be reappraised, as evidenced by the wolf reintroduction to Yellowstone in the 1990s. As wolf populations increased and conflicts mounted, support dwindled, particularly in the surrounding states. In addition, predators that are born and spend their early years in national parks are often habituated, which makes them uniquely vulnerable to hunting outside park boundaries. Habituation of both carnivores and herbivores will inevitably lead to rare but tragic encounters, as in October 2010, when a mountain goat fatally gored an experienced hiker in Olympic National Park.

Humans as Ethical Predators

Today the utilitarian view of wildlife held by both the utilization and preservation camps is losing its hold on the American public, giving way to arguments about the inherent rights of animals. The most cogent counter arguments are ethical. We are responsible for all wildlife, not only ensuring that viable populations remain (Redford *et al.* 2011), but that animals remain wild. The best way we see to do this is to acknowledge our role as the top trophic predators in evolving ecosystems.

Even if the utilization and preservation camps would stop wrangling over the credit for conservation, even if the state and federal agencies start working together, it would not be sufficient to restore the ecological role of wildlife species. Altered habitats and altered recreation habits suggest that there is no going back. At least equally important, there has been a paradigm shift in public attitudes: The utilitarian view (that animals were put on Earth for our enjoyment and inspiration) has given way to a view that acknowledges the inherent value of every species. The change has been codified in many laws protecting eagles, marine mammals, and most notably in the Endangered Species Act of 1973. The way forward could be in acknowledging the inherent value of species, but also in a synthesis

from the National Parks Organic Act of 1916, written before the term “wildlife” even existed. It states that the fundamental purpose of the national parks is “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

What must be left unimpaired about wildlife is its wildness, which is an additional aspect of the Public Trust. Animals should be valued not only as property, meat, or trophies, but also for their inherent wild nature. To restore wild life we must restore our role as the top trophic predator in the ecosystems that we have transformed. Just as we now teach students ecology at all levels, so we must teach our ethical obligation to seek to maintain the balance among trophic levels and the natural interactions between them.

It is an irony of our day that people who disdain hunting often find themselves in vehicle collisions with overabundant, unafraid deer. We must challenge the next generation to develop diverse hunting alternatives, where the goal is not only to reduce wildlife populations but also to affect their behavior and maintain wildness. Those alternatives could include primitive-weapon hunts at park boundaries and in cities, population reductions using volunteers in parks, and hunts solely designed to harass or move animals.

Wildlife management in this century will require rigorous experimentation; every hunting season will be an exercise in Adaptive Resource Management (Knutson *et al.* 2010). It will mean that the Canada geese that forego migration for the local golf course don't stay in the gene pool. We must agree on safe new ways to hunt them. This new era of ethical predation won't be without its detractors—those who see all animals as equal, with no difference between wild and domestic or rare and ubiquitous. If we are to have wild wildlife again, we must be focused not only on how animals die, but how and where they live.

It was a century ago that the first wildlife conservation consensus emerged, creating wildlife refuges, state agencies, hunting seasons, and national parks. We now need to develop a new consensus for this century that values all wildlife and acknowledges our role at the top trophic level, striving with science and some humility to achieve balance and wildness. ■



Stepping into the Breach

WILDLIFE CONSERVATION AMIDST WAR AND CONFLICT

By Peter Zahler and Eva Fearn



Credit: Lisa Herb

Peter Zahler is the Deputy Director for the Wildlife Conservation Society's Asia Program.



Credit: J. Crook

Eva Fearn is Assistant Director of the Wildlife Conservation Society's North America Program.

Conservation is difficult in the best of circumstances. Wildlife biologists must often face inclement weather, harsh living conditions, the potential of contracting any number of diseases, and animals that range from recalcitrant to undetectable to dangerous. On top of that there are often sensitive social and cultural conditions, complicated land-tenure issues, convoluted regulations, and byzantine permitting issues. When the potential of “someone shooting at you” is added to the mix, conservation might seem to go from the difficult to the downright unimaginable. Yet it is just this added complexity that conservationists face in a number of conflict zones across the globe—from Afghanistan to the Sudan, from the Democratic Republic of Congo to Iraq.

So why do we take the risk? The simplest answer is that wildlife does not get to choose its location or the political situation under which it must live. In fact, there is an unsettling correlation between the Earth's areas of highest biodiversity and those areas most prone to conflict: Over the past 50 years, 80 percent of armed conflicts have taken place in areas of high biodiversity ([Hanson et al. 2009](#)). So, if the

full complex of global biodiversity is to be preserved, the conservation community must carefully and seriously weigh the risks and benefits of working in conflict zones.

Just Like Normal—Only Different

Work in a conflict zone involves all the same issues faced by any conservation project anywhere, from the difficulties of research logistics to the complexities of community and government relationships. In conflict and post-conflict settings, however, there is an additional and very real risk that conservationists may become caught in the fighting or face dangers that linger after fighting has stopped, such as simmering resentments that can suddenly boil over, or landmines and unexploded ordinance that lurk out of sight. For example, when article author Peter Zahler led a United Nations Environment Programme (UNEP) group into Afghanistan in 2002, they had to spend hours with international de-mining personnel to determine where the group could—and often could not—go.

Such dangers should never be trivialized: Staff and partner security must remain first and foremost for any conservation project. Oddly enough, however, one of the biggest problems conservationists face in conflict and post-conflict settings is not so much the dangers to life and limb, but the dramatically increased level of complexity of the normal difficulties involved in any conservation project.

In terms of the work itself, there are two major problems: a badly damaged environment and a badly fractured political landscape. The damage to the environment can come in many different guises, and is often multiple and additive in consequence. This can include direct effects from bombing, defoliants, landmines, and the like. But dramatic explosions and firefights pose less of an environmental threat than do the more-pervasive and insidious indirect effects of war, such as the presence of millions of hungry displaced people, a loss of any previously existing enforcement capacity, and an increase in modern weapons among the populace. Unhinged



Courtesy of WCS-Afghanistan

A snow leopard appears poised to strike at the click of a camera trap, which volunteer rangers set in the rugged mountains of northeastern Afghanistan as part of a wildlife monitoring study. Afghanistan has nine species of wild felids. Perhaps as few as 100 snow leopards remain.



economic systems, social instability, and shifting waves of people fighting to survive can result in decimated forests, rangelands, and wildlife—both during a conflict and for years afterward.

The political landscape can be just as problematic. Central and provincial governments may be in complete disarray or even dismantled, including the agencies mandated with resource management. Local communities may also have lost the legacy of cultural practices related to resource management on their own lands. Returning refugees and internally displaced people, coupled with the loss of any existing records, may throw land tenure into question, with competing claims and no clear system for adjudication of disputes.

To implement effective interventions, conservationists must work through stakeholders, be they government officials, tribal elders, or local communities. However, in conflict and post-conflict settings, conservationists often find themselves faced with first helping to create or re-create new governance structures to provide a system to protect and sustainably manage wildlife and other resources.



Credit: Inayat Ali

In Afghanistan's mountainous Wakhan Corridor, December ice grips a jeep rented by the Wildlife Conservation Society. The jeep remained stuck for more than an hour until nearby villagers helped set it free. Nearly impassable terrain is just one of the many challenges facing conservationists in this conflict-scarred land.

Iraq: Documenting Biodiversity in a War-Torn Land

An Iraqi environmental organization called [Nature Iraq](#) works with the Iraqi Ministry of Environment to identify sites that are globally important for biodiversity conservation. Active in the country since 2005, Nature Iraq sends teams of Iraqi biologists into the field every winter and summer to collect data, primarily on birds, plants, mammals, and fish.

One such survey involved the Mesopotamian Marshes of south-eastern Iraq. Once a vast expanse of wetlands, the marshes were drained in the 1990s under Saddam Hussein to destabilize local populations. In 2003, the area was partially reflooded, and during Nature Iraq surveys in 2010, Iraqi biologists estimated that these vital marshes still support approximately 7,000 greater flamingos, 30,000 northern shovelers, and 41,000 marbled ducks among many other species, making this a globally important wetland habitat.



Courtesy of Nature Iraq

Conducting such surveys in this war-torn country poses unique risks. Nature Iraq's teams have faced kidnapping and gun fire in the field. Mine fields from current and past conflicts are an ever-present hazard in all border areas, and during recent years, regular bombing by Iran and Turkey on Iraq's northern border has posed a hazard for survey teams working in Kurdistan.

For protection, conservation teams often go into the field with armed security escorts (left). To prevent kidnappings, biologists may hire local villagers as security escorts since they know everyone in nearby areas. Nature Iraq has been very fortunate in that not a single member of the field team has ever been harmed. Indeed, often the biggest obstacles to their survey efforts involve the more mundane problems of needing endless letters of permission to get through checkpoints, or reaching an area only to find it closed for security reasons—nonlethal hazards that can slow conservation efforts to a crawl.



Democratic Republic of Congo: Healing the Rift



Credit: IDPE

In central Africa's biologically diverse Albertine Rift region, civil insurgencies and upheaval in the 1990s turned national parks into shelters for rebels and refugees, with a measurable impact on large-bodied mammals (such as the poached elephant at left). Decades of strife in the Democratic Republic of Congo (DRC) and neighboring countries have allowed for an explosion in the trade of

bushmeat, tropical timber, and charcoal. The hippo population in the Lake Edward section of the DRC has practically disappeared, largely due to poaching.

Work in the DRC has been anything but easy. A conservation program in [Kahuzi-Biega National Park](#), for example, essentially came to a halt when the DRC military moved into the park to remove members of the *Interhamwe*, a group responsible for genocide in neighboring Rwanda. As a result, the region became

very insecure, and the project only progresses as security improves. In such conflict situations, how can conservation organizations promote both conservation and political stability?

The Wildlife Conservation Society, with funding from the U.S. Agency for International Development, is helping multi-stakeholder village and park management committees to target overharvesting and corruption in the DRC, particularly in the Greater Virunga Landscape ([GVL](#)). In the Lake Edward region, for example, WCS and partners have helped three fishing villages address overfishing. Other efforts involve working with counterparts in Uganda to develop a lake-wide management approach and tackle cross-border poaching issues. Bringing together stakeholders that might otherwise not work together—including the military, police, fishing communities, local security officials, and park managers—can build the foundations of new democratic institutions, which will be essential to long-term stability and the sustainability of natural resources.

The Afghanistan Context

Afghanistan provides a vivid case in point. In 2003, a UNEP post-conflict environmental assessment identified a suite of threats to Afghanistan's environment, which further threatened the country's capacity for reconstruction ([UNEP 2003](#)). Most of these threats revolved around the uncontrolled resource extraction that occurred during nearly 30 years of conflict. Impacts included deforestation resulting in a loss of more than 50 percent of the nation's forests, water extraction that dried wetlands, poor grazing practices resulting in desertification, and an increase in wildlife exploitation, from hunting with automatic weapons to fishing with rocket launchers.

To help address some of these threats, the Wildlife Conservation Society (WCS), with funding from the U.S. Agency for International Development, in 2006 began a long-term program to improve natural resource management in parts of Afghanistan. When we began, we found a country stripped of its capacity to implement environmental management. With the major conflicts having ended only a few years

earlier, and with fighting still on-going in many parts of the country, there was only one provisional law on the environment and virtually no technical capacity to enact or enforce any provisions. At the local level, many communities had been shattered culturally and even physically, and those that were still functional were isolated.

Our WCS team was therefore forced to jump in on multiple levels. Our first task was to develop sweeping security protocols to ensure staff safety (see sidebar online). The staff then began to help the Afghan government draft new environmental laws and regulations regarding issues such as hunting and forest and rangeland management. We trained government officials and staff on what these efforts meant in terms of obligations and actions, both nationally and internationally. For example, though Afghanistan is a signatory to the Convention on International Trade on Endangered Species (CITES), it did not have a CITES management authority; and though it is a signatory to the Convention on Biological Diversity (CBD), it did not have a species Red List.



On the science side, our program set out to collect baseline data on wildlife, rangelands, and wildlife health—in many places providing the first such information in more than 30 years. Among these efforts:

- Bird surveys discovered 38 species new to the country, including the large-billed reed warbler, one of the world's rarest birds.
- We researched iconic species such as Marco Polo sheep and snow leopards, obtaining the first-ever camera trap photos of snow leopards, taken by community rangers trained by WCS staff.
- Teams assessed various livestock diseases such as brucellosis and foot-and-mouth, which can also impact wildlife.
- Surveys of alpine grasslands provided data on species diversity and health.
- In the first-ever surveys of timber and wildlife trade, we discovered that a principal driver of the illegal fur trade was the international military and development community, leading to a program of education and training aimed at both groups to stop the trade.

On the community level, staff helped build resource management committees for sustainable management planning. We then helped these committees identify and enact systems for improved management, helped identify and train volunteer rangers to monitor wildlife and enforce local and national regulations on resource use, and eventually linked these committees to central government agencies.

The Band-e-Amir Protected Area Committee, for example, is now the lead management unit for Afghanistan's Band-e-Amir National Park, the nation's first protected area. This park consists of six crystal blue lakes separated by natural travertine dams, all laid out in a gorge reminiscent of the Grand Canyon. Situated at approximately 10,000 feet in elevation, the region was a popular tourist destination before the Soviet invasion in the 1970s, and still gets thousands of national and international tourists every year. WCS has helped draft co-management legislation for the park to bring communities and government agencies together in a cooperative management process that will enable local people to benefit from revenue generated by the park.



Azure lakes amidst arid hills mark the breathtaking landscape of Band-e-Amir National Park in Afghanistan, designated in 2009 as the nation's first national park. Set on the mountainous Hazarajat Plateau, it lies in one of Afghanistan's poorest regions—and one of its most critical for biodiversity conservation and economic development, goals that WCS pursues with local partners.

Courtesy of Alex Dehgan/WCS-Afghanistan



South Sudan: Post-War Habitat Protection

In July 2011, South Sudan will gain its independence following a 22-year civil war. During the war, wildlife populations in many areas were decimated due to hunting for bushmeat, ivory, and horns. Yet South Sudan still contains vast un-fragmented savannas, wetlands, and woodlands, and holds unique assemblages of wildlife including elephants, giraffes, elands, oryx, lions, wild dogs, buffalo, and the world's second largest antelope migration—that of the white-eared kob (below).

Traditional peoples in South Sudan live primarily off the natural resources of the land, yet large numbers of arms are still in civilian hands and tribal conflicts over access to land, grazing areas, and water create instability. The Wildlife Conservation Society and the Government of Southern Sudan, with support from the U.S. Agency for International Development, have been working on a program to promote sustainable natural resource management across the [Boma-Jonglei](#) region—the most intact savanna ecosystem in East Africa.

The Boma-Jonglei landscape covers approximately 77,000 square miles, supports 17 ethnic groups, and contains rangelands for livestock production, potential for agricultural development, and a base of oil reserves critical for economic development of South Sudan. WCS's program works to establish dialogue with local and national stakeholders for land-use management, create monitoring and law enforcement presence in remote areas through supporting protected area management, and undertake community mapping research to improve understanding of resource and land conflicts. This multi-sector land-use planning approach—including agriculture, mining, oil, protected areas, and wildlife corridors—is helping to develop conflict-mitigation strategies. With the creation of a new country, it is essential to reduce natural resource conflicts, improve security, and develop ecotourism revenue to conserve the area's remarkable biodiversity.



Credit: Paul Elkan and J. Michael Fay/WCS

None of these conservation efforts in Afghanistan have been easy, and all have involved years of hard work and fighting through multiple setbacks. Some local leaders have blocked access to their communities, and factional fighting in some locations has made access impossible. Given the logistical nightmare of working in a war-torn country combined with the extraordinary geography of Afghanistan's Pamirs and Hindu Kush mountain ranges, access to some important conservation field sites can take two weeks or more via car, horse, yak, and finally by foot—all before the actual work can even begin.

For all its complications and difficulties, this work has broad implications for Afghan conservation. Sustainable resource management is now beginning to be recognized as the foundation for reconstruction by both the Afghanistan government and the international donor community. Local communities, which have always depended directly upon this natural resource base for their survival—and thus inherently understand its importance—are developing the tools to properly manage their lands. And globally threatened wildlife, from snow leopards and Marco Polo sheep to greater flamingoes and large-billed warblers (one of the rarest birds in the world) are beginning to see protective measures put in place to ensure their continued survival in Afghanistan ([Zahler 2010](#)).

The international community is beginning to recognize that perseverance through times of upheaval, though fraught with security concerns, is necessary for the conservation of global biodiversity ([Zahler 2005](#)). In addition, conservation work in conflict and post-conflict zones, if it is to succeed, has the additional benefit of helping to build or re-build management structures to conserve the natural resources upon which rural people depend. In Afghanistan and elsewhere, international conservation work, when done carefully and with long-term commitment to governance building and sustainable resource management, can help lay a critical part of the foundation that is needed for stability. ■



For a bibliography, an article about WCS security measures in Afghanistan, and additional photographs, go to www.wildlife.org.



So, You Want to Be a Graduate Student?

COMMITMENT, RIGOR, AND A TOUCH OF MACGYVER

By Blake Grisham, Wesley Anderson, Laura Navarrette, A.H.M. Ali Reza, Ph.D., Ben Skipper, and Bradley Strobel

Blake Grisham crawled from under the Texas Tech field house—his home for three months each year while he does fieldwork. He was soaked, tired, and covered in what appeared to be bits of rat carcass. His undergraduate technicians looked at him expectantly. “Is the water fixed?” one of them courageously asked. “Maybe,” Blake replied, doubtful after yet another attempt to get water to the dilapidated structure. Towns are few and far between on the Texas Southern High Plains, and all the plumbers he called refused to drive an hour and a half each way for the job. The same two thoughts he’d had for the past six years echoed through his head: “What did I get myself into?” and “Man, I love this job.”

Welcome to the often unpredictable life of a graduate student.

Many undergraduates in wildlife science or natural resource management assume that graduate school is the next logical step. But some undergrads may find themselves unprepared for the rigors of a graduate program. As graduate or post-graduate students with a combined 25 years’ experience in graduate school, we’ve learned a lot about what it takes to succeed in master’s or doctoral programs. In what follows, we attempt to shed some light on what graduate school is *really* like—an exposé that we hope will help current undergrads reach their career goals and know what to expect if they choose the grad school path.

We cannot stress enough that graduate school is *not* for everyone. Dedicated individuals can positively impact the wildlife field without an advanced degree by doing any of a variety of fulfilling and important jobs, from being a wildlife biologist for a consulting firm to serving as a wildlife law enforcement officer.

If you think graduate school is the path for you, conduct an honest self-evaluation. Ask yourself, “Why am I in the wildlife field?” You may respond with something like, “I like to be outside,” “I like to hunt and fish,” or “I love animals.” These passions may have gotten you through some or all of college,

but now it’s time for a reality check: Many wildlife biologists spend more time at the computer than in the field. Direct contact with wildlife is often rare, and hunting and fishing while on the job is frowned upon. To succeed in graduate school and in the “real world” beyond, you’ll need a deep curiosity about the natural world, a desire to find solutions through intense and persistent study, and a solid commitment to the profession.

The Tools You Will Need

Let’s say you’re serious about continuing your education. Perhaps the most daunting aspect of preparing for graduate school is getting in. In our view, there are three key elements to being a successful applicant:

A strong academic record. The saying “D’s get degrees” does not apply in graduate school. Most universities and some funding agencies have minimum criteria for graduate students, including a competitive grade point average and Graduate Record Exam scores. Foreign students may need to take a test such as the Test of English



Credit: Clint Boal

Blake Grisham is a doctoral student in the Department of Natural Resources Management at Texas Tech University.



Credit: Lucas Schilder

After rising early at the Texas Tech field house, master’s student Phil Borsdorf dons his “snake boots” to prepare for a day of radio tracking lesser prairie chickens. Living for weeks in less-than-luxury accommodations is part of life for many graduate students.



as a Foreign Language or the International English Language System.

Active participation in a wildlife club. Participating in the student chapter of The Wildlife Society, the Society of Conservation Biology, or similar clubs at your university connects you with undergraduates, graduate students, and faculty members who share your interests. Serving as an officer could also give you an edge on your graduate school application. Graduate advisors often look favorably upon applicants with evidence of leadership experience, since graduate students are expected to lead their own research project.

Field experience. Fieldwork should not be considered optional for undergraduates in wildlife science. Many universities require field classes or research internships as part of the curriculum, but more experience is always better. Check with your school's faculty and graduate students or online resources, like The Wildlife Society's [Career Center](#),

to see if any summer field technician positions are available. Faculty and graduate students often need volunteers to help with short-term field work or data entry. Such work won't fill your pocketbook, but it will stand out on your résumé and help build your professional network, which can lead to a valuable graduate assistantship and better jobs in the future. For example, when Ben Skipper was an undergrad, he volunteered to help a doctoral student complete tedious, time-consuming tasks, such as staining microscope slides and examining blood smears for parasites. That same graduate student recommended Ben for his first paid field position, which eventually grew into his master's degree project.

The Right Fit

All that experience should net you a pile of acceptance letters. Congratulations! Now you have to find a program that matches your professional aspirations. In the wildlife field, graduate degrees are usually research based. The topics, duration, and rigor of the research vary widely but generally fall into one of two categories. Descriptive studies often require you to dedicate long hours in the field or lab to monitor nests or radio-tagged animals, for instance. Experimental studies tend to be more rigorous and longer in duration because they require in-depth pre-fieldwork research and careful experimental design. Due to the long-term time commitment, experimental studies are usually conducted at the Ph.D. level.

Different degrees (e.g., Master of Science, Doctor of Philosophy) offer unique challenges and opportunities. For example, although most master's degrees in wildlife require a written thesis, some do not. Students interested in a research career or hoping to enter a Ph.D. program would be wise to pursue a thesis-based master's degree, while those more interested in on-the-ground management may benefit from a non-thesis program (see article on page 72).

What to Expect

Are you picturing nonstop intellectual discussions, tons of time in the field working with your study species, collegial debates with your advisor over coffee, or maybe getting a few papers published in short order? Some of that may be in store, but it's smart to approach school with a realistic mindset.

Commitment. A master's degree typically takes two to three years to complete, while a doctoral degree takes from three to six years or more. In some cases, salaries do not increase substantially among

A revealing look at Texas Tech doctoral candidate Ben Skipper's desk shows that coffee cups and reminder notes help fuel graduate work. Though many students choose wildlife studies hoping to spend time outdoors, pursuing a graduate degree virtually guarantees long hours in front of a computer.



Credit: Blake Grisham

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degree types. For instance, according to www.payscale.com, a state wildlife biologist with a Ph.D. will earn roughly 17 percent more than one with a B.S., or 10 percent more than someone with an M.S. Scholarships and teaching or research assistantships may cover or offset the costs of pursuing these degrees, but when your friends are out earning a real paycheck, such stipends may look puny. Also, during academic semesters, students can expect to invest 60 or more hours a week on coursework, teaching, and compiling, entering, and analyzing data. During semesters devoted to research, students can often expect to work 80 or more hours a week. You'll need a strong work ethic and considerable self-discipline to make it through these tough periods.

Advisor. While you may be quick to resent your advisor for critiquing your proposal or suggesting that you take an additional class, realize that your advisor is your main source of help during your graduate career. Your advisor survived the rigors of graduate school and understands the challenges. Don't be afraid to approach your advisor with any struggles you face during your graduate degree. Advisors care about your well-being and success.

Classes. Wildlife science classes are rigorous at both the undergraduate and graduate level, but differ philosophically. While many undergraduate courses are structured to cover all the basics, graduate courses typically presuppose a solid foundation and focus on teaching you to defensibly use your knowledge. Some graduate courses require students to teach sections of the class. Grad students also have greater flexibility in choosing their courses.

Teaching. Teaching assistantships are common, but the amount of time required to prepare for class and grade assignments and exams can vary greatly. Whether your teaching post requires two or 20 hours a week of prep, this responsibility should be approached maturely and professionally. We encourage you to not view teaching as a burden, but rather as a privilege—indeed, you will be educating the next cohort of wildlife professionals, and that is no small contribution.

Relationships. You may feel that you've moved a step up the totem pole as a graduate student, but you'll still need to keep your ego in check and avoid burning bridges. Focus on networking with other graduate students, faculty, and professionals both inside and outside your institution. You never know when a contact will help you overcome an impasse in

your research, offer guidance on completing your dissertation, or provide a positive job recommendation.

Flexibility. Graduate school can sometimes require a MacGyver-esque set of abilities. You may excel in the classroom, but what will you do when your all-terrain vehicle breaks down in July in a desert? On the flip side, an ability to fix a diesel motor with nothing but duct tape and barbed wire is impressive but will prove useless on an experimental design test. A combination of common sense and book-smarts is a necessity.

Professionalism. Whether on Facebook or at a national conference, make sure your conduct is respectful of others. We strongly advise you against posting any statements or pictures that may be considered inappropriate on social media websites. Many advisors and employers actively search these sites for red flags about their advisees or potential hires. Remember, as a graduate student, you represent not only yourself, but also your research project, graduate advisor, department, and institution.

Attitude. Personalities differ among graduate students, but attitudes are remarkably similar among those who are successful. They understand that there is a time for seriousness and a time for fun, and keeping the proper balance is important to both success and sanity. Doubtless, every former graduate student can recall periods of stress, exhaustion, exasperation, and failure during their research. Knowing that some things will go horribly wrong but having the ability to accept, overcome, and even laugh at these obstacles is instrumental for graduate students—like Blake, who finally fixed the water the day after he had felt so defeated. The project money he saved by doing the work himself was used to purchase radio transmitters and trapping supplies for his research. Remember, a little bit of MacGyver can go a long way.

At the end of your career as a graduate student, you will hopefully feel confident and prepared to tackle a challenging career in wildlife research or management. We wish you the best and hope our words of advice help you get there. ■



To learn more about different career types in the wildlife field and see a chart with salary ranges based on level of education attained, see this article online at www.wildlife.org.

The Ideal Wildlife Degree

TRAINING STUDENTS FOR THE REAL WORLD

By William M. Giuliano, Ph.D.



Credit: William M. Giuliano

William M. Giuliano, Ph.D., is a Professor in the Department of Wildlife Ecology and Conservation at the University of Florida in Gainesville.

When I was a student back in the 1980s, my mentors told me that a Master of Science (MS) was the ideal degree for wildlifers. Unless I wanted to teach at the university level, for which a Ph.D. would be necessary, they said, obtaining an MS degree would allow me to compete for most wildlife biologist jobs and then have the opportunity to ascend the career ladder. Today my colleagues tell students the same thing.

But having studied or worked at six universities, I'm now convinced that the typical MS degree in wildlife is *not* ideal for training most future wildlife professionals. I've taken steps to offer students at my current institution another option—one that I believe helps them get a leg up on their careers.

The Reality of the Workplace

A classic master's program revolves around research. Students complete courses in statistics, experimental design, and research methods. Most students also complete a thesis, a demonstration that they've learned how to conduct research.

Yet discussions I've had with wildlife professionals from several public and private organizations indicate that well over 95 percent of wildlife professionals don't do any research. Terry Peacock, for example, the refuge manager of St. Marks National Wildlife Refuge, is mainly an administrator, spending time supervising employees and working on budgets. The refuge's biologists "spend most of their time in routine biological tasks including surveys, data reporting, planning, and interpreting research data," says Peacock. "Refuge staff are rarely involved in conducting research."

Other professionals I've spoken with, who hold a variety of positions in the field, concur:

- Daniel Pearson, an environmental specialist with the Florida Department of Environmental Protection, suggests that the number of people involved in research in his agency "might be close to zero."
- Gary Norman, project leader in the Wildlife Division of the Virginia Department of Game

and Inland Fisheries, estimates that "around 2 percent" of their staff do research.

- Tim O'Meara, wildlife research section leader in the Florida Fish and Wildlife Conservation Commission, estimates that less than 10 percent of agency staff are involved in research.
- Mark Weckel, director of research and land management at New York's Mianus River Gorge Preserve, says he and his staff spend the majority of their time on non-research activities, primarily public outreach, education, and management of the land and facilities.
- Brian Zielinski of the National Wild Turkey Federation reports that "nearly 100 percent of what our employees do is non-research."

Developing an understanding of research is beneficial to all wildlife students. But given the assertions above, it seems that educators would better serve the majority of wildlife students and employers if most MS-level students focused less on gaining research skills and more on gaining experience in the application of wildlife ecology and management.

Reasons for the Disconnect

As Charles Scalet noted in his much-discussed 2007 article in *The Journal of Wildlife Management*, "Dinosaur Ramblings," some wildlifers believe that a shift toward teaching general ecology and conservation biology doesn't align with the hands-on knowledge and skills that agencies need (Scalet 2007). According to Dave Schad, director of the Division of Fish and Wildlife in the Minnesota Department of Natural Resources, the mismatch was most apparent "for the 'softer,' non-technical skills, such as oral and written communication ... but was also true for technical areas of competency," such as computer proficiency or operating heavy equipment.

The problem seems to stem primarily from the university side, for a few reasons: Increasingly, university faculty have never worked outside academia. In addition, a publish-or-perish mentality may compel faculty to focus on research and rely on a large flock of graduate students to assist in that pursuit. University administrators may encourage



this focus, as research brings much-needed funding and recognition to the school. At many institutions, faculty receive little or no credit toward promotion or tenure for graduating non-thesis students.

Agencies must also accept some blame for the gap between classroom preparations and on-the-job skills. Many require or prefer employees to have completed a thesis, even when hiring individuals for non-research positions. These preferences further the cycle of universities churning out students who are trained to be researchers and not the practitioners that agencies claim to need.

A Solution in Action

To help address this disconnect, about eight years ago I created a non-thesis MS program. Rather than complete a curriculum dominated by courses on research skills and methods, students in this program take more courses in wildlife and natural resources management, administration, policy, human dimensions, communications, conflict resolution, facilitation, and technological skills. Advisors help each student select management-oriented courses that fill holes in their background and best help the student complete their project or job.

That project or part-time job is the other unique aspect to the program. Rather than spend one or two years in the field conducting research, as most students in thesis programs do, students in the non-thesis program spend part of their time in the field working as hands-on wildlife professionals. Over the years these opportunities have included serving as preserve managers for a Nature Conservancy-associated property, wildlife managers for agribusinesses, wildlife biologists for the parks department of a large city, and managers and guides for hunting operations. These opportunities provide students with real-world experience in several relevant areas that are in demand by employers and useful for future careers, including:

- Development of wildlife, land, and people management programs
- Administration and staff supervision
- Media relations
- Application of wildlife science in habitat and population management
- Environmental education
- Human dimensions issues

Students who have completed this non-thesis master's program report that it helped them land a job



Credit: William M. Giuliano

Brandon Schad watches a translocated quail take flight at Devil's Garden Ranch, owned by agribusiness Alico, Inc. As part of his experience in the University of Florida's master's degree program, Schad helped the ranch restore a viable quail population and gained valuable experience he uses in his job today.

and be more successful in their work. For example, Brandon Schad, a fisheries and wildlife biologist for the Florida Fish and Wildlife Conservation Commission, says, "Land management, planning, and landowner relations comprise 90 percent or more of my daily activities." He notes that his master's work "has been far more useful in completing my day-to-day work than research-related training."

Likewise, program graduate Robert Hoffman of the Kentucky Department of Fish and Wildlife Resources says the skills he obtained in the program—such as applying land management practices and working with landowners—were key to getting and now carrying out his job as a Farm Bill biologist. Former student Mark Weckel of the Mianus River Gorge Preserve agrees, though he cautions that this track is not for everyone. Prospective Ph.D. students hoping to pursue research careers are likely better off in a classic research-focused MS program.

For the majority of wildlife-career-bound students, however, I think a non-thesis master's degree, weighed heavily on advanced coursework and practical skills, is the "ideal" option. And I believe similar degree programs are needed elsewhere. For that to happen, universities must be accepting of these programs—and financially support their establishment. Employers must also begin to recognize the value of non-thesis degrees in their hires. I struggle with how to better serve my students and the profession they seek to enter. Embracing non-thesis programs is a great place to start. ■

Turning Students into Problem Solvers

INTEGRATING ADAPTIVE MANAGEMENT INTO WILDLIFE CURRICULA

By Larkin A. Powell, Ph.D., Andrew J. Tyre, Ph.D., Michael J. Conroy, Ph.D., James T. Peterson, Ph.D., and B. Ken Williams, Ph.D.



Credit: Brett Hampton/
University of Nebraska-Lincoln

Larkin A. Powell, Ph.D., is a Professor in the School of Natural Resources at University of Nebraska-Lincoln.

In the popular movie *Apollo 13*, based on the actual NASA mission, three astronauts are stranded in space, their craft's electrical system broken, their oxygen quickly running out. To help them fix the problem and return home safely, mission controllers summon a group of engineers, dump a pile of equipment onto a desk—the tools available to the astronauts—and tell them to find a solution, or more specifically, “a way to put a square peg in a round hole. Rapidly.” Eventually, the engineers’ plan saves the day, and the astronauts make it home.

State and federal agency biologists generally do not face life-or-death decisions of this magnitude, but many do face day-to-day decisions that share traits with the Apollo 13 crisis. Biologists and managers have deadlines, uncertainty, and a limited toolset. The critical need, and the missing part of the analogy, is the team of engineers—trained problem solvers who are intimately familiar with the decision environment and the tools available to create a solution.

Structured decision making (SDM) is a formal process that problem solvers can use to document and weigh alternative management scenarios in terms of their respective benefits, costs, and likelihood of success or failure (Clemen 1996). SDM serves as a vital complement to Adaptive Resource Management (ARM), which—through an iterative cycle of planning, doing, monitoring, and evaluating—provides a learning-based framework for making conservation decisions (Knutson *et al.* 2010, Williams *et al.* 2007).

Although natural resource professionals are increasingly relying on SDM and ARM to make decisions about complex management situations, university programs in wildlife management rarely teach undergraduate or graduate students about decision-making strategies (Boyles *et al.* 2008). We believe that university and college faculty must respond to the need for student training in ARM. Here, we describe ways that existing undergraduate and graduate curricula can be modified to produce graduates who are ready to tackle today’s complex wildlife management problems.

An Integrated Approach

In our view, the strategy should not entail simply adding a new ARM course as a degree requirement—such a “one-off” exposure to a difficult idea is insufficient. Pedagogical research suggests that repeated exposure to concepts across an entire curriculum can be more effective. For example, researchers have found that repeated use of geospatial information technology (GIT) from the freshman to senior year not only reinforced the ability to use GIT, but it also reinforced quantitative skills that will be needed in the student’s career (Furner and Ramirez 1999). In a parallel fashion, we believe that integrating ARM’s components across the wildlife biology curriculum can help students build needed problem-solving and creative-thinking skills. An added benefit of the integrated approach? It can engage faculty in the educational process as a team.

The broad relevancy of ARM means that some university curriculum committees may feel that their program is, by default, training students to use ARM. While that may be true, we encourage these committees to assess their curricula to ensure that ARM learning objectives—such as understanding ecological dynamics, management techniques, study design, data analysis, and effective communication—are achieved. Faculty members should also inform students why ARM is part of their course of study. A General Ecology instructor, for example, should remind students that having a firm understanding of ecological theory is going to be critical to making management decisions in the future.

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B. Ken Williams, Ph.D., is Chief of Cooperative Research Units in USGS.



Course objectives may need to be updated to refer to decision-making end goals.

Approaches for Curricula

The two tables in this article present ARM learning objectives that curriculum committees and other faculty members may use to incorporate the principles of SDM and ARM into their wildlife students' programs of study. Depending on whether one is educating undergraduate or graduate students, the approach to including ARM may differ.

Undergraduate Level: There is no need to develop additional courses to integrate ARM into the undergraduate curriculum. Instead, redesigning communication courses to address conflict resolution, interpersonal communication, and use of various media may be the best method for introducing ARM, as communication failures among stakeholders and ARM facilitators are cited as a common reason that ARM does not succeed (Williams *et al.* in review). Likewise, assessing ecological data and creating models require applied mathematical and statistical skills, which may not be the focus of traditional courses taught to undergraduates. Thus, an integrated curriculum will require the cooperation of instructors in several subjects outside a natural resources department, including statistics, other mathematics, English, and communications.

Graduate Level: Graduate curricula approaches to ARM are very different from undergraduate. First, most MS degrees contain approximately 20 hours of coursework—only five or six courses—and many programs have no required courses. Incorporating ARM training into a program of study will thus fall to the student, advisor, and graduate committee. Second, because most graduate students have not been exposed to ARM as an undergraduate, graduate programs will need to perform “remedial” training during the next decade. This will gradually become unnecessary as undergraduate programs begin to provide introductory ARM training.

Graduate curricula may benefit from an introductory course in SDM. Such a course could include general principles of management and decision making, science and logic, and learning by doing—in other words, ARM in practice. We encourage faculty to consider how colleagues in related fields might contribute to such a course, and we emphasize that ARM should be a critical component, but not the focus, of the course.

Adaptive Resource Management Learning Objectives for Undergraduates

Stakeholder interactions

- Learn to constructively engage hypothetical stakeholders through student role-playing.
- Study at least one potential stakeholder's mission statement through internship-type activities.
- Constructively engage stakeholders through limited interaction with small groups of real stakeholders.

Goal-setting

- Set objectives for management that can be evaluated with monitoring data.
- Identify means and fundamental management objectives.
- Recognize and structure the relationships among management objectives.

Monitoring/study design

- Learn basic tools for wildlife survey design and implementation.
- Develop monitoring schemes which are designed to feed data toward decision-making processes.
- Develop small-scale research study designs.

Written communication

- Summarize in writing the key parts of a natural resource problem.
- Summarize and properly cite previous research or ARM exercises that provide insight into current problems.
- Write a formal habitat or wildlife management plan.
- Report the results of a quantitative analysis in terms that can be understood by stakeholders.

Law and policy

- Demonstrate knowledge of the derivations of public policy, as well as of the agencies and personnel responsible for public policy.
- Investigate legal issues pertinent to natural resource problems.

Model-based system predictions

- Use simple models to make predictions under contrasting scenarios.
- Evaluate the use of complex models to make predictions.

Data analysis

- Use basic statistical tools to evaluate research data.
- Evaluate trend-type data to detect changes over time in monitoring data.
- Interpret the results of statistical analysis in terms of management and biological significance.

Adaptive resource management

- Learn the basics of the ARM framework.
- Use the ARM process on an applied problem.

Formal decision making

- Apply the concept of uncertainty as management options are developed.
- Develop basic concepts of a decision-making process by solving simple problems with low levels of uncertainty.
- Develop skills needed to solve moderately complex problems with moderate levels of uncertainty.
- Apply decision-making skills to complex problems with multiple types of uncertainty.



Ready to Face a Complex Future

The University of Nebraska-Lincoln (UNL) has developed MS and Ph.D. specializations in Adaptive Resource Management; the graduate-level learning objectives listed in the table at right arose from that process. The University of Georgia has also incorporated ARM into select graduate courses. We've seen signs that including ARM material in our courses is working: After taking UNL professor Larkin Powell's spring 2010 course on wildlife ecology and management, students were asked to name one thing they learned of critical importance to wildlife management. The most frequently named lesson? Structured decision making. "I think that the topic is very important—if not indispensable—to today's wildlife managers and biologists, who must take on complex and multifaceted problems with diverse interests at stake," says UNL fisheries and wildlife major Ian Hoppe.

Though wildlife faculty can lead the way in introducing ARM to their students, they will require administrative support to be successful in implementing the new objectives. In addition, The Wildlife Society may be able to encourage incorporation of ARM principles into uni-

versity learning by requiring such coursework in their wildlife biologist certification process.

Now, more than ever, we need wildlife biologists who have an integrated, interdisciplinary background in decision-making skills. Exposing students repeatedly to ARM at the undergraduate and graduate levels will prepare students for challenges they will face in their careers. ■

ARM Learning Objectives for Graduate Students

Quantitative methods

- Learn advanced methods in study design and hypothesis generation.
- Study advanced methods to evaluate trend-type data to detect changes over time in monitoring data.
- Do parameter estimation.
- Interpret the results of statistical analysis in terms of management and biological significance.
- Practice advanced modeling techniques for wildlife populations and natural systems.
- Use complex models to make predictions under contrasting scenarios.

Stakeholder interaction

- Interact and cooperate with scientists, agency personnel, and other stakeholders in real-world situations.
- Facilitate a discussion among stakeholders in a real-world situation.

Communication and human dimensions

- Develop skills to work with groups in conflict situations.
- Gain leadership skills as a facilitator of a group discussion.

Law and policy

- Demonstrate knowledge of the derivations of public policy, as well as knowledge of the agencies and personnel responsible for public policy.
- Investigate legal issues pertinent to natural resource problems.

Interdisciplinary activities

- Summarize a natural resource problem that includes human dimension, ecological, economic, and legal issues.
- Demonstrate their use of the ARM decision-making process to make a simple decision.
- Apply the ARM process to a moderately complex problem with moderate uncertainty.
- Adapt ARM principles to complex problems with high levels of uncertainty.

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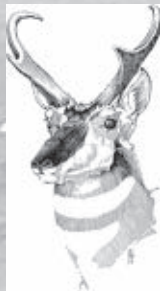
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Bird Havens: Western Oak Woodlands

AN OVERLOOKED HABITAT IN NEED OF CONSERVATION

By David A. Ross



Credit: Hoda Sondossi/USFWS

David A. Ross is a Partners Biologist with the U.S. Fish and Wildlife Service in Klamath Falls, Oregon.

A few years ago, I received a phone call from a landowner in Oregon's Klamath Basin. A neighboring resort wanted to expand and acquire his family's 300-acre woodland property, which had been in the family since the land was originally settled. Hoping to halt the buyout, the landowner asked me if there were any conservation easements available to protect the 200 acres of oak woodlands on the property—a rare habitat in the area. Few options existed, but I found one that seemed to fit the family's needs: the Oregon Department of Forestry's Forest Legacy Program (FLP). A competitive program, the FLP provides funds to purchase land-development rights, and ensures that the land is properly managed under the supervision of a state forester.

The ranch land in question is well worth protecting. Its mixed oak woodland holds a diversity of wildlife including white-headed woodpeckers (*Picoides albolarvatus*), dusky flycatchers (*Empidonax ober-*

holseri), oak titmouse (*Baeolophus inornatus*), and green-tailed towhee (*Pipilo chlorurus*). In autumn, black bears (*Ursus americanus*) pile in to feast on acorns and Klamath plum prior to hibernation. Protecting such a productive piece of habitat would be a boon for conservation.

The Klamath Valley ranch owner applied for FLP funding in 2009 and again in 2010, but has yet to win approval, presumably because applications have far exceeded available funding. We're hoping for approval in 2011. Meanwhile, the future of this patch of mixed oak habitat remains in limbo.

A Disappearing Habitat

Pacific Northwest oak woodlands are a critical habitat type for terrestrial wildlife in the region, especially for neotropical migratory birds, some of which are uniquely associated with oaks. Yet until recently, oak habitat has largely been overlooked, perhaps due to a focus on the loss of area wetlands and old-growth conifer forests.

Meanwhile, a variety of factors have caused oak habitats to plummet. In Oregon, the Coast Range now has less than 4 percent of its estimated historic Oregon white oak (*Quercus garryana*) woodlands; the Willamette Valley has less than 7 percent (ODFW 2006). My awareness of the plight of oak communities began in Oregon, where I participate in habitat restoration projects, and has since expanded to the rest of the western United States. The Gambel oak (*Quercus gambelii*) of the U.S. Southwest, for example, also faces threats, primarily from illegal firewood cutting and urban expansion.

I have reached the startling conclusion that very little research and monitoring specific to wildlife populations' use of oak habitat in the West is currently being undertaken, at the potential expense of many migratory and resident bird species as well as a plethora of invertebrates, mammals, and amphibians. Fortunately, emerging programs are helping to fill these gaps in knowledge and spread awareness of the importance of oak woodlands.



Credit: David A. Ross/USFWS

Young oaks marked with blue tape lie on the floor of a mixed oak woodland on private land in Jackson County, Oregon. They were thinned to reduce wildfire risk and to improve the growth of neighboring oaks, madrone, and fir, leaving a diverse habitat for wildlife.



Researchers have shown that some bird species in the Pacific Northwest prefer oak woods to other habitats, including Douglas fir. In one study, avian species richness was found to be considerably higher in south-central Washington's oak woodlands than in Douglas fir habitats (Manuwal 2003). Other biologists identified 113 species of birds in oak woodlands, including 43 species of year-round residents—a diversity they attributed to the diverse plant community in oak woodlands (Block and Morrison 1990, Block 1990).

This diversity is in danger. In 2007, the American Bird Conservancy listed oak woodlands in the Pacific Northwest as one of the most endangered bird habitats in the United States (ABC 2007). In Oregon's Willamette Valley, fire suppression, agricultural expansion, and urbanization have combined to cause an extreme decline in white oaks, while in California, urbanization, overgrazing, and vineyard development threaten the state's 10 million acres of oak hardwood rangelands. A primary concern for Oregon white oak conservation is conifer encroachment, as fire suppression, livestock grazing, and other human influences create conditions that favor conifers over oaks.

What the future holds for the vast majority of the region's oak woodlands remains an open question. Roughly 95 percent of the oak habitat in the Pacific Northwest has disappeared since the early 1800s (Wells 2010). Less than 1 percent of Oregon's oak-dominated habitats are protected as special management areas, parks, or preserves (Oregon Oak Communities Working Group). In California, about two-thirds of the original oak woodlands remain, 85 percent of which are privately owned and have an unpredictable future (FRAP 2003).

A Southwestern Keystone

The story is slightly different in the southwestern U.S., where Gambel oak, also known as scrub oak, occurs on more than nine million acres in Utah, Colorado, Arizona, and New Mexico. While there have not been any documented declines in availability of this type of habitat, oak woodlands have been impacted by livestock production, illegal harvest of oak for fuelwood, and fire suppression (Wagstaff 1984, Kruse 1992, Clary and Tiedemann 1992, Harper *et al.* 1985, Rosenstock 1998). In addition, Gambel oak is widespread and grows thickly, at times preventing free movement by livestock or wildlife. As a result, land managers have



Credit: Steve Matsuoka/USFWS



Credit: Dave Menke/USFWS



Credit: NPS



Credit: Gary Kramer/USFWS

Birds of the Oaks. The Townsend's warbler (*Dendroica townsendi*), loggerhead shrike (*Lanius ludovicianus*), Mexican spotted owl (*Strix occidentalis lucida*), and oak titmouse (*Baeolophus inornatus*) (top to bottom) are among the well over 100 bird species that depend on the oak woodlands of the American West. Many live there year-round, while migrants use them as stopping grounds.



Credit: Marko Bey/Lomakatsi Restoration

Solomon Abundez of Grayback Forestry sets a prescribed fire in Oregon's Colestin Valley to release soil nutrients and promote growth of native warm-season grasses. Before such burns, land managers remove conifers and ladder fuels to preserve oak trees, important habitat for migratory and resident birds.

gone to great lengths to eradicate oak woodlands, subjecting the habitat to herbicide applications, mechanical manipulation, and other invasive management techniques (Engle *et al.* 1983, Leidolf *et al.* 2000, Lauver *et al.* 1989, Abella 2008).

The view that Gambel oak is a nuisance species is less common now than it was 20 or more years ago, but has limited our understanding of how wildlife, particularly birds, rely on the trees. Studies show that oaks in the West support a great number of resident and migratory birds. Consider:

- Researchers have found 98 species of neotropical migratory birds using a variety of oak woodlands in the southwestern U.S. (Block *et al.* 1992).
- Studies reveal that warbler species such as Grace's (*Dendroica graciae*) and red-faced (*Cardellina rubrifrons*) warblers—typically linked with conifer habitats—use oaks for foraging, while hermit (*Dendroica occidentalis*) and Townsend's (*D. townsendi*) warblers use oaks during migration.
- Pine-oak stands have higher bird diversity than pine-only stands. One study found more species of neotropical migrants, ground nesters, primary cavity excavators, and secondary cavity users in the pine-oak woods (Rosenstock 1998).
- Researchers reporting in *The Journal of Wildlife Management* noted an association between the presence of small Gambel oak trees and Virginia's warblers (*Vermivora virginiae*), black-headed grosbeaks (*Pheucticus melanocephalus*), and red-faced warblers (*Cardellina rubrifrons*) in Arizona and New Mexico (Jentsch *et al.* 2008).

There is evidence that impacts to Gambel oak ecosystems may be affecting birds that use those habitats. Mexican spotted owls (*Strix occidentalis lucida*), a federally threatened species, nest in the cavities of Gambel oak more often than in other trees (Ganey and Dick 1995, May and Gutierrez 2002), and researchers note that the illegal collection of fuel wood has resulted in the loss of active nest trees for the owls (May *et al.* 2004). Also, peregrine falcons (*Falco peregrinus*), which forage in southwestern oak woodlands, and southwestern willow flycatchers (*Empidonax traillii extimus*), which nest in oaks, are federally endangered species that would suffer from the loss of oak ecosystems.

Collaborative Efforts

Targeted conservation programs aimed at mitigating and preventing the loss of critical oak habitat offer some hope. To preserve Mexican spotted owl habitat, biologists and managers recommend that state agencies retain Gambel oaks in ponderosa pine stands (Chambers 2002, May *et al.* 2004). Partners in Flight, a collaboration among agencies, industry, NGOs, and other groups, has created state-specific programs to promote oak woodland conservation. These include management prescriptions, plans for land acquisition and monitoring, and research recommendations designed to gain a better understanding of how threats facing western oak woodlands will affect birds (Zack *et al.* 2005).

The other major piece of the conservation puzzle is how to conserve the millions of acres of oaks on private property, such as that owned by the concerned landowner in the Klamath Basin. There and elsewhere, creative conservation easement programs and local landowner groups are working to foster education and communication. Washington's [Cascadia Prairie-Oak Partnership](#), the [Oregon Oak Communities Working Group](#), the [California Oaks Foundation](#), and the [California Wildlife Conservation Board](#) are among those that have brought together stakeholders to confront the issue of oak loss. Once informed about the value of oak woodlands for wildlife—and for reducing fire risk and improving landscape aesthetics—most landowners become supportive of oak woodland conservation. Through collaborative approaches, these oak woodland habitats will gain the attention they deserve. ■

This article has been reviewed by subject-matter experts.

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“We Can See a Deer’s Ears from Here”

WILDLIFE INVENTORIES USING INFRARED AERIAL CAMERAS

By Susan Bernatas



Credit: BBSG Photography

Susan Bernatas, CWB, is President of Vision Air Research in Boise, Idaho.

Believe it or not, a deer’s ears can give off a lot of energy—so much so that I can spot them from 1,500 feet above the ground. I gain this ‘bionic’ ability by using an infrared sensor attached to the wing of a Cessna 206 airplane. Infrared (IR) sensors, which measure the heat emitted from objects and organisms, provide useful information for a host of applications, from police surveillance to weather forecasting to, more recently, wildlife research.

Use of IR imaging for wildlife was uncommon back in the early 1990s, when we had to do tracking and population counts the hard way. During a bighorn survey in Idaho, for example, I worked with a team using helicopters to count the animals, which lived in steep, inaccessible canyons. Unfortunately, the noise of the helicopters quickly scared the animals off. I looked into alternative technologies that would avoid stressing the bighorns, including night vision goggles, ultralight

planes, even balloons. Then I read about infrared. To see if infrared sensors attached to planes could identify bighorn sheep on the ground, I helped secure a contract with the Air Force for a test study. The experiments worked: We could sight bighorns clearly with infrared, while flying high enough that the animals didn’t move when we passed over (Bernatas and Nelson 2004).

Soon after that, I mortgaged all I owned to start my own IR survey company. Now my company and others have opened the door to using infrared to survey for wildlife on the ground. I’ve used IR sensors to study sage grouse, elephants, elk, cattle, white-tailed deer, and black bears, to name a few. Using IR may seem high-tech, but the concept is straightforward: It’s simply another way to find and count animals on the landscape.

Seeing Things in a Different Light

Like a typical aerial survey, an IR survey involves a plane, a pilot, and a biologist “spotter” on board. With IR, however, that spotter is actually the sensor operator. I perform that duty, sitting directly behind the pilot, next to the left wing where the sensor is attached. The sensor is housed in a stabilizing container we call a ball or gimbal (picture R2D2 from Star Wars). I can maneuver the sensor to the angle I want using a joystick, occasionally asking the pilot to change directions to get a better view. This type of IR imaging, by which you aim and focus the sensor itself, is called forward-looking infrared or FLIR. It’s also possible to mount a sensor that looks straight down from the plane—a less expensive technology. But that fixed angle reduces the versatility of imaging, and makes it hard to sight animals in areas with a lot of relief, snow, or background features such as rocks or puddles.

Everything with a temperature above absolute zero (-273°C) emits IR energy, so IR sensors can detect “heat” in the middle of a New England stream in January. However, researchers will need to choose different types of sensors depending on the survey.



Credit: Vision Air Research

Posing by “R2D2,” the infrared sensor attached to the wing of a Cessna plane that is used to capture images of wildlife on the ground, Art Rodgers of the Ontario Ministry of Natural Resources and author Susan Bernatas prepare to survey moose from 1,000 feet up.



For example, different sensors can collect either short (3-5 micron) or long (8-12 micron) wave energy. Short-wave sensors are a bit better for warm, humid environments—since moisture affects how IR waves are absorbed, attenuated, or reflected—but fail in extreme cold. Long-wave sensors are less likely to include “noise” from solar reflection off water, some rock types, snow, or other reflective surfaces, making them the best choice in most of North America during the winter.

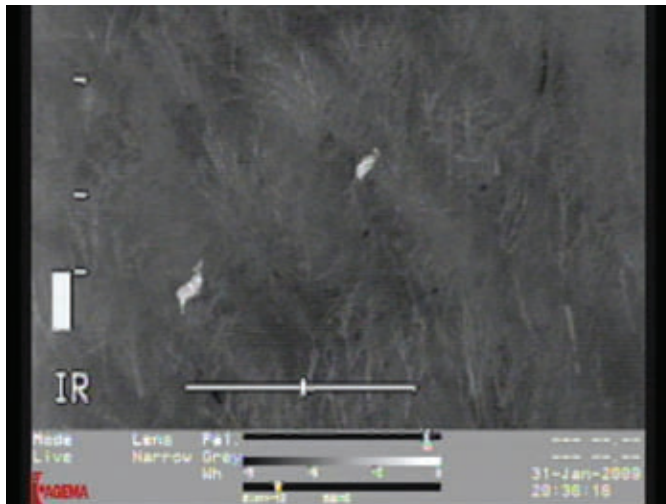
Resolution can also vary from sensor to sensor and, just as for point-and-shoot digital cameras, can make a big difference in image quality. Sensors have two types of resolution: thermal and pixel size. Thermal components are so precise that almost all sensors on the market can detect as little as a 0.1° C difference between the background and the subject, and thus work even in warm conditions. I’ve used FLIR to identify wild horses and burros in Yuma, Arizona, in the heat of July.

Pixel resolution is what gives us the ability to “see” precise shapes like a deer’s ears. This is a key criterion for wildlife applications, since we not only want to detect the hot spot but also want to know if it’s a deer, a moose, or something else. The more pixels filled by a target animal, the easier it is to distinguish body shape or morphological characteristics. With a high pixel resolution sensor, it’s possible to conduct surveys on multiple species at the same time, as different species have their own unique thermal signatures. White-tailed deer appear as though their heads are detached from their bodies because of thick fur on their necks. Elk have patterning on their flanks. Bighorn sheep have hot heads. Cattle look bright hot with no real pattern until the sensor is adjusted to allow us to see their backbones, which are cooler than the rest of their bodies. Chickens are harder to detect until you find a little head dancing around the farmyard.

The Power of FLIR

In the 15 years that I’ve been working with FLIR for wildlife and animal applications, I’ve participated in a wide array of studies:

- In Delaware, I worked with the Department of Natural Resources to survey a two-by-eight-mile block in each of 17 management units across the



Credit: Susan Bernatas

Through the lens of an infrared sensor, two moose shine bright white against a backdrop of dark conifers. After adjusting the sensor to pick up fine patterning, author Susan Bernatas can distinguish male moose from female, and older from younger animals, all based on specific thermal signatures.

state. The IR survey provided geo-referenced groups of deer and the number of deer within each group—useful information for a range of management purposes.

- During an elk survey on fenced land owned by a hunting club in northern Michigan, we learned that the elk bedded down at night under conifers rather than foraging like wild elk would, perhaps a response to living in an area with feeding stations and enclosed by a high fence.
- During a moose survey in northern Ontario, Canada, I located moose using IR and then toggled over to the color camera, which is housed in the same structure as the IR sensor, to observe enough details about the animals to verify age and sex. After locating many moose, I realized I could classify the age and sex using FLIR alone. Males have hotter, broader heads than females, among other subtle differences.
- One night while surveying deer at Brookhaven National Laboratory (BNL) on Long Island, I noticed that the deer had a ghostly appearance in IR, much fainter than the bright and strong signature given off by the deer I had just seen in an adjacent suburb. There was no evidence of atmospheric interference, such as a fog layer, because the shrubs and hard targets, such as buildings and cars, looked crisp. The BNL biologist later indicated these were rather sickly, undernourished deer. Though the pos-



During a survey at a captive elephant facility in Tennessee, the animals' distinctive shape stands out—including trunks, ears, and torso. Elephants are bigger than the typical study animal, but even similar-looking species, like elk and moose, can be distinguished from one another by their distinctive infrared emission patterns.



Credit: Vision Air Research/WWF AREAS Programme

sibility needs to be further investigated, this seems to open the door for using IR to evaluate overall body condition in wildlife.

Clearly FLIR offers a solution to many surveying challenges. IR surveys also have characteristics that set them apart from other techniques. Among the advantages:

Safety. Any aerial survey has its risks, but those risks rise as flight altitude declines. Fixed-wing aerial surveys often fly just 300 to 500 feet above the ground, and helicopter surveys also fly low, often in dangerous, steep terrain. Using a FLIR sensor, researchers can fly between 1,000 and 1,800 feet above ground, yet can still get much the same information—including age and sex data—with much less risk. In addition, by using FLIR, we can pivot the camera to the angle we want, rather than asking the pilot to make dangerous orbits of a certain spot to get a particular visual angle on an animal.

Less distress for wildlife. As with the big-horns, low-level flights create noise that can disturb animals on the ground, causing them to use valuable energy reserves and possibly abandon their normal territory. Though flying 1,000 feet over the animals is by no means silent, we've observed that animals are much less likely to change their behavior with FLIR surveys than with lower-level aerial survey techniques.

Detectability. Finding an animal is more than half the battle in wildlife surveys, and using FLIR can provide high detection rates. In our study

of bighorn sheep, we used radio-collared animals as a reference and determined that the IR survey had a detection probability of 89 percent (Bernatas and Nelson 2004). In addition, some visual surveys require snow to be on the ground for animals to stand out, or find that excessive tree cover makes it harder to spot animals. FLIR reduces these concerns.

Versatility. With FLIR, we can toggle between color video and infrared, opening up a range of different possibilities to study. Sometimes color is preferable for seeing distinctive markings, such as identifying antlers to determine a male moose from a female, or distinguishing an elk from a deer. It's also possible to record both infrared and color videos simultaneously, and then go over the images later for analysis.

There are some drawbacks to IR. For one, IR and water don't mix. Rain and high humidity will degrade an IR image, and IR sensors can't detect organisms beneath the surface of a body of water. Deciduous tree leaves can also pose a challenge, as the energy of photosynthesis can cloud an IR image. In temperate areas, fall and winter are the best times to obtain suitable images of wildlife on the ground.

The bells and whistles of FLIR don't offer a substitute for detailed survey design and statistical analysis. As with any survey, a biometrician can be an important team member for larger IR surveys, helping define the population of interest, choose a survey design, and recommend a number of replicates. Beyond that, a triad of skills is needed to conduct a quality airborne infrared wildlife survey: good aviation support to select the best aircraft, an understanding of thermography to select the right sensor for the application, and familiarity with wildlife habitat use and behavior. With those elements in place, seeing a deer's ears may be just a flight away. ■

This article has been reviewed by subject-matter experts.



To watch video footage of deer from Susan Bernatas's forward-looking infrared sensor, go to this article online at www.wildlife.org.

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New Forest Planning Rule Revealed ... Again

By Maeghan Brass



Courtesy of Maeghan Brass

Maeghan Brass is a Policy Intern for The Wildlife Society.

In February 2011, the U.S. Forest Service (USFS) released its long-awaited [Draft National Forest System Land Management Planning Rule](#). As the third major attempt to rework the original 1982 planning directive, this proposed rule—when approved—will guide the management of uses such as outdoor recreation, watershed, range, timber, ecosystem services, and wildlife and fish on all National Forest System (NFS) lands, including 155 national forests, 20 grasslands, and one prairie.

With requirements for each individual forest plan to provide for logging, recreation, grazing, and other uses to the extent possible, the rule tackles the daunting task of balancing multi-use interests and, like its predecessors, will be subject to the scrutiny of wide-ranging users and stakeholders. It also addresses a growing list of challenges, including climate change, insects and disease, water supply protection, wildfires, and shifts in local demands and national trends in markets such as timber and recreation.

The Wildlife Society (TWS) has been closely following the development of this rule, which will have major implications for wildlife on all NFS lands. When USFS first announced its intent to prepare the draft rule and environmental impact statement in December 2009, TWS submitted comments “encouraging the Forest Service to adopt ecological sustainability as the foundation for National Forest management.” TWS also recommended the “inclusion [of] species-level monitoring and viability assessments in the new land management planning rule.”

A Convoluted History

The Forest Service rule dates back to the 1976 National Forest Management Act (NFMA), which requires the USFS to manage NFS lands according to a planning rule that specifies the details to be included in the management plan of every forest and grassland. The first such rule was issued in 1982. A 1989 critique of the 1982 rule, however, found it to be too complex and costly. The rule has since had a tumultuous history of reviews and revisions, with one version replacing another. A 2000 version revised the 1982 rule but was

also found to be too complex. A second major attempt in 2005 and subsequent revision in 2008 also failed, as both were determined to be invalid on procedural grounds, including insufficient environmental and wildlife considerations. As a result, the original 1982 planning rule—now nearly 30 years old—still guides the management of all NFS lands, and all USFS land management plans have been developed, revised, and amended according to that original 1982 rule.

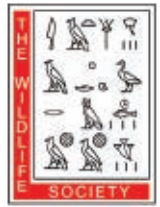
A lot has changed since the early 1980s, however. Advances have been made in the fields of forest ecology, conservation biology, and sustainability, and public values associated with NFS lands have evolved. The USFS planning rule must incorporate these advances, respond to today’s challenges, and address new management objectives, including greater emphasis on sustainability and restoration. The only factor that remains constant is the need to strike a balance among the System’s many uses.

What the Rule Entails

The 94-page draft details a new direction for management of the NFS, seeking to “promote healthy, resilient, diverse, and productive” lands. It has a strong focus on ecological restoration and sustainable multi-use, and promotes the following:

- A more “responsive” planning framework based on adaptive resource management.
- Watershed protection by requiring plans to include components to maintain and restore water resources.
- Wildlife conservation, such as managing for ecosystem diversity to maintain wildlife diversity.
- Consideration of climate change and potential impacts to resources in the development of management plans, such as in determining what constitutes sustainable multi-use.
- Specifications for greater public involvement throughout all stages of individual forest planning processes.

The rule also requires that science be taken into account in decision making—a position that TWS strongly endorsed in its comments—and greater au-



thority at the local level. For example, at the unit level (i.e., individual forest or grassland), the rule identifies the unit supervisor as the responsible official. The rule also grants these officials significant discretion on a number of management decisions, from efforts to engage the public to determining the scope of a unit's monitoring program.

The approach to addressing wildlife is also altered under the new rule. The 1982 rule required that USFS manage habitat to "maintain viable populations" of vertebrate species. The new proposed rule moves away from that population-viability standard, instead referring to the more general language of the NFMA to "provide for diversity of plant and animal communities." To meet that requirement, the draft rule endorses a coarse-filter/fine-filter approach: Coarse-filter refers to the provision of ecological conditions necessary to maintain a diversity of native plant and animal species, and fine-filter refers to providing conditions that would specifically benefit at-risk species, all of which should be done within the "inherent capability of the land."

A requirement to maintain viable populations is only specified for species of conservation concern, not candidate species or those listed under the Endangered Species Act, as the latter groups "may not have viable populations." The success of these approaches to manage habitat for wildlife will be determined through

monitoring plans, which must ascertain the status of focal species and ecological conditions on a scale left to the discretion of the responsible official.

Will it Meet the Challenge?

The Forest Service's new rule is poised to steer NFS management towards ecological, social, and economic sustainability, greater public involvement, and adaptive management. It's not without controversy, however. Areas of contention are likely to focus on the loss of a wildlife population-viability standard, the level of discretion afforded the responsible official, questions about what vague phrases like "inherent capability of the land" really mean in practice, and debates over how "species of conservation concern" are determined.

Whether it will stand the test of time—or at least last longer than the average planning rule—remains to be seen. A planning rule shouldn't last forever, but some level of consistency is essential if NFS management is to move forward and address the mounting challenges weighing heavily on these lands. The draft rule is currently under review by TWS members who are experts in forest planning and wildlife sustainability. "Ultimately," says Government Affairs Director, Laura Bies, "TWS hopes to enable the success of this rule by contributing recommendations for science-based management that will benefit NFS lands and the wildlife they sustain." ■

(Continued from page 33)

Similarly, the Cornell Lab of Ornithology, with its [Celebrate Urban Birds](#) program, recruits city-dwelling citizen-scientists to collect information about 16 species of birds that commonly live in urban areas. The program also offers mini-grants of roughly \$250 to \$500 to communities to host nature-related events. A 2010 grant winner—the For-Mar Nature Preserve and Arboretum near Flint, Michigan—used the funds to help put on a five-day event that included more than 200 children in activities such as making bird feeders and surveying for birds on the property.

Robinson himself has filed paperwork to start his own nonprofit, the International Institute for Bird Watching, to provide grants for educators who offer programs

to connect children with birds and nature. Though he knows he made a contribution to conservation working for FWS and the Forest Service, he says this new stage of his career—writing his book, doing research, speaking about minorities and nature, and starting a nonprofit—is "arguably the most significant contribution that I could make in my lifetime to the field of environmental conservation."

Robinson's path toward the wildlife profession began as a child, when a librarian suggested he read Jack London's classic *The Call of the Wild*—prompting dreams of becoming a wolf biologist in Alaska. While speaking at the Ohio conference, Robinson held up his yellowed 40-year-old copy of

that book before wildlife professionals, educators, and conservationists. "In two minutes that librarian changed my life," he said. "She touched a child."

But Robinson knows that increasing the number of minority wildlife professionals and conservationists in the future will require more than a chance encounter with a good book; the process won't be easy. "But as an old mentor of mine once said," Robinson told the audience at the Ohio conference, "if you're not feeling uncomfortable, then your goal isn't large enough." Perhaps through the efforts of Robinson and others, it won't be as rare to see birders as diverse in color and experience as the feathered creatures they're studying. ■



Faster-Release Avian Harnesses

To study birds, researchers often affix radio transmitters to small harnesses that the birds wear like little avian backpacks. Harness materials must be sturdy enough to stay put for the study's duration, but once it's over, the harness should ideally quickly wear out so birds won't be unnecessarily burdened.

To test the lifespan of some commonly used harness materials, Florida Atlantic University's Garth Herring and Dale Gawlik of the U.S. Geological Survey's Western Ecological Research Center used four different types of harness materials—7- and 9-mm wide polyester-coated rubber elastics and 7- and 9-mm wide polyester ribbons—to secure fake radio transmitters to foam bird molds. They attached the harnesses by wrapping them around the legs and up over the lower backs. The two loose ends of the harnesses were then pulled through the transmitter and attached in one of three ways: sewn with polyester thread, sewn with cotton thread, or glued with Gorilla Super Glue. Herring and Gawlik crafted a total of 120 harnesses, setting up 30 bird dummies per harness material and 10 dummies per fastening treatment.

For a year and a half the researchers left the foam bird molds outdoors on a frame, exposed to the elements. Every six to eight weeks, they assessed wear on the harnesses using a visual scoring system ranging from “no wear” to “heavy wear.” During these assessments they also tested the strength of the harnesses by attaching a 1-kilogram spring scale with 400 grams of tension—approximately equivalent to the potential pulling strength of an 800 gram bird—and pulling the harness in both lateral directions.

The researchers found that polyester ribbon and polyester-coated rubber elastic could both serve as durable harnesses, as some of each remained intact throughout the study. What really mattered, though, was the fastening method. Sewn harnesses lasted an average of 456 days before falling apart, though some lasted throughout the entire study. But fastening the harness with Gorilla Glue led to quicker failures. On average, 7-mm polyester ribbon harnesses fastened with Gorilla Glue failed in 408 days, and, surprisingly, the wider 9-mm ribbons failed faster, in 249 days on average. Both polyester-coated rubber elastic harnesses fastened with Gorilla Glue lasted an average of 438 days before failing.

According to Herring, it's ethically important for radio transmitters to detach from the bird so that the bird doesn't carry it for the rest of its life. Herring says most telemetry studies last less than 300 days, and most transmitter batteries last

no more than one year. Because his study indicates birds are unlikely to shed sewed-on radio transmitters in less than two years, Herring advises that researchers should avoid them “for telemetry studies if the intent is to guarantee that transmitters are shed at the end of a study.” Instead, he recommends using a product like Gorilla Glue to make sure birds can live unencumbered after a study is through.

—As reported by [Herring and Gawlik 2010](#)

Quick Prep for Bait Balls

Although tedious, preparing bait is an unavoidable step in many wildlife studies. To speed up the process, Walter Veselka—a wildlife biologist at the Environmental Research Center at West Virginia University's Davis College of Agriculture, Natural Resources and Design—summoned his inner Henry Ford and designed an efficient assembly-line approach to churn out bait for small mammal traps.

Veselka typically uses a standard combination of peanut butter and rolled oats to lure red and gray squirrels, voles, mice, shrews, chipmunks, flying squirrels, and weasels into small, box-style Sherman traps for study. A few years ago, he realized that while many researchers wrapped their bait with wax paper to ease cleanup, few used a streamlined, mass-production technique. So he and his colleagues developed a technique that



Credit: Walter Veselka

A large Tootsie-Roll shaped bait package hangs in a Sherman trap awaiting a nibble. The bait's two tails allow for convenient insertion into a trap and, if need be, researchers can also tear it in half to stretch their supplies in the field.

can save researchers between 40 and 60 percent of the time it takes to make bait balls individually.

With the new technique, Veselka and his colleagues combine one part peanut butter (microwaved, so it's more viscous) to two parts rolled oats, resulting in a mixture with a consistency like wet sand. After spooning out grape-sized chunks of bait and placing them about three inches apart on a long sheet of wax paper, Veselka then cuts the paper with a box cutter or sharp knife to form three-by-three-inch squares, each with one bait ball. Rolling the squares on the diagonal, he twists each end closed so that the final product resembles a Tootsie Roll. Using this method, Veselka says he can make an entire trapping season's worth of bait balls—upwards of 500—in roughly three hours.

The twisted tail shape of these bait balls makes them easy to insert into traps, allowing for easy clean up and removal when checking trap lines. The shape also makes it easy to tear the bait in half, should supplies run low in the field. “Previously, I had scattered oats and peanut butter mixtures loose in a trap, but this tends to be very messy in terms of clean up,” Veselka says. “With the peanut butter rolls, it is as simple as popping the back door and pulling the ‘Tootsie’ out.”

—As reported by *Walter Veselka and Kaytlyn Collins*

An Electric Deterrent for Elk

At cervid farms where elk are kept captive, there's a chance that wild elk could swap infections with captive animals at the fence line, sharing diseases such as chronic wasting disease and bovine tuberculosis (*Mycobacterium bovis*). Through a study that examined the behavior of elk on a ranch in north-central Colorado, Justin W. Fischer, a wildlife biologist and GIS specialist at the USDA-APHIS National Wildlife Research Center, and his fellow colleagues at USDA and the University of Nebraska have found a way to decrease the odds of disease transmission.

Between 2006 and 2007, Fischer and his team monitored a 20-foot expanse of 2.4-meter-high woven-wire test fence using video cameras. To see what motivated groups of elk in different pens to approach the test fence area, they conducted 26 trials—15 of which were done after adding two strands of baited electric fencing one meter away from the woven-wire fence, marking the first time this technique has been tested in a research setting, Fischer says. They also manipulated certain variables: They separated adult males from females during the



Courtesy of Justin Fischer

A captive bull elk cautiously approaches an electric fence, about to receive a shock. At cervid farms it's possible for captive and wild elk to swap diseases like bovine tuberculosis. A layer of electric fencing, which deters captive elk from approaching the fence line, can reduce this risk.

rut, situated rutting males on both sides of the fence, separated calves from their mothers, and placed grain in the spaces between the electric and woven-wire fence.

They found that the baited electric fence—which produced a pulsed energy output between 8kV and 9kV—successfully kept the farmed elk away from elk in an adjacent pen. While the team observed 426 contacts between elk before the electric fence went up, that number plummeted to zero for all adult elk afterwards. Additionally, 24 out of 25 farmed elk exposed to the electric fence were completely deterred from contacting other elk throughout the duration of the study once they had been zapped. “By placing the baited electric fence on the inside of a captive facility, these elk are continually exposed to it and become ‘trained’ to it,” says Fischer. “In short order, they learn to respect the electric fence, not even touching or trying to breach it.” Only a handful of elk actually touched the fence, he says, which means that the elk that didn't might have learned to avoid it after observing the negative behavioral reactions of the elk that received shocks. Additionally, electric fencing is actually less expensive than woven-wire fencing (about \$3.50 per meter as opposed to \$10-15 per meter), Fischer says. “We wanted to provide a tool that is less expensive, hoping that even if double fencing is not mandated by law, captive cervid producers would utilize the tool as a ‘common sense’ management practice.”

—As reported by *Fischer et al. 2011*



Taking the Reins at JWM

In July 2011, Bill Block will become the new Editor-in-Chief of *The Journal of Wildlife Management*, replacing outgoing editor Frank Thompson. Currently the Program Manager for the Wildlife Terrestrial Ecosystems Science Program in the U.S. Forest Service's Rocky Mountain Research Station, Block plans to bring several new ideas to the JWM table, such as launching special sections in each issue that explore timely and visionary subjects. "I'd like a collection of short papers that would focus on some hard-hitting topics," says Block, who plans to make these special sections a regular feature of the journal. Block also plans to apply his extensive knowledge of different taxa. "Over the course of my career, I've looked at passerine birds, woodpeckers, threatened and endangered species, reptiles, amphibians, and small mammals," Block says. "I have working knowledge of all these taxa, and I think that helps me."



Credit: John Squires

Bill Block carries a lynx captured during a habitat-use study in Montana.

Block is well aware that his new role editing JWM will require him to juggle time between the journal, his full-time job at the Forest Service, and his family life. "It's like taking a second job," he says, but he's looking forward to the opportunity. "It's a way for me to stay current in the field of wildlife biology and management, and hopefully make an impact in the way I shape the journal."

A member of The Wildlife Society since the early 1980s, Block has served as an associate editor of JWM as well as a co-Editor-in-Chief with Mike Morrison when JWM and the *Wildlife Society Bulletin* were merged. TWS leadership welcomes him aboard, and expresses heartfelt thanks to Frank Thompson for his superb and dedicated service as Editor-in-Chief of JWM for the last two years. Best of luck to both Block and Thompson in the coming transition.

IV International Wildlife Congress

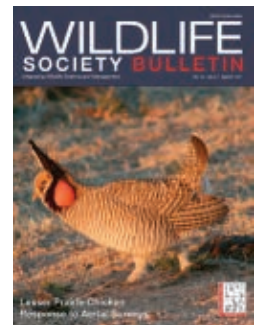
The Wildlife Society is pleased to announce that the International Wildlife Management Congress (IWMC) is being revived. Co-hosted by TWS and the Wildlife Environmental Society of South Africa (WESSA), this prestigious event will occur July 9-12, 2012, in Durban, South Africa. As the fourth IWMC—and the first in Africa—the meeting is expected to draw



more than 1,000 attendees from around the world to discuss the theme of *Wildlife Management Across Borders: Learning in the Face of Change*. "If we are THE society for wildlife biologists worldwide, we need to be involved internationally," says TWS President-Elect Paul Krausman, who has been instrumental in reinstating the Congress. "The purpose of the fourth IWMC is to minimize barriers to the management of wildlife both politically and biologically. It's designed for biologists, land managers, administrators, politicians, and other stakeholders who work to maximize the coexistence of man and wildlife." TWS hopes for a strong showing at the event.

It's Official: WSB is Back

The new online *Wildlife Society Bulletin* launched in March 2011, marking the return of TWS' highly lauded, peer-reviewed journal that integrates wildlife science and management. You can read the entire first issue free on Wiley Online Library: wildlife.org/freewsb. You can also subscribe to the journal for only \$35 a year through the Wiley site or by going directly to TWS' online membership center: wildlife.org/membercenter. It's a worthy investment in being informed about wildlife management in practice.

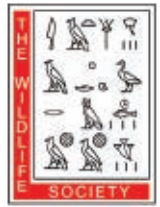


Credit: TWS

Investors' Campaign: Video Celebrating TWS

Every year, TWS Council chooses a project worthy of funding through the annual Investors' Campaign. This year, in honor of the Society's upcoming 75th anniversary in 2012, Council has voted to commission a short video about the history, accomplishments, and mission of The Wildlife Society. The video will launch on the Society's website in early 2012 to raise public awareness about TWS. It will also be shown at the 2012 Annual Conference in Portland, Oregon.

Planning is underway for the project, which will be produced by Jeremy Roberts, a wildlife biologist-turned-filmmaker whose business, [Conservation Media](http://www.conservationmedia.com), is based in Montana. With a deep respect for wildlife science, Roberts has done short films for the Wolverine Foundation, the Montana Conservation Science Institute, and other wildlife conservation organizations. We encourage all members of TWS to contribute to the making of the TWS video to commemorate our 75th anniversary. Donors' names will appear on our website and in the booklet for the 2012 Annual Conference. Please make your contributions online at www.wildlife.org/investorscampaign. Thank you for supporting this noteworthy tribute.



A New MOU with AAWV

At the mid-year Council meeting in Kansas City in March, TWS Council approved an MOU between TWS and the American Association of Wildlife Veterinarians (AAWV), ensuring close cooperation between the two groups on issues related to wildlife health and disease. The AAWV is a nonprofit organization of wildlife veterinarians, scientists, managers, and educators with expertise in the health and disease of free-ranging wildlife. They promote a philosophy of animal management and preventive medicine, and study the inter-relationships of human, domestic animal, and wildlife disease. According to the MOU, cooperation between the two groups will “improve the understanding of natural and human-induced changes in wildlife health, improve the use of wildlife disease information in the management of wildlife and their habitats ... and assist governments in setting management goals and policies that optimize wildlife health.” We look forward to a productive partnership.

A Lasting Legacy: 75 for Our 75th

Because The Wildlife Society will mark its 75th anniversary in 2012, we’re planning to launch a year-long celebration of this remarkable milestone during our Annual Conference in Hawaii, November 5-10, 2011. To honor our 75th, we’re also announcing a new effort to encourage 75 members to step forward to ensure the future of TWS by making a legacy gift. Their generosity will be publicly honored during our 2012 Annual Conference in Portland, Oregon.

Most legacy gifts—gifts by bequest, life insurance, or by naming TWS as a beneficiary of retirement plan assets—require no immediate donation and no minimum contribution. If you have already included TWS in your plans, please let us know so we can be sure you are a part of the special recognition we are planning. For more information about the legacy program, contact Darryl Walter at dwalter@wildlife.org or at 301-263-6000.

Results of TWP Reader Survey

In January of this year, TWS distributed a readers’ survey—conducted by Cell Associates—to assess reader responses to *The Wildlife Professional*, now in its fifth year of publication. We emailed 9,200 surveys and called 234 members who do not have email addresses. A total of 1,422 surveys were completed, a response rate of 15 percent. We received valuable and candid suggestions for improvement regarding content, and learned which features readers find most and least useful. Overall, it appears that TWP is moving in the

Meet the Candidates for TWS Council

Six distinguished candidates are running for three positions on The Wildlife Society Council, with elections scheduled in July. Electronic ballots, sent in May to all members via email, are due July 8, and the newly elected Council members will be installed at the 18th Annual Conference in Waikoloa, Hawaii in November. What follows is a brief rundown of the candidates with excerpts from their position statements, which you can read in full online at www.wildlife.org.

Vice President

Jonathon Haufler (Executive Director, Ecosystem Management Research Institute): “As a Society, we need to expand our ability to be effective communicators and managers through greater engagement with other natural resource disciplines, involvement in collaborative processes, and by clearly articulating definable limits of sustainable development.”

Darren Miller (Senior Scientist and Manager, Southern Environmental Research, Weyerhaeuser Company, and current Southeastern Representative on Council): “I strongly believe TWS must address conservation issues by adhering to and promoting science-based decision making, remaining mindful of our core values, recognizing the key role of existing partnerships, developing new partnerships, and continually providing tools and services to our members.”

Central Mountains and Plains Section (CMPS) Representative

Michael Conover (Professor of Wildlife Science, Utah State University): “It is the responsibility of the wildlife profession to serve as a buffer between society and wildlife. ... We need an active and vibrant TWS and CMPS because these tasks are beyond the reach of any one individual.”

Gary White (Professor Emeritus, Department of Fish, Wildlife, and Conservation Biology, Colorado State University): “I continue to promote efforts to make TWS more recognizable as the primary provider of scientific information in the wildlife arena, particularly through the TWS Technical Reviews and Position Statements ...” White is running for re-election.

Northeast Section Representative

Richard Chipman (Assistant National Rabies Management Coordinator, USDA-APHIS, Wildlife Services): “There remains a need for TWS to enthusiastically support and recognize the great work done by wildlife biologists tackling complex wildlife research, management, and education issues here in the Northeast.”

John McDonald (Wildlife Research Specialist, Wildlife and Sport Fish Restoration Program, U.S. Fish & Wildlife Service): “Through *The Wildlife Professional*, the website, social media, and the refinement and distribution of our Position Statements and Technical Reviews, we continue to get our messages out to a wider audience.” McDonald is running for re-election.



right direction: 87 percent of respondents report being satisfied or very satisfied, and the latter group (at 36 percent) has nearly doubled from the previous survey, done in 2008. Only 4 percent were somewhat or very dissatisfied, nearly half the rate of 2008. TWP staff hopes to use respondents' comments and suggestions to continue to improve the magazine to meet readers' needs. Many thanks to those of you who responded. We encourage those who did *not* respond—85 percent of survey recipients—to send us your thoughts by emailing editor@wildlife.org. We want to hear from you.

In Memory

Joe C. Truett, a TWS member for more than 35 years, passed away at his home in Glenwood, New Mexico, on February 27, 2011. He was 69 years old. During his distinguished career as a biologist and author, Truett engaged in diverse lines of research, from studying the impacts of industrial development on arctic wildlife habitats, to grasslands ecology, to environmental history.



Courtesy of Sam Truett

Truett earned a B.S. in wildlife management from Texas A&M University and a Master's and Ph.D. in wildlife biology from the University of Arizona. He then began working for Canadian ecological research firm LGL Limited in 1971, helping to establish the company's U.S. affiliate, LGL Ecological Research Associates, Inc., in 1974. As vice president of research and senior ecologist, he directed large-scale projects across the U.S. West and Canada until 1991, when he went into consulting for himself.

In 1999 Truett joined the Turner Endangered Species Fund as a senior biologist. He was one of the first biologists to use translocation to establish new black-tailed prairie dog colonies, and helped reestablish populations of Aplomado falcon, swift fox, bolson tortoise, and black-footed ferret on western ranchlands. "His ability to work productively with both public and private institutions, while preserving a high level of integrity and autonomy as a scientist, was the key to his success," says Truett's son Sam, an environmental history professor at the University of New Mexico. Truett authored several books, including *Land of Bears and Honey: A Natural History of East Texas*. Co-authored with Daniel W. Lay, it was awarded Best Book of the Year in 1984 by the Texas Chapter of The Wildlife Society. The Texas Chapter has set up a scholarship fund in Truett's name. Donations can be made to TCTWS/ Joe C. Truett Memorial and sent to the Texas Chapter of The Wildlife Society at P.O. Box 1400, Sinton, Texas 78387.

New Guidelines for Technical Reviews

The Wildlife Society has introduced formatting guidelines for its Technical Reviews to ensure that each review has some level of consistency in terms of length, style, usage, and formatting. Based on manuscript guidelines for *The Journal of Wildlife Management*, the new rules for Technical Reviews will "articulate the role, responsibility, and oversight of TWS staff, and identify consistent sections of information that are required from all reviews," says Associate Director of Government Affairs Terra Rentz, who coordinates Technical Review production. In addition, reviews must be no longer than 15 to 30 published pages, or 50 to 100 manuscript pages. Such guidelines will increase the effectiveness and readability of Technical Reviews, and provide a framework for TWS staff to measure compliance and provide guidance when returning draft reviews to authors prior to submission to TWS Council for approval. For a detailed description of the new guidelines, visit www.wildlife.org.

Milestone Anniversaries

This year marks milestone anniversaries for several TWS state and student chapters. Though noted in an earlier edition of the *Wildlifer* newsletter, we feel it bears repeating that the Society is grateful for the many productive years of these dedicated groups. Congratulations!

Chapters

45th Anniversary: Nebraska, Sacramento-Shasta (CA) (formerly Sacramento), San Francisco Bay Area (CA), San Joaquin (CA), South Dakota, Southern California, Washington

40th Anniversary: Alaska, California Central Coast, Colorado.

35th Anniversary: Maine

30th Anniversary: Kentucky

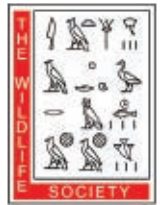
Student Chapters

45th Anniversary: University of Guelph (Ontario), West Virginia University

40th Anniversary: Cornell University (NY), Louisiana State University, Mississippi State University, Murray State University (KY), University of Wisconsin-Stevens Point

35th Anniversary: Brigham Young University (UT)

30th Anniversary: University of Nebraska at Kearney



Wildlife's Social Scientists

More and more, wildlife professionals are realizing that to effectively manage wildlife, it's critically important to understand what motivates people. That's where human dimensions research comes in. Yet Jeremy Bruskotter, the current co-chair of The Wildlife Society's **Human Dimensions Working Group**, says many wildlife professionals don't quite understand what "human dimensions" means, confusing it for outreach or public relations.

In fact, human dimensions specialists are social scientists who investigate why people think or act the way they do regarding natural resources. For example, researchers may conduct surveys to understand why individuals may or may not choose to partake in activities like hunting or fishing, or why some people may welcome cougars into their area while others abhor the thought. "The people that are involved [in human dimensions work] come from very diverse backgrounds and work in very focused areas," says Bruskotter. Along with his co-chair, Kirsten Leong, Bruskotter is working to create a sense of shared purpose among the membership of the working group, which gained official status in 2009.

At this year's Annual Conference in Hawaii, the group will host a symposium titled "Social conflict over wildlife: Human-wildlife conflict re-envisioned." "Human-wildlife conflict is one of those areas where there is an obvious integration between natural science and social science," says Bruskotter. "You can't have conflict without humans." Increasingly, state and federal agencies are turning to human dimensions research to identify the best ways to minimize this conflict by balancing the desires of people with the need for sustainable wildlife management. "If we take the Public Trust Doctrine seriously—recognizing that wildlife are resources that belong to the people—that means that all of those perspectives are legitimate in one way or another." Through the working group, Bruskotter hopes to better integrate those views with the work that wildlife biologists, managers, and policymakers do every day.

Welcome to Three Newcomers

The Wildlife Society would like to welcome three new working groups, which the Governing Council approved for interim status at its meeting on March 13, 2011.

The **Forestry and Wildlife Working Group** emerged when a group of wildlifers who worked in forestry in California—and who met monthly to discuss issues of common interest—realized there might be room for similar dialogue and discussion on the national level. Bob Carey, a wildlife biologist for Vestra Re-

sources, reached out to colleagues across the country and the working group was born. Carey hopes the group can improve outreach to show the public how forest management is necessary to improve habitat for some wildlife species. Carey would also like members to engage in discussions about forest certification programs, collaborate with other organizations like the Society of American Foresters, and brainstorm ways to improve communication among federal, state, and private forest managers. One contiguous forest may have a checkerboard of ownership, with "commercial timber on one side and spotted owls on the other," says Carey, but landscape-scale planning can resolve apparent conflicts. By bringing scientists, managers, and practitioners with different experiences together in the working group, he hopes forest professionals can find common ground.

The seed for the **Early Career Professional Working Group** was planted in Kristina Boyd's mind while she participated in TWS' Leadership Institute in 2010. "The final exercise was to think about how you could contribute to one of [TWS'] working groups," says Boyd, a project manager for the U.S. Geological Survey. "But I wasn't finding what I wanted." In an essay to complete the experience, Boyd wrote about starting a working group to serve young professionals such as herself. After meeting with Council at the Annual Conference in Snowbird and garnering the support of other enthusiastic TWS members, her idea took life. With the working group, Boyd wants to instill confidence in professionals taking their first career steps by providing a forum for peer support and discussion. The group will meet at the Annual Conference in Hawaii and use technologies including Skype and Google Docs to communicate before then—an appropriately cutting-edge approach for this group of young, energetic professionals.

The new **Military Lands Working Group** was organized by Rhys Evans, a wildlife biologist for the Air Force, and Chris Eberly, a biologist with Department of Defense (DoD) Partners in Flight. Even before the group gained interim status, members have shared information about wildlife management on DoD lands with articles in *The Wildlife Professional* and symposia at Annual Conferences. "We have a lot of challenges that everyone faces, like invasive species and climate change. We have some less common challenges, such as bird-aircraft strikes, and then we have some very uncommon challenges, like unexploded ordnance," says Evans. "By having this new group formed, we hope to provide an outlet for discussion on how to manage these challenges." Evans says he also hopes to broaden awareness of what military lands biologists do, and recruit students and young professionals to a career in the field. The group will have their first official meeting in Hawaii.



Welcome Aboard

The Wildlife Society is pleased to welcome Trent University as its newest student chapter in Canada. “I think our group can provide a great opportunity for students to share their passion for wildlife and to get experience in the wildlife field,” says chapter vice-president Allen Campeau. The 30-some student members have their work cut out for them: They plan to meet twice a month during the fall and winter terms to plan events for the chapter and increase chapter membership. “It’s good for the university to have this chapter because it will improve connections between graduate and undergraduate students,” says student chapter advisor Jeff Bowman.

That Must-Have Kit

The Wildlife Society has created an extensive toolkit for student chapter officers. The toolkit—available online at www.wildlife.org—provides 30 well-organized chapters that cover such topics as how to host events, conduct fundraising, hold elections, apply for awards, and work with the media to generate publicity. The student toolkit also offers advice on how to generate opportunities for professional growth by participating at conferences and conclaves and networking with experts in the field. In addition, young professionals offer advice on how to make the most out of the student chapter officer experience. Numerous universities and organizations—including the American Fisheries Society, the Society of American Foresters, and the Society for Human Resource Management—contributed to this valuable resource. According to Shannon Pederson, TWS Subunits and Certification Program Manager, “The toolkit is meant to teach officers how to professionally run a student chapter, while also demonstrating that leading a student chapter can be a fun and worthwhile experience ... and doable!”

TWS and Mexico

Across the border in Mexico, student members of The Wildlife Society are working hard to protect endangered species such as prairie dogs (*Cynomys ludovicianus*), Worthen’s sparrows (*Spizella wortheni*), and Maroon-fronted parrots (*Rhynchopsitta terrisi*). Leading the way is student advisor Alejandro Lozano, professor in the Department of Renewable Natural Resources at the Antonio Narro University in Coahuila State in northern Mexico. “[My] biggest dream was to become a specialist in wildlife management and contribute significantly to Mexico’s wildlife,” Lozano says. He’s realizing that dream, and passing it along to his students. Recently, the group helped assess the effects of the biggest wildfire in his-

tory that struck Northern Coahuila, and evaluated its impact on the distribution of species, such as black bears, deer, and wild turkey. A new era of wildlife conservation has begun in Mexico, says Lozano, even though that nation doesn’t have a “formal career” in the field. TWS looks forward to collaborating with wildlife experts in Mexico and building a network of like-minded students and professionals in the field.

Student Chapter Award Deadline

If you believe your student chapter has done exceptional work in the last year, consider applying for the Student Chapter of the Year Award. Winning chapters receive a plaque along with a \$1,000 travel grant to help send student chapter members to The Wildlife Society Annual Conference. In addition, the names of winning student chapters are added to a permanent plaque that’s displayed at the Society’s headquarters in Maryland. The application deadline for the award is July 30. To apply, go to www.wildlife.org.



Credit: D.A. Miller

Dashing Duo. During a light moment at TWS’ March Council Meeting in Kansas City, Student Council Liaison Jerod Merkle (at right) earns the “Good Sport” award by donning a burned-cork mustache and rubbing shoulders with TWS President Tom Ryder (whose mustache is the real McCoy). “In addition to the fun, the student liaison gets hands-on involvement with the interworkings of TWS, and gets to provide a student perspective to Council’s decisions,” Merkle says.

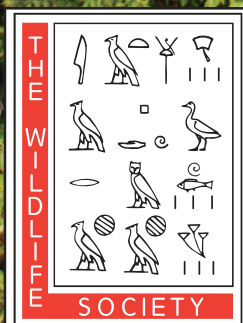
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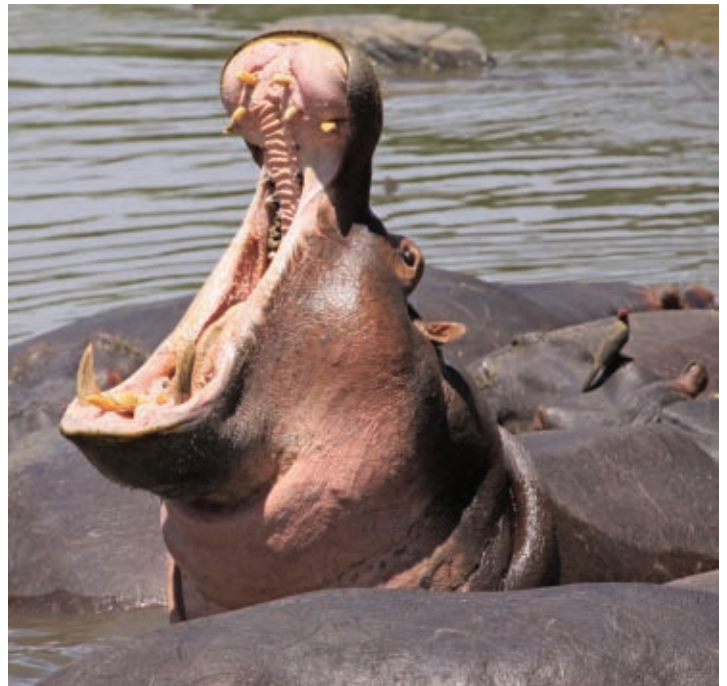
Credit: Kevin Rose

Duty bound, a male red-cockaded woodpecker (*Picoides borealis*) departs a nest cavity where his three young siblings rest. Rather than dispersing to his own territory, this one-year-old “helper” bird stayed with his natal family group to help raise nestlings and defend the territory, located on the Marine Corps Base Camp Lejeune in North Carolina. Photographer Kevin Rose hid in thick brush near the tree for half an hour before capturing this airborne moment.



Credit: Victor Koos

Feet tucked aerodynamically and wings held aloft, a mallard drake (*Anas platyrhynchos*) rises from the icy periphery of a pond in Syracuse, New York, during an unseasonably warm, 60-degree February day.

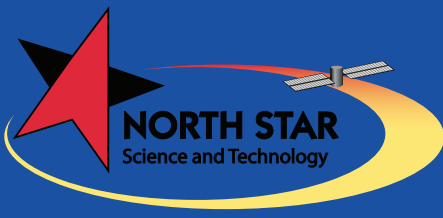


Credit: Michael Hutchins

A yawn or a threat? The gaping mouth of this hippo (*Hippopotamus amphibius*), a resident of Tanzania’s Serengeti National Park, serves to show off its formidable teeth to its neighbors—a potentially aggressive act.

Send your high-resolution, minimum 300-dpi electronic photographs to editor@wildlife.org.

For a photo gallery of more Gotcha! images, go to www.wildlife.org.



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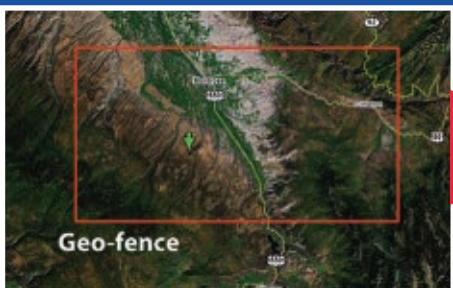
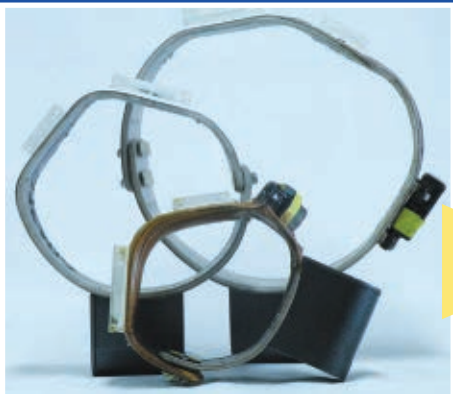


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