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The Department of the Interior was created in 1849 through the consolidation of several other offices. It was not until 1938 that the first scientist was hired who conducted substantial research in herpetology and, then, in 1972 the Department employed its first full-time herpetologist.

A History of Herpetologists and Herpetology in the U.S. Department of the Interior

Monograph 2.

Jeffrey E. Lovich, Norman J. Scott, Jr., R. Bruce Bury, C. Kenneth, Dodd, Jr., and Roy W. McDiarmid

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A HISTORY OF HERPETOLOGISTS AND HERPETOLOGY IN THE U.S. DEPARTMENT OF THE INTERIOR

MONOGRAPH 2.

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A HISTORY OF HERPETOLOGISTS AND HERPETOLOGY IN THE U.S. DEPARTMENT OF THE INTERIOR

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Abstract.—The U.S. Department of the Interior (DOI) has a long and distinguished history of employing herpetologists to conduct basic and applied research to better manage amphibian and reptile populations on public lands and even outside the boundaries of the United States. This history extends back over 125 years with roots in the U.S. Biological Survey, the Fish and Wildlife Service, the Bureau of Land Management, the National Park Service and later, the National Biological Service. In more recent times, the DOI employed more professional herpetologists than any single organization in the world, especially in the U.S. Geological Survey. In 1938, Henry Fitch was the first Interior scientist hired who conducted substantial herpetological research. William and Lucille Stickel of the Fish and Wildlife Service conducted herpetological research throughout the period from the 1940s-1980s but most DOI herpetologists were hired from 1975-80 with another hiring spike from 2000-2005. The former spike was congruent with early versions of the Endangered Species Act while the latter reflected growing recognition of global amphibian decline and the creation of the Amphibian Research and Monitoring Initiative in DOI. Collectively, these herpetologists produced hundreds of books, scientific publications and other scholarly publications, many of which are classics in the literature. In addition, many have served as officers and on the boards of numerous scientific societies particularly those specializing in amphibian and reptile research. The DOI shows a continuing commitment to funding herpetological research by hiring young scientists to replace the aging ranks of herpetologists who started their careers in the 1970s. This commitment is critical given the global decline of both amphibians and reptiles, including those found on public lands in the United States.

Key Words.—Bureau of Land Management; Fish and Wildlife Service; herpetology; herpetologists; National Biological Service; National Biological Survey; National Park Service; U.S. Department of the Interior

INTRODUCTION

Herpetology, or the scientific study of amphibians and reptiles, has a long history. Interest in these disparate classes of vertebrates has increased dramatically in the last few decades due in significant measure to their increasingly imperiled status. Recognition of global amphibian declines (Wake 1991) coupled with similar evidence for reptiles (Gibbons et al. 2000) fuels renewed interest in these animals as reflected in an increase in knowledge (Wake 2008). In an effort to distill this large volume of knowledge, several institutions have published historical overviews of their herpetological research (e.g., Myers 2000; Rodríguez-Robles et al. 2003) for posterity.

At various times in the past, the U.S. Department of the Interior (DOI), now through the U.S. Geological Survey's (USGS) Biological Resources Division (BRD), employed more research herpetologists (Ph.D.-level or equivalent experience) than any other organization in the world. This pattern continues today. Still, there is no current overview of the development of herpetological studies in this agency other than the brief summary provided by Lovich and Scott (2004). Thus, the purpose of this paper is to review the significant history and development of herpetological research in the Department of the Interior. We had several objectives when we began this project: (1) review the historical roots of herpetology back to the Bureau of Biological Survey (BBS); (2) summarize the rapid expansion of expertise starting in the 1970s onward; and (3) describe

the current composition and direction of herpetological research in the Interior Department.

SCOPE OF COVERAGE

We attempted to include all known “herpetologists” that have worked for the Biological Survey, Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), National Park Service (NPS), the National Biological Survey (NBS, later called National Biological Service) and the USGS. Still, some are not presented because they work primarily on applied problems without a specific research focus on amphibians or reptiles. For the purpose of this paper, we define a herpetologist as: 1) someone with an advanced degree (usually a Ph.D.) on a herpetological topic, 2) who conducts most of their research on reptiles and amphibians, 3) who is active in professional herpetological societies, and, importantly, 4) who considers themselves to be a herpetologist (Table 1). Our objective was to be as inclusive as possible. However, there are other research scientists in DOI who have conducted research on herpetological topics during their career but do not meet most of the criteria. For example, some have carried out extensive research on herpetological topics but do not consider themselves to be herpetologists based on our communications with them. These individuals are mentioned in passing or not included in the present treatment at the sole discretion of the authors. The contributions of these researchers are no less important than those who are given more

coverage. We made every attempt to provide accurate details of current affiliations and research interests, but careers change rapidly in the 21st century. The information presented was current as of early 2011 (with a few exceptions). We apologize in advance for any errors of omission or commission and encourage readers to seek out more current information on staff web pages.

Literature citations throughout this paper are examples of the modern breadth of herpetological publications generated by DOI scientists; a comprehensive list would be much more extensive and extend well back into the 20th Century. Acronyms are used liberally throughout the paper and the reader should consult Table 1 for guidance. In addition, we provide selected photographs of various herpetologists, some of which have never been published before. The photos are representative of what was available to us and do not signify an attempt to assemble a more comprehensive collection.

BUREAU OF BIOLOGICAL SURVEY: OUR ROOTS

The current herpetological program of the Department of the Interior can be envisioned as the trunk of a large tree, with roots extending back into the 19th Century. Research herpetology in DOI can trace its beginnings to the observations and collections made near the turn of the 20th century by the U.S. Bureau of Biological Survey (Fig. 1), under the direction of C. Hart Merriam (Fig. 2). His perceptive recognition that the elevational life zones in Arizona’s San Francisco Mountains were analogous in



FIGURE 1. Flag of the Bureau of Biological Survey that was carried in a parade down Pennsylvania Avenue, Washington, D.C., USA, after WWI. The blue stars represent those Survey employees who fought in this war, and the two gold stars (center of field) represent those who died in action. Department of Interior herpetologists, like others (Mitchell and Lovich 2010), served in the American armed forces. (Photographed by Robert Reynolds).

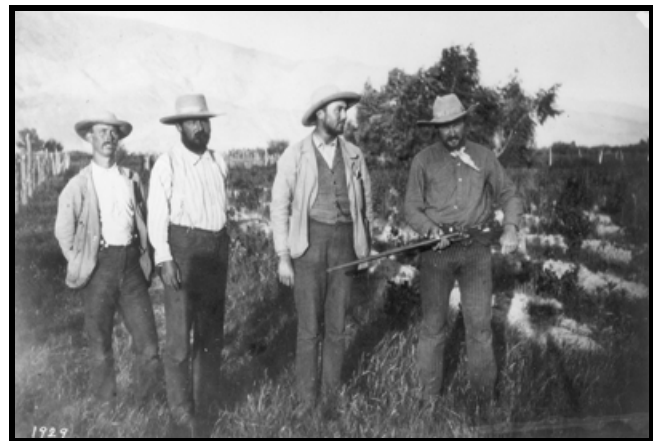


FIGURE 2. Biological Survey members in the field at Lone Pine, Owens Valley, California, USA, 13 June 1891. The photograph is apparently erroneously marked 1929. Left to right: Vernon O. Bailey, C. Hart Merriam, Theodore S. Palmer, and Albert K. Fisher. (Photograph from Robert D. Fisher 2012).

Herpetological Conservation and Biology

TABLE 1. Past and present research herpetologists (see Scope of Coverage for criteria for inclusion) of the Department of the Interior (DOI), with some or all of their DOI assignments, and, where appropriate, their current U.S. Geological Survey affiliation and location. Due to numerous reorganizations, transfers, and associated acronyms, complete institutional histories are not included for several individuals. A key to the acronyms used follows.

Herpetologists hired prior to year 2000			Herpetologists hired prior to year 2000 (continued)		
Name	Date	Select affiliation history, current location	Name	Date	Select affiliation history, current location
Barry Baker	1999	FWS, NFWFL, Ashland, OR	Robin E. Jung	1996	CERC, Columbia, MO
Kristin Berry	1973	BLM, WERC, Riverside, CA		1998	PWRC, Laurel, MD (resigned 2003)
R. Bruce Bury	1972	USNM, NFWL Washington, D.C.	Jeffrey E. Lovich	1979	NFWL/Smithsonian Institution, Washington, D.C.
	1977	NFWL, DWRC, NERC, Fort Collins, CO		1991	BLM, WERC, Riverside and Palm Springs, CA
	1993	FRESC, Corvallis, OR		2000	WERC, Sacramento, CA
Steve Busack	1972	USNM, NFWL, Washington, D.C.		2003	SBSC, Flagstaff, AZ
	1989	FWS, NFWFL, Ashland, OR (left 1996)	Roy W. McDiarmid	1978	NFWL, DWRC, NERC, PWRC, Washington, D.C.
Howard W. Campbell	1974	NFWL, Gainesville, FL (deceased 1981)	Philip A. Medica	1992	BLM, Las Vegas
Steven Christman	1975	NFWL, Gainesville, FL (resigned 1985)		1993	WERC, FWS, WERC, Las Vegas, NV
Donald R. Clark	1972	PWRC, Laurel, MD	Erin Muths	1995	MESC, Fort Collins, CO
	1991	CERC, College Station, TX (retired 2000)	Erika Nowak	1992	FWS, NPS, WERC, SBSC, Flagstaff, AZ
P. Stephen Corn	1979	NERC, MESC, Fort Collins, CO	Robert P. Reynolds	1979	NFWL, DWRC, Belle Chasse, LA
	1996	NOROC, Missoula, MO		1983	DWRC, NEC, NERC, PWRC, Washington, D.C.
C. Kenneth Dodd, Jr.	1976	FWS, Washington, D.C.,	Kenneth Rice	1998	FISC/SESC, Gainesville, FL
	1984	DWRC, NERC, FCSC, FISC, Gainesville, FL (retired 2007)	Gordon Rodda	1987	FWS, Tucson, AZ
Charles Drost	1980	NPS, San Francisco, CA		1991	NERC, MESC, Fort Collins, CO (Retired 2012)
	1984	NPS, Davis, CA	Rick Scherer	1998	FORT, Fort Collins, CO
	1994	NPS, SBSC, Flagstaff, AZ	Cecil R. Schwalbe	1993	NPS, WERC, Tucson, AZ
Todd Esque	1987	NERC, Fort Collins, CO	Norman J. Scott, Jr.	1974	NFWL, DWRC, NERC, Albuquerque, NM
	1991	BLM, WERC, St. George, UT		1992	NERC, WERC, San Simeon, CA (retired 2001)
	1998	WERC, Las Vegas, NV	Donna J. Shaver	1981	NPS
Gary M. Fellers	1979	NPS, San Francisco, CA		1993	FCSC, Corpus Christi, TX (returned to NPS 2003)
	1993	WERC, Pt. Reyes, CA	Lucille F. Stickel	1943	PWRC, Laurel, MD (retired 1982)
Robert N. Fisher	1998	WERC, San Diego, CA	William H. Stickel	1941	PWRC, Laurel, MD (retired 1982)
Henry S. Fitch	1938	BBS, FWS, O'Neals, CA			
	1947	FWS, New Orleans, LA (resigned 1948)			
Thomas H. Fritts	1978	NFWL, San Diego, CA	<u>Herpetologists hired after year 2000</u>		
	1979	NFWL, DWRC, Belle Chasse, LA	Michael Adams	2001	FRESC, Corvallis, OR
	1982	DWRC, NERC, Albuquerque, NM	Christine Britton	2002	CERC, Columbia, MO
	1988	NERC, Washington, D.C.	Larissa Bailey	2002	PWRC, Laurel, MD (resigned 2009)
	1998	MESC, Fort Collins, CO (retired)	Josh Ennen	2010	SBSC, Flagstaff, AZ (resigned 2011)
Steve Gotte	1988	PWRC, Washington, D.C.	Evan Grant	2003	PWRC, Laurel, MD
David E. Green	1999	NWHC, Madison, WI	Margaret S. Gunzburger	2004	FISC, Gainesville, FL (resigned 2006)
Russell J. Hall	1977	PWRC, Laurel, MD	Brian Halstead	2008	WERC, Sacramento, CA
	1996	FCSC, Gainesville, FL (retired 2006)	Steve A. Johnson	2002	FISC, Gainesville, FL (resigned 2004)
Kristin M. Hart	1999	SESC, Gainesville, FL	Kenneth Nussear	2004	WERC, Las Vegas, NV
Mark R. Jennings	1992	WERC, Davis, CA (appt. ended 2000)	Christopher A. Pearl	2003	FRESC, Corvallis, OR
K. Bruce Jones	1976	BLM, Las Cruces, NM	David S. Pilliod	2006	FRESC, Boise, ID
	1978	BLM, Kingman, AZ	Robert N. Reed	2006	FORT, Fort Collins, CO
	1985	FWS, Arlington, VA	Walter J. Sadinski	2002	UMESC, La Crosse, WI
	1988	EPA, Las Vegas, NV	Lora L. Smith	2000	FISC, Gainesville, FL (resigned 2002)
	2006	USGS, Reston, VA	Hardin Waddle	2005	FISC, Gainesville, FL
				2007	NWRS, Lafayette, LA
			Susan C. Walls	2002	NWRS, Lafayette, LA, FISC/SESC, Gainesville, FL

Key to Acronyms:

BBS Bureau of Biological Survey
 BLM Bureau of Land Management
 BRD Biological Resources Division, USGS
 CERC Columbia Environmental Research Center, Columbia, Missouri
 CPSU Cooperative Park Service Unit
 DWRC Denver Wildlife Research Center, Denver, Colorado
 EPA Environmental Protection Agency
 FISC Florida Integrated Science Center (formerly Florida Caribbean Science Center), Gainesville, Florida
 FORT Fort Collins Science Center, Fort Collins, Colorado
 FRESC Forest and Rangelands Ecosystem Science Center, Corvallis, Oregon
 FWS U.S. Fish and Wildlife Service
 MESC Midcontinent Ecological Science Center, Fort Collins, Colorado

NERC National Ecology Research Center, headquarters Fort Collins, Colorado
 NFWFL National Fish and Wildlife Forensic Laboratory (FWS)
 NFWL National Fish and Wildlife Laboratories, Washington, D.C.
 NOROC Northern Rocky Mountain Science Center
 NPS National Park Service
 NWHC National Wildlife Health Center, Madison, Wisconsin
 NWRC National Wetlands Research Center, Lafayette, Louisiana
 PWRC Patuxent Wildlife Research Center, Laurel, Maryland
 SBSC Southwest Biological Science Center, Flagstaff, Arizona
 SESC Southeast Ecological Science Center, Gainesville, Florida
 UMESC Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin
 USGS U.S. Geological Survey
 USNM U.S. National Museum, Washington, D.C.
 WERC Western Ecological Research Center, Sacramento, California

many ways to the climatically controlled latitudinal life zones of North America laid the groundwork for the modern biogeography of the American West (Merriam 1890). Historical summaries of the early years of the Biological Survey are presented by Henderson and Preble (1935) and Fisher (2012) as summarized in Table

2. The reader is referred to these primary sources for details beyond what we present in this paper.

Extensive bird and mammal collections were made by the Biological Survey throughout North America, including Mexico and Central America, the latter a

TABLE 2. A brief timeline of events leading to the formation of the Biological Survey and herpetology in the U.S. Department of the Interior. Created from material presented by Fisher (2012; <http://www.pwrc.usgs.gov/history/bsphist2.htm>), Henderson and Preble (1935), and other information from the authors' files.

<p>1885.—Precursor of Biological Survey (Section of Economic Ornithology, Branch in the Division of Entomology, U.S. Department of Agriculture) funded by Congress on 3 March. C. Hart Merriam, Chief. Funding became available 1 July same year.</p> <p>1886.—Division of Economic Ornithology and Mammalogy, U.S. Department of Agriculture.</p> <p>1889.—Relationship established between the U.S. Department of Agriculture and the U.S. National Museum concerning the care and management of specimens resulting from biological investigation by the Biological Survey.</p> <p>1896.—Division of Biological Survey, U.S. Department of Agriculture.</p> <p>1905.—Bureau of Biological Survey, U.S. Department of Agriculture.</p> <p>1911.—Biological Survey collections moved from the U.S. National Museum to the present National Museum of Natural History. Personnel housed with collections.</p> <p>1939.—Bureau of Biological Survey transferred from U.S. Department of Agriculture to the U.S. Department of the Interior (along with the Bureau of Fisheries from the U.S. Department of Commerce)</p> <p>1940.—Wildlife Division of the National Park Service transferred to the Biological Survey</p> <p>1941.—Bureau of Biological Survey and Bureau of Fisheries combined to create the Fish and Wildlife Service, U.S. Department of the Interior</p> <p>1958.—Bird and Mammal Laboratories created</p> <p>1972.—Section of Herpetology added to Bird and Mammal Laboratories</p> <p>1993.—Creation of the National Biological Survey (“Survey” later changed to “Service”)</p> <p>1996.—Transfer of the National Biological Service into the newly created Biological Resources Division of the U.S. Geological Survey on October 1.</p>	<p>1885.—Precursor of Biological Survey (Section of Economic Ornithology, Branch in the Division of Entomology, U.S. Department of Agriculture) funded by Congress on 3 March. C. Hart Merriam, Chief. Funding became available 1 July same year.</p> <p>1886.—Division of Economic Ornithology and Mammalogy, U.S. Department of Agriculture.</p> <p>1889.—Relationship established between the U.S. Department of Agriculture and the U.S. National Museum concerning the care and management of specimens resulting from biological investigation by the Biological Survey.</p> <p>1896.—Division of Biological Survey, U.S. Department of Agriculture.</p> <p>1905.—Bureau of Biological Survey, U.S. Department of Agriculture.</p> <p>1911.—Biological Survey collections moved from the U.S. National Museum to the present National Museum of Natural History. Personnel housed with collections.</p> <p>1939.—Bureau of Biological Survey transferred from U.S. Department of Agriculture to the U.S. Department of the Interior (along with the Bureau of Fisheries from the U.S. Department of Commerce)</p> <p>1940.—Wildlife Division of the National Park Service transferred to the Biological Survey</p> <p>1941.—Bureau of Biological Survey and Bureau of Fisheries combined to create the Fish and Wildlife Service, U.S. Department of the Interior</p> <p>1958.—Bird and Mammal Laboratories created</p> <p>1972.—Section of Herpetology added to Bird and Mammal Laboratories</p> <p>1993.—Creation of the National Biological Survey (“Survey” later changed to “Service”)</p> <p>1996.—Transfer of the National Biological Service into the newly created Biological Resources Division of the U.S. Geological Survey on October 1.</p>
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a legacy of extensive work done in the late 1800’s and early 1900’s by Edward W. Nelson and Edward A. Goldman (Henderson and Preble 1935).

These specimens became the Survey Collections, housed in the U.S. National Museum of Natural History (USNM), in Washington, D.C., and at the time, kept separate from the main museum collections curated by the Smithsonian Institution. Survey scientists produced an impressive array of publications based on the collections. Monographs covered the systematics, biogeography, life history, and economic aspects of birds and mammals from the Yukon, Hudson Bay, Newfoundland, Argentina, Chile, Mexico, Paraguay, Puerto Rico, Uruguay, and many states and former territories of the U.S. including Alaska (with the Aleutians), Arizona, California, Colorado, Georgia, Hawaii, Idaho, Maryland, Texas, Washington, and Wyoming. Some Biological Survey personnel collected amphibians and reptiles during these faunal studies, and significant collections often times were deposited in the USNM shortly after their work (e.g., more than 900 herpetological specimens were collected during the

Death Valley Expedition [Stejneger 1893] and about 1820 resulted from the work of Nelson and Goldman in Mexico [Goldman 1951]). A cursory search of catalog records of amphibians and reptiles in the USNM located more than 450 collections and 60,000 specimens that resulted from the work of the Biological Survey and DOI projects since the days of C. Hart Merriam, and the work of documenting the herpetological diversity of North America continues.

Henry S. Fitch (1909-2009): A pioneer.—Henry S. Fitch, as a recent graduate from the University of California at Berkeley, was perhaps the first Interior biologist to carry out detailed ecological investigations. Starting work for the Bureau of Biological Survey in 1938 as a rodent ecologist, his studies of the ecology of Western Rattlesnakes (*Crotalus viridis*) on the San Joaquin Experimental Range in California are classics (Fitch and Twining 1946; Fitch and Glading 1947), and he did them without the help of radio transmitters! Although herpetologists would like to claim Henry as one of their own, he is probably better classified as an animal ecologist; almost one-third of his more than 150 publications dealt with subjects other than reptiles or amphibians (Fitch 1984; Fitch et al. 2000).

Disagreements between what managers thought they wanted from his research and what Henry thought was important to study complicated his early career. His Forest Service hosts at the Experimental Range wanted him to test baits and poisons for more effective rodent control, whereas Henry was convinced that basic studies of the life histories of pest species would be a more fruitful research approach in the long run. When he was ordered to stop working on rattlesnakes, he quit bringing them into the station and, instead, measured them in the field. As the story goes, the Forest Service superintendent and local ranchers, antagonistic to Henry's rattlesnake studies, conspired with the local draft board to induct Henry into the Army in 1940 (Fig. 3).

When Henry was discharged in 1945, he returned to the Experimental Range to finish his studies there. In 1947, "Washington" sent him to Louisiana, where he initiated studies on Longleaf Pine (*Pinus palustris*) seed predators, deer browsing, and life histories of the Cottonmouth (*Agkistrodon piscivorus*) and Nine-banded Armadillo (*Dasypus novemcinctus*). Henry did his usual outstanding job, culminating in a definitive Armadillo life-history study (Fitch et al. 1952). In 1948, he left government service for a position at the University of Kansas where he worked until he retired. Henry has always been a prolific producer of scientific papers; in the four years after he left the Army, he authored or co-authored 21 papers. Most of these were based on his studies while employed by the government (Fitch 1984).



FIGURE 3. Henry S. Fitch in the Army Pharmacy School, El Paso, Texas, USA, August 1941. For more information, see “Historical perspective: Henry S. Fitch. Henry S. Fitch as told to Alice Fitch Echelle” in *Copeia* 2000:891–900. (Photograph courtesy of Alice Echelle).



FIGURE 4. Henry S. Fitch and family members visiting the San Joaquin Experimental Station, California, USA, 15 June 1981. (Photograph courtesy of Alice Echelle).

His service and research at the San Joaquin Experimental Station made a lasting impression on herpetologists and he returned there for later visits (Fig. 4). Summaries of Henry’s highly productive career and tributes to his mentorship can be found in two recent editions of *Reptiles & Amphibians* magazine (2010, Volume 17, Nos. 1 and 2), as well as in Duellman (2009).

The National Museum Project of the U.S. Fish and Wildlife Service.—In 1941, the Bureau of Biological Survey, along with the Bureau of Fisheries, became the U.S. Fish and Wildlife Service (FWS). The FWS Bird and Mammal Laboratories retained the statutory responsibility for curation of the Survey collections, which continued to increase through the efforts of Service biologists. Prompted by the 1969 passage of the Endangered Species Conservation Act, a Section of Herpetology was formed in the Bird and Mammal Laboratories comparable to existing sections devoted to birds and mammals. At this point, the FWS curatorial responsibilities at the USNM were broadened to include the collections of reptiles and amphibians from North America, broadly defined as the area from Alaska and Canada to the Panama-Colombia border. In 1973, the center was renamed the National Fish and Wildlife Laboratory (NFWL).

After receiving his Ph.D. at the University of California at Berkeley in 1972, R. Bruce Bury (Fig. 5) was hired as a Research Zoologist and Chief of the new Herpetology Section. To our knowledge, he was the first scientist in the Department of Interior hired specifically as a herpetologist. Besides being the curator of the North American collection, he also assisted with the listing of endangered species, identified parts and

products of crocodylians and sea turtles for the FWS Division of Law Enforcement, and developed an active program of field research. After five years, Bruce found that his first and foremost interests were as a field biologist, and he moved from the USNM to a new field station in Fort Collins, Colorado, to pursue research in the great outdoors. In the 1970s and 1980s, he conducted field work throughout the Southwest and Pacific Northwest, including tortoise studies in Mexico and surveys on National Wildlife Refuges across the country (Florida, Texas, Nebraska, Colorado, Washington). When he started, only one species of Desert Tortoise (*Gopherus agassizii*) was recognized in the United States but recently it was split into two species (Murphy et al. 2011): Agassiz’s Desert Tortoise found north and west of the Colorado River retained the old name, and Morafka’s Desert Tortoise (*G. morafkai*)

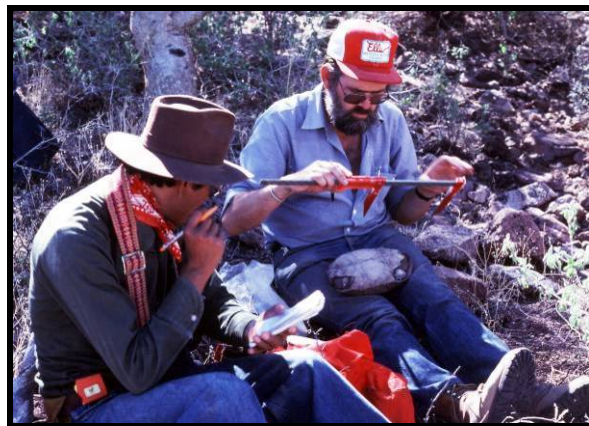


FIGURE 5. Sandalio Reyes (left), Jefatura Forestal y de la Fauna, México, and R.B. Bury (right), USGS, during a desert tortoise survey on Tiburon Island, México 1978/79. (Photograph by P. Steven Corn).

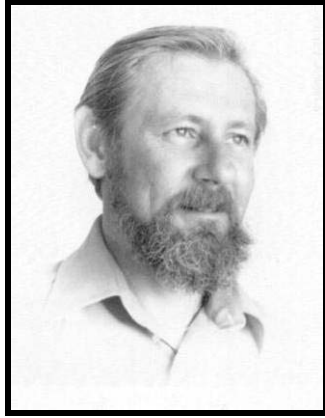


FIGURE 6. Duke Campbell. The photograph appeared in the Foreword (p. 2) of the H.W. Campbell memorial issue of the Bulletin of the Florida State Museum (Bulletin of the Florida State Museum, Biological Sciences 28:1–4, i–vii). (Photographer unknown).



FIGURE 7. Left to right: Cecil Schwalbe, Norm Scott, and Charlie Painter (New Mexico Department of Game and Fish) at San Bernardino National Wildlife Refuge in Arizona, removing American Bullfrogs (*Lithobates catesbeianus*). (Photographer unknown).

restricted to the east side of the river.

While in Washington, D.C., Bruce hired Stephen D. Busack as his assistant; Steve later received his Ph.D. at the University of California at Berkeley. Bury and his team pursued studies in three major arenas, all in the western United States: The effects of off-road vehicles on desert herpetofaunas (Busack and Bury 1974; Bury et al. 1977), Agassiz's Desert Tortoise (*Gopherus agassizii*) biology (Medica et al. 1975), and the ecology of herpetofauna in the Pacific Northwest (Bury 1973; Bury and Martin 1973).

From the 1920s to the 1980s, the FWS's primary constituents were farmers, duck hunters, and other economic and resource consumptive-based interests, and there was considerable resistance to hiring in the narrow "esoteric" field of herpetology, a bias reflected in scientific publications even in recent times (Bonnet et al. 2002). In 1973, a mammalogist, Clyde Jones, became director of NFWL. Clyde, a far-sighted leader, saw the need for herpetologists more clearly than most of his FWS colleagues. Part of Clyde's reasoning was that on all mammal collecting trips, a herpetologist was needed to clean out the rattlesnakes before the mammalogists could set their trap lines!

Clyde Jones knew how to make the system work effectively to accomplish agency objectives. Because the FWS hierarchy saw no need to employ high-priced scientists to work on lowly reptiles and amphibians, he hired herpetologists to do everything except study reptiles and amphibians. Howard W. "Duke" Campbell (Fig. 6) was recruited from the FWS Office of Endangered Species to lead a new field station in Gainesville, Florida, to study the biology of Manatees

(*Trichechus manatus*); Norman J. Scott, Jr. (Fig. 7) was hired to study monkeys in Africa and desert rodent ecology at a new field station at the University of New Mexico; and Thomas H. Fritts (Fig. 8) was brought on board in 1978 to lead an extensive aerial survey of marine birds, mammals, and sea turtles in the Gulf of Mexico. Fritts was located at a newly created field station in a World War II ammunition bunker on property owned by Tulane University in Belle Chasse, Louisiana. In this period, Bury worked on projects related to energy development in the Rocky Mountain region. Collectively, these biologists produced publications on amphibians and reptiles, yet much of their "day job" work focused on applied or practical projects funded by land-management agencies (e.g., Bureau of Land Management).

In 1978, Jones lured Roy W. McDiarmid from the University of South Florida to replace Bury as the NFWL curator in the Division of Amphibians and Reptiles at the Smithsonian Institution's National Museum of Natural History. Roy's primary research interests were centered in the Neotropics. Since coming to the National Museum, he has authored or co-authored more than 70 papers on the systematics, biogeography, ecology, and behavior of tropical amphibians and reptiles, that include descriptions of a genus, 20 new species, and several tadpoles; aspects of herpetological natural history; and several site or regional herpetofaunal studies (e.g., Greene and McDiarmid 1981, 2005; McDiarmid and Foster 1981; Thomas et al. 1985; Cadle and McDiarmid 1990; McDiarmid and Altig 1990; Savage and McDiarmid 1992; Morales and McDiarmid 1996; Crocft et al. 2001; McDiarmid and Savage 2005;



FIGURE 8. Left to right: Jose Trevino, Director General de la Fauna Silvestre, Chihuahua, Mexico; R.B. Bury; David J. Morafka, California State University–Dominguez Hills; Thomas H. Fritts, USGS; Clarence 'Jack' McCoy, Carnegie Museum; and Pablo Dominguez, Fauna Silvestre, Mexico. They are on a stop at a village in State of Chihuahua, Mexico in 1982. (Photographed by Dean Biggins).

McDiarmid and Donnelly 2005; Cisneros-Heredia and McDiarmid 2007). Roy also has edited and/or contributed to a volume on measuring and monitoring biodiversity in amphibians (Heyer et al. 1994), a companion volume on mammals (Wilson et al. 1996), a major treatise on the biology of tadpoles (McDiarmid and Altig 1999), and a taxonomic review of snake species of the world (McDiarmid et al. 1999). He recently completed a volume on measuring and monitoring biodiversity of reptiles (McDiarmid et al. 2012) and has three other book projects underway.

Jeffrey E. Lovich (Fig. 9) started his federal career in 1979 working for Roy McDiarmid, George Zug, and Ron Heyer in the Division of Amphibians and Reptiles at the USNM. There, Roy and the other curators instructed Jeff in basic museum skills. Jeff's graduate

work focused on the ecology and systematics of freshwater turtles under the direction of Carl Ernst at George Mason University, where he obtained an M.S. degree, and later he worked under the direction of Whit Gibbons at the University of Georgia, Savannah River Ecology Laboratory (SREL) where he earned his Ph.D. studying sexual size dimorphism in turtles (Gibbons and Lovich 1990, Lovich and Gibbons 1992). Under the influence of his mentors, he started a career-long interest in turtles including Diamondback Terrapins (Lovich and Gibbons 1990; Gibbons et al. 2001) and turtles formerly in the genus *Clemmys* (e.g., Lovich et al. 1991, 1992, 1998). His research eventually led to publication of two editions of the book *Turtles of the United States and Canada*, co-authored with Carl Ernst (Ernst et al. 1994, Ernst and Lovich, 2009), descriptions of four new species of turtles, including *Cuora evelynae* from Asia (Ernst and Lovich 1990) and three *Graptemys* from the southeastern United States (Lovich and McCoy 1992; Ennen et al. 2010), and a variety of other papers on the biology, conservation, and systematics of freshwater turtles and other topics (Grant et al. 1992; Lovich 1994; Lovich et al. 1996; Gibbons et al. 1997; Hinton et al. 1997). He also co-edited the book, *Biological Diversity: Problems and Challenges* (Majumdar et al. 1994).

Robert P. Reynolds was added to the USNM staff in 1983. Prior to arriving at the National Museum, Bob completed his Ph.D. in 1978 with Norm Scott at the University of New Mexico where he studied a community of mammal-eating snakes in Chihuahua, Mexico (Reynolds 1982; Reynolds and Scott 1982).

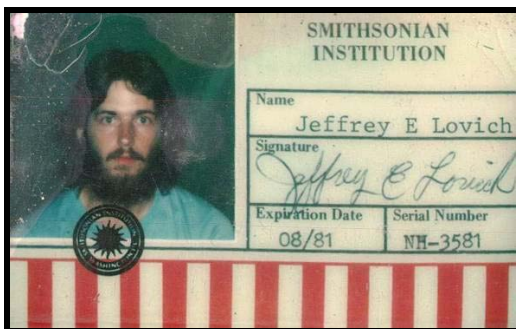


FIGURE 9. Photo identification badge for Jeff Lovich. (Photograph of the Smithsonian Institution, 1981).



FIGURE 10. Steve Gotte with a snapping turtle. (Photographer unknown).

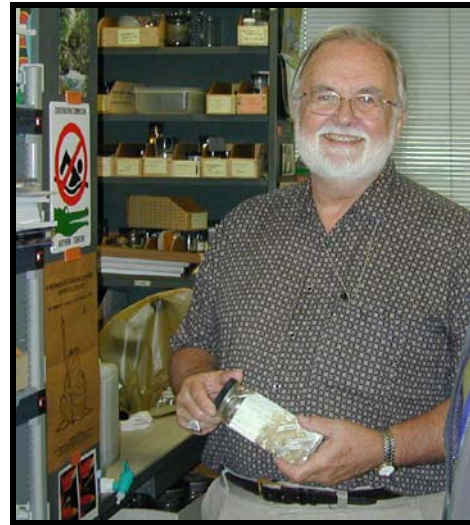


FIGURE 11. Roy McDiarmid in 2006 conducting curation duties. (Photograph courtesy National Museum of Natural History, Research Training Program Archives)

Bob also worked on the Gulf of Mexico studies with Tom Fritts at Tulane's Belle Chasse Research Center from 1979 to 1980, and then served as the resident herpetologist for the Charles Darwin Research Station, Galapagos, Ecuador, from 1980 to 1983 (Reynolds and Pickwell 1984). Steve Gotte (Fig. 10) and James Poindexter joined the museum herpetology project in 1988, following Steve's completion of his M.S. on turtle nesting with Carl Ernst at George Mason University and James finishing his B.S. with George Middendorf at Howard University. Reynolds, Gotte, and Poindexter all assist Roy (Fig. 11) in his curatorial duties and sometimes take the lead on research projects. Steve continued to work with turtles early in his DOI career (e.g., Congdon et al. 1992; Gotte et al. 1994, Lovich et al. 1996) and more recently has participated in herpetological surveys in Latin America, mostly in Peru and Honduras (Reynolds et al. 1997; McCranie et al. 2001; Wilson et al. 2003) and studies of snake taxonomy (Gotte and Wilson 2005; Zug et al. 2011). Bob has published the results of faunal and systematic studies done in Central and South America (Reynolds 1990; Reynolds and Foster 1991; Reynolds and Icochea 1997; Middendorf and Reynolds 2000; Reynolds et al. 2001; Hollowell and Reynolds 2005; Bolaños et al. 2008; MacCulloch et al. 2007), and contributed chapters on voucher specimens to the amphibian, mammal, and reptile monitoring volumes (Heyer et al. 1994; Wilson et al. 1996; McDiarmid et al. 2012).

Joining the Gainesville Field Station of NFWL in 1974, Duke Campbell ran the Manatee project, but he and his protégés, Steven P. Christman and Charles R. Smith, developed a vigorous auxiliary herpetological research program (Campbell et al. 1974, 1976; Campbell

and Christman 1982a, 1982b; Smith 1982). Duke was an outstanding field and laboratory herpetologist, and an international leader in the biology and conservation of sirenians and crocodylians (Campbell and Irvine 1978). He died of lung cancer in 1981. A measure of the respect that Duke commanded among his colleagues are the two volumes of collected studies dedicated to his memory (Dickinson 1982; Scott 1982a) and the dedication of a building in his honor at the University of Florida's Ordway-Swisher Biological Station in Melrose, Florida. The Campbell building currently houses the station's library and visiting researcher facilities.

Steve Christman continued to give the Florida program a herpetological twist. Prior to joining FWS, he served as an U.S. Army Ranger in Viet Nam and then completed his Ph.D. dissertation on variation in Florida snakes (Christman 1980). He was a man of all-consuming passions; his maxim was that "anything worth doing is worth overdoing." First it was herpetology and, under Duke's tutelage, he rapidly became an expert in Florida's ecosystems. At about the same time, he took up competitive bass fishing with all of the high tech boats and other expensive paraphernalia that go with it. He became highly proficient at his hobby. Ornithology and botany became his next obsessions, and he headed up a research project on Greentree Reservoir Management at White River National Wildlife Refuge (NWR) in Arkansas that combined both interests (Christman 1984). Unfortunately, after a difference of opinion with FWS direction, Steve resigned in 1985. He currently works as a private consultant in Florida and remains a leading

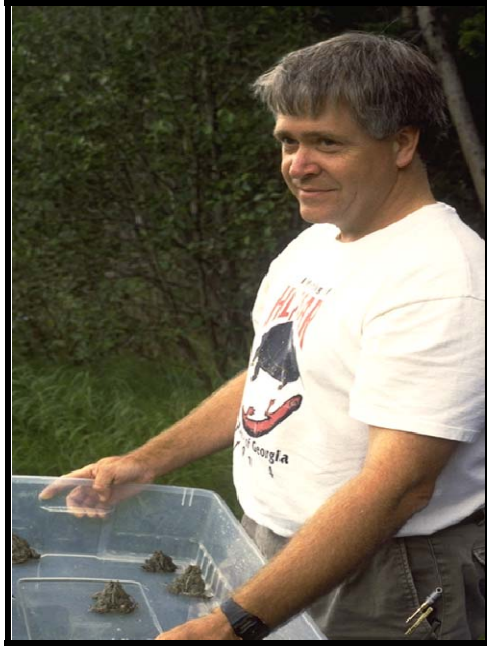


FIGURE 12. Steve Corn with toads. (Photograph by Erin Muths).

expert on the plants and animals of the imperiled Florida scrub community.

In 1976, C. Kenneth (Ken) Dodd, Jr. joined the Office of Endangered Species (U.S. Fish and Wildlife Service) as Staff Herpetologist. Over eight years, he was responsible for listing more than 40 species and initiating conservation efforts resulting in the establishment of Green Cay and Sandy Point National Wildlife Refuges for endangered reptiles. He was most proud of these efforts, although most of his friends and colleagues knew little of his role in the early history of endangered species protection. In 1984, Ken transferred to a research position in the Gainesville Florida Field Station. This was not unwelcomed as Ken cringes at the sight of a snow flake or road ice.

In Gainesville, Ken became one of Interior's most productive herpetologists, carrying out definitive studies of an impressive list of endangered reptiles and amphibians, including the Amargosa Toad (*Bufo nelsoni*; Altig and Dodd 1987), the Red Hills Salamander (*Phaeognathus hubrichti*; Dodd 1991), the Striped Newt (*Notophthalmus perstriatus*; Dodd 1993a; Dodd and LaClaire 1995), the Flattened Musk Turtle (*Sternotherus depressus*; Dodd 1988a, 1990; Dodd et al. 1988), and the Loggerhead Sea Turtle (*Caretta caretta*; Dodd 1988b; Dodd and Byles 2003). In between, he found time to study the ecology of several additional Florida species and communities (Dodd 1992, 1993b, 1994, 1995, 2001; Dodd and Cade 1998).

In 1979, supervision of the FWS herpetological projects moved west when Clyde Jones became the Director of the Denver Wildlife Research Center

(DWRC). Clyde left the Service when DWRC was disbanded in 1982, and the supervision of FWS herpetologists moved to Fort Collins under the newly formed National Ecology Research Center (NERC). Other elements of DWRC that studied predators and pests became part of Animal and Plant Health Inspection Service, Department of Agriculture.

When NERC was formed, Bruce Bury was already in Fort Collins. He had continued his off-road vehicle studies (Bury 1980; Bury and Luckenbach 1983; Luckenbach and Bury 1983) and his investigations of Agassiz's Desert Tortoises took on new life, culminating in a comprehensive edited volume on the tortoises of North America (Bury 1982). Also, long before the current hyperawareness of the problems facing amphibian populations, Bruce and two Interior colleagues, Gary Fellers and Ken Dodd, published a detailed review of the conservation needs of the amphibians of the United States (Bury et al. 1980).

In 1979, Bruce recruited a Ph.D. student at Colorado State University, P. Stephen Corn (Fig. 12), to help with his ongoing studies of the ecology and status of small mammals, frogs, and salamanders in the Rocky Mountains and the Pacific Northwest. This association continued after Steve's graduation in 1982 and has been extremely productive (Bury 1983; Bury and Corn 1988a, b, 1995; Corn 1994a, b, c, d; Corn and Bury 1986, 1989, 1991a, b; Corn and Vertucci 1992). They also collaborated on Agassiz's Desert Tortoise studies (Bury and Corn 1995). As a necessary part of their investigations they developed methods of studying these difficult subjects (Bury and Corn 1987, 1991; Bury and Raphael 1983; Corn and Bury 1990). On the side, Bruce continued to nurture his collegiate love affair with the Western Pond Turtle, *Actinemys marmorata* (see Bury and Wolfheim 1973; Bury 1986).

Upon completion of his Gulf of Mexico studies in 1982, Tom Fritts moved from Louisiana to the Albuquerque field station of DWRC at the University of New Mexico. There he worked on tortoises in Arizona, México, and the Galápagos Islands (Fritts 1983, 1984; Fritts and Jennings 1994; Germano and Fritts 1994) and ranid frogs in New Mexico. He also initiated his studies of the Brown Tree Snake (*Boiga irregularis*; Fritts et al. 1987, 1989). The snake, an introduced predator on Guam, was rapidly eating to extinction several native species of skinks and geckos and most of the island's avifauna. Tom continued to lead this project (Fritts 1988) after he moved to Washington, D.C. in 1988 to head up the FWS National Museum Project.

Tom recruited Gordon H. Rodda (Fig. 13) in 1987 for a position at the University of Arizona Cooperative Wildlife Research Unit in Tucson, Arizona. Gordon had been working on crocodylians and *Iguana* in Panamá and Venezuela. He became an integral part of the Brown Tree Snake research team, and in 1991 joined other

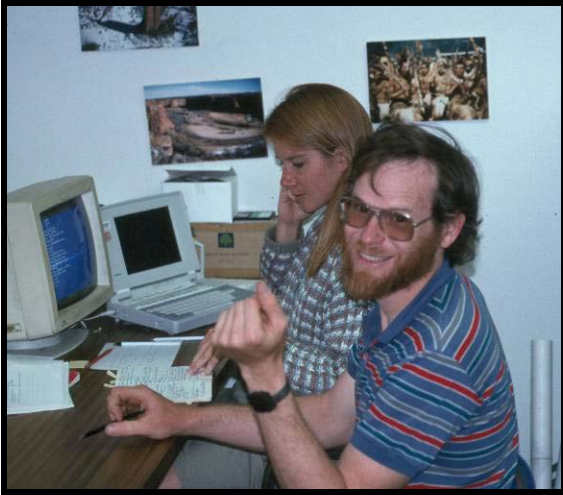


FIGURE 13. Gordon Rodda and Marie Timmerman ca. 1993 in the office in Fort Collins, Colorado. (Photographed by Jeff Lovich).

scientists at the NERC laboratory headquarters in Fort Collins, Colorado. The collaboration between Gordon and Tom Fritts resulted in a flurry of publications, not

only on the Brown Tree Snake (Rodda et al. 1992), but also on many aspects of the ecology of island faunas, including a cover article on Brown Tree Snakes in *BioScience* (Rodda et al. 1997), papers on the protection of island biotas from introduced predators (Rodda and Fritts 1992; Rodda et al. 1998), a review of the effects of biotic introductions on insular ecosystems (Fritts and Rodda 1998), and snake problem management (Rodda et al. 1999).

Norm Scott (Fig. 7, 14) started out at the New Mexico Field Station (with centers changing from NFWL to DWRC to NERC, etc.). He studied the status and ecology of monkeys in Colombia, Panamá, Costa Rica, and Cameroon (Scott et al. 1976; Zucker et al. 1996), but he also found time to make extensive herpetological collections in Colombia, Cameroon, and Baja California (Scott 1982b). He organized and edited a symposium "Herpetological Communities" held at the 1977 combined herpetological society meetings at the University of Kansas (Scott 1982a). As time passed, the FWS began to support research on reptiles and amphibians, and Norm was allowed to work on Harter's Water Snake (*Nerodia harteri*) in Texas (Scott et al. 1989), the Sacramento Mountains Salamander (*Aneides*



FIGURE 14. Norm Scott (left) with Jeff Lovich (center) and Whit Gibbons (right: University of Georgia, Savannah River Ecology Laboratory), San Simeon State Park, California, January 2001. (Photographer unknown).



FIGURE 15. Lucille Stickel. (File photo: Photographer unknown).



FIGURE 16. Russell Hall. (Photographer unknown).

hardii; Ramotnik and Scott 1988; Scott and Ramotnik 1992), and the five declining species of New Mexican leopard frogs (*Rana* spp.; Scott and Jennings 1985; Jennings and Scott 1993). He also contributed to a manual of standard survey methods for amphibians (Crump and Scott 1994; Scott 1994; Scott and Woodward 1994).

In 1980, Norm accompanied a group of government biologists to Paraguay. There they teamed up with Peace Corps volunteers, students of the Universidad Nacional de Asunción, and Paraguay's Servicio Forestal to initiate a national biological inventory based in the newly formed Museo Nacional de Historia Natural del Paraguay. This cooperation has continued to the present time. He helped survey the status of Paraguayan crocodilians in 1986 (Scott et al. 1990) and 1993 (King et al. 1994) and has continued to support the Museo, which is fully staffed and functional with important collections in all major taxonomic groups (Romero Martinez 1996).

The Patuxent Wildlife Research Center.—Two herpetological graduate students from the University of Michigan, Lucille F. (Fig. 15) and William H. Stickel, were hired in the early 1940s to help staff the new FWS Patuxent Research Refuge, Maryland. This wife and husband team collaborated in scientific research at Patuxent for almost 40 yr. Bill was hired first, but he was drafted into the military during World War II and never finished his Ph.D. While serving in the Pacific, Bill managed to collect and send to the USNM more than 300 specimens from New Guinea. Meanwhile,

Lucille continued to work on her doctorate, completing it in 1949.

The Stickels specialized in the new and burgeoning field of pesticide studies, helping make the Patuxent Wildlife Research Center (PWRC) a world leader, first in DDT, and later in all pesticide research (L.F. Stickel 1951, 1973; W.H. Stickel 1975). Like Fitch, the Stickels pursued studies on a wide range of vertebrate animals, most of the studies pesticide related, but they still found time to publish a classic ecological treatise based on a 35-year study of a population of the Black Rat Snake (*Elaphe obsoleta*, sometimes called *Pantherophis alleghaniensis*) at the Patuxent Wildlife Research Center (Stickel et al. 1980). Bill also published papers dealing with snake systematics and biology (W.H. Stickel 1943, 1951; Stickel and Cope 1947).

In 1973, Lucille broke the gender barrier to become the first woman director of an FWS laboratory. She managed to break away from a heavy administrative load long enough to personally monitor the growth, movements, and population dynamics of local Eastern Box Turtles (*Terrapene carolina*). In what has to be one of the longest running studies of any reptile or amphibian population, she started fieldwork as a junior biologist in 1944 and made the last observations as laboratory director in 1981 (L.F. Stickel 1950, 1978, 1989; Stickel and Bunck 1989).

About the same time that the NFWL herpetological team was being assembled, Lucille Stickel was also hiring herpetologists. Donald R. Clark, Jr., graduated with a Ph.D. from Henry Fitch's program at the University of Kansas where he completed a



FIGURE 17. Kristin Berry at a Desert Tortoise study site in the Soda Mountains, Mojave Desert, California in 2002. (Photographed by Dominic P. Oldershaw).

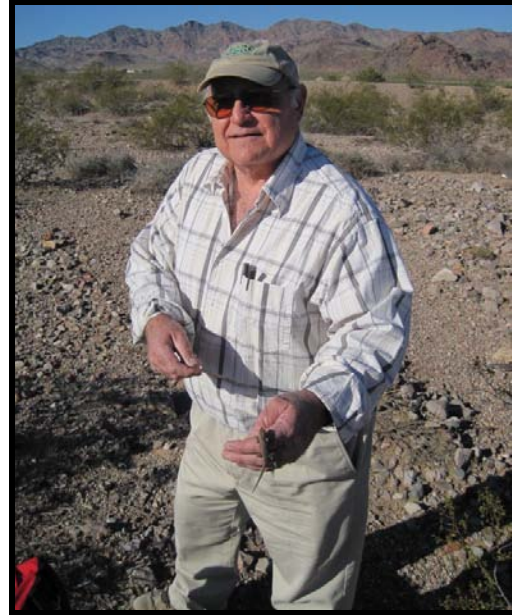


FIGURE 18. Phil Medica noosing a lizard at Hemenway Marina, Lake Mead National Recreation Area. (Photographer unknown).

dissertation on the Western Worm Snake (*Carphophis vermis*; Clark 1970). He came to Patuxent in 1972 and was initially assigned to study contaminants in bats. However, he also found time to continue his studies of snake and lizard biology begun at Texas A&M University (Clark 1974; Clark and Kroll 1974; Clark and Fleet 1976) and collaborated with PWRC colleagues on studies of contaminants in reptiles and amphibians (Hall and Clark 1982; Clark and Krinitzky 1985). In 1991, Don moved to the Patuxent field station at Texas A&M University in College Station, Texas, where he continued to work with reptiles and amphibians, as well as other vertebrates. Most of his research dealt with contaminants (Clark et al. 1998, 2000), but he also continued his studies of basic snake biology (Clark et al. 1997). He retired in 2000.

Russell J. Hall (Fig. 16), another of Henry Fitch's students, was added to the PWRC staff in 1977. Russ's research started off with some of the earliest contaminant work done on amphibians and reptiles (Hall 1980; Hall and Swineford 1979, 1980, 1981; Hall and Kolbe 1980; Hall et al. 1979; Heinz et al. 1980), but he was rapidly shunted off into administrative responsibilities.

OTHER HERPETOLOGISTS IN THE DEPARTMENT OF THE INTERIOR

It was not until the late 1970s that two other agencies of the Department of the Interior, the Bureau of Land Management (BLM) and the National Park Service,

began to recognize their responsibilities towards the scientific management of reptiles and amphibians. With this realization, they also began to hire herpetologists.

Bureau of Land Management.—In 1991, Jeff Lovich departed the University of Georgia, Savannah River Ecology Laboratory to accept a position with BLM in Riverside, California. Having focused his research career to that point on turtles, he joined a group of BLM biologists, including Hal Avery, Kristin Berry, and Bill Boarman, who were working on issues related to the ecology, conservation, and management of Agassiz's Desert Tortoise (*Gopherus agassizii*). The three worked for Kristin Berry (Fig. 17) who had completed her Ph.D. on Common Chuckwalla (*Sauromalus ater*) behavior under noted herpetologist Robert Stebbins at U.C. Berkeley in 1972 (Berry 1974). Later, she established a major Agassiz's Desert Tortoise research program while employed by BLM, conducting research on virtually every aspect of Agassiz's Desert Tortoise biology (e.g., Berry 1986).

Shortly after he was hired by BLM, Jeff Lovich initiated studies on the ecology of Agassiz's Desert Tortoises at a wind energy development near Palm Springs (Lovich et al. 1999; Lovich and Daniels 2000). After a year in Riverside, he became the Lead Wildlife Biologist for the Palm Springs office of BLM working on a more eclectic group of species, including the Coachella Valley Fringe-toed Lizard (*Uma inornata*; Barrows et al. 1995) and Flat-tailed Horned Lizard (*Phrynosoma mcallii*; Nicolai and Lovich 2000). During

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his time with BLM, he became interested in the ecology of invasive plant species (DeLoach et al. 2000, Lovich 2000, Lovich and de Gouvenain 1998) and the impacts of human disturbance on ecological processes in the California desert (Lovich and Bainbridge 1999).

With more than 30 years of experience in the Southwest, Philip A. Medica (Fig. 18) is a familiar name to most desert biologists. He finished his Master's degree at New Mexico State University in 1966, and started a Ph.D. program at Brigham Young University. Then Phil embarked on a career studying all aspects of animal ecology in the Mojave and Colorado deserts. Although best known for his work with the Department of Energy on the Nevada Test Site, Phil worked throughout the California deserts with Fred Turner of the University of California at Los Angeles producing a series of classic papers on Side-blotched Lizards (*Uta stansburiana*), Flat-tailed Horned Lizards, and Agassiz's Desert Tortoises. In 1992, he was hired as an ecologist by the Las Vegas District office of BLM to work on various ecological studies that included numerous Agassiz's Desert Tortoise conservation issues (Bury et al. 1994b, Germano et al. 1994).

Like Jeff and Phil, Todd C. Esque (Fig. 19) came to USGS from BLM via a FWS connection, starting with NERC in Ft. Collins, Colorado in 1987. While there, he became closely allied with herpetologists Bruce Bury and Steve Corn and completed a Master's degree at Colorado State University (CSU) studying the foraging ecology of Desert Tortoises. In 1991, he began work as an ecologist for BLM in their St. George, Utah Field Office. His continued association with Bruce resulted in a fruitful collaboration on the book "Biology of North American Tortoises", in which Todd contributed to three chapters (Bury et al. 1994a; Esque and Peters 1994; Germano et al. 1994). Later, he contributed to another book on Morafka's Desert Tortoise in the Sonoran

Desert (Esque et al. 2002). Besides his tortoise work, Todd has experience with other taxa including the Desert Slender Salamander (*Batrachoseps aridus*), Flat-tailed Horned Lizards, and amphibians in the Rocky Mountains. His colleague in St. George, Lesley DeFalco (Fig. 20), produced a significant compendium of information on the Agassiz's Desert Tortoise of the United States (Grover and DeFalco 1995) in addition to conducting her own research on tortoise foraging ecology. Both now work in the Henderson office of USGS, just outside of Las Vegas.

Bruce Jones got his first federal job with BLM while still a graduate student at New Mexico State University in 1976. While there, he conducted a reptile and amphibian survey in the Peloncillo Mountains of southwest New Mexico, and later did extensive surveys and studies for BLM in Arizona, working on reptiles (Jones 1990) and their communities (Jones et al. 1985). Bruce later transferred to the US Fish and Wildlife Service's Endangered Species Office replacing Ken Dodd. He left Washington, D.C., and worked for the Environmental Protection Agency (EPA), where he developed a comprehensive landscape ecology program. In 1990 Bruce went back to the University of Nevada, Las Vegas for a Ph.D., where he studied historical ecology and phylogenetics in horned lizards (*Phrynosoma*) under Brett Riddle. In 2006 Bruce left EPA to take a job as the Chief Scientist for Geography in USGS, and in 2008 he became the Chief Scientist for Biology. Currently Bruce is the President of the International Association of Landscape Ecologists and serves on editorial boards for Ecological Indicators and the International Journal of Environmental Monitoring and Assessment. His current interests are in multi-scaled assessments of riparian ecosystems (Jones et al. 2010), climate change/land-use interactions (Opdam et al 2009), and the nexus between climate change and phylogenetics

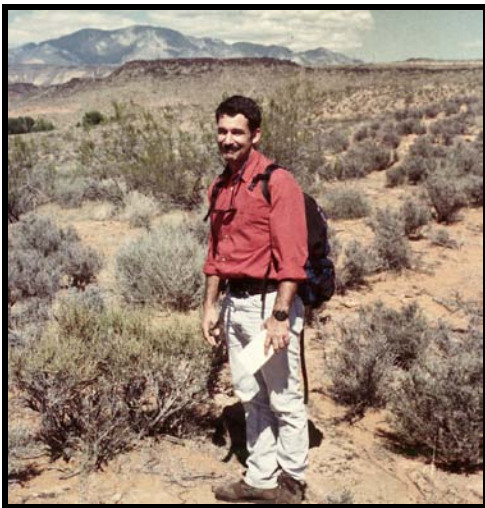


FIGURE 19. Todd Esque somewhere near St. George, Utah. (Photographer unknown).



FIGURE 20. Lesley DeFalco, collecting data somewhere in the Mojave Desert. (Photographer unknown).

using reptiles as case studies. In 2011 Bruce moved back to Las Vegas, Nevada to take an assignment as a Senior Landscape Ecologist in the USGS National Climate Change and Wildlife Science Center. There he will conduct research on climate/land-cover change response models and climate change vulnerability assessments. He plans to get involved in the emerging issue of climate change and lizard species decline.

National Park Service.—Gary M. Fellers started his career as a staff biologist in the San Francisco office of the National Park Service in 1979, but he soon transferred to a research position at Point Reyes National Seashore, Marin County, California. He has carried out research on a wide range of organisms, including plants (Clark and Fellers 1987), Island Night Lizards (*Xantusia riversiana*; Fellers and Drost 1991a, b), bats and other small mammals (Drost and Fellers 1991), and amphibians on NPS lands in the mountains of central and northern California (Fellers and Drost 1993).

Gary has provided protocols for surveying amphibians and other small animals on Park Service lands in California (Fellers and Drost 1989). He has also been very active in amphibian conservation, participating in an early publication on the subject (Bury et al. 1980). Gary was chairman of the California-Nevada Working Group of the Declining Amphibian Populations Task Force of the World Conservation Union (IUCN).

From 1984 to 1990, Cecil R. Schwalbe (Fig. 21) was the Arizona State Herpetologist. He then took a research

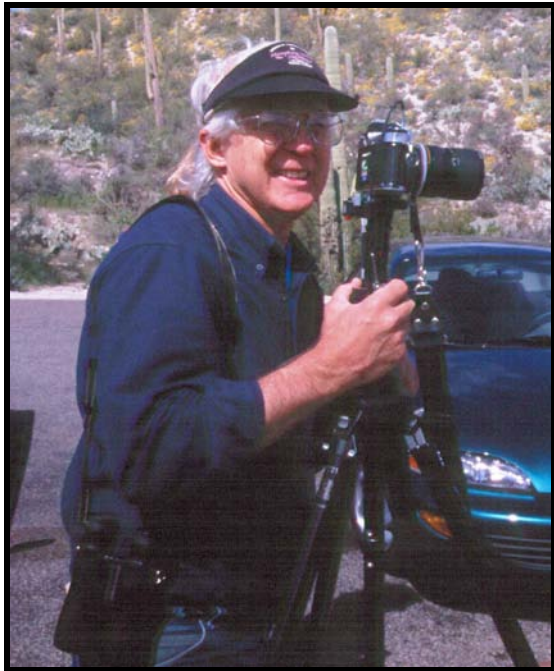


FIGURE 21. Cecil Schwalbe, somewhere in the Sonoran Desert. (Photographer unknown).

position at the University of Arizona, where, in 1993, he became part of the NPS' Cooperative Park Service Unit (CPSU), a position that he occupied for just six months before it was merged with the newly formed National Biological Survey. He and his students have studied Morafka's Desert Tortoise (Dickinson et al. 1995; Bailey et al. 1995) and other reptiles and amphibians in southern Arizona and México.

Donna Shaver was brought from NPS into the National Biological Survey to continue her work on Kemp's Ridley Sea Turtles (*Lepidochelys kempii*) at Padre Island, Texas. She developed an international reputation for her groundbreaking work to reestablish this critically endangered species in the United States (e.g., Shaver and Miller 1999; Fontaine and Shaver 2005). In 2003, however, Donna's position was shifted back to the National Park Service. Because of her outstanding dedication to sea turtle conservation, Donna was named the ABC News "Person of the Week" on 29 July 2005.

USGS-Biological Resources Division.—In 1993, the Secretary of the Department of the Interior, Bruce Babbitt, combined the research biologists working for the diverse agencies of the Department into a single new agency, the National Biological Survey (NBS). All of the research herpetologists in FWS, NPS, and BLM were swept up in the amalgamation. After a brief period under the name National Biological Service (still NBS), the organization was combined with the USGS in 1996 and changed its name again to the Biological Resources Division (BRD) of the USGS.

THE CURRENT SCENARIO

National Museum Project.—With the formation of NBS, the entire Department of the Interior's museum section was transferred to the Patuxent Wildlife Research Center and became the Biological Survey Unit. Roy McDiarmid and Robert Reynolds, ably assisted by Steve W. Gotte and James Poindexter, form the USGS Herpetology Project in the Division of Amphibians and Reptiles and continue with curatorial activities (e.g., Gotte and Reynolds 1998; Reynolds et al. 2007).

Roy's most recent expeditions were to the celebrated "tepui," the lofty sandstone mesas that loom high above lowland rainforests near the borders of Venezuela, Brazil, and Guyana (Givnish et al. 1986; McDiarmid et al. 1988; McDiarmid and Gorzula 1989; Donnelly et al. 1992; Myers et al. 1993; Kizirian and McDiarmid 1998; McDiarmid and Donnelly 2005; Barrio-Amorós et al. 2010). His current research focuses on the biology, systematics, biogeography, and conservation of the reptiles and amphibians primarily of the western hemisphere, with a continuing focus on describing new or unusual species (e.g., Cisneros-Heredia and



FIGURE 22. Susan Walls with a Milksnake (*Lampropeltis triangulum*) at Cedar Glade State Natural Area, Tennessee. (Photographed by Joe Mitchell).



FIGURE 23. Jeff Lovich with a Sonora Mud Turtle (*Kinosternon sonoriense*; photo left) and Red-eared Slider (*Trachemys scripta elegans*; photo right) at Montezuma Well, Montezuma Castle National Monument, Arizona, April 2008. (Photographed by Sheila Madrak).

McDiarmid 2006a, b; Padial et al. 2006a, b; Morales and McDiarmid 2009; Albuquerque and McDiarmid 2010), elucidating interesting life-history information (Altig and McDiarmid 2006, 2007; Furness et al. 2010), and providing perspective on other aspects of science (e.g., Frost et al. 2009). At the same time Roy is hard at work with Ron Altig on a book of species accounts for North American larval amphibians and with Jonathan Campbell on volumes 2 and 3 of *Snake Species of the World*.

Bob Reynolds became station leader of the Biological Survey Unit in 1998 and assumed administrative duties for the entire section, which includes mammalogists, ornithologists, and museum specialists. He continues to make collecting trips to tropical America, especially Guyana, to share in the curation of the North American herpetological collections, and to serve as herpetological editor for the *Proceedings of the Biological Society of Washington*. Bob is currently collaborating on an annotated and illustrated checklist of the amphibians and reptiles of Guyana with Jay Cole, Carol Townsend, Ross MacCulloch, and Amy Lathrop.

Southeastern U.S.-Caribbean: Florida Integrated Science Center.—Biologists in the herpetology program at the Florida Integrated Science Center (FISC) have conducted research on reptiles and amphibians in the Southeastern United States and Caribbean for more than 30 years. The project began with studies that assessed status and distribution of amphibians and reptiles in threatened Florida biotic communities. Herpetological research under Duke Campbell and Steve Christman centered on three main topics: the Cross Florida Barge Canal project (conducted in Ocala National Forest), the effects of forest management on non-game wildlife (conducted at St. Marks NWR), and the effects of

phosphate mining on herpetofauna (conducted in Osceola National Forest). This work resulted in a series of publications (Campbell and Christman 1982a, 1982b; Smith 1982), although much of the data remain unpublished. An assessment of habitat changes at St. Marks NWR over a 28-yr period was published using data from the earlier study combined with intensive surveys at the same locations using the same techniques sampled in the mid-2000s (Dodd et al. 2006).

Since then, research has expanded to focus on the life histories, diversity, and importance of amphibians and reptiles in a wide variety of Southeastern and Caribbean ecosystems. USGS scientists pioneered the development of herpetofaunal community sampling techniques, now adopted throughout the world. Since the mid-1980s, research has centered on communities, guilds, and individual species, focusing especially on the status of Southeastern amphibians, the ecology of amphibians and reptiles inhabiting the endangered Longleaf Pine community of the Coastal Plain, the management and restoration of island herpetofaunas, and the life history of declining, endangered, and threatened species.

Ken Dodd continued to work with local amphibian faunas (Dodd and Barichivich 2007). Research projects have included a major effort to inventory the diverse amphibian fauna of Great Smoky Mountains National Park (Dodd 2003, 2004; Dodd and Dorazio 2004), a project with the Florida Department of Transportation studying ways to alleviate snake and other small animal mortality on Payne's Prairie State Preserve, through which runs a stretch of highway (U.S. 441) near Gainesville that is well known to snake collectors the world over (Dodd et al. 2004), an inventory of the Exuma Cays Land and Sea Park in the Bahamas (Dodd and Franz 1996), and a long-term project on the population biology of the Florida Box Turtle (*Terrapene*

carolina bauri) on Egmont Key in Tampa Bay (Langtimm et al. 1996; Dodd 1997a, 1997b, 2005; Dodd and Griffey 2005). The Egmont Key project also led to a book on North American box turtles (Dodd 2001). In addition, Ken edited three books on Russian amphibians and, like Roy McDiarmid, has served as President of the Herpetologists' League, one of the three main international herpetological societies based in North America. Ken served as Principal Investigator for the Amphibian Research and Monitoring Initiative (ARMI) in the Southeastern US (see below), and continues to write on conservation biology issues (Dodd 1997c; Dodd and Smith 2003; Schlaepfer et al. 2005; Dodd et al. 2012). He retired in 2007.

Two of Ken's Ph.D. students from the University of Florida (Lora Smith, Steve Johnson) worked as term appointments with Ken on the Southeastern ARMI project. Lora's research was focused on the Okefenokee National Wildlife Refuge (Smith et al. 2006), whereas Steve worked primarily at St. Marks National Wildlife Refuge (Johnson and Barichivich 2004). In 2004, Margaret Gunzburger was hired to continue ARMI research in the Southeast. Margaret received her Ph.D. from Florida State University, where she worked on larval amphibian ecology. Margaret's research focused on trapping techniques and the effects of salinity on amphibian communities (Gunzburger 2007; Gunzburger et al. 2010). Margaret left USGS in 2006, and her position was filled by Susan Walls (Fig. 22), the USGS ARMI coordinator in the South-central US. Susan received her Ph.D. from the University of Louisiana-Lafayette, and later held a post-doc position at Oregon State University. Susan continues in this position where her research focuses on amphibian trends and the effects of climate change on amphibians (Walls 2009).

Kristen Hart was hired at the Southeast Ecological Science Center (SESC), formerly Florida Integrated Science Center (FISC) by Russ Hall in 1999. She has been studying the ecology of Mangrove terrapins (Hart et al. 2007; Hart & McIvor 2008) in the Florida Everglades, as well as the ecology of sympatric juvenile Green Sea Turtles (*Chelonia mydas*; Hart 2008; Hart & Fujisaki 2010). She also leads a sea turtle tagging and tracking project in the Dry Tortugas National Park (Hart et al. 2010; Hart 2010). In her spare time, she co-authored a major review of the use of molecular techniques in turtle research (FitzSimmons and Hart 2007) and another major review on satellite telemetry of marine megavertebrates (Hart and Hyrenbach 2009). She also worked with her fishing colleagues to tackle a unique sea turtle problem in the Blue Crab fishery in North Carolina (Avissar et al. 2009), where she was located during her Ph.D. research at Duke University Marine Lab. Recently, Kristen has been playing a key role in research on exotic Burmese Pythons (*Python*

molorus) in the Everglades (Fujisaki et al. 2009; Mazzotti et al. 2010).

The Southeastern Herpetology Project has been extremely fortunate to have outstanding young herpetologists serve on seasonal field crews or much longer term wildlife biologists who contributed not only muscle, but also creative ideas to ongoing projects. Many of them went on to careers in federal and state agencies or academic research and conservation, including C.R. Smith, Howard Kochman, James Stuart, Kevin Enge, Bert Charest, Russell Burke, Kelly Irwin, Jayme Waldron, Kevin Smith, Jeff Corser, Julia Earl, Denise Gregoire, Jennifer Staiger, Mary Brown, and Jamie Barichivich. Their names appear extensively throughout the publications list of the (now) Southeast Ecological Science Center (see publication list at: http://fl.biology.usgs.gov/Center_Publications/Publications/publications_06_to_08.html).

Few government administrators are able to maintain a credible research record, but Russ Hall, former FISC director, was an exception. Although he was a full-time administrator, Russ produced an average of more than one publication per year during the latter part of his career. Besides continuing the Patuxent box turtle studies initiated by Lucille Stickel (Hall et al. 1999) and other faunal studies (Hall 1994), he was interested in discovering the possible effects of contaminants on the reproduction of the Florida Red-bellied Turtles (*Pseudemys nelsoni*) that put their eggs in American Alligator (*Alligator mississippiensis*) nests. He retired in January 2006.

Arizona: USGS Southwest Biological Science Center.—Under the National Park Service, members of the Cooperative Park Study Unit of the NPS at the University of Arizona were part of the host university's faculty with teaching and research responsibilities. Now a member of the USGS, Cecil Schwalbe continues his relationship with the university from his office on campus. Well-known for his expertise with Sonoran Desert reptiles and amphibians, he and his many students have a wide variety of ongoing projects covering the ecology, status, and trends of populations of diverse species including ranid frogs (Schwalbe and Rosen 1988; Rosen et al. 1995), Barking Frogs (*Craugaster augusti*; Goldberg and Schwalbe 2004), Morafka's Desert Tortoise (Swann et al. 2002; Edwards et al. 2004; Dickinson et al. 2005), and rattlesnakes (Lowe et al. 1986; Holycross et al. 2002). In addition he made important contributions to studies of the effects of fire and alien grasses on Sonoran Desert vegetation and wildlife (Esque et al. 2003, 2004).

Between research assignments, Jeff Lovich (Fig. 23) spent approximately 12 years serving in research management positions within USGS, including stints as Director of the Western Ecological Research Center

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(WERC) in Sacramento, Chief of the USGS Grand Canyon Monitoring and Research Center in Flagstaff, and Deputy Director of the Southwest Biological Science Center (SBSC). In 2008, he received a Fulbright Senior Specialist Award to teach graduate ecology at Cadi Ayyad University in Marrakech, Morocco, and while there conducted research on the geographic variation in sexual size dimorphism of the Stripe-necked Terrapin (*Mauremys leprosa*; Lovich et al. 2010a). During his tenure as a USGS manager, he continued to conduct research in the southwest including studies on Agassiz's Desert Tortoises (Lovich and Daniels 2000), Western Pond Turtles (Lovich and Meyer 2002), Gila Monsters (*Heloderma suspectum*; Lovich and Beaman 2007), and the Glen Canyon Dam Adaptive Management Program in Grand Canyon (Gloss et al. 2005; Lovich and Melis 2007).

Jeff returned to research full time in 2009 to once again pursue herpetological interests related to turtle ecology and taxonomy. His current research, funded by the California Energy Commission, provides a rare opportunity to study the long-term demography and reproductive ecology of Agassiz's Desert Tortoises at a wind energy generation facility near Palm Springs, California (Lovich et al. 2011a, Lovich et al. 2011b). Jeff hired Josh Ennen (Ph.D., University of Southern Mississippi, 2009), another herpetologist, to coordinate the tortoise project. They recently co-authored a paper describing a new species of turtle from Mississippi, *Graptemys pearlensis* (Ennen et al. 2010), the 57th native turtle species recognized in the U.S. (Ernst and Lovich 2009) at that time. Together with Charles Drost, they are also studying the ecology of the Sonora Mud Turtle (*Kinosternon sonoriense*) in central Arizona (Drost et al. 2011; Lovich et al. 2010b). Josh left USGS in 2011 to teach at Maryville College in Tennessee, but he and Jeff are continuing their collaboration on the effects of utility-scale wind and solar energy development on wildlife (Lovich and Ennen 2011).

Charles Drost began his career in 1981 as a field technician for Gary Fellers and the National Park Service, studying the Island Night Lizard (*Xantusia riversiana*) on Santa Barbara Island, California (Fellers and Drost 1991a, b). He also carried out field inventories for vertebrate and invertebrate species on the Channel Islands, as well as studies of field survey methods for amphibians (Fellers and Drost 1994). He continued work for the Park Service in Davis, California, highlighted by studies of declining amphibian species in northern California (Cascades Frog, *Rana cascadae*; Fellers and Drost 1993) and the Sierra Nevada (Drost and Fellers 1996). The latter work replicated a survey transect across the Sierras originally carried out by Joseph Grinnell and Tracy Storer and associates, and documented major declines in virtually all of the amphibian species in the area. Charles moved to

Flagstaff, Arizona in 1994 to work on amphibian and reptile inventories (Drost 2005) and researches declines in the Northern Leopard Frog (*Lithobates pipiens*) in northern Arizona and southern Utah (Oláh-Hemmings et al. 2010). As a naturalist, Charles has also worked on small mammals, birds, cave invertebrates, and island plants.

Erika M. Nowak began working for the DOI in 1992, as a seasonal biological technician for Malheur National Wildlife Refuge, where she conducted herpetological inventories. In November 1992 she joined the Colorado Plateau Research Station (Flagstaff, Arizona), then a Cooperative Unit of the National Park Service, and has remained through the Unit's association with the National Biological Service and later the USGS Southwest Biological Science Center. She completed her Ph.D. in the Student Career Experience Program with the USGS in 2009. Her projects include focal-animal telemetric studies of venomous reptile ecology and management (Nowak et al. 2002; Kwiatkowski et al. 2008; Nowak et al. 2008), inventory and monitoring of reptiles and amphibians on federal and other lands (Persons et al. 2008), and research on the Narrow-headed Gartersnake (*Thamnophis rufipunctatus*) and Mexican Gartersnake (*T. eques megalops*) in Arizona.

Desert Tortoise Research Project: Western Ecological Research Center.—Shortly after the formation of the NBS, an informal alliance of herpetologists was assembled within the agency called the Desert Tortoise Research Project (DTRP). The purpose of this group was to bring the collective research expertise of the NBS to bear on the Desert Tortoise situation. With the Mojave "population" of the tortoise (now *G. agassizii*) federally listed as threatened under the Endangered Species Act in 1990, and publication of the Recovery Plan for the species in 1994, a huge demand was created among government agencies for information that would speed recovery and eventual delisting of the species. Kristin Berry continued her focus on Agassiz's Desert Tortoise having produced a large number of publications on a wide variety of topics including health and disease (e.g., Berry and Christopher 2001, Christopher et al. 2003), relocation (McCoy and Berry 2008), assessments of the taxonomic status of tortoises throughout their range (Berry et al. 2002, Murphy et al. 2007, 2011), and many other topics.

As originally constituted, the DTRP consisted of John Oldemeyer as coordinator, Hal Avery, Kristin Berry, Bill Boarman (Fig. 24), Lesley DeFalco, Todd Esque, Jeff Lovich, and Phil Medica. Of these, only Jeff and Phil are typically called herpetologists. While the rest have conducted significant research on the Desert Tortoise, several have research foci well outside the realm of herpetology (e.g., Kristan and Boarman 2003). Changes



FIGURE 24. Bill Boarman in Zion National Park. (Photographer unknown).

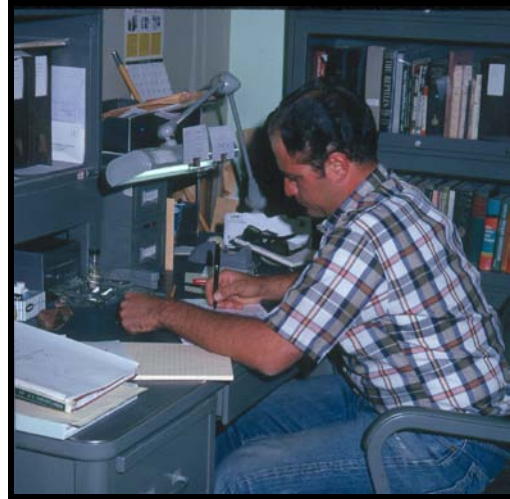


FIGURE 25. Phil Medica at the Nevada Test Site, Mercury, Nevada, June 1966. (Photographer unknown).

included the retirement of Oldemeyer and the departure of Boarman and Avery to other endeavors.

Phil Medica (Fig. 25) has a long history of studies on Agassiz's Desert Tortoise including investigations of the behavior and survival of translocated animals and evaluation of range-wide censusing techniques, all conducted from the Las Vegas Field Station of WERC. Todd Esque is especially interested in the effects of habitat alteration (Esque et al. 2010) in the Mojave Desert, especially the effects of fire on tortoises. Both Todd and Lesley completed Ph.D.s at the University of Nevada, Reno; Todd studied the effects of fire on desert ecological processes, and Lesley determined the effects of elevated CO₂ on native and exotic desert plants. Both continue to work out of WERC's Henderson Field Station.

Although not an original member of the DTRP, Kenneth E. Nussear was a member of the FWS Desert Tortoise Recovery Plan Assessment Committee. He joined WERC in 2004 after completing his studies at Colorado State University (B.S. Zoology, 1994) on lizard physiology, and the University of Nevada, Reno working on biophysical ecology and the distributional limitations of Agassiz's Desert Tortoises, earning a Ph.D. in 2004. His research focuses on the physiological ecology of desert ectotherms, especially Agassiz's Desert Tortoise. Recent studies involve thermal biology (Nussear et al. 2000), hibernation (Nussear et al. 2007), aspects of monitoring (Nussear and Tracy 2007), and conservation physiology (Tracy et al. 2006). He has also worked on GIS decision support modeling (Heaton et al. 2008) and habitat suitability and connectivity modeling for Agassiz's Desert Tortoise (Nussear et al. 2009).

Other California herpetologists: Western Ecological Research Center.—All USGS herpetologists in California are part of the Western Ecological Research Center, headquartered in Sacramento. Gary Fellers, located at Point Reyes north of San Francisco, is leading research into the causes of declines of amphibian populations in northern California, especially in the Sierra Nevada (Drost and Fellers 1996; Shaffer et al. 2000). He has continued research into small mammal biology (Fellers 1994; Pierson and Fellers 1998), survey techniques (Fellers and Drost 1994; Fellers et al. 1994; Fellers and Freel 1995; Fellers 1997), and the effects of contaminants on amphibian populations (Sparling and Fellers 2007, 2009). Other research is focused on the biology of the threatened California Red-Legged Frog (*Rana draytonii*) at Point Reyes.

Robert N. Fisher (Fig. 26) at the San Diego State Field Station has a multitude of enthusiastic scientists, technicians, and students engaged in research projects throughout southern California and in the Pacific Basin. Their longest running project is the regular monitoring of hundreds of drift fence arrays, including more than 3300 pitfalls and 1400 snake traps, scattered over most of southern California from the southern Sierra Nevada and the Mojave Desert to the Pacific Coast, and from the Whittier Hills to the Mexican border. His program has also been working for a decade with federally listed amphibians in southern California including population assessments, adaptive management, and conservation genetics.

At the same time, Robert is continuing scientifically productive partnerships with his colleagues, including Brad Shaffer (formerly at the University of California, Davis, now at the University of California, Los Angeles) and other USGS scientists such as Amy Vandergast, Jay

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Diffendorfer, and Erin Boydston. Some of their recent contributions have dealt with the genetics of the reptiles and amphibians of southern California and the south Pacific (Keogh et al. 2008; Leache et al. 2009), their movement ecology (Diffendorfer et al. 2005), spatial distribution modeling and genetic landscape analysis (Vandergast et al. 2008; Delaney et al. 2010) and natural and anthropogenic threats to their persistence (Riley et al. 2005; Perry et al. 2008; Rochester et al. 2010). Robert also is a co-author of the definitive work on the status and distribution of the fishes of southern California (Swift et al. 1993) and is author or co-author on seven sections in the upcoming book on inventorying and monitoring reptiles just released by University of California Press (McDiarmid et al. 2012).

Mark R. Jennings (Fig. 27) worked in Davis as part of the NERC/WERC lineage between 1992 and 2000. He first completed an in-depth study of the possible effects of a rise in sea level on endangered animals surrounding San Francisco Bay, among them the San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*). Mark operated throughout California with regular data-gathering trips to the Piedras Blancas Field Station. Mark is one of the people that agencies go to first for information concerning the distribution and status of reptiles and amphibians in California (Jennings and Hayes 1994a; Jennings 1995). His summary work "Amphibian and Reptile Species of Special Concern in California" (Jennings and Hayes 1994b) is a succinct review of the biology, distribution, and status of 48 taxa of the most vulnerable of California's species. The detailed distribution maps, based on museum specimens, are the remarkable results of many years of hard work on Mark's part, and all of the species' identifications have been verified by him personally. Mark is also an accomplished ichthyologist (Mills et al. 1996).



FIGURE 26. Robert N. Fisher with crab at Palmyra Atoll. (Photographer unknown).

In 1993, after 18 years with the FWS stationed at the University of New Mexico, Norm Scott moved to the Piedras Blancas Field Station of the Western Ecological Research Center in central coastal California. He continued work begun in New Mexico (Farley et al. 1994; Ford and Scott 1996), reviewed the evolution of the herpetofaunas of North American grasslands (Scott 1996), and continued his Paraguayan studies (Aquino et al. 1996). Norm, Galen Rathbun, and Mark Jennings finished up a cooperative project with the California State Department of Transportation investigating the effects of highway-bridge building on a suite of aquatic reptiles, amphibians, and fish (Rathbun et al. 2002; Bulger et al. 2003; Scott et al. 2008). A long-time Research Associate of the Smithsonian Institution, Norm retired in 2001. Since then, he has been working on Paraguayan reptiles and amphibians with South American scientists (Scott and Aquino, 2005; Scott et al. 2006; Motte et al. 2009). His latest effort, with Pier Cacciali, will culminate in an annotated, distributional checklist of the reptiles of Paraguay.

Galen Rathbun (Fig. 28), better known as a mammalogist for his research on West Indian Manatees (*Trichechus manatus*), Sea Otters (*Enhydra lutris*), and other species, retired in 1999 after making significant contributions to the knowledge of California Red-Legged Frogs and Western Pond Turtles on the central California coast. He is now a Research Associate of the California Academy of Sciences and makes regular trips to Africa, where he is studying sengis (elephant shrews; Macroscelididae) with colleagues from Africa and Europe (e.g., Rathbun 2009).

Brian Halstead, a newcomer to Interior, is a Wildlife Biologist with WERC. Brian's graduate research with Henry Mushinsky and Earl McCoy at the University of South Florida (USF) focused on the predator-prey

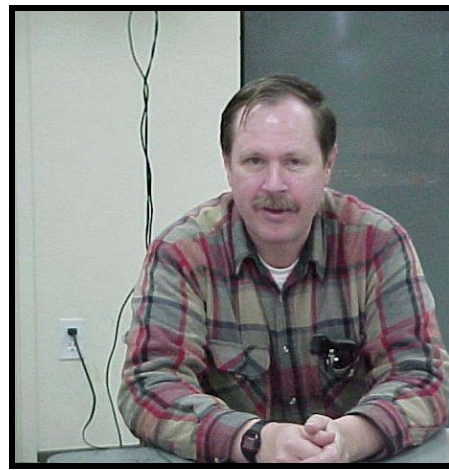


FIGURE 27. Mark Jennings, Piedras Blancas Light House, San Simeon, California, January 1999. (Photographed by Jeff Lovich).

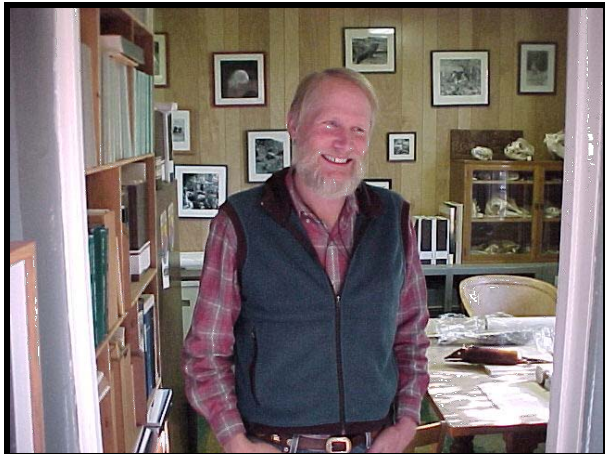


FIGURE 28. Galen Rathbun at Piedras Blancas Light House, San Simeon, California, October 1998. (Photographed by Jeff Lovich).



FIGURE 29. Bruce Bury diving into marsh at Cuatro Ciénegas, México to catch an aquatic box turtle. (Photographed by Dean Biggins).

interactions of the Coachwhip (*Coluber flagellum*) and North American Racer (*C. constrictor*) with the Florida Scrub Lizard (*Sceloporus woodi*; Halstead et al. 2008, 2009). Since graduating with his Ph.D. in Biology from USF in 2008, he has been studying California gartersnakes (Halstead et al. 2011). Brian's primary research interests are population ecology, conservation biology, herpetology, and Bayesian statistics.

Pacific Northwest: Forest and Rangeland Ecosystem Science Center.—Bruce Bury (Fig. 29), the first research herpetologist hired by the Department of the Interior, moved to the NBS Forest and Rangeland Ecosystem Science Center (FRESC) in Corvallis, Oregon, in 1993. He continues to publish the results of former and present projects, with a major research focus on the effects of logging, fire, and other perturbations on amphibians of the Northwest forests (Bury 1994, 1997, 2004, 2008; Olson et al. 1997; Adams et al. 1998, 2001; Palen et al. 2002; Pearl et al. 2009), especially plethodontid salamanders and stream amphibians (Bury and Adams 1999). Further, he continues writing about Agassiz's Desert Tortoise (Bury and Corn 1995; Bury and Luckenbach 2002) and has produced another edited volume on North American tortoises (Bury and Germano 1994). At the same time, Bruce has not forgotten Western Pond Turtles (Bury and Germano 1998; Germano and Bury 1998; Germano and Bury 2009; Bury et al. 2010).

He was fortunate to have hired many outstanding field biologists in temporary or term (usually 3–4 yr) appointments, many of whom became professional biologists. Key employees in recent years included Michael J. Adams (Ph.D., University of Washington) and Donald J. Major (Ph.D., Utah State University). He

also mentored Christopher A. Pearl (M.Sc, University of Oregon) who obtained a permanent position at FRESC. Bruce also was the research adviser for Tanya Wahbe (Ph.D., University of British Columbia) and served on committees including those of David Germano (Ph.D., University New Mexico) and Niels Leuthold (M.Sc, Oregon State University).

Michael J. Adams was hired at FRESC in 2001 to expand studies on factors affecting amphibian declines regionally. He has produced many quantitative studies on chytrid fungus (Adams et al. 2010), UV-B radiation (Adams et al. 2005), grazing effects (Adams et al. 2009) and introduced predators (Adams 2000; Adams et al. 2003; Adams and Pearl 2007). In 2004, Chris Pearl was hired as a Wildlife Biologist to support ARMI and amphibian research questions in the Pacific Northwest. He has published on a wide variety of topics such as regional assessments (Funk et al. 2008; Pearl et al. 2009), *Saprolegnia* fungus on amphibians (Petrisko et al. 2008), chytrid fungus (e.g., Pearl et al. 2007), and introduced predators (Pearl et al. 2003, 2004, 2005) on amphibians. He has also studied pollen stratigraphy (Walsh et al. 2010) and, more recently, invasive crayfish in the Pacific Northwest.

David Pilliod was hired at the FRESC in 2006 as a Research Ecologist. His research focuses on understanding how wildlife populations and communities respond to changes in their environment and improving methods for monitoring these responses. Much of his recent work has examined sagebrush-associated wildlife, including insects, reptiles, and small mammals. He examines questions related to the effects on wildlife from non-native species (Pilliod and Peterson 2001; Pilliod et al. 2010a), disease (Muths et al. 2008; Petrisko et al. 2008; Pilliod et al. 2010b), and land

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management (Pilliod et al. 2003; Pilliod and Wind 2008). He has studied the ecology of the Long-toed Salamander (*Ambystoma macrodactylum*), Boreal Toad (*Anaxyrus boreas*), Columbia Spotted Frog (*Rana luteiventris*), and Rocky Mountain Tailed Frog (*Ascaphus montanus*) since 1995 (Pilliod et al. 2002; Funk et al. 2005; Karraker et al. 2006; Murphy et al. 2010). David is currently Co-chair of the Northwest Chapter of Partners in Amphibian and Reptile Conservation, an international organization of public and private partnerships dedicated to the conservation of reptiles and amphibians and their habitats.

Rocky Mountains Science Centers.—In 1996, Steve Corn moved to the interagency Aldo Leopold Wilderness Research Institute but was supervised through the Midcontinent Ecological Science Center (MESC: formerly called the National Ecology Research Center [NERC] and later the Fort Collins Science Center [FORT]) in Fort Collins, Colorado. Steve is now supervised through the Northern Rocky Mountain Science Center (NOROC) in Bozeman, Montana. Although Steve continued to be involved with research on Agassiz's Desert Tortoise in the Mojave Desert (Anderson et al. 2001), most of the work in the Rocky Mountains has been directed toward amphibian decline topics, including monitoring (Corn et al. 2005a), population studies (Muths et al. 2006), methods development (Corn et al. 2000), and effects of stressors, including acid precipitation (Vertucci and Corn 1996), ultraviolet radiation (Corn and Muths 2002), fire (Hossack and Corn 2007), introduced fish (Knapp et al. 2001), and climate change (Corn 2005). Particular attention has been paid to the Boreal Toad (*Anaxyrus boreas*), which has undergone serious declines in the southern Rocky Mountains (Muths et al. 2003). Steve has been assisted since 1999 by Blake Hossack (Ph.D. University of Montana, 2011). Blake published papers on the effects of fire and disease on amphibians (Hossack et al. 2006, 2010). Steve has taken on several editorial tasks (*Herpetological Review*, *Northwestern Naturalist*, *Herpetological Conservation*) and is currently an associate editor for *Journal of Herpetology*.

Before leaving Fort Collins, Steve recruited Erin Muths (Fig. 30), fresh from her dissertation work on kangaroos at the University of Queensland, Brisbane, Australia, to assist with his research on amphibians in the Rocky Mountains. Erin continued Steve's work on amphibians in northern Colorado at what is now the Fort Collins Science Center (FORT) and expanded regional efforts into Wyoming where collaborations among Steve Corn, Blake Hossack, David Pilliod, Rick Scherer and Erin are ongoing (Muths et al. 2008). Her areas of emphasis include population dynamics (Muths et al. 2006, Muths et al. 2010), disease (Muths et al. 2003; Muths et al. 2008), and conservation (Muths and Dreitz



FIGURE 30. Erin Muths. (Photographer unknown).

2008). Erin has been associate editor for *Herpetological Conservation and Biology* and is currently co-Editor-in-Chief of the *Journal of Herpetology*. Rick Scherer (Ph.D. Colorado State University, 2011) has worked for Erin at FORT since 1998. Rick's primary research has been on amphibian population dynamics (Scherer et al. 2005; Scherer 2008; Scherer et al. 2008). He is an Associate Editor for *Herpetological Conservation and Biology*.

Brown Tree Snake Project: Fort Collins Science Center.—Tom Fritts moved from the National Museum to MESC in Fort Collins, Colorado (formerly National Ecology Research Center, now Fort Collins Science Center) in 1998. His main activity was leading the Brown Tree Snake project but that expanded into general studies of the impacts of invading species on insular faunas (Fritts and Rodda 1998; Perry et al. 1998; Rodda et al. 1998). His expertise was enlisted for a project to eliminate the introduced Wolf Snake (*Lycodon aulicus*) from an islet near Mauritius in the Indian Ocean. Tom also maintained his long-term studies in the Galápagos Islands. He is now retired.

Gordon Rodda was the other permanent USGS member of the Brown Tree Snake team. He continues to study the biology of the snake and the herpetofaunas of Guam and the Northern Marianas (Collins and Rodda 1994; McCoid et al. 1995). He led the editing team and made several contributions to a book on two problem

snakes of the western Pacific: the Brown Tree Snake on Guam and the Habu (*Trimeresurus flavoviridis*) on Okinawa (Rodda et al. 1999). Gordon also worked on the ecology of Tiger Salamanders (*Ambystoma tigrinum*) in Colorado. He retired in 2012.

Gordon hired Bob Reed in 2006 to work on the snake project and an expanding research program on invasive Burmese Pythons and other giant constrictors. Bob was schooled by a number of herpetologists. Harry Greene was his undergraduate advisor at U.C. Berkeley, after which he received his M.S. at Arizona State for his research on Grand Canyon rattlesnakes under the direction of Michael Douglas (Reed and Douglas 2002). Bob then received his Ph.D. at Auburn University in Craig Guyer's lab. While at Auburn, he won a Fulbright Fellowship to work with Rick Shine at the University of Sydney; work at Auburn and Sydney focused on macroecology of reptiles, with side projects on sea kraits and other taxa (Reed and Shine 2002; Shine et al. 2002). Bob then moved to the Savannah River Ecology Laboratory in South Carolina for a post-doc with Whit Gibbons (Reed and Gibbons 2003) before spending a few years as an Assistant Professor at Southern Utah University (SUU). While at SUU, he produced a risk assessment for invasive snake species (Reed 2005) and initiated an ongoing project on ecology of Boa Constrictors (*Boa constrictor*) in the Cayos Cochinos islands off Honduras, which resulted in the largest mark-recapture dataset available for this species (Reed et al. 2007). As a Research Wildlife Biologist with USGS in Fort Collins, he works with a wide range of staff and collaborators in Guam, Florida, and elsewhere, with research emphases on invasive reptile topics including control tool development, snake ecology, risk assessment, and prevention, as well as more general herpetological topics (Reed and Rodda 2009; Reed et al. 2010).

Contaminants Research: Columbia Environmental Research Center.—As discussed elsewhere in this paper, DOI herpetologists, especially Don Clark, Gary Fellers, Russ Hall, and Don Sparling, established a strong reputation for quality research on contaminants. Christine Britton (formerly Bridges) continued the tradition of studying the effects of environmental stressors on amphibian populations at the Columbia Environmental Research Center (CERC) in Columbia, Missouri (Bridges and Little 2005).

Amphibian Research and Monitoring Initiative.—The decline and extinction of many amphibian taxa throughout the world has sparked considerable interest in the biology and biogeography of this group (Houlahan et al. 2000; Stuart et al. 2004). Although the causes of declines are complex and may be interrelated (Corn 2000; Blaustein and Kiesecker 2002; Collins and Storfer

2003), research efforts are underway to determine the status and trends of amphibians even in areas where declines have not been recorded. Crucial to recognizing declines is the need for current information on the distribution of amphibians across a landscape, so that species and populations can be monitored for signs of imperilment (Heyer et al. 1994). Accordingly, much attention has been directed at how to monitor amphibians (Dodd et al. 2012). As such, monitoring approaches have evolved from individual perceptions of abundance and simple counts made at sampling locations, to complex mathematical and model-driven assessments of status. In this emerging field, USGS scientists have been leaders in developing sampling approaches, statistical analyses, GIS applications, and database management.

As part of the interest in monitoring amphibians, in 2000 the US Congress authorized the USGS to undertake a national assessment of the status of amphibians within the United States and to develop a research program designed to detect trends and identify factors that might be causing declines. This program, the Amphibian Research and Monitoring Initiative (ARMI), currently focuses on Department of Interior lands, which are largely under the jurisdiction of the National Park Service, the U.S. Fish and Wildlife Service, and the Bureau of Land Management. Details of this program are available elsewhere (Corn et al. 2005b, 2005c; Dodd 2005; Muths et al. 2005).

Both new and established USGS scientists have been enlisted by ARMI, and they now spend much of their time conducting research and coordinating research efforts on amphibian status and trends. These include more senior biologists Bury, Corn, Fellers, Fisher, and Schwalbe. At the same time, the ARMI program has allowed an influx of new research herpetologists in the last decade

After finishing her Ph.D. on amphibian ecotoxicology at the University of Wisconsin in 1996, Robin Jung started her career at the USGS Columbia Environmental Research Center as a postdoc (Karasov et al. 2005). In 1998, she moved to the PWRC to work on amphibian monitoring at Big Bend and Shenandoah National Parks as part of a PRIMENet (Park Research and Intensive Monitoring of Ecosystems Network) grant (Carpenter et al. 2001; Jung et al. 2000, 2002a, 2002b). In 2001, Robin was hired to coordinate Northeast ARMI where she focused studies on vernal pool amphibians and terrestrial and stream salamanders in partnership with National Park Service and National Wildlife Refuge biologists (Grant et al. 2005; Jung et al. 2005). In 2005, she left her position at Patuxent. Recently, Robin co-edited the book *Urban Herpetology* with Joseph Mitchell and Breck Bartholomew (Mitchell et al. 2008).

Larissa Bailey completed her Ph.D. at North Carolina State University and started at PWRC in late 2002 as a

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post-doc with James Nichols. Larissa replaced Robin Jung in September 2004 as the coordinator of the USGS Northeast Amphibian Research and Monitoring Initiative. Her research focuses on amphibian population dynamics and factors that influence amphibian distribution. With ARMI, she has been involved in developing quantitative methods that use presence-absence information to estimate the probability that an area is occupied by a species (MacKenzie et al. 2006). In 2009, Larissa accepted a faculty position at Colorado State University.

Evan Grant (PWRC) joined USGS in March of 2003. He started his Ph.D. at the University of Maryland, College Park in 2005. After graduation he joined the ARMI research team as the Northeast Coordinator in 2009. His research focuses on the movement ecology of stream amphibians (Grant et al. 2010), especially at large spatial scales (Grant et al. 2005, 2009).

Walt Sadinski earned his Ph.D. from Penn State University in 1991. After a number of positions in which he worked on various aspects of amphibian ecology for universities, The Nature Conservancy, and the US Fish and Wildlife Service, he joined the Upper Midwest Environmental Science Center (UMESC) of USGS as a Research Ecologist in 2002. Walt's principal responsibility is to implement ARMI in the 13 states of the Upper Midwest (Muths et al. 2005).

Susan Walls of the National Wetland Research Center (NWRC/SESC) received her Ph.D. in Environmental and Evolutionary Biology from the University of Southwestern Louisiana. Most of her research focuses on amphibian biology, especially larval amphibians. She was one of the first researchers to suggest that increases in UV radiation were responsible for amphibian declines (Blaustein et al. 1994, 1995), and she made important contributions regarding the effects of climate change on amphibian populations (Walls 2009; Blaustein et al. 2010). Susan transferred to the SESC in Gainesville in 2006 and now serves as the ARMI coordinator in the southeastern US.

Hardin Waddle (NWRC) received his Ph.D. from the University of Florida at Gainesville in 2006 while working at FISC. Hardin is the ARMI biologist at the National Wetlands Research Center, Lafayette, Louisiana. He is very interested in applying quantitative models of species occurrence to amphibians (Waddle et al. 2008, 2010).

David E. Green, an amphibian pathologist at the National Wildlife Health Center (NWHC), has been with the ARMI program since its beginning in 2000. In the 1990's, he became involved in amphibian declines and disease investigations as a result of participating in > 50 field trips with Richard Highton (University of Maryland) to survey and collect plethodontid salamanders throughout the eastern US. He is involved with continuous monitoring of the health status of

amphibians on ARMI monitoring sites, diagnostic investigations of spontaneous amphibian morbidity and mortality events nationwide, and various funded special projects such as characterization of water molds on amphibian eggs, development of molecular screening methods for the pathogenic chytrid fungus (*Batrachochytrium dendrobatidis*) in surface waters and sediments, and identification of amphibian diseases in national fish hatcheries. Projects have included directed and funded studies with USFWS, University of Puerto Rico, University of Virginia, and Department of Defense on the prevalence of deformed amphibians on national wildlife refuges, the role of infectious diseases in the declines and probable extinctions of three endemic eleutherodactylids in Puerto Rico, molecular characterization of novel amphibian diseases, and health screening of amphibians and snakes on military bases in southeastern states. From 1999–2006, David necropsied > 7,000 amphibians (egg masses, larvae, metamorphs and adults) from all but two states nationwide. Publications include Green et al. (2002), Burrowes et al. (2004), Converse and Green (2005a, 2005b), Green and Converse (2005a, 2005b), Green and Muths (2005), Green and Dodd (2007). The ARMI program continues to evolve and the reader is referred to <http://armi.usgs.gov/> for more up to date information.

OTHER INTERIOR SCIENTISTS

Other USGS biologists working with reptiles and amphibians include Kathryn Converse and Carol Meteyer (NWHC), Roger Hothem (WERC), Don Sparling (formerly of PWRC, later at Southern Illinois University), and Tim Gross (formerly of FISC). They have conducted research on contaminants issues. Sam Droege (PWRC) helped design and develop the North American Amphibian Monitoring Program (NAAMP) and, with colleagues at PWRC, undertook studies of methods for monitoring amphibians in Big Bend and Shenandoah National Parks. Douglas Johnson (formerly of the Northern Prairie Wildlife Research Center) maintained a national registry of amphibian deformities. Cindy Ramotnik (FORT) studied the effects of logging on the Sacramento Mountains Salamander (*Aneides hardii*; Ramotnik and Scott 1988; Scott and Ramotnik 1992; Ramotnik 2005). She currently is stationed at the Museum of Southwestern Biology at the University of New Mexico where she continues curatorial duties for important USGS Biological Survey Collections (<http://www.msb.unm.edu/USGS/>). Ray Carthy (Fish and Wildlife Cooperative Research Unit, University of Florida) and his students are studying sea turtle ecology in Florida and elsewhere, as well as developing standardized monitoring protocols for Gopher Tortoises (*Gopherus polyphemus*) on Department of Defense lands, and Glenn Wylie (WERC) has radiotracked and

studied the Giant Garter Snake (*Thamnophis gigas*) in California for many years and collaborates with Brian Halstead (above). Ken Rice (FISC in south Florida) is an American Alligator specialist who has also worked on Pig Frogs (*Lithobates grylio*) and Cuban Treefrogs (*Osteopilus septentrionalis*).

Other DOI bureaus also contain notable herpetologists. Melinda Knutson, formerly of the Upper Midwest Environmental Sciences Center and now with FWS, has done work on habitat associations of amphibians and participated in the Amphibian Research and Monitoring Initiative of USGS (Knutson et al. 2004). Stephen Busack received a Ph.D. studying biogeography of reptiles and amphibians in the region surrounding the Straits of Gibraltar (e.g., Fritz et al. 2006) under David Wake at U.C. Berkeley in 1985. From 1989 to 1996 he was the Chief, Section of Morphology, FWS, National Fish and Wildlife Forensic Laboratory (NFWFL) in Ashland, Oregon. He retired as Director of Research and Collections at the North Carolina State Museum of Natural Sciences in 2006 but continues to publish herpetological papers (Busack and Lawson 2008). Barry Baker of FWS carries on the tradition of “forensic herpetology” at the NFWFL (Baker 2008).

DISCUSSION

The information presented in this paper makes it clear that the DOI has a long and distinguished history of

supporting herpetological research with roots that extend back to the original U.S. Biological Survey. Visionaries like Clyde Jones and Lucille Stickel recognized the importance of having professional herpetologists in the ranks of government research organizations. Their initiatives were directly responsible for the present world-class herpetological research programs in contaminants and active research programs on the status, conservation, and biodiversity of amphibians and reptiles. However, a significant number of research herpetologists in Interior were hired in the 1970s, and they are now retired or in the latter part of their government careers.

The need has never been greater to maintain a cadre of research herpetologists to provide land managers and decision makers with information on how to better manage this increasingly imperiled group of organisms. A multitude of factors continue to cause worldwide declines of reptiles (Gibbons et al. 2000) and amphibians (Wake 1991; Houlahan et al. 2000; Stuart et al. 2004). Global amphibian decline is in the headlines regularly; about half of the 58 turtle species in the United States are in need of conservation action (Ernst and Lovich 2009), and most of the world's crocodylians, with the exception of the American Alligator, are critically imperiled (Baillie and Groombridge 1996). It will take a renewed commitment on the part of government managers to replace these scientists and maintain the quality and integrity of federal herpetological research. When the

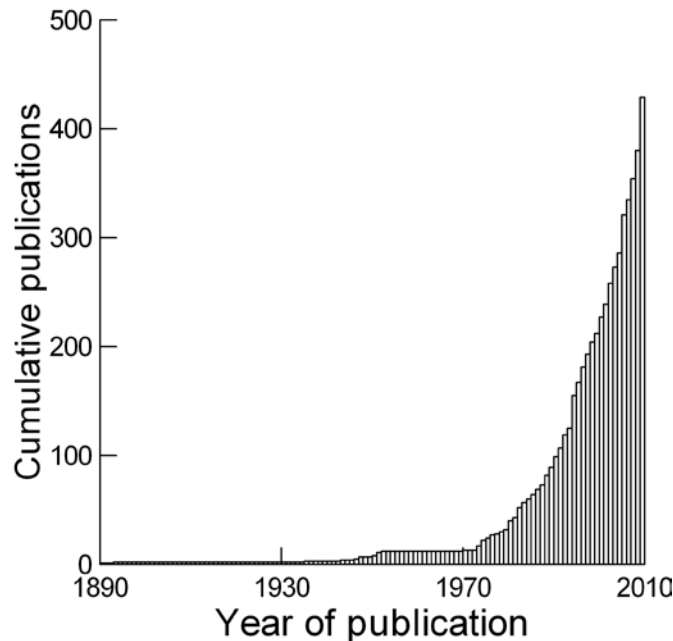


FIGURE 31. The cumulative number of publications cited in the bibliography of this paper from 1890–2010. The list of citations is not exhaustive but still reflects the increased contribution of Department of Interior herpetologists over time.

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TABLE 3. Department of the Interior scientists have held (or hold) significant service appointments in major herpetological societies. The following is a selected list of those appointments, past and present. Abbreviations are as follows: AH – Applied Herpetology, ASIH – American Society of Ichthyologists and Herpetologists, CCB – Chelonian Conservation and Biology, HC – Herpetological Conservation, HCB – Herpetological Conservation and Biology, HL – Herpetologists' League, ISSCA – International Society for the Study and Conservation of Amphibians, JH – Journal of Herpetology, SSAR – Society for the Study of Amphibians and Reptiles, WCH – World Congress of Herpetology.

Name	Position	Society/Journal
Barry Baker	Editorial Board	AH
Kristin Berry	Editorial Board	CCB
R. Bruce Bury	Henry S. Fitch Award recipient	ASIH
	Editor-in-Chief	HCB
	Editorial Board	AH
Steve Corn	Editor	SSAR, HC
Ken Dodd	Past President	HL, ISSCA
	Board of Directors	SSAR, ASIH
	Board of Councilors	HL
	Associate Editor	JH
Tom Fritts	Past President	SSAR
	Board of Directors	SSAR
Jeff Lovich	Board of Councilors	HL
	Co-Editor	CCB
	Editorial Board	ASIH
Roy McDiarmid	Past President	ASIH, HL, SSAR
	Board of Directors	SSAR
	Distinguished Herpetologist	HL
	International Herpetological Committee	WCH
	Editorial Board	AH
Erin Muths	Associate Editor	HCB
	Co-Editor-in-Chief	JH
Rick Scherer	Associate Editor	HCB
Norm Scott	Past President	SSAR
	Board of Directors	SSAR

hiring dates shown in Table 1 are plotted with five year intervals, two peaks are evident: one in the period from 1975-1980 and a slightly larger one from 2000-2005. The first spike may be related to early versions of the Endangered Species Act and the need to collect information on imperiled species of reptiles and amphibians. The latter hiring spike is congruent with widespread recognition of global amphibian decline and genesis of the Amphibian Research and Monitoring Initiative in DOI. The fact that there is a new crop of recently recruited, bright, young DOI herpetologists suggests that such a commitment is recognized and being implemented.

How have DOI herpetologists contributed the vital information needed to manage reptiles and amphibians on public lands across the United States? The most tangible product generated is in the form of rigorous, peer-reviewed scientific publications (Fig. 31). As environmental problems become ever more complex, the need for reliable, objective scientific information grows. An estimate of the number of publications produced by only the top five most productive Interior herpetologists is estimated to exceed 500! A total estimate of output would likely approach or exceed 1,000. Yet knowledge produced is not always knowledge applied (Pouyat et al.

2010). Application of knowledge by federal agencies has not always been effective, but techniques are available to improve integration of science, policy, and natural resource management (Pouyat et al. 2010).

DOI herpetologists have also provided valuable service to scientific societies, especially the American Society of Ichthyologists and Herpetologists, Herpetologists' League, and the Society for the Study of Amphibians and Reptiles. A short list of selected appointments is given in Table 3 but there are others.

Herpetological research in the Department of the Interior is not uniformly distributed throughout the United States. At the present time there are as many as 33 herpetologists still working in the USGS-BRD (Table 1). Most are scattered throughout the west (22) with only 11 in the central and eastern United States. There is an understandable lack of herpetologists in the Hawaiian Islands and Alaska, but there are also significant gaps in the Northeast, the Midwest, Texas, and Puerto Rico. The Southeast is also generally understaffed, especially given the diversity of amphibians and reptiles with attendant problems that occur there. These gaps will have to be filled if the needs of managers for credible scientific information are going to be met in the future.

Acknowledgments.—Many of the people mentioned in this article contributed bibliographies and memories; Clyde Jones, Russ Hall, and Henry Fitch (the latter now deceased), were especially helpful, mostly because they have been around the longest. Dick Jachowski, Arnold Kluge, Howard Kochman, and Galen Rathbun also made significant contributions. Alice Echelle, daughter of Henry S. Fitch, provided access to many family photographs. Hannah Lucas provided valuable editorial assistance, and Caleb Loughran assisted with the bibliography. We thank them all. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government. Photographs not in the public domain are used with permission.

LITERATURE CITED

This is not an exhaustive list of products generated by DOI herpetologists but it is representative of the number and diversity of topics addressed during the 122 years since Merriam (1890).

- Adams, M.J. 2000. Pond permanence and the effects of exotic vertebrates on anurans. *Ecological Applications* 10:559–568.
- Adams, M.J., and C.A. Pearl. 2007. Problems and opportunities managing invasive Bullfrogs—Is there any hope? Pp. 679–693 *In* Biological Invaders in Inland Waters: Profiles, Distribution and Threats. Gherardi, F. (Ed.). Springer, Dordrecht, The Netherlands.
- Adams, M.J., R.B. Bury, and S.A. Swarts. 1998. Amphibians of the Fort Lewis Military Reservation, Washington: sampling methods and community patterns. *Northwestern Naturalist* 79:12–18.
- Adams, M.J., C.A. Pearl, and R.B. Bury. 2003. Indirect facilitation of an anuran invasion by non-native fishes. *Ecology Letters* 6:343–351.
- Adams, M.J., D.E. Schindler, and R.B. Bury. 2001. Association of pond amphibians with attenuation of ultraviolet-b radiation in montane ponds. *Oecologia* 128:519–525.
- Adams, M.J., B.R. Hossack, R.A. Knapp, P.S. Corn, S.A. Diamond, P.C. Trenham, and D. Fagre. 2005. Distribution patterns of lentic-breeding amphibians in relation to ultraviolet radiation exposure in western North America. *Ecosystems* 8:488–500.
- Adams, M.J., C.A. Pearl, B. McCreary, S.K. Galvan, S. Wessell, W.H. Wentz, C.W. Anderson, and A.B. Kuehl. 2009. Short-term effect of cattle exclosures on Columbia Spotted Frog (*Rana luteiventris*) populations and habitat in northeastern Oregon. *Journal of Herpetology* 43:132–138.
- Adams, M.J., N.D. Chelgren, D. Reinitz, R.A. Cole, L.J. Rachowicz, S.K. Galvan, B. McCreary, C.A. Pearl, L. Bailey, J. Bettaso, E.L. Bull, and M. Leu. 2010. Using occupancy models to understand the distribution of an amphibian pathogen, *Batrachochytrium dendrobatidis*. *Ecological Applications* 20:289–302.
- Albuquerque, N.R. and R.W. McDiarmid. 2010. Redescription of *Leptophis cupreus* (Cope) (Serpentes, Colubridae), a rare South American colubrine snake. *Papéis Avulsos de Zoologia, Museo de Zoologia da Universidade de São Paulo* 50:375–384.
- Altig, R. and C.K. Dodd, Jr. 1987. The status of *Bufo nelsoni* in the Amargosa River drainage, Nevada. *Southwestern Naturalist* 32:276–278.
- Altig, R. and R.W. McDiarmid. 2006. Descriptions and biological notes on three unusual mantellid tadpoles (Amphibia: Anura: Mantellidae) from southeastern Madagascar. *Proceedings of the Biological Society of Washington* 119:418–425.
- Altig, R. and R.W. McDiarmid. 2007. Morphological diversity and evolution of egg and clutch structure in amphibians. *Herpetological Monographs* 21:1–32.
- Anderson, D.R., K.P. Burnham, B.C. Lubow, L. Thomas, P.S. Corn, P.A. Medica, and R.W. Marlow. 2001. Field trials of line transect methods applied to estimation of Desert Tortoise abundance. *Journal of Wildlife Management* 65:583–597.
- Aquino, A.L., N.J. Scott, and M. Motte. 1996. Lista de anfibios y reptiles del Museo Nacional de Historia Natural del Paraguay (Marzo 1980 - Septiembre 1995). Pp. 331–400 *In* Colecciones de Flora y Fauna del Museo Nacional de Historia Natural del Paraguay. Romero Martinez, O. (Ed.). Ministerio de Agricultura y Ganadería, Asunción, Paraguay.
- Avissar, N.A., K.M. Hart, L.B. Crowder, J. Gannon, and J.C. Marsh. 2009. At loggerheads: Gear damage in the Blue Crab fishery attributed to Loggerhead Sea Turtles. *North American Journal of Fisheries Management* 29:163–169.
- Baillie, J., and B. Groombridge. 1996. 1996 IUCN Red List of Threatened Animals. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.
- Bailey, S.J., C.R. Schwalbe, and C.H. Lowe. 1995. Hibernaculum use by a population of Desert Tortoises (*Gopherus agassizii*) in the Sonoran Desert. *Journal of Herpetology* 29:361–369.
- Baker, B.W. 2008. A brief overview of forensic herpetology. *Applied Herpetology* 5:307–318.
- Barrio-Amorós, C.L., J. Mesa, C. Brewer-Carías, and R.W. McDiarmid. 2010. A new *Pristimantis* (Anura, Terrarana, Strabomantidae) from Churi-tepui in the Chimanta massif, Venezuelan Guayana. *Zootaxa* 2483:35–44.
- Barrows, C., A. Muth, M. Fisher, and J.E. Lovich. 1995. Coachella Valley Fringe-toed Lizard. Pp. 137–138 *In* Our Living Resources: A Report to the Nation on the Distribution, Abundance and Health of U.S. Plants,

Herpetological Conservation and Biology

- Animals and Ecosystems. Laroe, E.T., C.E. Puckett, P.D. Doran, and M.J. Mac (Eds.). U.S. Department of the Interior, National Biological Service Report.
- Berry, K.H. 1974. The ecology and social behavior of the Chuckwalla, *Sauromalus obesus obesus* Baird. University of California Publications in Zoology 101:1–60.
- Berry, K.H. 1986. Desert Tortoise (*Gopherus agassizii*) research in California, 1976–1985. *Herpetologica* 42:62–67.
- Berry, K.H., and M.M. Christopher. 2001. Guidelines for the field evaluation of Desert Tortoise health and disease. *Journal of Wildlife Diseases* 37:427–450.
- Berry, K.H., D.J. Morafka, and R.W. Murphy. 2002. Defining the Desert Tortoise(s): our first priority for a coherent conservation strategy. *Chelonian Conservation and Biology* 4:249–262.
- Blaustein, A.R., and J.M. Kiesecker. 2002. Complexity in conservation: Lessons from the global decline of amphibian populations. *Ecology Letters* 5:597–608.
- Blaustein, A.R., J.M. Kiesecker, D.G. Hokit, and S.C. Walls. 1995. Amphibian declines and UV radiation. *BioScience* 45:514–515.
- Blaustein, A.R., P.D. Hoffman, D.G. Hokit, J.M. Kiesecker, S.C. Walls, and J.B. Hays. 1994. UV repair and resistance to solar UV-B in amphibian eggs: a link to population declines? *Proceedings of the National Academy of Sciences* 91:1791–1795.
- Blaustein, A.R., S.C. Walls, B.A. Bancroft, J.J. Lawler, C.L. Searle, and S.S. Gervasi. 2010. Direct and indirect effects of climate change on amphibian populations. *Diversity* 2:281–313.
- Bolaños, F., F. Castro, C. Cortez, I. De la Riva, T. Grant, B. Hedges, R. Heyer, R. Ibáñez, E. La Marca, E. Lavilla, D. Leite Silvano, S. Lötters, G. Parra Olea, S. Reichle, R. Reynolds, L. Rodríguez, G. Santos Barrera, N. Scott, C. Ubeda, A. Veloso, M. Wilkinson, and B. Young. 2008. Amphibians of the Neotropical realm. Pp. 92–105 *In* *Threatened Amphibians of the World*. Stuart, S.N., M. Hoffmann, J.S. Chanson, N.A. Cox, R.J. Berridge, P. Ramani, and B.E. Young (Eds.). Lynx Edicions, in association with IUCN and Conservation International, Barcelona, Spain.
- Bonnet, X., R. Shine, and O. Lourdais. 2002. Taxonomic chauvinism. *Trends in Ecology and Evolution* 17:1–3.
- Bridges, C.M., and E.E. Little. 2005. Toxicity of environmental extracts from natural waters in National Parks and Fish and Wildlife Refuges to amphibians. *Alytes* 22:130–145.
- Bulger, J.B., N.J. Scott, Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of California Red-legged Frogs *Rana aurora draytonii* in forested habitats. *Biological Conservation* 110:85–95.
- Burrowes, P.A., R.J. Joglekar, and D.E. Green. 2004. Potential causes for amphibian declines in Puerto Rico. *Herpetologica* 60:141–154.
- Bury, R.B. 1973. The Cascade Frog, *Rana cascadae*, in the North Coast Range of California. *Northwest Science* 47:228–229.
- Bury, R.B. 1980. What we know and do not know about off-road vehicle impacts on wildlife. Pp. 110–120 *In* *Off-road Vehicle Use: A Management Challenge*. Andrews, R.N.L., and P.F. Nowak (Eds.). University of Michigan School of Natural Resources, Ann Arbor, Michigan, USA.
- Bury, R.B. (Ed.). 1982. North American tortoises: conservation and ecology. U.S. Fish and Wildlife Service Wildlife Research Report 12.
- Bury, R.B. 1983. Differences in amphibian populations in logged and old-growth redwood forests. *Northwest Science* 57:167–178.
- Bury, R.B. 1986. Feeding ecology of the turtle *Clemmys marmorata*. *Journal of Herpetology* 20:515–521.
- Bury, R.B. 1994. Vertebrates in the Pacific Northwest: species richness, endemism and dependency on old-growth forests. Pp. 392–404 *In* *Biological Diversity: Problems and Challenges*. Majumdar, S.K., D.J. Brenner, J.E. Lovich, and J.F. Schalles (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Bury, R.B. 1997. Biogeography of the herpetofauna in the Siskiyou Mountains Region. Pp. 11–15 *In* *Proceedings of the First Conference on Siskiyou Ecology*. Bell, J.F. and T. Atterbury (Eds.). The Nature Conservancy, Portland, Oregon, USA.
- Bury, R.B. 2004. Wildfire, fuel reduction, and herpetofaunas across diverse landscape mosaics in northwestern forests. *Conservation Biology* 18:969–975.
- Bury, R.B. 2008. Low thermal tolerances of stream salamanders in the Pacific Northwest: implications for riparian and forest management. *Applied Herpetology* 5:63–74.
- Bury, R.B., and M.J. Adams. 1999. Variation in age at metamorphosis across a latitudinal gradient for the Tailed Frog, *Ascaphus truei*. *Herpetologica* 55:283–291.
- Bury, R.B., and P.S. Corn. 1987. Evaluation of pitfall trapping in Northwest forests: trap arrays with drift fences. *Journal of Wildlife Management* 51:112–119.
- Bury, R.B., and P.S. Corn. 1988a. Responses of aquatic and streamside amphibians to timber harvest: a review. Pp. 165–184 *In* *Streamside Management: Riparian Wildlife and Forestry Interaction*. Raedeke, K. (Ed.). Institute of Forest Resources Contribution 59. University of Washington, Seattle, Washington, USA.
- Bury, R.B., and P.S. Corn. 1988b. Douglas-fir forests in the Oregon and Washington Cascades: abundance of herpetofauna related to stand age and moisture. Pp. 11–22 *In* *Management of Amphibians, Reptiles, and Small Mammals in North America*. Szaro, R.C., K.E.

- Severson, and D.R. Patton (Eds.). USDA Forest Service General Technical Report RM-166.
- Bury, R.B., and P.S. Corn. 1991. Sampling methods for amphibians in streams in the Pacific Northwest. USDA Forest Service General Technical Report PNW-275.
- Bury, R.B., and P.S. Corn. 1995. Have Desert Tortoises undergone a long-term decline in abundance? *Wildlife Society Bulletin* 23:41–47.
- Bury, R.B., and D.J. Germano (Eds.). 1994. *Biology of North American Tortoises*. USDI National Biological Survey Fish and Wildlife Research 13.
- Bury, R.B., and D.J. Germano. 1998. Annual deposition of scute rings in the Western Pond Turtle, *Clemmys marmorata*. *Chelonian Conservation and Biology* 3:108–109.
- Bury, R.B., and R.A. Luckenbach. 1983. Vehicular recreation in arid land dunes: biotic responses and management alternatives. Pp. 207–221 *In* *Off-road Vehicle Impacts: Elements and Management*. Webb, R.H., and H.G. Wilshire (Eds.). Springer-Verlag, New York, New York, USA.
- Bury, R.B., and R.A. Luckenbach. 2002. Comparison of Desert Tortoises (*Gopherus agassizii*) in an unused and off-road vehicle area in the Mojave Desert. *Chelonian Conservation and Biology* 4:457–463.
- Bury, R.B., and M. Martin. 1973. Comparative studies on the distribution and foods of plethodontid salamanders in the redwood region of northern California. *Journal of Herpetology* 7:331–335.
- Bury, R.B., and M.G. Raphael. 1983. Inventory methods for amphibians and reptiles. Pp. 416–419 *In* *Proceedings of a Symposium: Renewable Resource Inventories for Monitoring Changes and Trends*. Bell, J.F., and T. Atterbury (Eds.). Society of American Foresters 83-14. Oregon State University, Corvallis, Oregon, USA.
- Bury, R.B., and J. Wolfheim. 1973. Aggression in free-living pond turtles, *Clemmys marmorata*. *BioScience* 23:659–662.
- Bury, R.B., C.K. Dodd, Jr., and G.M. Fellers. 1980. Conservation of the Amphibians of the United States: A Review. U.S. Fish and Wildlife Service Resource Publication 134.
- Bury, R.B., T.C. Esque, and P.S. Corn. 1994a. Conservation of Desert Tortoises (*Gopherus agassizii*): genetics and protection of isolated populations. *Proceedings of the Desert Tortoise Council* 1987–1991:59–66.
- Bury, R.B., D.J. Germano, and G.W. Bury. 2010. Comparison of the population structure and growth of the turtle *Actinemys marmorata* in the Klamath-Siskiyou ecoregion: Age, not size, matters. *Copeia* 2010:443–451.
- Bury, R.B., R.A. Luckenbach, and S.D. Busack. 1977. Effects of off-road vehicles on vertebrates in the California desert. U.S. Fish and Wildlife Service Research Report 8.
- Bury, R.B., T.C. Esque, L. DeFalco, and P.A. Medica. 1994b. Distribution, habitat use, and protection of the Desert Tortoise in the eastern Mojave Desert. Pp. 57–72 *In* *Biology of North American Tortoises*. Bury, R.B., and D.J. Germano (Eds.). USDI National Biological Survey Fish and Wildlife Research 13.
- Busack, S.D., and R.B. Bury. 1974. Some effects of off-road vehicles and sheep grazing on lizard populations in the Mojave Desert. *Biological Conservation* 6:179–183.
- Busack, S.D., and R. Lawson. 2008. Morphological, mtDNA and allozyme evolution in representative amphibians and reptiles inhabiting each side of the Strait of Gibraltar. *Biological Journal of the Linnean Society* 94:445–461.
- Cadle, J.E., and R.W. McDiarmid. 1990. Two new species of *Centrolenella* (Anura: Centrolenidae) from northwestern Peru. *Proceedings of the Biological Society of Washington* 103:746–768.
- Campbell, H.W., and S.P. Christman. 1982a. The herpetological components of Florida sandhill and sand pine scrub associations. Pp. 163–171 *In* *Herpetological Communities: A Symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977*. Scott, N.J., Jr. (Ed). U.S. Fish and Wildlife Service Wildlife Research Report 13.
- Campbell, H.W., and S.P. Christman. 1982b. Field techniques for herpetological community analysis. Pp. 193–200 *In* *Herpetological Communities: A Symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977*. Scott, N.J., Jr. (Ed). U.S. Fish and Wildlife Service Wildlife Research Report 13.
- Campbell, H.W., and A.B. Irvine. 1978. Aerial census of the West Indian Manatee, *Trichechus manatus*, in the southeastern United States. *Journal of Mammalogy* 59:613–617.
- Campbell, H.W., J. Jackson, and K. Campbell. 1974. The feeding behavior of crocodylians: validity of evidence from stomach contents. *Journal of Herpetology* 8:378–381.
- Campbell, H.W., J. Jackson, and W. Ingram. 1976. The dorsal pigmentation patterns of snakes as an antipredator strategy: a multivariate approach. *American Naturalist* 110:1029–1053.
- Carpenter, D.W., R.E. Jung, and J.W. Sites, Jr. 2001. Conservation genetics and preservation of the endangered Shenandoah Salamander (*Plethodon shenandoah*, Plethodontidae). *Animal Conservation* 4:111–119.
- Christman, S.P. 1980. Patterns of geographic variation in Florida snakes. *Bulletin of the Florida State Museum* 25:157–256.

Herpetological Conservation and Biology

- Christman, S.P. 1984. Breeding bird response to greentree reservoir management. *Journal of Wildlife Management* 48:1164–1172.
- Christopher, M.M., K.H. Berry, B.T. Henen, and K.A. Nagy. 2003. Clinical disease and laboratory abnormalities in free-ranging Desert Tortoises in California (1990–1995). *Journal of Wildlife Diseases* 39:35–56.
- Cisneros-Heredia, D.F. and R.W. McDiarmid. 2006a. A new species of the genus *Centrolene* (Amphibia: Anura: Centrolenidae) from Ecuador with comments on the taxonomy and biogeography of glassfrogs. *Zootaxa* 1244:1–32.
- Cisneros-Heredia, D.F. and R.W. McDiarmid. 2006b. Review of the taxonomy and conservation status of the Ecuadorian Glassfrog *Centrolenella puyoensis* Flores and McDiarmid (Amphibia: Anura: Centrolenidae). *Zootaxa* 1361:21–31.
- Cisneros-Heredia, D.F., and R.W. McDiarmid. 2007. Revision of the characters of Centrolenidae (Amphibia: Anura: Athesphatanura), with comments on its taxonomy and the description of new taxa of glassfrogs. *Zootaxa* 1572:1–82.
- Clark, D.R., Jr. 1970. Ecological study of the Worm Snake, *Carphophis vermis* (Kennicott). University of Kansas Publications of the Museum of Natural History 19:85–194.
- Clark, D.R., Jr. 1974. The Western Ribbon Snake (*Thamnophis proximus*): ecology of a Texas population. *Herpetologica* 30:372–379.
- Clark, D.R., Jr., and R.R. Fleet. 1976. The Rough Earth Snake (*Virginia striatula*): ecology of a Texas population. *Southwestern Naturalist* 20:467–478.
- Clark, D.R., Jr., and A.J. Krinitsky. 1985. DDE residues and artificial incubation of Loggerhead Sea Turtle eggs. *Bulletin of Environmental Contamination and Toxicology* 34:121–125.
- Clark, D.R., Jr., and J.C. Kroll. 1974. Thermal ecology of anoline lizards: temperate versus tropical strategies. *Southwestern Naturalist* 19:9–19.
- Clark, D.R., Jr., C.M. Bunck, and R.J. Hall. 1997. Female reproductive dynamics in a Maryland population of Ringneck Snakes (*Diadophis punctatus*). *Journal of Herpetology* 31:476–483.
- Clark, D.R., Jr., J.W. Bickham, D.L. Baker, and D.F. Cowman. 2000. Environmental contaminants in Texas wetland reptiles: an evaluation using blood samples. *Environmental Toxicology and Chemistry* 19:2259–2265.
- Clark, D.R., Jr., R. Cantu, D.F. Cowman, and D.J. Maxson. 1998. Uptake of arsenic and metals by tadpoles at an historically contaminated Texas site. *Ecotoxicology* 7:61–67.
- Clark, R.A., and G.M. Fellers. 1987. Rare plants at Point Reyes National Seashore. *Fremontia* 15:13–16.
- Cocroft, R., V.R. Morales, and R.W. McDiarmid. 2001. Frogs of Tambopata, Peru. CD of calls of 70 species with a 28 page booklet and 70 colored photos. Macaulay Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, New York.
- Collins, E.P., and G.H. Rodda. 1994. Bone layers associated with ecdysis in laboratory-reared *Boiga irregularis* (Colubridae). *Journal of Herpetology* 28:378–381.
- Collins, J.P., and A. Storfer. 2003. Global amphibian declines: sorting the hypotheses. *Diversity and Distributions* 9:89–98.
- Congdon, J.D., S.W. Gotte, and R.W. McDiarmid. 1992. Ontogenetic changes in habitat use by juvenile turtles, *Chelydra serpentina* and *Chrysemys picta*. *The Canadaia Field-Naturalist* 106:241–248.
- Converse, K.A., and D.E. Green. 2005a. Diseases of tadpoles. Pp. 72–88 *In* *Wildlife Diseases: Landscape Epidemiology, Spatial Distribution, and Utilization of Remote Sensing Technology*. Majumdar, S.K., J. Huffman, F.J. Brenner, and A.I. Panah (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Converse, K.A., and D.E. Green. 2005b. Diseases of salamanders. Pp. 118–130 *In* *Wildlife Diseases: Landscape Epidemiology, Spatial Distribution, and Utilization of Remote Sensing Technology*. Majumdar, S.K., J. Huffman, F.J. Brenner and A.I. Panah (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Corn, P.S. 1994a. Displacement of Desert Tortoises: overview of a study at the Apex Heavy Industrial Use Zone, Clark County, Nevada. *Proceedings of The Desert Tortoise Council 1987–1991*:295–303.
- Corn, P.S. 1994b. Recent trends in Desert Tortoise populations in the Mojave Desert. Pp. 85–93 *In* *Biology of North American Tortoises*. Bury, R.B., and D.J. Germano (Eds.). USDI National Biological Survey Fish and Wildlife Research 13.
- Corn, P.S. 1994c. Straight line drift fences and pitfall traps. Pp. 109–117 *In* *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Corn, P.S. 1994d. What we know and don't know about amphibian declines in the West. Pp. 59–67 *In* *Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management*. *Proceedings of a Symposium 12–15 July 1993*. Covington, W.W., and L.F. DeBano (Tech. Eds.). USDA Forest Service General Technical Report RM-247.
- Corn, P.S. 2000. Amphibian declines: review of some current hypotheses. Pp. 663–696 *In* *Ecotoxicology of*

- Amphibians and Reptiles. Sparling, D.W., G. Linder, and C.A. Bishop (Eds.). SETAC Press, Pensacola, Florida, USA.
- Corn, P.S. 2005. Climate change and amphibians. *Animal Biodiversity and Conservation* 28:59–67.
- Corn, P.S., and R.B. Bury. 1986. Morphological variation and zoogeography of Racers (*Coluber constrictor*) in the central Rocky Mountain region. *Herpetologica* 42:254–260.
- Corn, P.S., and R.B. Bury. 1989. Logging western Oregon: responses of headwater habitats and stream amphibians. *Forest Ecology and Management* 29:1–19.
- Corn, P.S., and R.B. Bury. 1990. Sampling Methods for Terrestrial Amphibians and Reptiles. USDA Forest Service General Technical Report PNW-256.
- Corn, P.S., and R.B. Bury. 1991a. Small mammal communities in the Oregon Coast Range. Pp. 240–254 *In* *Wildlife and Vegetation of Unmanaged Douglas-fir Forests*. Ruggiero, L.F., K.B. Aubry, A.B. Carey, and M.H. Huff (Tech. Eds.). USDA Forest Service General Technical Report PNW-285.
- Corn, P.S., and R.B. Bury. 1991b. Terrestrial amphibian communities in the Oregon Coast Range. Pp. 305–317 *In* *Wildlife and Vegetation of Unmanaged Douglas-fir Forests*. Ruggiero, L.F., K.B. Aubry, A.B. Carey, and M.H. Huff (Tech. Eds.). USDA Forest Service General Technical Report PNW-285.
- Corn, P.S., and E. Muths. 2002. Variable breeding phenology affects the exposure of amphibian embryos to ultraviolet radiation. *Ecology* 83:2958–2963.
- Corn, P.S., and F.A. Vertucci. 1992. Descriptive risk assessment of the effects of acidic deposition on Rocky Mountain amphibians. *Journal of Herpetology* 26:361–369.
- Corn, P.S., E. Muths, and W.M. Iko. 2000. A comparison in Colorado of three methods to monitor breeding amphibians. *Northwestern Naturalist* 81:22–30.
- Corn, P.S., E. Muths, M.J. Adams, and C.K. Dodd, Jr. 2005c. The U.S. Geological Survey’s Amphibian Research and Monitoring Initiative. *Alytes* 22:65–71.
- Corn P.S., B.R. Hossack, E. Muths, D.A. Patla, C.R. Peterson, and A.L. Gallant. 2005a. Status of amphibians on the Continental Divide: surveys on a transect from Montana to Colorado, USA. *Alytes* 22:85–94.
- Corn, P.S., M.J. Adams, W.A. Battaglin, A.L. Gallant, D.L. James, M.L. Knutson, C.A. Langtimm, and J.R. Sauer. 2005b. Amphibian Research and Monitoring Initiative: concepts and implementation. U.S. Geological Survey Scientific Investigations Report 2005-5015.
- Crump, M.L., and N.J. Scott, Jr. 1994. Visual encounter surveys. Pp. 84–92 *In* *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Delaney, K.S., S.P.D. Riley, and R.N. Fisher. 2010. A rapid, strong, and convergent genetic response to urban habitat fragmentation in four divergent and widespread vertebrates. *PLoS ONE* 5: e12767. doi:10.1371/journal.pone.0012767.
- DeLoach, C.J., R.I. Carruthers, J.E. Lovich, T.L. Dudley, and S.D. Smith. 2000. Ecological interactions in the biological control of saltcedar (*Tamarix* spp.) in the United States: toward a new understanding. Pp. 819–873 *In* *Proceedings of the X International Symposium on Biological Control of Weeds*. Spencer, N.R. (Ed.). Montana State University Press, Bozeman, Montana, USA.
- Dickinson, J.C., Jr. (Ed.). 1982. Collected papers in memory of Howard W. Campbell. *Bulletin of the Florida State Museum, Biological Sciences* 28:1–102.
- Dickinson, V.M., T. Duck, C.R. Schwalbe, and J.L. Jarchow. 1995. Health studies of free-ranging Mojave Desert Tortoises in Utah and Arizona. Arizona Game and Fish Department Research Branch Technical Report 1-70.
- Dickinson, V.M., I.M. Schumacher, J.L. Jarchow, T. Duck, and C.R. Schwalbe. 2005. Mycoplasma in free-ranging Desert Tortoises in Utah and Arizona. *Journal of Wildlife Diseases* 41:839–842.
- Diffendorfer, J.E., C. Rochester, R.N. Fisher, and T.K. Brown. 2005. Movement and space use by Coastal Rosy Boas (*Lichanura trivirgata roseofusca*) in coastal southern California. *Journal of Herpetology* 39:24–36.
- Dodd, C.K., Jr. 1988a. Disease and population declines in the Flattened Musk Turtle *Sternotherus depressus*. *American Midland Naturalist* 119:394–401.
- Dodd, C.K., Jr. 1988b. A biological synopsis of the Loggerhead Sea Turtle, *Caretta caretta* (Linnaeus, 1758). U.S. Fish and Wildlife Service Biological Report 88.
- Dodd, C.K., Jr. 1990. Effects of habitat fragmentation on a stream-dwelling species, the Flattened Musk Turtle *Sternotherus depressus*. *Biological Conservation* 54:33–45.
- Dodd, C.K., Jr. 1991. The status of the Red Hills Salamander *Phaeognathus hubrichti*, Alabama, USA, 1976–1988. *Biological Conservation* 55:57–75.
- Dodd, C.K., Jr. 1992. Biological diversity of a temporary pond herpetofauna in north Florida sandhills. *Biodiversity and Conservation* 1:125–142.
- Dodd, C.K., Jr. 1993a. Cost of living in an unpredictable environment: the ecology of Striped Newts *Notophthalmus perstriatus* during a prolonged drought. *Copeia* 1993:605–614.

Herpetological Conservation and Biology

- Dodd, C.K., Jr. 1993b. Population structure, body mass, activity, and orientation of an aquatic snake (*Seminatrix pygaea*) during a drought. *Canadian Journal of Zoology* 71:1281–1288.
- Dodd, C.K., Jr. 1994. The effects of drought on population structure, activity, and orientation of toads (*Bufo quercicus* and *B. terrestris*) at a temporary pond. *Ethology Ecology and Evolution* 6:331–349.
- Dodd, C.K., Jr. 1995. The ecology of a sandhills population of the Eastern Narrow-mouthed Toad, *Gastrophryne carolinensis*, during a drought. *Bulletin of the Florida Museum of Natural History* 38:11–41.
- Dodd, C.K., Jr. 1997a. Clutch size and frequency in Florida Box Turtles (*Terrapene carolina bauri*): implications for conservation. *Chelonian Conservation and Biology* 2:370–377.
- Dodd, C.K., Jr. 1997b. Population structure and the evolution of sexual size dimorphism and sex ratios in an insular population of Florida Box Turtles *Terrapene carolina bauri*. *Canadian Journal of Zoology* 75:1495–1507.
- Dodd, C.K., Jr. 1997c. Imperiled amphibians: a historical perspective. Pp. 165–200 *In Aquatic Fauna in Peril: The Southeastern Perspective*. Benz, G.W., and D.E. Collins (Eds.). Southeast Aquatic Research Institute and Lenz Design and Communications, Decatur, Georgia, USA.
- Dodd, C.K., Jr. 2001. North American Box Turtles: A Natural History. University of Oklahoma Press, Norman, Oklahoma, USA.
- Dodd, C.K., Jr. 2003. Monitoring amphibians in Great Smoky Mountains National Park. U.S. Geological Survey Circular 1258.
- Dodd, C.K., Jr. 2004. The Amphibians of Great Smoky Mountains National Park. University of Tennessee Press, Knoxville, Tennessee, USA.
- Dodd, C.K., Jr. (Ed.). 2005. The Amphibian Research and Monitoring Initiative: proceedings of a symposium held in Norman, Oklahoma, USA, 2004. *Alytes* 22:65–167.
- Dodd, C.K., Jr., and W.J. Barichivich. 2007. Establishing a baseline and faunal history in amphibian monitoring programs: the amphibians of Harris Neck, Georgia, USA. *Southeastern Naturalist* 6:125–134.
- Dodd, C.K., Jr., and R.A. Byles. 2003. Post-nesting movements and behavior of Loggerhead Sea Turtles (*Caretta caretta*) departing from east-central Florida nesting beaches. *Chelonian Conservation and Biology* 4:530–536.
- Dodd, C.K., Jr., and B.A. Cade. 1998. Movement patterns and the conservation of amphibians breeding in small, temporary wetlands. *Conservation Biology* 12:331–339.
- Dodd, C.K., Jr., and R.M. Dorazio. 2004. Using counts to simultaneously estimate abundance and detection probabilities in a salamander community. *Herpetologica* 60:468–475.
- Dodd, C.K., Jr., and R. Franz. 1996. Species richness and biogeography of the herpetofauna in the Exuma Cays Land and Sea Park, Bahamas. Pp. 359–369 *In Contributions to West Indian Herpetology: A Tribute to Albert Schwartz*. Powell, R., and R.W. Henderson (Eds.). Society for the Study of Amphibians and Reptiles, St. Louis, Missouri, USA.
- Dodd, C.K., Jr., and M.L. Griffey. 2005. The conservation of box turtles on public lands in Florida. Pp. 103–110 *In Amphibians and Reptiles: Status and Conservation in Florida*. Meshaka, W.E., Jr. and K.J. Babbitt (Eds.). Krieger Publishing, Malabar, Florida, USA.
- Dodd, C.K., Jr., and L.V. LaClaire. 1995. Biogeography and status of the Striped Newt (*Notophthalmus perstriatus*) in Georgia, USA. *Herpetological Natural History* 3:37–46.
- Dodd, C.K., Jr., and L.L. Smith. 2003. Habitat destruction and alteration. Historical trends and future prospects for amphibians. Pp. 94–112 *In Amphibian Conservation*. Semlitsch, R.D. (Ed.). Smithsonian Institution Press, Washington, D.C., USA.
- Dodd, C.K., Jr., W.J. Barichivich, and L.L. Smith. 2004. The effectiveness of a barrier wall and underpasses in reducing wildlife mortality on a heavily traveled highway in Florida. *Biological Conservation* 118:619–631.
- Dodd, C.K., Jr., K.M. Enge, and J.N. Stuart. 1988. Aspects of the biology of the Flattened Musk Turtle (*Sternotherus depressus*) in northern Alabama. *Bulletin of the Florida State Museum, Biological Sciences* 34:1–64.
- Dodd, C.K., Jr., W.J. Barichivich, S.A. Johnson, and J.S. Staiger. 2006. Changes in a Florida Panhandle Gulf Coast herpetofaunal community over a 28-year period. *American Midland Naturalist* 158:29–48.
- Dodd, C.K., Jr., J. Loman, D. Cogalniceanu, and M. Puky. 2012. Monitoring amphibian populations. *In Conservation and Decline of Amphibians*. Amphibian Biology Volume 10. Heatwole, H.H., and J.W. Wilkinson (Eds.). Surrey Beatty & Sons, Chipping Norton, New South Wales, Australia.
- Donnelly, M.A., R.W. McDiarmid, and C.W. Myers. 1992. A new lizard of the genus *Arthrosaura* (Teiidae) from southern Venezuela. *Proceedings of the Biological Society of Washington* 105:821–833.
- Drost, C.A. 2005. Vertebrates of Montezuma Castle National Monument: present status and historical changes. Pp. 235–251 *In The Colorado Plateau II: Biophysical, Socioeconomic, and Cultural Research*. van Riper, C., III, and D.J. Mattson (Eds.). University of Arizona Press, Tucson, Arizona, USA.

- Drost, C.A., and G.M. Fellers. 1991. Density cycles in an island population of Deer Mice, *Peromyscus maniculatus*. *Oikos* 60:351–364.
- Drost, C.A., and G.M. Fellers. 1996. Collapse of a regional frog fauna in the Yosemite area of the California Sierra Nevada, USA. *Conservation Biology* 10:414–425.
- Drost, C.A., J.E. Lovich, S.V. Madrak, and A.J. Monatesti. 2011. Removal of non-native Slider Turtles (*Trachemys scripta*) and effects on native Sonora Mud Turtles (*Kinosternon sonoriense*) at Montezuma Well, Yavapai County, Arizona. U.S. Geological Survey Open-File Report 2010–1177, <http://pubs.usgs.gov/of/2010/1177/>
- Duellman, W.E. 2009. A monument to natural history: Henry S. Fitch (1909–2009). *Phyllomedusa* 8:75–79.
- Edwards, T., C.R. Schwalbe, D.E. Swann, and C.S. Goldberg. 2004. Implications of anthropogenic landscape change on inter-population movements of the Desert Tortoise (*Gopherus agassizii*). *Conservation Genetics* 5:485–489.
- Ennen, J.R., J.E. Lovich, B.R. Kreiser, W. Selman, and C.P. Qualls. 2010. Genetic and morphological variation between populations of the Pascagoula Map Turtle (*Graptemys gibbonsi*) in the Pearl and Pascagoula rivers with description of a new species. *Chelonian Conservation and Biology* 9:98–113.
- Ernst, C.H., and J.E. Lovich. 1990. A new species of *Cuora* (Reptilia: Testudines: Emydidae) from the Ryukyu Islands. *Proceedings of the Biological Society of Washington* 103:26–34.
- Ernst, C.H., and J.E. Lovich. 2009. *Turtles of the United States and Canada*. 2nd Edition. Johns Hopkins University Press, Baltimore, Maryland, USA.
- Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. *Turtles of the United States and Canada*. Smithsonian Institution Press, Washington, D.C., USA.
- Esque, T.C., and E.L. Peters. 1994. Ingestion of bones, stones, and soil by Desert Tortoises. Pp. 105–111 *In* *Biology of North American Tortoises*. Bury, R.B., and D.J. Germano (Eds.). USDI National Biological Survey Fish and Wildlife Research 13.
- Esque, T.C., C.R. Schwalbe, D.F. Haines, and W.L. Halvorson. 2004. Saguaros under siege: invasive species and fire. *Desert Plants* 20:49–55.
- Esque, T.C., D.R. Schwalbe, L.A. DeFalco, R.B. Duncan, and T.J. Hughes. 2003. Effects of desert wildfires on Desert Tortoise (*Gopherus agassizii*) and other small vertebrates. *Southwestern Naturalist* 48:103–111.
- Esque, T.C., A. Búrquez-M., C.R. Schwalbe, T.R. Van Devender, P.J. Anning, and M.J. Nijhuis. 2002. Fire ecology of the Sonoran Desert Tortoise. Pp. 312–333 *In* *The Sonoran Desert Tortoise: Natural History, Biology And Conservation*. Van Devender, T.R. (Ed.). University of Arizona Press, Tucson, Arizona, USA.
- Esque, T.C., K.E. Nussear, K.K. Drake, A.D. Walde, K.H. Berry, R.C. Averill-Murray, A.P. Woodman, W.I. Boarman, P.A. Medica, J. Mack, and J.S. Heaton. 2010. Effects of subsidized predators, resource variability, and human population density on Desert Tortoise populations in the Mojave Desert, USA. *Endangered Species Research* 12:167–177.
- Farley, G.H., L.M. Ellis, J.N. Stuart, and N.J. Scott, Jr. 1994. Avian species richness in different-aged stands of riparian forest along the middle Rio Grande, New Mexico. *Conservation Biology* 8:1098–1108.
- Fellers, G.M. 1994. Species diversity, selectivity, and habitat associations of small mammals from coastal California. *Southwestern Naturalist* 39:128–136.
- Fellers, G.M. 1997. Design of Amphibian Surveys. Pp. 23–24 *In* *Sampling Amphibians in Lentic Habitats: Methods and Approaches for the Pacific Northwest (Northwest Fauna 4)*. Olson, D.H., W.P. Leonard, and R.B. Bury (Eds.). Society for Northwestern Vertebrate Biology, Olympia, Washington, USA.
- Fellers, G.M., and C.A. Drost. 1989. Fluorescent powders as a marking technique for reptiles. *Herpetological Review* 20:91–92.
- Fellers, G.M., and C.A. Drost. 1991a. Ecology of the Island Night Lizard, *Xantusia riversiana*, on Santa Barbara Island, California. *Herpetological Monographs* 5:28–78.
- Fellers, G.M., and C.A. Drost. 1991b. *Xantusia riversiana* species account. *Catalog of American Amphibians and Reptiles* 518:1–4.
- Fellers, G.M., and C.A. Drost. 1993. Disappearance of the Cascades Frog *Rana cascadae*, at the southern end of its range, California, USA. *Biological Conservation* 65:177–181.
- Fellers, G.M., and C.A. Drost. 1994. Sampling with Artificial Cover. Pp. 146–150 *In* *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Fellers, G.M., and K.L. Freel. 1995. A standardized protocol for surveying aquatic amphibians. USDI National Biological Service Technical Report NPS/WRUC/NRTR-59-001.
- Fellers G.M., C.A. Drost, and W.R. Heyer. 1994. Handling Live Amphibians. Pp. 275–276 *In* *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Fisher, R.D. 2012. Biological Survey Unit, USGS Patuxent Wildlife Research Center. Available at: <http://www.pwrc.usgs.gov/history/bsphist2.htm> (accessed 24 Feb., 2012).

Herpetological Conservation and Biology

- Fitch, H.S., and B. Glading. 1947. A field study of a rattlesnake population. *California Fish and Game* 33:103–123.
- Fitch, H.S., and H. Twining. 1946. Feeding habits of the Pacific Rattlesnake. *Copeia* 1946:64–71.
- Fitch, H.S., A.F. Echelle, and M.M. Stewart. 2000. Historical perspective: Henry S. Fitch. *Copeia* 2000:891–900.
- Fitch, H.S., P. Goodrum, and C. Newman. 1952. The Armadillo in the southeastern United States. *Journal of Mammalogy* 33:21–37.
- Fitch, V.R. 1984. The published contributions of Henry S. Fitch. Pp 5–9 *In* *Vertebrate Ecology and Systematics: A Tribute to Henry S. Fitch*. Seigel, R.A., L.E. Hunt, J.L. Knight, L. Malaret, and N.L. Zuschlag (Eds.). University of Kansas Museum of Natural History, Lawrence, Kansas, USA.
- FitzSimmons, N., and K.M. Hart. 2007. Genetic studies of freshwater turtles and tortoises: a review of the past 70 years. Pp. 15–46 *In* *Defining Turtle Diversity: Proceedings of a Workshop on Genetics, Ethics, and Taxonomy of Freshwater Turtles and Tortoises*. Shaffer, H.B., N.N. FitzSimmons, A. Georges, and A. Rhodin (Eds.). Chelonian Research Monographs 4.
- Fontaine, C.T., and D.J. Shaver. 2005. Head starting the Kemp's Ridley Sea Turtle, *Lepidochelys kempii*, at the National Marine Fisheries Service Galveston Laboratory (1978–1992): a review. *Chelonian Conservation and Biology* 4:838–845.
- Ford, P.L., and N.J. Scott, Jr. 1996. Descriptions of *Bufo* tadpoles from the southwestern coast of Jalisco, Mexico. *Journal of Herpetology* 30:253–257.
- Fritts, T.H. 1983. Morphometrics of Galápagos tortoises: evolutionary implications. Pp. 107–122 *In* *Patterns of Evolution in Galápagos Organisms*. Bowman, R.I., M. Berson, and A. Leviton (Eds.). American Association for the Advancement of Science, Pacific Division, San Francisco, California, USA.
- Fritts, T.H. 1984. Evolutionary divergence of giant tortoises in Galápagos. *Biological Journal of the Linnean Society* 21:165–176.
- Fritts, T.H. 1988. The Brown Tree Snake, *Boiga irregularis*, a threat to Pacific islands. U.S. Fish and Wildlife Service Biological Report 88.
- Fritts, T.H., and R.D. Jennings. 1994. Distribution, habitat use, and status of the Desert Tortoise in Mexico. Pp. 49–56 *In* *Biology of North American Tortoises*. Bury, R.B., and D.J. Germano (Eds.). U.S. Department of the Interior, National Biological Survey Fish and Wildlife Research 13.
- Fritts, T.H., and G.H. Rodda. 1998. The role of introduced species in the degradation of island ecosystems: a case history of Guam. *Annual Review of Ecology and Systematics* 29:113–140.
- Fritts, T.H., N.J. Scott, Jr., and J.A. Savidge. 1987. Activity of the Brown Tree Snake (*Boiga irregularis*) on Guam as determined by electrical outages. *The Snake* 19:51–58.
- Fritts, T.H., N.J. Scott, Jr., and B.E. Smith. 1989. Trapping *Boiga irregularis* on Guam using bird odors. *Journal of Herpetology* 23:189–192.
- Fritz, U., M. Barata, S.D. Busack, G. Frittsch, and R. Castilho. 2006. Impact of mountain chains, sea straits and peripheral populations on genetic and taxonomic structure of a freshwater turtle, *Mauremys leprosa* (Reptilia, Testudines, Geoemydidae). *Zoologica Scripta* 35:97–108.
- Frost, D.R., R.W. McDiarmid, and J.R. Mendelson III. 2009. Response to the *Point of View* of Gregory B. Pauley, David M. Hillis, and David C. Cannatella, by the Anuran Subcommittee of the SSAR/HL/ASIH Scientific and Standard English Names list. *Herpetologica* 65:136–153.
- Fujisaki I., K.M. Hart, F.J. Mazzotti, K.G. Rice, R. Snow, and M.R. Rochford. 2009. Risk assessment of potential invasiveness of exotic reptiles to south Florida based on import pathway. *Biological Invasions* 12:2585–2596.
- Funk, W.C., C.A. Pearl, H.M. Draheim, M.J. Adams, T.D. Mullins, and S.M. Haig. 2008. Range-wide phylogeographic analysis of the spotted frog complex (*Rana luteiventris* and *R. pretiosa*) in northwestern North America. *Molecular Phylogenetics and Evolution* 49:198–210.
- Funk, W.C., M.S. Blouin, P.S. Corn, B.A. Maxell, D.S. Pilliod, S. Amish, and F.W. Allendorf. 2005. Population structure of Columbia Spotted Frogs (*Rana luteiventris*) is strongly affected by the landscape. *Molecular Ecology* 14:483–496.
- Furness, A.I., R.W. McDiarmid, W.R. Heyer, and G.R. Zug. 2010. Oviduct modifications in foam-nesting frogs, with emphasis on the genus *Leptodactylus* (Amphibia, Leptodactylidae). *South American Journal of Herpetology* 5:13–29.
- Germano, D.J., and R.B. Bury. 1998. Age determination in turtles: evidence of annual deposition of scute layers. *Chelonian Conservation and Biology* 3:123–132.
- Germano, D.J., and R.B. Bury. 2009. Variation in body size, growth, and population structure of *Actinemys marmorata* from lentic and lotic habitats in southern Oregon. *Journal of Herpetology* 43:510–520.
- Germano, D.J., and T.H. Fritts. 1994. Methods of age determination of the Desert Tortoise, *Gopherus agassizii*. *Proceedings of The Desert Tortoise Council* 1987–1991:93–100.
- Germano, D.J., R.B. Bury, T.C. Esque, T.H. Fritts, and P.A. Medica. 1994. Range and habitats of the Desert Tortoise. Pp. 73–84 *In* *Biology of North American Tortoises*. Bury, R.B., and D.J. Germano (Eds.). USDI National Biological Survey Fish and Wildlife Research 13.

- Gibbons, J.W. and J.E. Lovich. 1990. Sexual dimorphism in turtles with emphasis on the slider turtle (*Trachemys scripta*). Herpetological Monographs 4:1–29.
- Gibbons, J.W., J.E. Lovich, A.D. Tucker, N.N. Fitzsimmons, and J.L. Greene. 2001. Demographic and ecological factors affecting conservation and management of the Diamondback Terrapin (*Malaclemys terrapin*) in South Carolina. Chelonian Conservation and Biology 4:66–74.
- Gibbons, J.W., D.E. Scott, T.J. Ryan, K.A. Buhlmann, T.D. Tuberville, B.S. Metts, J.L. Greene, T. Mills, Y. Leiden, S. Poppy and C. Winne. 2000. The global decline of reptiles, déjà vu amphibians. BioScience 50:653–666.
- Gibbons, J.W., V.J. Burke, J.E. Lovich, R.D. Semlitsch, T.D. Tuberville, J.R. Bodie, J.L. Greene, P.H. Niewiarowski, H.H. Whiteman, D.E. Scott, J.H.K. Pechmann, C.R. Harrison, S.H. Bennett, J.D. Krenz, M.S. Mills, K.A. Buhlmann, J.R. Lee, R.A. Seigel, A.D. Tucker, T.M. Mills, T. Lamb, M.E. Dorcas, J.D. Congdon, M.H. Smith, D.H. Nelson, M.B. Deitsch, H.H. Hanlin, J.A. Ott, and D.J. Karapatakis. 1997. Perceptions of species abundance, distribution, and diversity: lessons from four decades of sampling on a government-managed reserve. Environmental Management 21:259–268.
- Givnish, T.J., R.W. McDiarmid, and W.R. Buck. 1986. Fire adaptation in *Neblinaria celiæ* (Theaceae), a high-elevation rosette shrub endemic to a wet equatorial tepui. Oecologia 70:481–485.
- Gloss, S.P., J.E. Lovich, and T.S. Melis (Eds.). 2005. The State of the Colorado River Ecosystem in the Grand Canyon. U.S. Geological Survey Circular 1282.
- Goldberg, C.S., and C.R. Schwalbe. 2004. Habitat use and spatial structure of a Barking Frog (*Eleutherodactylus augusti*) population in southeastern Arizona. Journal of Herpetology 38:305–312.
- Goldman, E.A. 1951. Biological Investigations in Mexico. Smithsonian Miscellaneous Collections 115.
- Gotte, S.W. and R.P. Reynolds. 1998. Observations on the effects of alcohol vs. formalin storage of amphibian larvae. Available at: <http://www.pwrc.usgs.gov/resshow/reynld1rs/amphlarv.htm>.
- Gotte, S.W., and L.D. Wilson. 2005. Commentary on the type material of *Tantilla gracilis* Baird and Girard, 1853, and *Tantilla nigriceps* Kennicott, 1860 (Reptilia Squamata), with a neotype designation for *T. nigriceps*. Proceedings of the Biological Society of Washington 118:596–604.
- Gotte, S.W., R.W. McDiarmid, and R.P. Reynolds. 1994. The Snapping Turtle: An Important Component of North American Wetlands. USDI National Biological Survey Research Information Bulletin 32.
- Grant, B.W., A.D. Tucker, J.E. Lovich, A.M. Mills, P.M. Dixon, and J.W. Gibbons. 1992. The use of coverboards in estimating patterns of reptile and amphibian biodiversity. Pp. 379–403 In Wildlife 2001: Populations. McCullough, D.R., and R.H. Barrett (Eds). Elsevier Applied Science, New York, New York, USA.
- Grant, E.H.C., L.E. Green, and W.H. Lowe. 2009. Salamander occupancy in dendritic ecological networks. Freshwater Biology 54:1370–1378.
- Grant, E.H.C., R.E. Jung, and K.C. Rice. 2005. Stream salamander species richness and abundance in relation to environmental factors in Shenandoah National Park, Virginia. American Midland Naturalist 153:348–356.
- Grant, E.H.C., J.D. Nichols, W.H. Lowe, and W.F. Fagan. 2010. Overland movement facilitates amphibian persistence in stream networks. Proceedings of the National Academy of Sciences, USA 107:6936–6940.
- Green, D.E., and K.A. Converse. 2005a. Diseases of amphibian eggs. Pp. 62–71 In Wildlife Diseases: Landscape Epidemiology, Spatial Distribution, and Utilization of Remote Sensing Technology. Majumdar, S.K., J. Huffman, F.J. Brenner, and A.I. Panah (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Green, D.E., and K.A. Converse. 2005b. Diseases of frogs and toads. Pp. 89–117 In Wildlife Diseases: Landscape Epidemiology, Spatial Distribution, and Utilization of Remote Sensing Technology. Majumdar, S.K., J. Huffman, F.J. Brenner, and A.I. Panah (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Green, D.E., and C.K. Dodd, Jr. 2007. Presence of amphibian chytrid fungus *Batrachochytrium dendrobatidis* and other amphibian pathogens at warm-water fish hatcheries in southeastern North America. Herpetological Conservation and Biology 2:43–47.
- Green, D.E., and E. Muths. 2005. Health evaluation of amphibians in and near Rocky Mountain National Park (Colorado, USA). Alytes 22:109–129.
- Green, D.E., K.A. Converse, and A.K. Schrader. 2002. Epizootiology of sixty-four amphibian morbidity and mortality events in the USA, 1996–2001. Annals of New York Academy of Sciences 969:323–339.
- Greene, H.W., and R.W. McDiarmid. 1981. Coral Snake mimicry: does it occur? Science 213:1207–1212.
- Greene, H.W., and R.W. McDiarmid. 2005. Wallace and Savage: heroes, theories, and venomous snake mimicry. Pp. 190–208 In Ecology and Evolution in the Tropics: A Herpetological Perspective. Donnelly, M.A., B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (Eds.). University of Chicago Press.
- Grover, M.C. and L.A. DeFalco. 1995. Desert Tortoise (*Gopherus agassizii*): Status-of-knowledge Outline with References. USDA Forest Service General Technical Report INT-GTR-316.

Herpetological Conservation and Biology

- Gunzburger, M.S. 2007. Evaluation of seven aquatic sampling methods for amphibians and other aquatic fauna. *Applied Herpetology* 4:47–63.
- Gunzburger, M.S., W. Hughes, W. Barichivich, and J. Staiger. 2010. Hurricane storm surge and amphibian communities in coastal wetlands of northwestern Florida. *Wetlands Ecology and Management* 18:651–663.
- Hall, R.J. 1980. Effects of Environmental Contaminants on Reptiles: A Review. U.S. Fish and Wildlife Service Special Scientific Report-Wildlife 228.
- Hall, R.J. 1994. Herpetofaunal Diversity of the Four Holes Swamp, South Carolina. USDI National Biological Survey Resource Publication 198.
- Hall, R.J., and D.R. Clark, Jr. 1982. Responses of the iguanid lizard *Anolis carolinensis* to four organophosphorus pesticides. *Environmental Pollution (Series A)* 28:45–52.
- Hall, R.J., and E. Kolbe. 1980. Bioconcentration of organophosphorus pesticides to hazardous levels by amphibians. *Journal of Toxicology and Environmental Health* 6:853–860.
- Hall, R.J., and D. Swineford. 1979. Uptake of methoxychlor from food and water by the American Toad (*Bufo americanus*). *Bulletin of Environmental Contamination and Toxicology* 23:335–337.
- Hall, R.J., and D. Swineford. 1980. Toxic effects of endrin and toxaphene on the Southern Leopard Frog *Rana sphenoccephala*. *Environmental Pollution (series A)* 23:53–65.
- Hall, R.J., and D. Swineford. 1981. Acute toxicities of toxaphene and endrin to larvae of seven species of amphibians. *Toxicology Letters* 8:331–336.
- Hall, R.J., P.F.P. Henry, and C.M. Bunck. 1999. Fifty-year trends in a box turtle population in Maryland. *Biological Conservation* 88:165–172.
- Hall, R.J., T.E. Kaiser, W.B. Robertson, Jr., and P.C. Patty. 1979. Organochlorine residues in eggs of the endangered American Crocodile (*Crocodylus acutus*). *Bulletin of Environmental Contamination and Toxicology* 23:87–90.
- Halstead, B.J., H.R. Mushinsky, and E.D. McCoy. 2008. Sympatric *Masticophis flagellum* and *Coluber constrictor* select vertebrate prey at different levels of taxonomy. *Copeia* 2008:897–908.
- Halstead, B. J., H.R. Mushinsky, and E.D. McCoy. 2009. *Masticophis flagellum* selects Florida scrub habitat at multiple spatial scales. *Herpetologica* 65:268–279.
- Halstead, B.J., G.D. Wylie, P.S. Coates, and M.L. Casazza. 2011. Bayesian adaptive survey protocols for resource management. *Journal of Wildlife Management* 75:450–457.
- Hart, K.M. 2008. Tracking sea turtles in the Everglades. U.S. Fish and Wildlife Service Endangered Species Bulletin 33:26–29.
- Hart, K.M. 2010. Use of protected areas by threatened and endangered marine turtles in the Dry Tortugas. Pp 12–13 *In* Implementing the Dry Tortugas National Park Research Natural Areas Science Plan: The 3-year Report. Hallac, D., and J. Hunt (Eds.). National Park Service and The Florida Fish and Wildlife Conservation Commission.
- Hart, K.M., and I. Fujisaki. 2010. Satellite tracking reveals habitat use by juvenile Green Sea Turtles, *Chelonia mydas*, in the Everglades, Florida, USA. *Endangered Species Research* 11:221–232.
- Hart, K.M., and K.D. Hyrenbach. 2009. Satellite telemetry of marine megavertebrates: the coming of age of an experimental science. *Endangered Species Research* 10:9–20.
- Hart, K.M., and C.C. McIvor. 2008. Demography and ecology of mangrove Diamondback Terrapins in a wilderness area of Everglades National Park, Florida, USA. *Copeia* 2008:200–208.
- Hart, K.M., C.A. Langtimm, and C.C. McIvor. 2007. Adult survival, probability of capture, and abundance estimates for mangrove Diamondback Terrapins (*Malaclemys terrapin*) in Everglades National Park, Florida. *Bulletin of Marine Science* 80:922. [Abstract]
- Hart, K.M., D.G. Zawada, I. Fujisaki, and B.H. Lidz. 2010. Inter-nesting habitat-use patterns of Loggerhead Sea Turtles: enhancing satellite tracking with benthic mapping. *Aquatic Biology* 11:77–90.
- Heaton, J.S., K.E. Nussear, T.C. Esque, R.D. Inman, F.M. Davenport, T.E. Leuteritz, P.A. Medica, N.W. Strout, P.A. Burgess, and L. Benvenuti. 2008. Spatially explicit decision support for selecting translocation areas for Desert Tortoises. *Biodiversity and Conservation* 17:575–590.
- Heinz, G.H., S.D. Hazeltine, R.J. Hall, and A.J. Krinitsky. 1980. Organochlorine and mercury residues in snakes from Pilot and Spider Islands, Lake Michigan – 1978. *Bulletin of Environmental Contamination and Toxicology* 25:738–743.
- Henderson, W.C., and E.A. Preble. 1935. 1885 – fiftieth anniversary notes – 1935: work and workers of the first twenty years. *The Survey* 16:59–65.
- Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington, D.C., USA.
- Hinton, T.G., P.D. Fledderman, J.E. Lovich, J.D. Congdon, and J.W. Gibbons. 1997. Radiographic determination of fecundity: Is the technique safe for developing turtle embryos? *Chelonian Conservation and Biology* 2:409–414.
- Hollowell, T. and R.P. Reynolds (Eds.). 2005. Checklist of the Terrestrial Vertebrates of the Guiana Shield. *Bulletin of the Biological Society of Washington*, No. 13.

- Holycross, A.H., C.W. Painter, D.B. Prival, D.E. Swann, M.J. Schroff, T. Edwards, and C.R. Schwalbe. 2002. Diet of *Crotalus lepidus klauberi* (Banded Rock Rattlesnake). *Journal of Herpetology* 36:589–597.
- Hossack, B.R., and P.S. Corn. 2007. Responses of pond-breeding amphibians to wildfire: short-term patterns in occupancy and colonization. *Ecological Applications* 17:1403–1410.
- Hossack, B.R., P.S. Corn, D.B. Fagre. 2006. Divergent patterns of abundance and age-class structure of headwater stream tadpoles in burned and unburned watersheds. *Canadian Journal of Zoology* 84:1482–1488.
- Hossack, B.R., M.J. Adams, E.H.C. Grant, C.A. Pearl, J.B. Bettaso, W.J. Barichivich, W.H. Lowe, K. True, J.L. Ware, and P.S. Corn. 2010. Low prevalence of chytrid fungus (*Batrachochytrium dendrobatidis*) in amphibians of U.S. headwater streams. *Journal of Herpetology* 44:253–260.
- Houlahan, J.E., C.S. Findlay, B.R. Schmidt, A.H. Meyer, and S.L. Kuzmin. 2000. Quantitative evidence for global amphibian population declines. *Nature* 404:752–755.
- Jennings, M.R. 1995. Native ranid frogs in California. Pp. 131–134 *In* Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems. LaRoe, E.T., G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac (Eds.). USDI National Biological Service Report.
- Jennings, M.R., and M.P. Hayes. 1994a. Decline of native ranid frogs in the desert Southwest. Pp. 183–211 *In* Herpetology of the North American Deserts: Proceedings of a Symposium. Brown, P.R., and J.W. Wright (Eds.). Southwestern Herpetologists Society, Special Publication Number 5.
- Jennings, M.R., and M.P. Hayes. 1994b. Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game Final Report.
- Jennings, R.D., and N.J. Scott, Jr. 1993. Ecologically correlated morphological variation in tadpoles of the leopard frog, *Rana chiricahuensis*. *Journal of Herpetology* 27:285–293.
- Johnson, S.A., and W.J. Barichivich. 2004. A simple technique for trapping *Siren lacertina*, *Amphiuma means*, and other aquatic vertebrates. *Journal of Freshwater Ecology* 19:263–269.
- Jones, K.B. 1990. Habitat use and predatory behavior of *Thamnophis cyrtopsis* (Serpentes: Colubridae) in a seasonally variable aquatic environment. *Southwestern Naturalist* 35:115–122.
- Jones, K.B., L.P. Kepner, and T.E. Martin. 1985. Species of reptiles associated with habitat islands in western Arizona: a deterministic assemblage. *Oecologia* 66:595–601.
- Jones, K.B., T.E. Slonecker, M.S. Nash, A.C. Neale, T.G. Wade, and S. Hamann. 2010. Riparian habitat changes across the continental United States (1972–2003) and potential implications for sustaining ecosystem services. *Landscape Ecology* 25:1261–1275.
- Jung, R.E., S. Droege, J.R. Sauer, and R. Landy. 2000. Evaluation of terrestrial and streamside salamander monitoring techniques at Shenandoah National Park. *Environmental Monitoring and Assessment* 63:65–79.
- Jung, R.E., G.H. Dayton, S.J. Williamson, J.R. Sauer, and S. Droege. 2002a. An evaluation of population index and estimation techniques for tadpoles in desert pools. *Journal of Herpetology* 36:465–472.
- Jung, R.E., K.E. Bonine, M.L. Rosenshield, A. de la Reza, S. Raimondo, and S. Droege. 2002b. Evaluation of canoe surveys for anurans along the Rio Grande in Big Bend National Park, Texas. *Journal of Herpetology* 36:390–397.
- Jung, R.E., J.A. Royle, J.R. Sauer, C. Addison, R.D. Rau, J.L. Shirk, and J.C. Whissel. 2005. Estimation of stream salamander (Plethodontidae, Desmognathinae and Plethodontinae) populations in Shenandoah National Park. *Alytes* 22:72–84.
- Karasov, W.H., R.E. Jung, S. Vanden Langenberg, and T.L.E. Bergeson. 2005. Field exposure of frog embryos and tadpoles along a pollution gradient in the Fox River and Green Bay ecosystem in Wisconsin, USA. *Environmental Toxicology* 24:942–953.
- Karraker, N.E., D.S. Pilliod, E.L. Bull, P.S. Corn, L.V. Diller, L.A. Dupuis, M.P. Hayes, B.R. Hossack, G.R. Hodgson, E.J. Hyde, K. Lohman, B.R. Norman, L.M. Ollivier, C.A. Pearl, and C.R. Peterson. 2006. Taxonomic variation in oviposition by tailed frogs (*Ascaphus* spp.). *Northwestern Naturalist* 87:87–97.
- Keogh, J.S., D.L. Edwards, R.N. Fisher, and P.S. Harlow. 2008. Molecular and morphological analysis of the critically endangered Fijian iguanas reveals cryptic diversity and a complex biogeographic history. *Philosophical Transactions of the Royal Society B* 363:3413–3426.
- King, F.W., A.L. Aquino, N.J. Scott, Jr., and R. Palacios. 1994. Status of the crocodylians of Paraguay: results of the 1993 monitoring surveys. Pp. 162–198 *In* Crocodiles: Proceedings of the 12th Working Meeting of the Crocodile Specialist Group of the Species Survival Commission of the IUCN, Pattaya, Thailand, 2–6 May, 1994. Volume II.
- Kizirian, D.A., and R.W. McDiarmid. 1998. A new species of *Bachia* (Squamata: Gymnophthalmidae) with plesiomorphic limb morphology. *Herpetologica* 54:245–253.
- Knapp, R.A., P.S. Corn, and D.E. Schindler. 2001. The introduction of nonnative fish into wilderness lakes: good intentions, conflicting mandates, and unintended consequences. *Ecosystems* 4:275–278.
- Knutson, M.G., W.B. Richardson, D.M. Reineke, B.R. Gray, S.E. Parmelee, Jr., and S.E. Weick. 2004.

- Agricultural ponds support amphibian populations. *Ecological Applications* 14:669–684.
- Kristan, W.B., III, and W.I. Boarman. 2003. Spatial patterns of risk of common raven predation on Desert Tortoises. *Ecology* 84:2432–2443.
- Kwiatkowski, M.W., G.W. Schuett, R.A. Repp, E.M. Nowak, and B.K. Sullivan. 2008. Does urbanization influence the spatial ecology of Gila Monsters in the Sonoran Desert? *Journal of Zoology* 276:350–357.
- Langtimm, C.A., C.K. Dodd, Jr., and R. Franz. 1996. Estimates of abundance of box turtles (*Terrapene carolina bauri*) on a Florida island. *Herpetologica* 52:496–504.
- Leaché, A.D., M.S. Koo, C.L. Spencer, T.J. Papenfuss, R.N. Fisher, and J.A. McGuire. 2009. Quantifying ecological, morphological, and genetic variation to delimit species in the Coast Horned Lizard species complex (*Phrynosoma*). *Proceedings of the National Academy of Sciences, USA*. 106:12418–12423.
- Lovich, J.E. 1994. Biodiversity and zoogeography of non-marine turtles in Southeast Asia. Pp. 380–391 *In* Biological Diversity: Problems and Challenges. Majumdar, S.K., D.J. Brenner, J.E. Lovich, and J.F. Schalles (Eds.). Pennsylvania Academy of Sciences, Easton, Pennsylvania, USA.
- Lovich, J.E. 2000. *Pennisetum setaceum* Forsskal. Pp. 258–262 *In* Invasive Plants of California's Wildlands. Bossard, C.C., J.M. Randall, and M.C. Hoshovsky (Eds.). University of California Press, Berkeley, California, USA.
- Lovich, J.E., and D. Bainbridge. 1999. Anthropogenic degradation of the southern California desert ecosystem and prospects for natural recovery and restoration. *Environmental Management* 24:309–326.
- Lovich, J.E. and K.R. Beaman. 2007. A history of Gila Monster (*Heloderma suspectum cinctum*) records from California with comments on factors affecting their distribution. *Bulletin of the Southern California Academy of Science* 106:39–58.
- Lovich, J. E. and R. Daniels. 2000. Environmental characteristics of Desert Tortoise (*Gopherus agassizii*) burrow locations in an altered industrial landscape. *Chelonian Conservation and Biology* 3:714–721.
- Lovich, J.E., and R.G. de Gouvenain. 1998. Saltcedar invasion in desert wetlands of the Southwestern United States: ecological and political implications. Pp. 447–467 *In* Ecology of Wetlands and Associated Systems. Majumdar, S.K., E.W. Miller, and F.J. Brenner (Eds.). Pennsylvania Academy of Science, Easton, Pennsylvania, USA.
- Lovich, J.E. and J.R. Ennen. 2011. Wildlife conservation and solar energy development in the Desert Southwest United States. *BioScience* 61:982–992.
- Lovich, J.E., and J.W. Gibbons. 1990. Age at maturity influences adult sex ratio in the turtle *Malaclemys terrapin*. *Oikos* 59:126–134.
- Lovich, J.E., and J.W. Gibbons. 1992. A review of techniques for quantifying sexual size dimorphism. *Growth, Development and Aging* 56:269–281.
- Lovich, J.E., and C.J. McCoy. 1992. Review of the *Graptemys pulchra* group (Reptilia, Testudines, Emydidae), with descriptions of two new species. *Annals of Carnegie Museum* 61:293–315.
- Lovich, J.E. and T.S. Melis. 2007. The state of the Colorado River ecosystem in Grand Canyon: lessons from 10 years of adaptive ecosystem management. *International Journal of River Basin Management* 5:207–221.
- Lovich, J.E., and K. Meyer. 2002. The Western Pond Turtle (*Clemmys marmorata*) in the Mojave River, California, USA: highly adapted survivor or tenuous relict? *Journal of Zoology* 256:537–545.
- Lovich, J.E. and N. Scott. 2004. Herpetology in the USGS. People, Land and Water (U.S. Department of the Interior news magazine). March issue, 10:35.
- Lovich, J.E., D.W. Herman, and K.M. Fahey. 1992. Seasonal activity and movements of Bog Turtles (*Clemmys muhlenbergii*) in North Carolina. *Copeia* 1992:1107–1111.
- Lovich, J.E., J.R. Ennen, S.V. Madrak, and B. Grover. 2011a. Turtles, culverts and alternative energy development: an unreported but potentially significant mortality threat to the Desert Tortoise (*Gopherus agassizii*). *Chelonian Conservation and Biology* 10:124–129.
- Lovich, J.E., C.H. Ernst, R.T. Zappalorti, and D.W. Herman. 1998. Geographic variation in growth and sexual size dimorphism of Bog Turtles (*Clemmys muhlenbergii*). *American Midland Naturalist* 139:69–78.
- Lovich, J.E., A.F. Laemmerzahl, C.H. Ernst, and J.F. McBreen. 1991. Relationships among turtles of the genus *Clemmys* (Reptilia: Testudines: Emydidae) as suggested by plastron scute morphology. *Zoologica Scripta* 20:425–429.
- Lovich, J.E., M. Znari, M. Abdeljalil Ait Baamrane, M. Naimi, and A. Mostalij. 2010a. Biphasic geographic variation in sexual size dimorphism of turtle (*Mauremys leprosa*) populations along an environmental gradient in Morocco. *Chelonian Conservation and Biology* 9:45–53.
- Lovich, J.E., S.W. Gotte, C.H. Ernst, J. Harshbarger, A.F. Laemmerzahl, and J.W. Gibbons. 1996. Prevalence and histopathology of shell disease in turtles from Lake Blackshear, Georgia. *Journal of Wildlife Diseases* 32:259–265.
- Lovich, J.E., C. Drost, A.J. Monatesti, D. Casper, D. Wood, and M. Girard. 2010b. New reptilian prey items for the Sonora Mud Turtle (*Kinosternon sonoriense*) with a brief review of saurophagy and ophiophagy in North American turtles. *Southwestern Naturalist* 55:135–138.

- Lovich, J.E., P. Medica, H. Avery, K. Meyer, G. Bowser, and A. Brown. 1999. Studies of reproductive output of the Desert Tortoise at Joshua Tree National Park, the Mojave National Preserve, and comparative sites. *Park Science* 19:22–24.
- Lovich, J.E., J.R. Ennen, S. Madrak, K. Meyer, C. Loughran, C. Bjurlin, T. Arundel, W. Turner, C. Jones, and G.M. Groenendaal. 2011b. Effects of wind energy production on growth, demography and survivorship of a Desert Tortoise (*Gopherus agassizii*) population in southern California with comparisons to natural populations. *Herpetological Conservation and Biology* 6:161–174.
- Lowe, C.H., C.R. Schwalbe, and T.B. Johnson. 1986. The Venomous Reptiles of Arizona. Arizona Game and Fish Department, Phoenix, Arizona, USA.
- Luckenbach, R.A., and R.B. Bury. 1983. Effects of off-road vehicles on the biota of the Algodones Dunes, Imperial County, California. *Journal of Applied Ecology* 20:265–286.
- MacCulloch, R.D., A. Lathrop, R.P. Reynolds, J.C. Señaris and G.E. Schneider. 2007. Herpetofauna of Mount Roraima, Guiana Shield region, northeastern South America. *Herpetological Review* 38:24–30.
- MacKenzie, D.I., J.D. Nichols, J.A. Royle, K.H. Pollock, L.L. Bailey, and J.E. Hines. 2006. *Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence*. Academic Press, San Diego, California, USA.
- Majumdar, S.K., D.J. Brenner, J.E. Lovich, and J.F. Schalles (Eds.). 1994. *Biological Diversity: Problems and Challenges*. Pennsylvania Academy of Science, Easton, Pennsylvania, USA.
- Mazzotti, F.J., M.S. Cherkis, K.M. Hart, S. Snow, M.R. Rochford, M.E. Dorcas, and R. Reed. 2010. Cold induced mortality of invasive Burmese Pythons in south Florida. *Biological Invasions*. DOI 10.1007/s10530-010-9797-5.
- McCoid, M.J., G.H. Rodda, R.A. Hensley, and T.H. Fritts. 1995. Habitat selection by *Cryptoblepharus poecilopleurus* (Scincidae) in the Mariana Islands. *Micronesica* 28:103–108.
- McCoy, E.D., and K. Berry. 2008. Using an ecological ethics framework to make decisions about the relocation of wildlife. *Science and Engineering Ethics* 14:505–521.
- McCranie, J.R., L.D. Wilson, and S.W. Gotte. 2001. Three new country records for Honduran snakes. *Herpetological Review* 32:62–63.
- McDiarmid, R.W., and R. Altig. 1990. Description of a bufonid and two hyloid tadpoles from western Ecuador. *Alytes* 8:51–60.
- McDiarmid, R.W., and R. Altig (Eds.). 1999. *Tadpoles: The Biology of Anuran Larvae*. University of Chicago Press, Chicago, Illinois, USA.
- McDiarmid, R.W., and M.A. Donnelly. 2005. The herpetofauna of the Guayana Highlands: amphibians and reptiles of the Lost World. Pp. 461–560 *In Ecology and Evolution in the Tropics: A Herpetological Perspective*. Donnelly, M.A., B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (Eds.). University of Chicago Press, Chicago, Illinois, USA.
- McDiarmid, R.W., and M.S. Foster. 1981. Breeding habits of the toad *Bufo coccifer* in Costa Rica, with a description of the tadpole. *Southwestern Naturalist* 26:353–363.
- McDiarmid, R.W., and S. Gorzula. 1989. Aspects of the reproductive ecology and behavior of the tepui toads, genus *Oreophrynella* (Anura: Bufonidae). *Copeia* 1989:445–451.
- McDiarmid, R.W. and J.M. Savage. 2005. The herpetofauna of the Rincón area, Peninsula de Osa, Costa Rica, a Central American lowland evergreen forest site. Pp. 366–427 *In Ecology and Evolution in the Tropics: A Herpetological Perspective*. Donnelly, M.A., B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (Eds.). University of Chicago Press, Chicago, Illinois, USA.
- McDiarmid, R.W., J.A. Campbell, and T.A. Touré. 1999. *Snake Species of the World: A Taxonomic and Geographic Reference*. Volume 1. Herpetologists' League, Washington, D.C., USA.
- McDiarmid, R.W., R.B. Coccoft, and A. Paolillo. 1988. Preliminary field report: herpetology collections-Cerro de la Neblina. Pp. 665–670 *In Cerro de la Neblina: Resultados de la Expedición 1983–1987*. Brewer-Carias, C. (Ed.). Fundación para el Desarrollo del Comercio Internacional, Caracas, Venezuela.
- McDiarmid, R.W., M.S. Foster, C. Guyer, J.W. Gibbons, and N. Chernoff (Eds.). 2012. *Reptile Biodiversity: Standard Methods for Inventory and Monitoring*. University of California Press, Berkeley, California, USA.
- Medica, P.A., R.B. Bury, and F.B. Turner. 1975. Growth of the Desert Tortoise (*Gopherus agassizii*) in Nevada. *Copeia* 1975:639–643.
- Merriam, C.H. 1890. Results of a biological survey of the San Francisco mountain region and the desert of the Little Colorado, Arizona. *North American Fauna* 3:1–113.
- Middendorf, G. and R. Reynolds. 2000. Herpetofauna of the Beni Biological Station Biosphere Reserve, Amazonian Bolivia: additional information, and current knowledge in context. Pp. 151–169 *In Biodiversidad, Conservación y Manejo en la Región de la Reserva de la Biosfera Estación Biológica del Beni, Bolivia/Biodiversity, Conservation and Management in the Region of the Beni Biological Station Biosphere Reserve, Bolivia*. Herrera-MacBryde, O., F. Dallmeier, B. MacBryde, J.A.

Herpetological Conservation and Biology

- Cominsky and C. Miranda (Eds.). SI/MAB Series No. 4, Smithsonian Institution, Washington, D.C.
- Mills, T.J., D.R. McEwan, and M.R. Jennings. 1996. California Salmon and Steelhead: beyond the crossroads. Pp. 91–111 *In* Pacific Salmon and Their Ecosystems: Status and Future. Stouder, D.J., P.A. Bisson, R.J. Naiman, and M.G. Duke (Eds.). Chapman and Hall, New York, New York, USA.
- Mitchell, J.C., and R.E. Lovich. 2010. Prominent herpetologists from the United States armed services. Natural Selections, Department of Defense Legacy Resource Management Program 6:20–24. Available at: https://www.dodlegacy.org/Legacy/News/PrevYearsNewsletters/NaturalSelections_April2010.pdf. (Accessed 17 April 2012).
- Mitchell, J.C., R.E. Jung Brown, and B. Bartholomew (Eds.). 2008. Urban Herpetology. Herpetological Conservation 3. Society for the Study of Amphibians and Reptiles, Salt Lake City, Utah, USA.
- Morales, V.R. and R.W. McDiarmid. 1996. Annotated checklist of the amphibians and reptiles of Pakitza, Manu National Park, Reserve Zone, with comments on the herpetofauna of Madre de Dios, Peru. Pp. 503–522 *In* MANU: The Biodiversity of Southeastern Peru. Wilson, D.E., and A. Sandoval (Eds.). Smithsonian Institution and Editorial Horizonte, Lima, Peru.
- Morales, V.R., and R.W. McDiarmid. 2009. A new species of *Chiasmocleis* (Anura: Microhylidae) from southern Amazonian Peru with comments on some other microhylids. *Biotempo* 9:71–76.
- Motte, M., K. Nuñez, P. Cacciali, F. Brusquetti, N. Scott, and A.L. Aquino. 2009. Categorización del estado de conservación de los anfibios y reptiles de Paraguay. *Cuadernos de Herpetología* 23:5–18.
- Murphy, M.A., R. Dezzani, D.S. Pilliod, and A. Storfer. 2010. Landscape genetics of high mountain frog metapopulations. *Molecular Ecology* 19:3634–3649.
- Murphy, R.W., K.H. Berry, T. Edwards, and A.M. McLuckie. 2007. A genetic assessment of the recovery units for the Mojave population of the Desert Tortoise, *Gopherus agassizii*. *Chelonian Conservation and Biology* 6:229–251.
- Murphy, R.W., K.H. Berry, T. Edwards, A.E. Leviton, A. Lathrop, and J.D. Riedle. 2011. The dazed and confused identity of Agassiz's land tortoise, *Gopherus agassizii*, the description of a new species, and its consequences for conservation. *ZooKeys* 113:39–71.
- Muths, E., and V.J. Dreitz. 2008. Designing monitoring programs to assess reintroduction efforts: a critical component in recovery. *Animal Biodiversity and Conservation* 31:47–56.
- Muths, E., D.S. Pilliod, and L. Livo. 2008. Distribution and environmental limitations of an amphibian pathogen in the Rocky Mountains, USA. *Biological Conservation* 141:1484–1492.
- Muths E., R.D. Scherer, and B.R. Lambert. 2010. Unbiased survival estimates and evidence for skipped breeding opportunities in females. *Methods in Ecology & Evolution* 1:123–130.
- Muths, E., P.S. Corn, A.P. Pessier, and D.E. Green. 2003. Evidence for disease-related amphibian decline in Colorado. *Biological Conservation* 110: 357–365.
- Muths E., R.D. Scherer, P.S. Corn, and B.R. Lambert. 2006. Estimation of the probability of male toads to return to the breeding site. *Ecology* 87:1048–1056.
- Muths, E., R.E. Jung, L. Bailey, M.J. Adams, P.S. Corn, C.K. Dodd, Jr., G. Fellers, W.J. Sadinski, C. Schwalbe, S. Walls, R.N. Fisher, A.L. Gallant, W.A. Battaglin, and D.E. Green. 2005. The U.S. Department of Interior's Amphibian Research and Monitoring Initiative (ARMI): a successful start to a national program. *Applied Herpetology* 2:355–371.
- Myers, C.W. 2000. A history of herpetology at the American Museum of Natural History. *Bulletin of the American Museum of Natural History* 252:1–232.
- Myers, C.W., E.E. Williams, and R.W. McDiarmid. 1993. A new anoline lizard (*Phenacosaurus*) from the highlands of Cerro de la Neblina, southern Venezuela. *American Museum Novitates* 3070:1–15.
- Nicolai, N.C. and J.E. Lovich. 2000. Preliminary observations of the behavior of male Flat-tailed Horned Lizards before and after an off-highway vehicle race in California. *California Fish and Game* 86:208–212.
- Nowak, E.M., T. Hare, and J. McNally. 2002. Management of "nuisance" vipers: Effects of translocation on Western Diamondback Rattlesnakes (*Crotalus atrox*). Pp. 533–560 *In* Biology of the Vipers. Schuett, G.W., M. Höggren, M.E. Douglas, and H.W. Greene (Eds.). Eagle Mountain Publishing, Eagle Mountain, Utah, USA.
- Nowak, E.M., T. Theimer, and G.W. Schuett. 2008. Functional and numerical responses of predators: Where do vipers fit in the traditional paradigms? *Biological Reviews* 83:601–620.
- Nussear, K.E., and C.R. Tracy. 2007. Can modeling improve estimation of Desert Tortoise population densities? *Ecological Applications* 17:579–586.
- Nussear, K.E., E.T. Simandle, and C.R. Tracy. 2000. Misconceptions about colour, infrared radiation, and energy exchange between animals and their environments. *Herpetological Journal* 10:119–122.
- Nussear, K.E., T.C. Esque, D.F. Haines, and C.R. Tracy. 2007. Desert Tortoise hibernation: temperatures, timing, and environment. *Copeia* 2007:378–386.
- Nussear, K.E., T.C. Esque, R.D. Inman, L. Gass, K.A. Thomas, C.S.A. Wallace, J.B. Blainey, D.M. Miller, and R.H. Webb. 2009. Modeling habitat of the Desert Tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah,

- and Arizona. US Geological Survey Open-File Report 2009–1102.
- Oláh-Hemmings, V., J.R. Jaeger, M.J. Sredl, M.A. Schlaepfer, R.D. Jennings, C.A. Drost, D.F. Bradford, and B.R. Riddle. 2010. Phylogeography of declining Relict and Lowland Leopard Frogs in the desert Southwest of North America. *Journal of Zoology* 280:343–354.
- Olson, D.H., W.P. Leonard, and R.B. Bury (Eds.). 1997. Sampling Amphibians in Lentic Habitats: Methods and Approaches for the Pacific Northwest (Northwest Fauna 4). Society for Northwestern Vertebrate Biology, Olympia, Washington, USA.
- Opdam, P., S. Luque, and K.B. Jones. 2009. Changing landscapes to accommodate for climate change impacts: a call for landscape ecology. *Landscape Ecology* 24:715–721.
- Padial, J.M., R.W. McDiarmid, and I. De la Riva. 2006a. Distribution and morphological variation of *Eleutherodactylus mercedesae* Lynch & McDiarmid, 1987 (Amphibia, Anura, Leptodactylidae) with first record for Peru. *Zootaxa* 1278:49–56.
- Padial, J.M., S. Riechle, R.W. McDiarmid, and I. De la Riva. 2006b. A new species of arboreal toad (Anura: Bufonidae: *Chaunus*) from Madidi National Park, Bolivia. *Zootaxa* 1278:57–68.
- Palen, W.J., D.E. Schindler, M.J. Adams, C.A. Pearl, R.B. Bury, and S.A. Diamond. 2002. Optical characteristics of natural waters protect amphibian populations from UV-B in the U.S. Pacific Northwest. *Ecology* 83:2951–2957.
- Pearl, C.A., M.J. Adams, R.B. Bury, and B. McCreary. 2004. Asymmetrical effects of introduced Bullfrogs *Rana catesbeiana* on native ranid frogs in Oregon, USA. *Copeia* 2004:11–20.
- Pearl, C.A., M.J. Adams, N. Leuthold, and R.B. Bury. 2005. Amphibian occurrence and aquatic invaders in a changing landscape: implications for wetland mitigation in the Willamette Valley, Oregon. *Wetlands* 25:76–88.
- Pearl, C.A., M.J. Adams, G.S. Schuytema, and A.V. Nebeker. 2003. Behavioral responses of anuran larvae to chemical cues of native and introduced predators in the Pacific Northwestern United States. *Journal of Herpetology* 37:572–576.
- Pearl, C.A., M.J. Adams, R.B. Bury, W.H. Wentz, and B. McCreary. 2009. Evaluating amphibian declines with site revisits and occupancy models: status of montane anurans in the Pacific Northwest, USA. *Diversity* 1:166–181.
- Pearl, C.A., E.L. Bull, D.E. Green, J. Bowerman, M.J. Adams, A. Hyatt, and W.H. Wentz. 2007. Occurrence of the amphibian pathogen *Batrachochytrium dendrobatidis* in the Pacific Northwest. *Journal of Herpetology* 41:145–149.
- Perry, G., G.H. Rodda, T.H. Fritts, and T.R. Sharp. 1998. The lizard fauna of Guam's fringing islets: island biogeography, phylogenetic history, and conservation implications. *Global Ecology and Biogeography Letters* 7:353–365.
- Perry, G., B.W. Buchanan, R.N. Fisher, M. Salmon, and S.E. Wise. 2008. Effects of artificial night lighting on reptiles and amphibians in urban environments. Pp. 239–256 *In* *Urban Herpetology*. Mitchell, J.C., R.E. Jung Brown, and B. Bartholomew (Eds.). Herpetological Conservation 3. Society for the Study of Amphibians and Reptiles, Salt Lake City, Utah, USA.
- Persons, T.B., E.M. Nowak, and D. Mikesic. 2008. Overview of herpetofauna inventories in southern Colorado Plateau National Parks. Pp. 197–218 *In* *Proceedings of the 8th Biennial Conference of Research on the Colorado Plateau*. van Riper, C., III, and M. Sogge (Eds.). University of Arizona Press, Tucson, Arizona, USA.
- Petrisko, J.E., C.A. Pearl, D.S. Pilliod, P.P. Sheridan, C.F. Williams, C.R. Peterson, and R.B. Bury. 2008. Saprolegniaceae identified on amphibian eggs throughout the Pacific Northwest, USA, by internal transcribed spacer sequences and phylogenetic analysis. *Mycologia* 100:171–180.
- Pierson, E.D., and G.M. Fellers. 1998. Distribution and ecology of the Big-Eared Bat, *Corynorhinus (=Plecotus) townsendii*. U.S. Geological Survey Species at Risk Report.
- Pilliod, D.S., and C.R. Peterson. 2001. Local and landscape effects of introduced trout on amphibians in historically fishless watersheds. *Ecosystems* 4:322–333.
- Pilliod, D.S., and E. Wind (Eds.). 2008. Habitat Management Guidelines for Amphibians and Reptiles of the Northwestern United States and Western Canada. Partners in Amphibian and Reptile Conservation Technical Publication HMG-4.
- Pilliod, D.S., C.R. Peterson, and P.I. Ritson. 2002. Seasonal migration of Columbia Spotted Frogs (*Rana luteiventris*) among complementary resources in a high mountain basin. *Canadian Journal of Zoology* 80:1849–1862.
- Pilliod, D.S., R.B. Bury, E.J. Hyde, C.A. Pearl, and P.S. Corn. 2003. Fire and amphibians in North America. *Forest Ecology and Management* 178:163–181.
- Pilliod, D.S., B.R. Hossack, P.F. Bahls, E.L. Bull, P.S. Corn, G. Hokit, B.A. Maxell, J.C. Munger, and A. Wyrick. 2010a. Nonnative salmonids affect amphibian occupancy at multiple spatial scales. *Diversity and Distributions* 16:959–974.
- Pilliod, D.S., E. Muths, R. Scherer, P.E. Bartelt, P.S. Corn, B.A. Hossack, B. Lambert, R. McCaffrey, and C. Gaughan. 2010b. Effects of amphibian chytrid

Herpetological Conservation and Biology

- fungus on individual survival probability in wild Boreal Toads. *Conservation Biology* 24:1259–1267.
- Pouyat, R.V., K.C. Weathers, R. Hauber, G.M. Lovett, A. Bartuska, L. Christenson, J.L.D. Davis, S.E.G. Findlay, H. Menninger, E. Rosi-Marshall, P. Stine, and N. Lymn. 2010. The role of federal agencies in the application of scientific knowledge. *Frontiers in Ecology and the Environment* 8:322–328.
- Ramotnik, C. 2005. *Aneides hardii* (Taylor, 1941): Sacramento Mountain Salamander. Pp. 661–662 *In* Amphibian Declines: The Conservation Status of United States Species. Lannoo, M. (Ed.). University of California Press, Berkeley, California, USA.
- Ramotnik, C.A., and N.J. Scott, Jr. 1988. Habitat requirements of New Mexico's endangered salamanders. Pp. 54–63 *In* Management of Amphibians, Reptiles, and Small Mammals in North America. Szaro, R.C., K.E. Severson, and D.R. Patton (Tech. Eds.). USDA Forest Service General Technical Report RM-166.
- Rathbun, G.B. 2009. Why is there discordant diversity in sengi (Mammalia: Afrotheria: Macroscelidea) taxonomy and ecology? *African Journal of Ecology* 47:1–13.
- Rathbun, G.B., N.J. Scott, Jr., and T.G. Murphey. 2002. Terrestrial habitat use by Pacific Pond Turtles in a Mediterranean climate. *Southwestern Naturalist* 47:225–235.
- Reed, R.N. 2005. An ecological risk assessment of non-native boas and pythons as potential invasive species in the United States. *Risk Analysis* 25:753–766.
- Reed, R.N., and M.E. Douglas. 2002. Ecology of the Grand Canyon Rattlesnake, *Crotalus viridis abyssus*, in the Little Colorado River Canyon. *Southwestern Naturalist* 47:30–39.
- Reed, R.N., and J.W. Gibbons. 2003. Conservation Status of Live United States Nonmarine Turtles in Domestic and International Trade. U.S. Fish and Wildlife Service Division of Scientific Authority Report.
- Reed, R.N., and G.H. Rodda. 2009. Giant constrictors: biological and management profiles and an establishment risk assessment for nine large species of pythons, anacondas, and the Boa Constrictor. U.S. Geological Survey Open-File Report 2009-1202.
- Reed, R.N., and R. Shine. 2002. Lying in wait for extinction: ecological predictors of conservation status among Australian elapid snakes. *Conservation Biology* 16:451–461.
- Reed, R.N., K.L. Krysko, R.W. Snow, and G.H. Rodda. 2010. Is the Northern African Python (*Python sebae*) established in southern Florida? *Reptiles and Amphibians* 17:52–54.
- Reed, R.N., S.M. Boback, C.E. Montgomery, S. Green, Z. Stevens, and D. Watson. 2007. Ecology and Conservation of an Exploited Insular-endemic Population of *Boa constrictor* (Squamata: Boidae) in the Cayos Cochinos, Honduras. Pp. 388–404 *In* Biology of the Boas and Pythons. Henderson, R.W., and R. Powell (Eds.). Eagle Mountain Publishing, Eagle Mountain, Utah, USA.
- Reynolds, R.P. 1982. Seasonal incidence of snakes in northeastern Chihuahua, Mexico. *The Southwestern Naturalist* 27:161–166.
- Reynolds, R.P. 1990. Geographical distribution: *Phrynops geoffroanus tuberosus* (Geoffroy's Sideneck Turtle). *Herpetological Review* 21:40.
- Reynolds, R.P., and M.S. Foster. 1991. Four new species of frogs and one new species of snake from the Chapare Region of Bolivia. *Herpetological Monographs* 5:83–104.
- Reynolds, R.P. and J. Icochea M. 1997. Amphibians and reptiles of the upper Rio Comainas, Cordillera del Condor. Pp. 82–86, 202–206 *In* The Cordillera del Cóndor region of Ecuador and Peru: A Biological Assessment. Schulenberg, T.S., and K. Awbrey (Eds.). Rapid Assessment Working Paper No. 7, Conservation International, Washington, D. C.
- Reynolds, R.P., and G.V. Pickwell. 1984. Records of the yellow-bellied sea snake, *Pelamis platurus*, from the Galápagos Islands. *Copeia* 1984:786–789.
- Reynolds, R.P., and N.J. Scott, Jr. 1982. Use of a mammalian resource by a Chihuahuan snake community. Pp. 99–118, *In* Herpetological Communities. Scott, N.J., Jr. (Ed.). U.S. Fish and Wildlife Service, Wildlife Research Reports 13.
- Reynolds, R.P., S.W. Gotte, and C.H. Ernst. 2007. Catalog of Type Specimens of Recent Crocodylia and Testudines in the National Museum of Natural History, Smithsonian Institution. Smithsonian Contributions to Zoology 626. Smithsonian Institution Scholarly Press, Washington, DC, USA.
- Reynolds, R., T. Fritts, S. Gotte, J. Icochea, and G. Tello. 1997. Amphibians and reptiles I: Biodiversity assessment in the Lower Urubamba region. Pp. 213–221 *In* Biodiversity Assessment and Long-Term Monitoring, Lower Urubamba Region, San Martin-3 and Cashiriari-2 Well Sites, Dallmeier, F., and A. Alonso (Eds.). SI/MAB Series # 1. Smithsonian Institution/MAB Biodiversity Program, Washington, D.C.
- Reynolds, R., R. MacCulloch, M. Tamessar, C. Watson, C.J. Cole, and C. Townsend. 2001. Preliminary checklist of the herpetofauna of Guyana. Available at: <http://botany.si.edu/bdg/guyherps.html>. (Accessed 17 April 2012).
- Riley, S.P.D., G.T. Busteed, L.B. Kats, T.L. Vandergon, L.F.S. Lee, R.G. Dagit, J.L. Kerby, R.N. Fisher, and R.M. Sauvajot. 2005. Effects of urbanization on the distribution and abundance of amphibians and invasive species in southern California streams. *Conservation Biology* 19:1894–1907.

- Rochester, C.J., C.S. Brehme, D.R. Clark, D.C. Stokes, S.A. Hathaway, and R.N. Fisher. 2010. Reptile and amphibian responses to large-scale wildfires in southern California. *Journal of Herpetology* 44:333–351.
- Rodda, G.H., and T.H. Fritts. 1992. The impact of the introduction of the Brown Tree Snake, *Boiga irregularis*, on Guam's lizards. *Journal of Herpetology* 26:166–174.
- Rodda, G.H., T.H. Fritts, and D. Chizar. 1997. The disappearance of Guam's wildlife: new insights for herpetology, evolutionary ecology, and conservation. *BioScience* 47:565–574.
- Rodda, G.H., T.H. Fritts, and P.J. Conry. 1992. Origin and population growth of The Brown Tree Snake, *Boiga irregularis*, on Guam. *Pacific Science* 46:46–57.
- Rodda, G.H., T.H. Fritts, G. Perry, and E.W. Campbell, Jr. 1998. Managing island biotas: Can indigenous species be protected from introduced predators such as the Brown Treesnake? *Transactions of the 63rd North American Wildlife and Natural Resources Conference* 1998:95–108.
- Rodda, G.H., Y. Sawai, D. Chizar, and H. Tanaka (Eds.). 1999. *Problem Snake Management: Habu and Brown Treesnake Examples*. Cornell University Press, Ithaca, New York, USA.
- Rodríguez-Robles, J.A., D.A. Good, and D.B. Wake. 2003. *Brief History of Herpetology in the Museum of Vertebrate Zoology, University of California, Berkeley, with a List of Type Specimens of Recent Amphibians and Reptiles*. University of California Publications in Zoology. Volume 131. University of California Press, Berkeley, California, USA.
- Romero Martínez, O. (Ed.). 1996. *Colecciones de Flora y Fauna del Museo Nacional de Historia Natural del Paraguay*. Ministerio de Agricultura y Ganadería, Asunción, Paraguay.
- Rosen, P.C., C.R. Schwalbe, D.A. Parizek, P.A. Holm, and C.H. Lowe. 1995. Introduced aquatic vertebrates in the Chiricahua region: effects on declining native ranid frogs. Pp. 251–261 *In* *Biodiversity and Management of the Madrean Archipelago: The Sky Islands of Southwestern United States and Northwestern Mexico*. DeBano, L.F., P.F. Ffolliott, A. Ortega-Rubio, G.J. Gottfried, R.H. Hamre, and C.B. Edminster (Tech. Eds.). USDA Forest Service General Technical Report RM-GTR-264.
- Savage, J.M. and R.W. McDiarmid. 1992. Rediscovery of the Central American colubrid snake, *Sibon argus*, with comments on related species from the region. *Copeia* 1992:421–432.
- Scherer, R.D. 2008. Detection of Wood Frog egg masses and implications for amphibian monitoring programs. *Copeia* 2008:669–672.
- Scherer, R.D., E. Muths, and B.A. Lambert. 2008. The effects of weather on survival in populations of Boreal Toads in Colorado. *Journal of Herpetology* 42:508–517.
- Scherer, R.D., E. Muths, B.R. Noon, and P.S. Corn. 2005. An evaluation of weather and disease as causes of decline in two populations of Boreal Toads. *Ecological Applications* 15:2150–2160.
- Schlaepfer, M.A., C. Hoover, and C.K. Dodd, Jr. 2005. Challenges in evaluating the impact of the trade in amphibians and reptiles on wild populations. *BioScience* 55:256–263.
- Schwalbe, C.R., and P.C. Rosen. 1988. Preliminary report on effect of Bullfrogs on wetland herpetofaunas in southeastern Arizona. Pp. 166–173 *In* *Management of Amphibians, Reptiles, and Small Mammals in North America. Proceedings of the Symposium, July 19–21, 1988, Flagstaff, Arizona*. Szaro, R.C., K.E. Severson, and D.R. Patton (Tech. Eds.). USDA Forest Service General Technical Report RM-166.
- Scott, N.J., Jr. (Ed.). 1982a. *Herpetological Communities: A Symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977*. U.S. Fish and Wildlife Service Wildlife Research Report 13.
- Scott, N.J., Jr. 1982b. The herpetofauna of forest litter plots from Cameroon. Pp. 145–150 *In* *Herpetological Communities: A Symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977*. Scott, N.J., Jr. (Ed.). U.S. Fish and Wildlife Service Wildlife Research Report 13.
- Scott, N.J., Jr. 1994. Complete species inventories. Pp. 78–84 *In* *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Scott, N.J., Jr. 1996. Evolution and management of the North American grassland herpetofauna. Pp. 40–53 *In* *Ecosystem Disturbance and Wildlife Conservation in Western Grasslands: A Symposium Proceedings*. Finch, D.M. (Ed.). USDA Forest Service General Technical Report RM-285.
- Scott, N.J., Jr., and A.L. Aquino. 2005. It's a frog-eat-frog world in the Paraguayan Chaco: food habits, anatomy, and behavior of the frog-eating anurans. Pp. 243–259 *In* *Ecology and Evolution in the Tropics: A Herpetological Perspective*. Donnelly, M.A., B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (Eds.). University of Chicago Press, Chicago, Illinois, USA.
- Scott, N.J., Jr., and R.D. Jennings. 1985. The tadpoles of five species of New Mexican leopard frogs. *Occasional Papers of the Museum of Southwestern Biology* 3:1–21.

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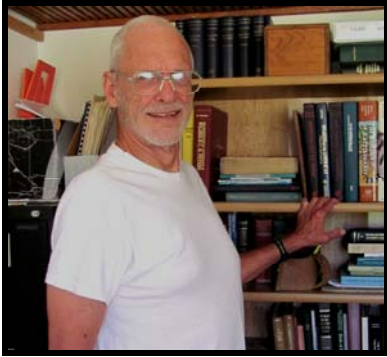
- Scott, N.J., Jr., and C.A. Ramotnik. 1992. Does the Sacramento Mountain Salamander require old-growth forests? Pp. 170–178 *In* Old-growth Forests in the Southwest and Rocky Mountain Regions. Kaufmann, M.R., W.H. Moir, and R.L. Bassett (Tech. Eds.). USDA Forest Service General Technical Report RM-213.
- Scott, N.J., Jr., and B.W. Woodward. 1994. Surveys at breeding sites. Pp. 118–130 *In* Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster (Eds.). Smithsonian Institution Press, Washington, D.C., USA.
- Scott, N.J., Jr., A.L. Aquino, and L.A. Fitzgerald. 1990. Distribution, habitats, and conservation of the caimans (Alligatoridae) of Paraguay. *Vida Silvestre Neotropical* 2:43–51.
- Scott, N.J., Jr., T.C. Maxwell, O.W. Thornton, Jr., and J.W. Flury. 1989. Distribution, habitat, and future of Harter's Water Snake, *Nerodia harteri*, in Texas. *Journal of Herpetology* 23:373–389.
- Scott, N.J., G.B. Rathbun, T.G. Murphey, and M.B. Harker. 2008. Reproduction of Pacific Pond Turtles (*Actinemys marmorata*) in coastal streams of central California. *Herpetological Conservation and Biology* 3:143–148.
- Scott, N.J., Jr., T.T. Struhsaker, K.L. Glander, and H. Chiriví. 1976. Primates and their habitats in northern Colombia with recommendations for future management and research. Pp. 30–50 *In* Proceedings of the First Inter-American Conference on Conservation and Utilization of American Nonhuman Primates in Biomedical Research, Lima, Perú. Anonymous (Ed.). Pan American Health Organization World Health Organization Scientific Publication 317.
- Scott, N.J., Jr., A.R. Giraud, G. Scrocchi, A.L. Aquino, P. Cacciali, and M. Motte. 2006. The genera *Boiruna* and *Clelia* (Serpentes: Pseudoboini) in Paraguay and Argentina. *Papéis Avulsos de Zoologia (São Paulo)* 46:77–105.
- Shaffer, H.B., G.M. Fellers, A. Magee, and S.R. Voss. 2000. The genetics of amphibian decline: population substructure and molecular differentiation in the Yosemite Toad, *Bufo canorus* (Anura, Bufonidae) based on SSCP and mtDNA sequence data. *Molecular Ecology* 9:245–257.
- Shaver, D.J., and J.E. Miller. 1999. Kemp's Ridley Sea Turtles return to Padre Island National Seashore. *Park Science* 19:16–17.
- Shine, R., R.N. Reed, S. Shetty, M. LeMaster, and R.T. Mason. 2002. Reproductive isolating mechanisms between two sympatric sibling species of sea-snakes. *Evolution* 56:1655–1662.
- Smith, C.R. 1982. Food resource partitioning of fossorial Florida reptiles. Pp. 173–178 *In* Herpetological Communities: A Symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977. Scott, N.J., Jr. (Ed.). U.S. Fish and Wildlife Service Wildlife Research Report 13.
- Smith, L.L., W.J. Barichivich, J.S. Staiger, K.G. Smith, and C.K. Dodd, Jr. 2006. Detection probabilities and site occupancy estimates for amphibians at Okefenokee National Wildlife Refuge. *American Midland Naturalist* 155:149–161.
- Sparling, D.W. and G.M. Fellers. 2007. Comparative toxicity of chlorpyrifos, diazinon, malathion and their oxon derivatives to *Rana boylei*. *Environmental Pollution* 147:535–539.
- Sparling, D.W. and G.M. Fellers. 2009. Toxicity of two insecticides to California, USA, anurans and its relevance to declining amphibian populations. *Environmental Toxicology and Chemistry* 28:1696–1703.
- Stejneger, L. 1893. Annotated list of the reptiles and batrachians collected by the Death Valley Expedition in 1891, with descriptions of new species. *North American Fauna* 7:159–228.
- Stickel, L.F. 1950. Populations and home range relationships of the box turtle: *Terrapene c. carolina* (Linnaeus). *Ecological Monographs* 20:351–378.
- Stickel, L.F. 1951. Wood Mouse and box turtle populations in an area treated annually with DDT for five years. *Journal of Wildlife Management* 15:161–164.
- Stickel, L.F. 1973. Pesticide residues in birds and mammals. Pp. 254–312 *In* Environmental Pollution by Pesticides. Edwards, C.A. (Ed.). Plenum Press, London, England.
- Stickel, L.F. 1978. Changes in a box turtle population during three decades. *Copeia* 1978:221–225.
- Stickel, L.F. 1989. Home range behavior among box turtles (*Terrapene c. carolina*) of a bottomland forest in Maryland. *Journal of Herpetology* 23:40–44.
- Stickel, L.F., and C.M. Bunck. 1989. Growth and morphometrics of the box turtle *Terrapene c. carolina*. *Journal of Herpetology* 23:216–223.
- Stickel, L.F., W.H. Stickel and F.C. Schmid. 1980. Ecology of a Maryland population of Black Rat Snakes (*Elaphe o. obsoleta*). *American Midland Naturalist* 103:1–14.
- Stickel, W.H. 1943. The Mexican snakes of the genera *Sonora* and *Chionactis* with notes on the status of other colubrid genera. *Proceedings of the Biological Society of Washington* 56:109–128.
- Stickel, W.H. 1951. Distinctions between the snake genera *Contia* and *Eirenis*. *Herpetologica* 7:125–131.
- Stickel, W.H. 1975. Some effects of pollutants in terrestrial ecosystems. Pp. 25–74 *In* Ecological Toxicology Research. McIntyre, A.D., and C.F. Mills (Eds.). Plenum Press, London, England.

- Stickel, W.H., and J.B. Cope. 1947. The home ranges and wanderings of snakes. *Copeia* 1947:127–136.
- Stuart, S.N., J.S. Chanson, N.A. Cox, B.E. Young, A.S.L. Rodrigues, D.L. Fischman, and R.W. Waller. 2004. Status and trends of amphibian declines and extinctions worldwide. *Science* 306:1783–1786.
- Swann, D.E., R.C. Averill-Murray, and C.R. Schwalbe. 2002. Distance sampling for Sonoran Desert Tortoises. *Journal of Wildlife Management* 66:960–975.
- Swift, C.C., T.R. Haglund, M. Ruiz, and R.N. Fisher. 1993. The status and distribution of the freshwater fishes of southern California. *Bulletin of the Southern California Academy of Sciences* 92:101–172.
- Thomas, R., R.W. McDiarmid, and F.G. Thompson. 1985. Three new species of thread snakes (Serpentes: Leptotyphlopidae) from Hispaniola. *Proceedings of the Biological Society of Washington* 98:204–220.
- Tracy, C.R., K.E. Nussear, T.C. Esque, K. Dean-Bradley, C.R. Tracy, L.A. DeFalco, K.T. Castle, L.C. Zimmerman, R.E. Espinoza, and A.M. Barber. 2006. The importance of physiological ecology in conservation biology. *Integrative and Comparative Biology* 46:1191–1205.
- Vandergast, A.G., S.A. Hathaway, R.N. Fisher, J. Boys, and A.J. Bohonak. 2008. Are hotspots of evolutionary potential adequately protected in southern California? *Biological Conservation* 141:1648–1664.
- Vertucci, F.A., and P.S. Corn. 1996. Evaluation of episodic acidification and amphibian declines in the Rocky Mountains. *Ecological Applications* 6:449–457.
- Waddle, J.H., K.G. Rice, F.J. Mazzotti, and H.F. Percival. 2008. Modeling the effect of toe-clipping on treefrog survival: beyond the return rate. *Journal of Herpetology* 42:467–473.
- Waddle, J.H., R.M. Dorazio, S.C. Walls, K.G. Rice, J. Beauchamp, M.J. Schuman, and F.J. Mazzotti. 2010. A new parameterization for estimating co-occurrence of interacting species. *Ecological Applications* 20:1467–1475.
- Wake, D.B. 1991. Declining amphibian populations. *Science* 253:860.
- Wake, M.H. 2008. “Eye of newt and toe of frog”: herpetology in 21st Century science. *Herpetologica* 64:1–11.
- Walls, S.C. 2009. The role of climate in the dynamics of a hybrid zone in Appalachian salamanders. *Global Change Biology* 15:1903–1910.
- Walsh, M.K., C.A. Pearl, C. Whitlock, P.J. Bartlein, and M.A. Worona. 2010. An 11,000-year-long record of fire and vegetation history at Beaver Lake, Oregon, central Willamette Valley. *Quaternary Science Reviews* 29:1093–1106.
- Wilson, D.E., F.R. Cole, J.D. Nichols, R. Rudran, and M.S. Foster. 1996. *Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*. Smithsonian Institution Press, Washington, D.C., USA.
- Wilson, L.D., J.R. McCranie, S.W. Gotte, and J.H. Townsend. 2003. Distributional comments on some members of the herpetofauna of the Mosquitia, Honduras. *Herpetological Bulletin* 84:15–19.
- Zucker, E.L., M.R. Clarke, K.E. Glander, and N.J. Scott, Jr. 1996. Sizes of home ranges and howling monkey groups at Hacienda La Pacifica, Costa Rica: 1972–1991. *Brenesia* 45–46:153–156.
- Zug, G.R., S.W. Gotte and J.F. Jacobs. 2011. *Pythons in Burma: Short-tailed Python (Reptilia: Squamata)*. *Proceedings of the Biological Society of Washington* 124:112–136.



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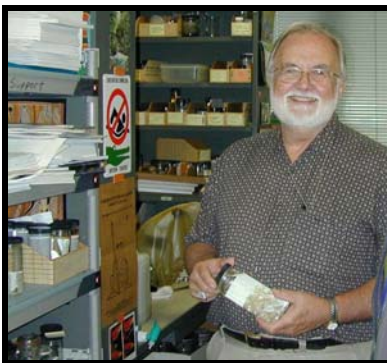
Norman J. Scott received his B.S. and M.Sc. at Humboldt State University, California, and Ph.D. from the University of Southern California. He served as a Director, 1982–84, and President, 1987, of the Society for the Study of Amphibians and Reptiles. Academic interests are in the biology, ecology, taxonomy, biogeography, and evolution of reptiles and amphibians. He has authored or coauthored > 80 papers, mostly on southwestern U. S. and South American reptiles and amphibians, but also on monkey populations, duck taxonomy, and bird faunas. He has had faculty positions at the Universidad de Costa Rica, the University of Connecticut, and the University of New Mexico. In 1974, he was hired in a research position by the Fish and Wildlife Service, and he retired from the U.S. Geological Survey to Creston, California in 2001. He continues to work with Paraguayan scientists on projects that were initiated more than 30 years ago. (Photographed by Joan Scott)



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C. Kenneth Dodd received his Ph. D. with E.D. Brodie at Clemson University in 1974. Most of his career was with the U.S. Department of Interior: Office of Endangered Species 1976–1984; Research division of the U.S. Fish and Wildlife Service, later transferred to the U.S. Geological Survey (1984–2007). Ken retired from the USGS in early 2007, and is currently Courtesy Associate Professor in the Department of Wildlife Ecology and Conservation at the University of Florida. Ken has published more than 200 papers, reviews, and books, mostly on turtle and amphibian ecology and conservation. His book “Frogs of the United States and Canada” will be published by Johns Hopkins University Press in 2013. Ken lives in Gainesville Florida with his wife Marian Griffey and their nine cats and numerous turtles. Ken is shown with a snake in Great Smokey Mountains National Park, summer 2001. (Photograph by Marian Griffey: added 20 August 2012 after initial publication).



Roy W. McDiarmid is a Research Zoologist affiliated with the USGS Patuxent Wildlife Research Center in Laurel, Maryland and stationed at the National Museum of Natural History in Washington D.C. He serves as Curator of Amphibians and Reptiles and is responsible for the North American part of the 580,000 specimens in the National Collection of Amphibians and Reptiles. He earned his Ph. D. from the University of Southern California in 1968 and taught at the University of Chicago and the University of South Florida for 10 years before coming to the National Museum. Most of his professional career has focused on understanding the natural history and evolution of Neotropical amphibians and reptiles, principally in Mexico, Costa Rica, Ecuador, Peru, and Venezuela. He has been active in herpetological societies and written more than 140 scientific papers and authored or edited four books. He continues his curatorial and research activities and currently is working on the next volume of the world checklists of snakes. He just finished writing and editing a book-length manuscript on techniques and standard methods for measuring the biodiversity of reptiles and is working on another book with Ron Altig that reviews the biology of North American larval amphibians. (Photograph courtesy National Museum of Natural History, Research Training Program Archives)



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