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Number 64 21 January 2016

UNITED STATES BIOLOGICAL SURVEY: A COMPENDIUM OF ITS HISTORY, PERSONALITIES, IMPACTS, AND CONFLICTS



EDITED BY

DAVID J. SCHMIDLY, WILLIAM E. TYDEMAN, AND ALFRED L. GARDNER

Editorial Comment:

HISTORY AND ARCHIVES IN NATURAL HISTORY: WHAT CAN THEY TELL US?

“If you don’t know history, you don’t know anything. You are like a leaf that doesn’t know it is part of a tree.” *Michael Crichton*

“There is history in all men’s lives.” *William Shakespeare*

“The past is never dead. It’s not even past.” *William Faulkner*

The history of natural science yields a complex mosaic not only about the life and work of naturalists, but also quite specific and unique perspectives about their investigations, collections, and personalities. It is instructive to see how some of the thoughts, attitudes, and practices of today differ from those of the past. Here history plays a key role in unlocking the complexities of how science changes. It can even enlighten us about ideas that began 100 years ago and that are still percolating in scientific debates.

A sophisticated understanding of the past is one of the most powerful tools we have for shaping the future. The history of any enterprise is important to instill a sense of identity and purpose and remind people of “who we are.” Or as Pearl Buck once said, “If you want to understand today, you have to search yesterday.” One of the most impressive aspects of these papers is the depth and scope of the search process that Buck alludes to.

The work presented here is comprehensive and utilizes previously untapped sources. An archival-based written record provides a scientific laboratory for historical investigation of both past and present events. The various papers represent these perspectives that relate to the field of natural history and the discipline of mammalogy. Twentieth-century mammalogy is inextricably linked to the history of the United States Biological Survey and its key personnel. The history represented here is based on a wide use of primary sources and brings a large variety of archival material to remind us of Marc Bloch’s notion that “history is the science of man in time.”

~ David J. Schmidly, William E. Tydeman, and Alfred L. Gardner

Front cover: Service flag of the Bureau of Biological Survey. This flag was carried in a parade down Pennsylvania Avenue in Washington, D.C., by Hartley H. T. Jackson after World War I. The stars indicate the number of personnel that served in WWI; the gold stars are for those that did not return. Courtesy of U.S. Geological Survey, Patuxent Wildlife Research Center, Biological Survey files (hereafter USGS-PWRC, Biological Survey files).

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Layout and Design: Lisa Bradley
Cover Design: Photograph courtesy of U.S. Geological Survey, Patuxent Wildlife Research
Center, Biological Survey files
Production Editor: Lisa Bradley

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This book was set in Times New Roman and printed on acid-free paper that meets the guidelines for permanence and durability of the Committee on Production Guidelines for Book Longevity of the Council on Library Resources.

Printed: 21 January 2016

Library of Congress Cataloging-in-Publication Data

Special Publications of the Museum of Texas Tech University, Number 64
Series Editor: Robert D. Bradley

United States Biological Survey: A Compendium of its History, Personalities, Impacts, and Conflicts

David J. Schmidly, William E. Tydeman, and Alfred L. Gardner (editors)

ISSN 0149-1768
ISBN 1-929330-28-6
ISBN13 978-1-929330-28-7

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DEDICATION

This volume is dedicated to our friend and colleague, Dr. Clyde Jones, who passed away on 6 April 2015 at the age of 80. Clyde's professional career included service with the United States Fish and Wildlife Service (1970–1982) and three universities (University of New Mexico, Tulane University, and Texas Tech University). His career spanned over seven decades and produced numerous contributions about the natural history of mammals and fishes in the southwestern United States and Mexico. He also served in various administrative assignments with the Fish and Wildlife Service as well as at Texas Tech University. His life story has been eloquently told by himself in an earlier publication that he helped edit about the lives and careers of significant American mammalogists (see "You Have to Catch Them First," pp. 185–199 in *Going Afield*, Museum of Texas Tech University, 2005).

A few weeks before his death, two of us (Schmidly and Tydeman) visited him in the hospital in Lubbock. We took with us a first draft of this volume and asked if he would review it and provide comments. Because of his deteriorating health, he was unable to complete this task, but he explained to us the connection between his career and the content of our work. From 1972 to 1979, Clyde served as Director of the Bird and Mammal Laboratories, which became the

National Fish and Wildlife Laboratory in 1973, and administratively merged with the Denver Wildlife Research Center in 1980. The forerunner of the Bird and Mammal Laboratories was the Section of Wildlife Surveys established in the U.S. Biological Survey in 1936 under the direction of Hartley H. T. Jackson. Clyde had known Jackson who, in turn, was personally acquainted with many of the old naturalists discussed in this publication. Also, Clyde served as Director of the Denver Wildlife Research Center (1979–1982), where many of the controversial predator and rodent control programs started by the Biological Survey were later administered.

Waldo McAtee, whom spent five decades working for the Biological Survey and is prominently mentioned in this volume, said this about the death of valued colleagues: "Merely to recall all of these departed comrades is enough to break one's heart, and no cry of woe, however deep, can assuage the feeling of their loss" (see Terres 1963). We can think of no better words to express our feelings about our friend and colleague, Dr. Clyde Jones.

*David J. Schmidly
William E. Tydeman
Alfred L. Gardner*



TABLE OF CONTENTS

Preface	v
<i>David J. Schmidly and William E. Tydeman</i>	
The United States Biological Survey: A Brief History 1885–1940	1
<i>Alfred L. Gardner</i>	
C. Hart Merriam: Pioneering Mammalogist	15
<i>Keir B. Sterling</i>	
Vernon Bailey (1864–1942): Chief Field Naturalist of the Biological Survey	25
<i>David J. Schmidly</i>	
Merriam’s Men: The Federal Agents of the Biological Survey (1885–1910)	55
<i>David J. Schmidly</i>	
The Influence of E. W. Nelson and E. A. Goldman on Mexican Mammalogy	87
<i>Xavier López-Medellín and Rodrigo A. Medellín Legorreta</i>	
Eradicating Predators and Rodents: The Biological Survey Offends Scientists to Serve the Livestock Industry	105
<i>Michael J. Robinson</i>	
The Legacy of the United States Biological Survey: A Summary	115
<i>David J. Schmidly and William E. Tydeman</i>	
Literature Cited	119

PREFACE

David J. Schmidly and William E. Tydeman

This volume is about both history and the men who made it regarding the growth of natural history and mammalogy at the end of the 19th and beginning of the 20th centuries. It is told through the lens of the United States Biological Survey (hereafter the USBS or Biological Survey), the precursor of what today is the U.S. Fish and Wildlife Service.

The USBS was started more than 125 years ago, when on 3 March 1885, Congress appropriated \$5,000 for the purpose of studying economic ornithology, emphasizing the interrelations of birds and agriculture. That seemingly tiny appropriation would form the seed for the beginning of the major arm of the United States government devoted to the scientific study, management, and regulation of the nation's wildlife resources.

Upon the recommendation of the American Ornithologists Union, Dr. C. Hart Merriam, physician and lifelong student of natural history, was appointed head of the new project. It was first established as a branch of the Division of Entomology in the United States Department of Agriculture. Subsequently the name changed several times to reflect the growing and changing mission of the division. On 3 March 1905, just 20 years after the date of the first appropriation, it became the Bureau of Biological Survey. It would remain that way until just before World War II in 1940 when the Bureau of Fisheries in the Department of Commerce was merged with the Biological Survey in the Department of Agriculture to form the U.S. Fish and Wildlife Service.

The Survey was established and operated as a formal entity during a key period of American history—after the conclusion of the Indian Wars and just before the Great Depression. This was a time of massive westward migration driven by immigration pressure and the easy availability of land for homesteaders. The mass movement was facilitated first by railroads and later by the automobile. For a period of four or five decades, from the 1870s to the 1920s, the North American landscape began to take on a mosaic character of dense settlements mingled with lightly occupied areas.

This created an unusual intimacy between settled and natural areas producing what has been termed an “inner frontier” (see Kohler 2006 for a thorough discussion).

This caught the attention of the American public, and interest in natural history spiked throughout the country. Hunting and natural history collecting became popular. The inner frontier became a landscape for nature goers and nature-going, as well as for scientists and collectors. As the railroads pushed even deeper into remote areas of North America, naturalists were never far behind to explore the remaining pockets of relatively undisturbed nature still teeming with wildlife. Thus began the age of federal natural history surveys during the latter half of the 19th and first half of the 20th centuries—an era driven more by government agencies and private natural history museums than by the academic environment (Kohler 2006).

This period also was known for the boom and bust exploitation of natural resources, particularly soils, forests, and wildlife. When the Survey was organized, market and career bounty hunting were the prevalent uses of wildlife, and birds were being slaughtered in huge numbers for fashion wear. By the time it was merged with the Bureau of Fisheries to form the Fish and Wildlife Service, conservation and management of wildlife resources had become the dominant themes. Science also changed during these times, moving from a focus on field work, natural history, and taxonomy to a concentration on theory supported by laboratory experiments and ecological work.

After its establishment and organization, the Biological Survey became the first public institution devoted to natural history on a continental scale. In its glory years under C. Hart Merriam from 1887 to 1910, it was to taxonomy and biogeography what the U.S. Geological Survey was to field geology and physiography under John Wesley Powell—an exemplar of organized, large-scale field science, a cornucopia of new knowledge and exacting field methods, and a proving ground for a generation of talented natural history practitioners (Mastroni 2012). Under Merriam's

leadership, it emphasized scientific research, mapping the North American continent's life zones, and describing its mammal fauna, and secondarily determining which animal species were beneficial or injurious to agriculture.

In 1901, when Theodore Roosevelt had become President of the United States, much attention became focused on conservation and preventing the destruction of natural resources. The amount of acreage in both national forests and the number of national parks grew tremendously. Roosevelt and Merriam were good friends and the success and importance of the survey was never greater than during the Roosevelt era (Cutright 1956).

From its initial scientific research focus under Merriam's leadership, the Survey's mission gradually evolved to include controlling predators and rodents, protecting wildlife on big game reservations and avian refuges, and enforcing wildlife legislation (Mastroni 2012). These added responsibilities resulted in a conflicted mission for the Survey, producing a high degree of tension and uncertainty and pulling it in multiple directions. This conflict would create a tainted image of the Survey in the minds of many constituents.

One would think that given the times and with such a rich history of accomplishment and controversy, there would be a general understanding about the significance of the U.S. Biological Survey and its leadership. Unfortunately, that has not been the case. A recent chapter by Robert Brown (2013) in a book about the history of wildlife management and conservation focuses on the political leadership of President Roosevelt and other charismatic individuals such as Gifford Pinchot, George Bird Grinnell, and John Muir. There is only cursory mention of the Survey and of Merriam, who is briefly discussed in a later chapter of the book about "Hunting and Trapping."

The papers assembled in this volume were presented at two different annual meetings of the American Society of Mammalogists. In 2013, David Schmidly presented a paper at the meeting in Philadelphia entitled "The Life and Career of Vernon Bailey: One of America's Greatest Field Naturalists." In the following year, at the 2014 annual meeting in Oklahoma City, Schmidly

and the other authors in this volume participated in a symposium entitled "United States Biological Survey and North American Natural History." Collectively, those papers make up the contents of this volume.

This compendium includes papers that progress from the broader history of the Biological Survey to the personalities behind it. It then continues on to a more specific look at the impacts on a particular region, Mexico. It concludes with a close and critical analysis of one of the major issues it faced—predator control. We also draw attention to the important role the Survey played in birthing both the American Society of Mammalogists and the Wildlife Society, two organizations with a legacy of scientific research for the effective management and conservation of wildlife resources in the country.

The first paper is by Dr. Alfred L. Gardner of the Biological Survey Unit, at the United States Geological Survey Patuxent Wildlife Research Center, who has prepared an overview, *The United States Biological Survey: A Brief History 1885–1940*, that chronicles the amazing expansion of responsibilities that occurred during its first years of operation, including an emphasis on mammals as well as birds, and an increasingly scientific approach that involved studies of wildlife distribution, taxonomy, conservation, and invasive species control. The second paper, by Keir B. Sterling, the biographer of C. Hart Merriam, is entitled *C. Hart Merriam: Pioneering Mammalogist*. It describes Merriam's contributions to the organization, to field work, and to scientific publication as well as his role in establishing the discipline of mammalogy as a recognized field of scientific inquiry.

These are followed by two papers by David J. Schmidly: *Vernon Bailey (1864–1942): Chief Field Naturalist of the Biological Survey*, describes Bailey's many contributions to the Biological Survey and mammalogy; and *Merriam's Men: The Federal Agents of the Biological Survey (1885–1910)* emphasizes the key individuals (other than Merriam and Bailey) of the Survey who did the real work in the field.

Then, two colleagues from Mexico, Xavier López-Medellín and Rodrigo Medellín Legoretta, discuss the role of E. W. Nelson and E. A. Goldman in

the development of Mexican mammalogy in a paper entitled *The Influence of Edward William Nelson and Edward Alphonso Goldman on Mexican Mammalogy*. Nelson and Goldman, while working for the Survey, spent almost 15 years in Mexico collecting and studying Mexican mammals. This paper examines their ground-level field operations and the essential duties of the Biological Survey far from home.

The final paper, by Michael J. Robinson, discusses one of the most important and divisive issues faced by the Biological Survey. The controversy over predator control and the massive program of the Survey to destroy predators shook the organization and its sister organization, the American Society of Mammalogists (ASM), to their core and forced a polarization among leading naturalists of the day. This controversy became so bitter that it split the ASM and almost caused its demise. Robinson (2005) has published a major book on this subject, and his paper in this volume draws heavily from that material.

Reference citations in the various papers are presented in two different formats depending upon the academic background of the author and the content of the article. The papers prepared by Gardner, Schmidly, and Medellin and Medellin (all scientific naturalists) use the format of scientific literature citations with all of the references collectively presented at the end of the volume. The papers by Sterling (a historian) and Robinson (from the legal profession) are referenced by the use of endnotes to provide additional interpretation about the reference material with regard to the discussion in the paper. The figures at the end of each chapter include photographs of personnel and landscapes, maps, and other materials to illustrate important people and events discussed in each of the papers.

Our hope is that this publication will increase awareness of the Biological Survey and its key personnel to the history of North American natural history, including wildlife conservation and management. For those readers who wish to delve even further into the history of the Survey and its personnel, several excellent references are available. Jenks Cameron in 1929 published an account of the history, activities and orga-

nization that was reprinted with only minor changes in 1974. There is the foundational work of Keir Sterling, published in 1973 and 1974 (revised in 1977), regarding the life and career of C. Hart Merriam. Sterling (1978, 1989, and 1991) also published a series of insightful articles concerning the key naturalists of the Survey and their many contributions to its success. Harriet Kofalk (1989) published a biography of Florence Merriam Bailey, the wife of Vernon and sister of C. Hart Merriam, which contains much information about the Survey and its leaders. More recently, Robert Kohler (2008) has written an excellent account of Vernon Bailey's apprenticeship under C. Hart Merriam. Finally, there is a recently completed Ph.D. dissertation about the Survey and its conflicted mission by Lawrence Mastroni (2012).

Waldo McAtee, an economic ornithologist and general naturalist, worked at the Survey from 1903 until 1947, and he was instrumental in the efforts to archive many of its early records. In 1951 he sent to the Library of Congress notes on 103 persons connected with the Survey; in February 1953 he added notes on field trips including happenings and personalities. This totaled 374 manuscript long-hand pages and mentioned 392 individuals. These materials went to the Manuscript Division of the Library of Congress and were restricted for use until any individual treated was dead (Kalmbach 1963). In many instances this invaluable collection, although it represents the thoughts and opinions of a single person, provides some of the best information available about the personalities, idiosyncrasies, and interactions among the Biological Survey staff.

McAtee also was a leading figure and moving spirit in the formation of the Wildlife Society, of which he was a charter member and first secretary-treasurer. He was the founding editor of the *Journal of Wildlife Management*, and an honorary member until death. His documentation and research are often referenced in the various articles of this volume.

In reflecting on the legacy of the early naturalists associated with the Survey, he had this to say about the importance of recording and reflecting on their many achievements:

History should be recorded in the making, else much of it will be lost ... light can be thrown on the history of organizations by accounts of the lives of their members ... honoring the

dead and recording our esteem should not be forgotten (Journal of Wildlife Management 11:354, 1947).

ACKNOWLEDGMENTS

Archival research has played a prominent role in the preparation of each of these papers, including all of the photographs. Among the many archives consulted, the following have been especially instrumental:

- University of Wyoming, American Heritage Center, Vernon Bailey Papers. Tom Buchanan, Past President of the University, and Rick Ewig, Associate Director of the Center, were extremely helpful in accessing these archives.
- Smithsonian Institution Archives, Vernon Bailey and Florence Merriam Bailey papers; E. W. Nelson and E. A. Goldman papers; and Hartley H. T. Jackson papers. Tad Bennicoff was extremely helpful in locating materials in the collection and provided images for many of the photographs used in the two papers by Schmidly.
- Library of Congress Archives, W. L. McAtee papers, T. S. Palmer papers, and A. K. Fisher papers. Many staff there assisted with accessing these records.
- American Society of Mammalogist Archives. The ASM records are now held by the Smithsonian Institution.
- National Archives and Records Administration, Personnel Files, St. Louis, Missouri, kindly provided access to the personnel files of some of the key employees in the Biological Survey.
- Denver Public Library, Western History and Genealogy Department, J. Stokely Ligon Collection.
- USGS Patuxent Wildlife Research Center, Biological Survey Unit, National Museum of Natural History.
- Museum of Vertebrate Zoology, University of California at Berkeley.

The authors of the various papers thank the following individuals for their assistance: Christine Hice, Assistant Research Professor in the Department of Biology at the University of New Mexico, assisted with locating and documenting the publications of Vernon Bailey; Kevin Comerford, Digital Initiatives Librarian at the University of New Mexico, introduced DJS to the HoverCam and its versatility in scanning images of old photographs; Amanda Jones, graduate research assistant in the Department of Biology at UNM, used the HoverCam to scan the images of hundreds of old photographs; and Lisa Bradley, Production Editor of *Special Publications* at Texas Tech University, was most helpful in formatting and designing the volume. We wish to thank Ellen Alers, Smithsonian Institution Archives, and Rose Gullede, Department of Botany, National Museum of Natural History, for assistance in locating certain photographs used herein. Support for Gardner's research comes from the USGS Ecosystems Mission Area. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. government.



Waldo McAtee in 1926. McAtee worked at the Survey from 1903 to 1947. He helped preserve key documents about its early history and recorded his personal memories and opinions of Survey personnel, which he deposited in the Library of Congress.

THE UNITED STATES BIOLOGICAL SURVEY: A BRIEF HISTORY 1885–1940

Alfred L. Gardner

INTRODUCTION

In 1885, a small three-person unit was created in the U.S. Department of Agriculture to gather and analyze information on bird migrations. Originally called the Section of Economic Ornithology, over the next 55 years this unit underwent three name changes and accumulated ever-increasing responsibilities for the nation's faunal resources. Transferred to the Department

of the Interior in 1939, this agency was merged with the Bureau of Fisheries in 1940 to create the U.S. Fish and Wildlife Service (FWS). The following account details the chronology, directorship, and growth of the U.S. Bureau of Biological Survey up to its renovation as the FWS. This account also profiles some employees of the Biological Survey.

CHRONOLOGY

Effective 1 July 1885, the Section of Economic Ornithology was established in the Division of Entomology, U.S. Department of Agriculture, and charged with studying the food habits and migration of birds in relation to insects and plants. Congress was responding to pressure from Spencer Fullerton Baird of the Smithsonian Institution, and others, to take over the gathering and processing of information accumulated by the American Ornithologists' Union (AOU) on bird migration in North America. Staff consisted of Dr. C. Hart Merriam, Ornithologist (Fig. 1); Dr. Albert K. Fisher, Assistant Ornithologist; and Miss Elizabeth Gosnell, a clerk secretary; they had a working budget of \$5,000.

Elevated to divisional status in 1886 and renamed the Division of Economic Ornithology and Mammalogy with a budget of \$10,000, the agency's focus was defined as the promotion of "economic ornithology and mammalogy: an investigation of the food-habits, distribution, and migrations of North American birds and mammals in relation to agriculture, horticulture, and forestry" (Merriam 1887:227). Although initially reduced to a staff of two—Merriam and Fisher (Merriam had married his clerk secretary)—the Division started to grow.

In 1896, the agency was renamed the Division of Biological Survey to reflect its two main lines of

work: 1) investigations of the geographic distribution of mammals and birds; and 2) studies of the food habits of useful and injurious species. This work was defined by Merriam (1897:15) as:

...a study of the geographic distribution of animals and plants with a view to determining the boundaries of the natural life zones and their subdivisions, and a study of the food habits of birds and mammals—for the purpose of ascertaining the economic relations of our native species.

The Division became the Bureau of Biological Survey in 1905. Activities at that time were defined along three lines: 1) geographic distribution; 2) economic ornithology and mammalogy; and 3) game preservation and protection.

Transfer of the Bureau from the Department of Agriculture to the Department of the Interior occurred in 1939. In January of 1940 the Division of Wildlife was transferred from the National Park Service to the Biological Survey. On 30 June 1940, the Biological Survey was combined with the Bureau of Fisheries from the Department of Commerce to create the U.S. Fish and Wildlife Service (Gabrielson 1940).

SURVEY CHIEFS

During its 55-year history, the Survey had six chiefs. The first was C. Hart Merriam (1885–1910). Second was Henry W. Henshaw (1910–1916). Edward W. Nelson (1916–1927) was the third chief, followed by Paul G. Redington (1927–1934) as the fourth. Jay “Ding” Darling (1934–1935) was the fifth and only served 22 months. Ira N. Gabrielson (1935–1940) was the last chief of the Survey and remained director of the FWS until retiring in 1946.

C. HART MERRIAM (Chief, 1885–1910; Fig. 1). A graduate of the College of Physicians and Surgeons of New York, Merriam practiced medicine in Locust Grove, New York, from 1879 to 1885, and had one medical publication, titled “The Hot Water Vaginal Douche.” Perhaps best known for his generally discredited Life Zone System, Merriam directed the Survey through all of its name changes. He, and the men he hired and trained, had a profound impact on the conduct of biological surveys and taxonomic research in the 19th and early 20th centuries. Not customary procedure at the time, Merriam established documentation standards for specimen records and required the preparation of series of specimens so that variation between species and populations could be studied and described. He was a biogeographic pioneer and, among his many accomplishments, introduced the life zone concept in North America, coined the term “biogeography,” and was the first president of the American Society of Mammalogists.

Originally, Merriam’s Section of Economic Ornithology was charged with determining North American distributions of birds, particularly of migrants. This expanded to food habits analyses and the evaluation of which birds and mammals were of value to the farmer. The determination of geographical distributions required surveys into relatively unexplored regions, by-products of which were the many publications resulting from taxonomic study of the diverse vertebrates collected. These surveys and expeditions usually included mammalogists, ornithologists, botanists, entomologists, and sometimes scientists or field collectors from other disciplines. The mammal collections in the National Museum of Natural History (formerly the U.S. National Museum), Smithsonian Institution, contain the types of 651 taxa described by Merriam himself.

In addition to name changes as the organization grew during Merriam’s tenure, several new responsibilities were added to the Survey’s agenda. Its primarily scientific focus was altered dramatically after 1900 with the passage of the Lacey Act (revised in subsequent years), which was an attempt to control interstate commerce in wildlife and the sale of illegally taken wildlife. Also in 1900, the Survey was charged with oversight for Alaskan wildlife. The annual report of the Survey for 1900 (Palmer 1900) includes the first mentions of research on raising rabbits, on fur farming, and on the extermination of prairie dogs. Beginning in 1902, added responsibilities included control of importation of eggs for propagation, an increased role in protecting Alaskan game, and the first research on control of “noxious” birds and mammals (sparrows, field mice, gophers, rabbits, and ground squirrels).

Between 1903 and 1910, new responsibilities were added that stretched the Survey’s meager budget and severely cut into its scientific activities. Many of these new assignments came as unfunded mandates from Congress. In addition to law-enforcement obligations, the Survey soon had conservation and wildlife and land management responsibilities, the first of which was Pelican Island (Florida), established in 1903. This bird reservation was soon followed by the Breton Island (Louisiana) and Stump Island (Florida) bird reservations (1904), and the Wichita Game Refuge in Oklahoma (1905). The National Bison Range (Montana) was created in 1908, and in 1910, the Survey was charged with protecting seal fisheries. In the annual reports, Merriam always placed biological investigations (geographic distributions) first, followed by economic considerations (activities more directly related to agriculture). However, the annual report for 1908 listed economic relationships first, followed by geographic distributions and “supervision of matters relating to game preservation and protection,” and third, the importation of foreign birds and mammals. These activity categories did not include the voluminous correspondence carried out by the administrative office, nor the preparation of the many publications produced by the Survey. In 1910, frustrated by years of dealing with an antagonistic, tight-fisted Congress, whose members were critical of the value and direction of the Survey, Merriam resigned.

In addition to the many scientific papers published by Survey personnel in the several scientific journals of the time, Merriam initiated several publications, three of which were exclusive to the Survey. First was the *Biological Survey Circular* series initiated in 1886. Next was the *North American Fauna* series; Number 1 was Merriam's *Revision of the North American Pocket Mice*, published in 1889. A technical series publication called the *Biological Survey Bulletin* also began in 1889. The Survey also contributed to other Department of Agriculture publications such as the *Farmers' Bulletin* series, which was intended for a nonscientific audience and emphasized the use and control of the subject animals and practices useful for farmers (Fig. 2). Over the years, the Survey produced several additional kinds of literature that included maps, leaflets, and special reports, as well as its in-house newsletter called *The Survey*.

HENRY W. HENSHAW (Chief, 1910–1916; Fig. 3). A longtime friend and early mentor, Henshaw had been Merriam's assistant since 1905 (Hodge and Merriam 1931) before taking over as Chief. Henshaw was much more conciliatory to critics in Congress and was quick to emphasize the practical over the scientific. Nevertheless, Henshaw's tenure also had its trying times. Congress passed a series of acts, amended legislation, or tacked new responsibilities to budget appropriations. The Lacey Act was strengthened, but the lack of law enforcement agents made enforcement largely nonexistent. From 1911 on, problems with wintering elk in Wyoming plagued the Survey for most of its existence. New game preserves were being created, and research on raising rabbits and furbearers became an established activity, along with the control of ground squirrels and other rodents on Forest Service lands. The year 1913 saw legislation banning the importation of feathers for the millinery trade, ostrich and domestic fowl excluded. Also initiated in 1913 was legislation leading to the Migratory Bird Treaty Act.

What came to be known as predator and rodent control started in 1914 as a research project on experimenting with control methods for predators and rodents. By 1916, predator and rodent control came to be one of the major, if not principal, activities of the Survey and was to continue within the FWS. Previously, Survey personnel, especially those who had demonstrated their expertise while conducting faunal

surveys for Merriam, provided direction and training to state and private individuals in methods of predator and rodent control.

New bird and game reserves and responsibility for research on diseases of ducks were added. These activities required the establishment of regional offices and the employment of many additional workers. By 1916, the year Henshaw was replaced as Chief by Nelson, the Survey identified five principal lines of activity: 1) investigations of food habits of North American birds and mammals in relation to agriculture; 2) biological investigations with special reference to the geographic distribution of native animals and plants; 3) supervision of national bird (67) and mammal (5) reservations, and preservation of native wild game; 4) enforcement of the Lacey Act regulating importation of birds and interstate shipment of game; and 5) administration of the Federal migratory bird law (Henshaw 1916:237). In addition, the Survey administrative office managed a voluminous correspondence load and diverse publication activities.

EDWARD W. NELSON (Chief, 1916–1927; Fig. 4). A good organizer, able administrator, and an employee of the Survey since 1891, Nelson's tenure as Chief must have been difficult. Nelson was instrumental in negotiating the Migratory Bird Treaty Act protecting migratory birds in the United States and Canada, and in 1918 the act became law. Mexico signed in 1936. Reindeer farming in Alaska was a new activity begun in 1920 and remained under the purview of the Survey for many years. The first mid-western wildlife refuge was created on the Upper Mississippi River in 1924. The Survey had a seat on the Alaska Game Commission when it was formed in 1925, although the Survey's oversight responsibilities over Alaskan wildlife had begun in 1902. Beginning as a minor program during Henshaw's last year as Chief, predator and rodent control became the dominant activity within the Survey by the early 1920s, and for many years the financial support received from western States and livestock associations well exceeded monies appropriated by Congress for the Survey's budget (ECC 1934:11; Nelson 1926:2).

Survey organization in 1926 (Nelson 1926) included Administration plus the following seven divisions. 1) Economic Investigations of wild animals, which included control of injurious wildlife, primarily

through poisoning. 2) The Division of Fur Resources, which maintained an experimental fur farm (in Saratoga Springs, New York), provided advice to the fur-farming industry, and gathered harvest records on wild-trapped furbearers. The Fur Division also conducted research on raising rabbits for fur and meat, and inspected rabbitries. 3) The Division of Food Habits Research analyzed stomach contents of birds, mammals, reptiles and amphibians. 4) The Division of Biological Investigations conducted research on mammalian taxonomy, carried out biological surveys in states and territories, and did further research on bird migrations including bird censuses and bird banding (begun in 1920). 5) The Division of Alaska Investigations monitored fur shipments from Alaska, provided law enforcement, and conducted research on reindeer stocking and propagation. 6) The Division of Game and Bird Reservations managed five big game preserves, 67 bird reservations, and was working to acquire additional lands. 7) The administration of the Migratory-bird Treaty Act and Lacey Act included law enforcement, monitoring of interstate commerce in game, and granting of permits for scientific collecting and for control of certain migratory birds, and permits for the importation of foreign birds and mammals. Nelson resigned from administrative duties in 1927 and retired from the Survey in 1929 (Goldman 1935).

PAUL G. REDINGTON (Chief, 1927–1934; Fig. 5). Paul Redington, the first “outsider” to head the Survey, took over as Chief in 1927. He came from the Forest Service and returned to the Forest Service in 1934. Survey organization in 1929 (Redington 1929) included Administration plus these six divisions grouped under “Wild-Life Research, Control, and Conservation”: 1) Biological Investigations; 2) Food Habits and Propagation of Game Birds; 3) Fur-Animal Production; 4) Methods of Wild-life Control; 5) Maintenance of Wild-Life Reservations; and 6) Administration of Wild-life Protective Laws. Later in 1929, a new Division of Land Acquisition was created and charged with seeking lands for refuges and reserves at a reasonable price per acre.

Economic Investigations became known as “Methods of Wild-life Control”; later renamed Predatory-animal and Rodent Control. Disapproval of the indiscriminant destruction of predators by Survey predator control personnel began to be heard as early

as the mid 1920s. Criticism, particularly of poisoning campaigns that destroyed valuable furbearers along with other nontarget mammals and birds, came to a head during Redington’s tenure and was publicized nationwide and discussed at scientific meetings (e.g., ASM 1930) and in Congressional hearings (Committee on Agriculture and Forestry 1931). There was considerable effort in the Survey administration to present Survey activities in a more benign light to counter the negative image of the Survey as, for example, being called the “Bureau of Destruction and Extermination” (ECC 1934).

The annual report for the year ending 30 June 1933 (Redington 1933) reflected attempts to present Survey activities in a more positive light. Survey organization in 1933 included Administration plus eight divisions and one project (soon to become a division). Aside from Administration, which included an editorial office and an office of exhibits, photographs, and publication distribution, these divisions were listed as: 1) Investigations of Wild-life Habitats and Relationships; 2) Economic Investigations of Wild Life; 3) Studies of Environment for Upland Game-bird Production; 4) Wild-life Disease Investigations (actually a project); 5) Fur-production Investigations; 6) Control of Predatory Animals and Injurious Rodents; 7) Land Acquisitions for Wild-life Refuges; 8) Wild-life Refuge Administration; and 9) Administration of Laws for Wild-life Conservation (Redington 1933).

JAY N. DARLING (Chief, 1934–1935; Fig. 6). Jay “Ding” Darling served only 22 months (10 March 1934 to 15 November 1935) as Chief, but had major impact. Ding Darling was an internationally known cartoonist whose cartoons often dealt with conservation and land-use issues. He considered himself to be a Teddy Roosevelt Republican and did not have high regard for Franklin Delano Roosevelt and the New Deal. His appointment was recommended to President Roosevelt by his friend Henry A. Wallace, Secretary of Agriculture (later Vice President, 1941–1945). Darling had been a severe critic for many years of what he saw as the lack of protection and the gross governmental mismanagement of natural resources resulting in loss of critical wetlands and other wildlife habitat (Figs. 7 and 8). A major culprit was the Bureau of Reclamation, which had programs to convert wetlands to agricultural

purposes. Reclamation had joint jurisdiction with the Survey over certain lands the Survey wanted to use as waterfowl refuges.

Darling immediately reorganized the Survey (Darling 1934) as Administration plus five divisions. Public Relations, which included publications and previously a part of Administration, became a separate division. Wildlife diseases, fur resources, food-habits research, and distributions and migrations of birds were combined under the Division of Wildlife Research. He created a separate Division of Migratory Waterfowl and retained the Division of Land Acquisition. Predator and rodent control, law enforcement, importations and permits, and reservations and game agents became sections under the Division of Game Management. Darling's shifting of Survey staff and reorganization of divisions included a complete reorganization of the Wildlife Refuge system.

Darling initiated the Cooperative Wildlife Unit Program as a function of the Survey to develop a science of Wildlife Management. Darling, in 1932 with his own money and some additional private and state funds, had founded the first Wildlife Unit at what is now Iowa State University. The Iowa State unit was originally independent of the Survey and the Federal government.

Legislation initiating his Duck Stamp program had been signed by President Roosevelt. A few months before Darling became Chief he drew the first Duck Stamp. Ding Darling got gun and ammunition manufacturers to go along with an excise tax to fund wildlife habitat restoration. This became the Federal

Aid in Wildlife Restoration Act of 1937, better known as the Pittman-Robertson Act, which distributes the tax revenues to state wildlife agencies. He also revamped law enforcement, added agents, and created mobile enforcement units. Because of his political connections and stature in the conservation community, Darling was able to do things that would not have been possible for a career civil servant.

IRA N. GABRIELSON (Chief, 1935–1940; Fig. 9). Aside from a few years as a school teacher, Gabrielson was a career employee of the Survey, having joined in 1915. He started out in the Survey's food habits laboratory; but by the time Darling became Chief, Gabrielson was in charge of predator and rodent control in the Northwest. Brought into Washington by Darling to be his assistant, Gabrielson proved to be an able administrator; and continued as Director of the FWS until he retired in 1946 to take on new wildlife-related responsibilities in the private sector.

Survey organization in 1939 (USDA 1939) consisted of the following nine divisions: 1) Administration; 2) Public Relations; 3) Wildlife Research; 4) Land Acquisition; 5) Federal Aid in Wildlife Restoration, 6) Wildlife Refuges; 7) Construction and CCC (Civilian Conservation Corps) Operations; 8) Game Management; and 9) Predator and Rodent Control. Federal Aid in Wildlife Restoration administered the funds that were generated under the Pittman-Robertson Act. An expanded effort begun under Ding Darling was the construction of new wildlife refuges, including the Patuxent Wildlife Research Refuge (Maryland), using resources and manpower supplied through the CCC program.

OVERVIEW

The transition from a small, primarily scientific organization in the late 1880s, to a complex and diverse Bureau by 1940, necessarily included new personnel with little or no regard or interest in taxonomy or research collections. As these people advanced their careers in the Survey, their backgrounds as lawyers, land and resource managers, and predator and rodent control specialists dominated Survey functions and direction. This de-emphasis of pure research continued in the

FWS. The Survey has been described as a conflicted organization (Mastroni 2012). In addition to research, the agency was charged with conservation of wildlife and the enforcement of wildlife laws. However, at the same time it was charged with the destruction of wildlife through its predator and rodent control program (also see Cameron 1929). A comprehensive list of the scientists and field collectors who at some time in their careers worked for the Survey would read as a

“Who’s Who” of late 19th and early 20th Century North American biologists. I am ending this short review of the history of the Biological Survey by briefly profiling three of these Survey biologists.

ALEXANDER WETMORE (Fig. 10). (Frank) Alexander Wetmore was a biologist in the Survey from 1910 to 1924 and one of the early investigators of the toxic effects of lead shot on waterfowl. His field work for the Survey included study of migrant birds in Puerto Rico and as far away as Paraguay and Argentina. He became the sixth Secretary of the Smithsonian Institution. An ornithologist and paleontologist, he told me that his most popular publication was an often reprinted *Farmers’ Bulletin* on raising canaries (Fig. 11).

CLARENCE BIRDSEYE. Birdseye was a field biologist for the Survey. The Biological Survey Unit of the USGS–Patuxent Wildlife Research Center has his field catalogs and journals (see Fig. 12). Birdseye published some of the results of his field work (Fig. 13). His last

publication was a note in the *Journal of Mammalogy* in 1956 on the behavior of a captive Peruvian desert fox. Birdseye transferred to the Fur Division when it was created and left the Survey while in Labrador. While there, he observed that winter-caught fish flash froze on the ice and retained their freshness when thawed. With this knowledge and some experimentation he was able to duplicate the flash freezing process, which led to the founding of “Birds Eye” frozen foods.

VIOLA S. SCHANTZ (Fig. 14). Schantz was an employee of the Biological Survey and the FWS from 1918 to 1961. Starting out as a technician caring for the Biological Survey collections of mammals at the U.S. National Museum, she became one of the curators of the collection. Also known by her married name Viola Snyder, she was a charter member of the American Society of Mammalogists (ASM), served as ASM treasurer from 1931 to 1952, and alone compiled the *Journal of Mammalogy* index for most years up to 1961.



Figure 1. C. Hart Merriam, 1887, during his tenure as Chief of the Division of Economic Ornithology and Mammalogy in the Department of Agriculture. Courtesy of the American Heritage Center, Bailey Papers, University of Wyoming (hereafter University of Wyoming).

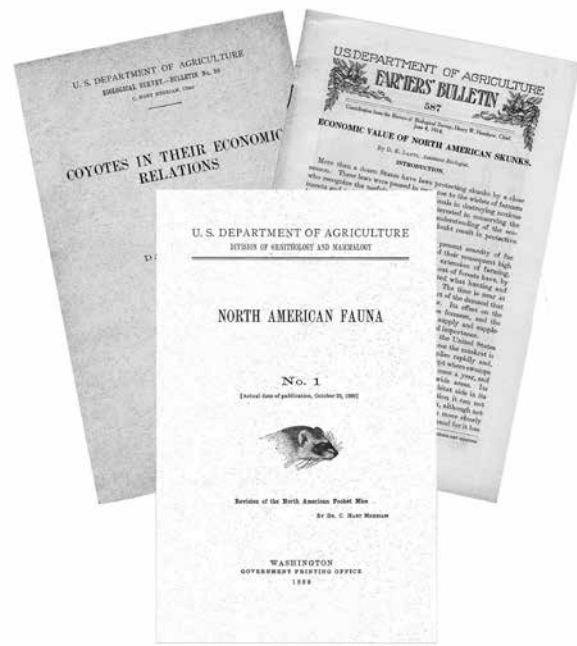


Figure 2. Three examples of publication outlets used by Survey employees. The *Biological Survey Bulletin* series and the *North American Fauna* were exclusive to the Survey. Employees also contributed to other Department of Agriculture publications such as the *Farmers' Bulletin*.

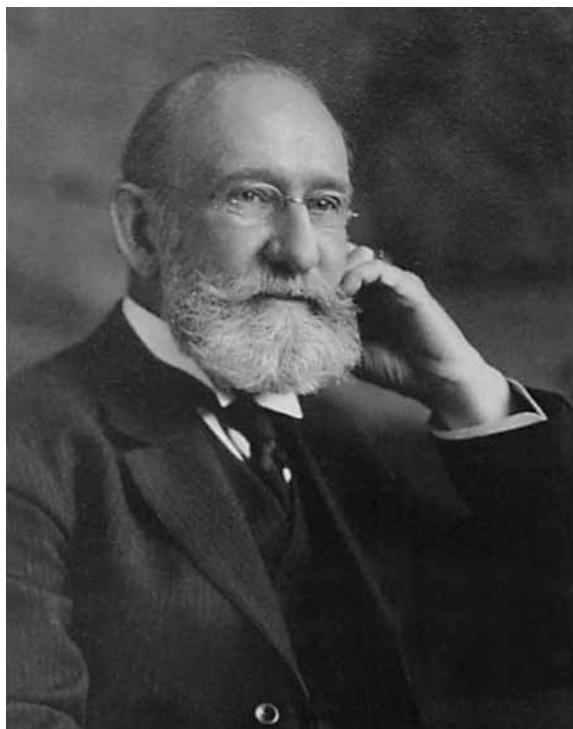


Figure 3. Henry W. Henshaw, second Chief of the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.

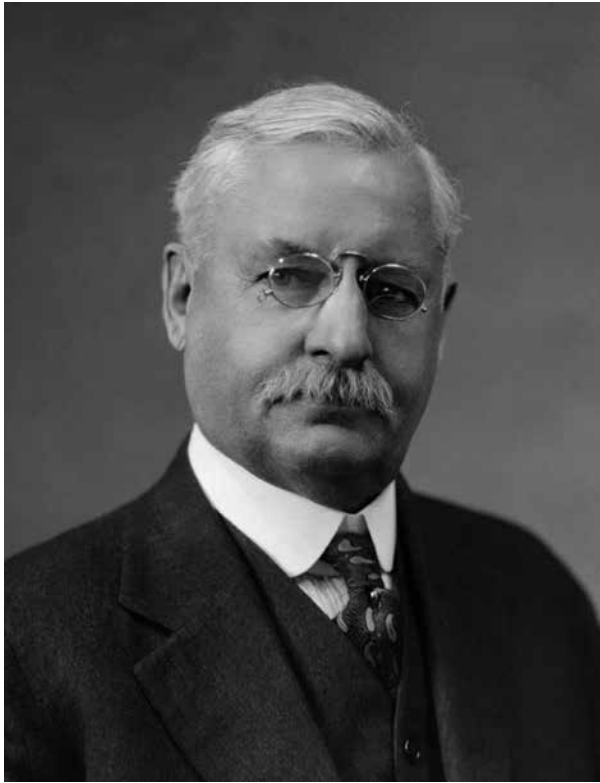


Figure 4. Edward W. Nelson, third Chief of the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.



Figure 5. Paul G. Redington, fourth Chief of the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.



Figure 6. Jay N. "Ding" Darling, fifth Chief of the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.

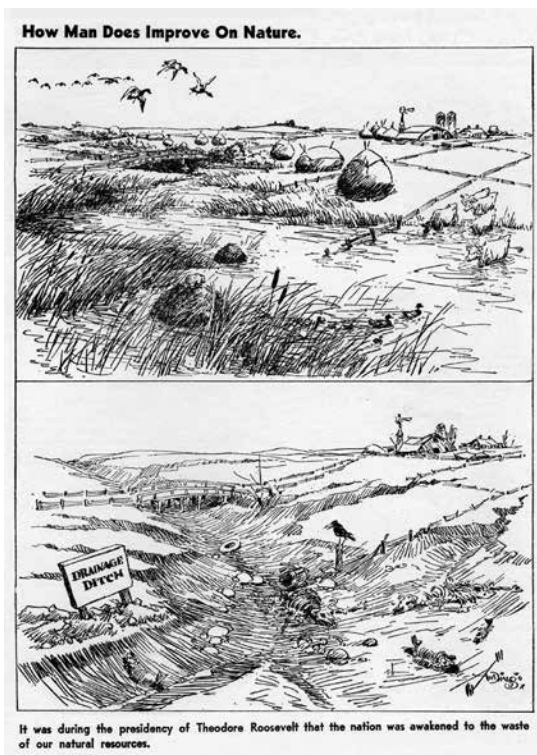


Figure 7. "Ding" Darling cartoon "How Man Does Improve On Nature." Courtesy of the "Ding" Darling Wildlife Society.



Figure 8. "Ding" Darling cartoon "Going The Indian One Better." Courtesy of the "Ding" Darling Wildlife Society.



Figure 9. Ira N. Gabrielson, sixth and last Chief of the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.

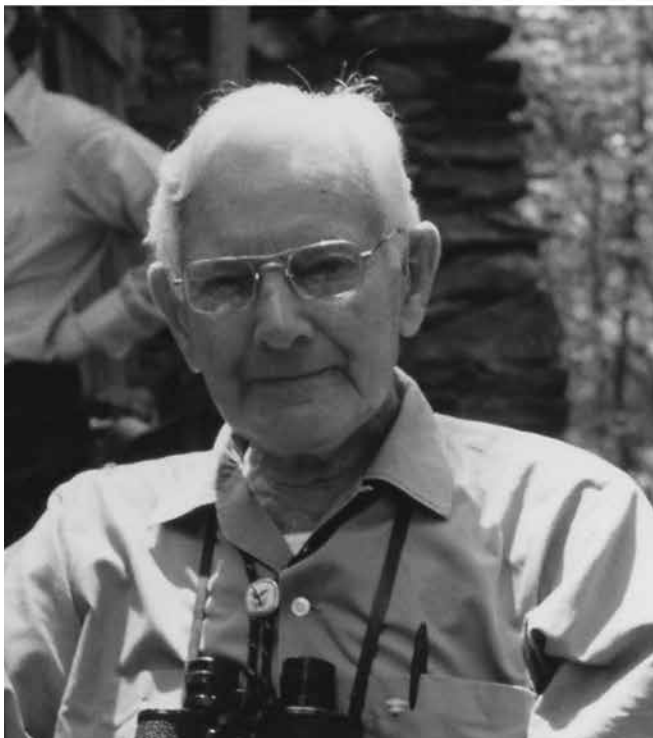


Figure 10. Alexander Wetmore: Veracruz, Mexico, 1939 (above); Plummers Island, Maryland, Fall 1972 (below). Courtesy Smithsonian Institution Archives, Record Unit 7006, Wetmore, Alexander, 1886-1978, Alexander Wetmore Papers (above); courtesy of the Washington Biologists' Field Club (below).

31.

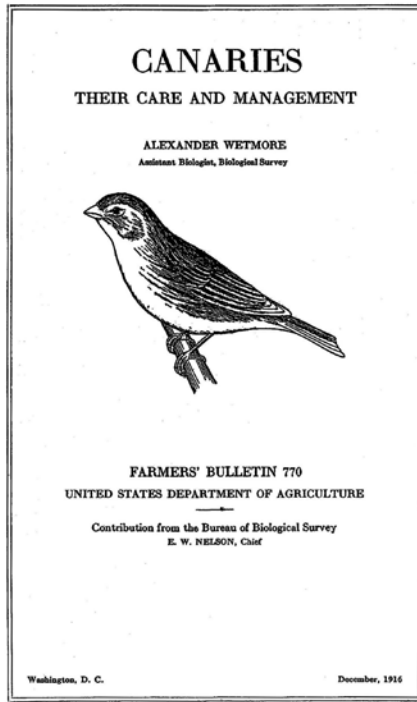


Figure 11. *Farmer's Bulletin 770*, "Canaries, Their Care and Management," by Alex Wetmore, was considered one of the most popular publications issued by the Biological Survey. Courtesy of USGS-PWRC, Biological Survey files.

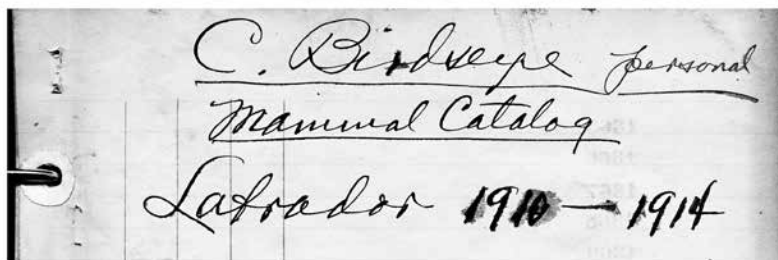
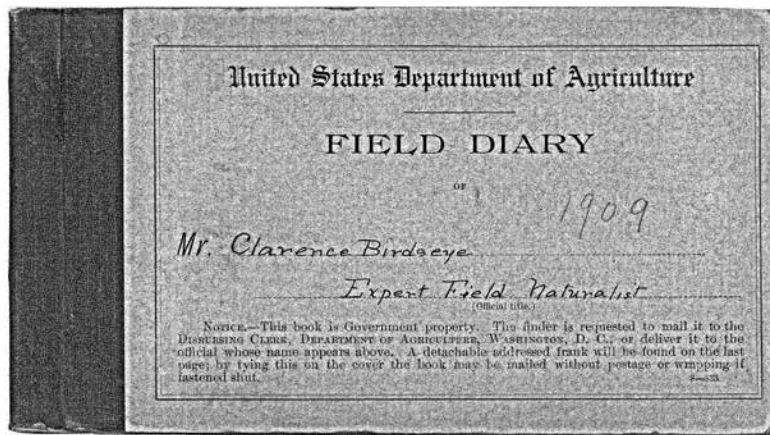


Figure 12. Cover of Clarence Birdseye's Biological Survey field diary for 1909 (above) and top of first page of Birdseye's mammal catalog for Labrador (below). Courtesy of USGS-PWRC, Biological Survey files.

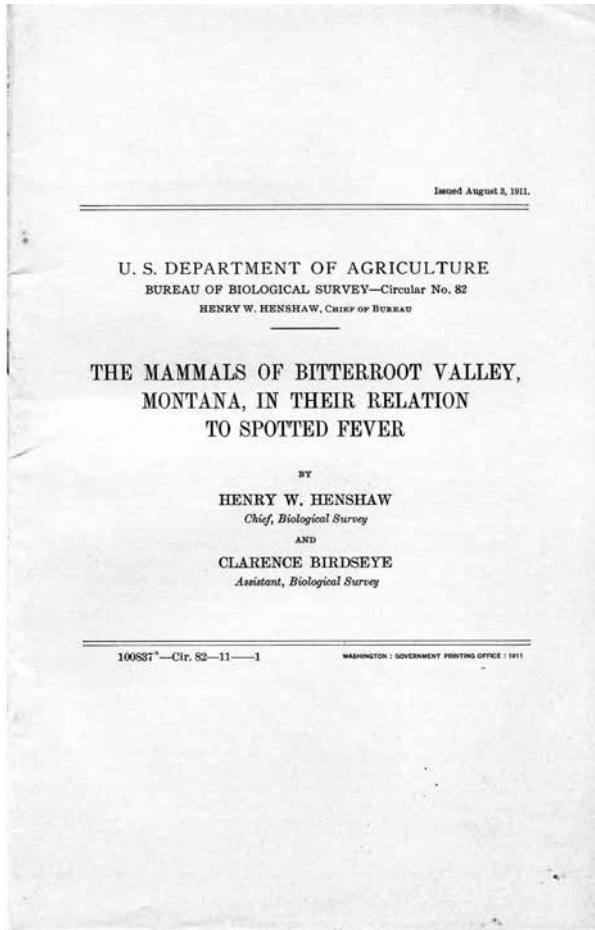


Figure 13. *Biological Survey Circular* No. 82 by H. W. Henshaw and C. Birdseye. The *Biological Survey Circular* series was the first Survey publication established by C. Hart Merriam.



Figure 14. Viola S. Schantz in the collections of the Bureau of Biological Survey, U.S. National Museum. Courtesy of Smithsonian Institution Archives, Record Unit 7172, Hartley H. T. Jackson Papers.

C. HART MERRIAM: PIONEERING MAMMALOGIST

Keir B. Sterling

In 1884, members of the newly formed American Ornithologists' Union created a Committee on Migration. This group undertook an ambitious national bird count, overseeing hundreds of volunteers around the nation collecting migration and distribution data. Named as chair was C. Hart Merriam, a promising 28 year old physician and naturalist from New York.

The Committee was soon inundated with more information than it could handle. Merriam wrote a friend that:

the work...has assumed such vast proportions that I am completely swamped...I fear that I have gotten into trouble. It is perfectly clear that it will be utterly impossible to take care of the returns without a corps of assistants.

His resolution of this problem soon led to the creation of a path-breaking federal scientific agency, the United States Biological Survey. (1)

Merriam proved uniquely suited to bring federal funds and scientific exploration together. His father, Clinton Levi Merriam, a successful businessman and investment banker, had served two terms in Congress from 1871 to 1875. Semi-retired by age forty, he and his family spent most of their time at Homewood, their country place in upstate Lewis County, New York. There, from age five, young Hart became an enthusiastic naturalist, encouraged by his father and a widowed aunt who lived nearby (Fig. 1). Until age fourteen, Hart was educated by what he later called "those amiable creatures termed governesses." He then attended the Pingry School in Elizabeth, New Jersey, and Williston Seminary in Easthampton, Massachusetts. (2)

In 1871, when Hart was fifteen, the new Congressman took his son, carrying bird and mammal specimens he had collected, to meet Spencer Fullerton Baird, Director of the U.S. National Museum. Baird took some time with the young man and declared that he showed real promise as a natural historian. Until

his death in 1887, Baird would play an important role in Merriam's career. (3)

The next year, Baird invited young Merriam to join geologist and physician Francis V. Hayden's Geological Survey of the Rocky Mountains as the expedition's naturalist. Hart performed well, and Hayden invited him back again the following year. Baird, however, cautioned the Congressman that his son would never be anything more than a competent field man unless he completed his formal education. He suggested Hart seek entry into Yale because of its outstanding biology faculty. (4)

After an additional year of prep school, Hart entered Yale and completed a special three-year program in natural history, becoming proficient in anatomy and osteology. (5)

Back at Homewood, the Congressman had a three-story structure built for his son, where Hart housed his growing collection of specimens (Fig. 2). During his final semester at Yale, Hart completed and published his first major work, *A Review of the Birds of Connecticut, with Remarks on their Habits*. (6)

Because comprehensive graduate programs in natural history did not yet exist in the U.S., Merriam entered the College of Physicians and Surgeons at Columbia University in New York in 1877 (Fig. 3). Other 19th Century naturalists, including Baird, had found medical studies useful for training in anatomy. Some—though not all of them—ended up practicing medicine. Merriam completed his M.D. degree in just two years, with a year's credit for his studies at Yale. (7)

Merriam set up a busy medical practice, specializing in the diseases of women, and pursued it for six years. Yet increasing amounts of his time were spent studying mammals and birds. Early in 1883, Baird arranged a position for the young doctor as surgeon on the Newfoundland sealing vessel *Proteus*. Hart returned with many specimens for the U.S. National Museum.

In 1884, his two-volume account *The Mammals of the Adirondack Region, Northeastern New York* was published, receiving excellent reviews. (8)

When the AOU Migration Committee sought government support for their nationwide project, Merriam consulted with Baird and others, then wrote a memorial to Congress. Submitted with the help of New York Senator Warner Miller, a cousin and family friend, this paper propounded that migratory birds were critically important in controlling noxious insects. Merriam noted that the committee's migration "material now in hand is of great value, [but it] is so voluminous that [we] cannot properly arrange, systematize, and publish it without government assistance." (9)

Overcoming objections from some congressmen, who asked how this project would help farmers, Senator Miller helped establish an Office of Economic Ornithology in the Agriculture Department's Bureau of Entomology. The new agency was formed 1 July 1885, with an appropriation of \$5,000. Merriam was in Europe at the time, visiting several natural history museums. At the request of Agriculture Commissioner Norman Colman, AOU leaders nominated Merriam as the new federal Ornithologist, and he began work in the fall of 1885 at a salary of \$2,000. The next year, annual appropriations were increased to \$10,000, and Merriam's agency became the Division of Economic Ornithology and Mammalogy. A decade later, in 1895, the office was reorganized as the Division of Biological Survey, and in 1905, the agency became the Bureau of Biological Survey. (10)

For 20 years from its beginnings in 1885, Merriam's evolving agency focused on scientific research. While the bird migration project continued, he also thought it essential to get a better picture of North American fauna. Over 25 years, he and his agents did fieldwork in every state except four eastern ones. The field work also covered seven Canadian provinces and territories, and 24 of the (then) 30 Mexican states. He and his men collected representative specimens of mammals and birds, many of them new to science, while amassing extensive data on distribution. Merriam consistently placed emphasis on the results of fieldwork, a penchant which greatly increased the value of the surveys. (11)

Biological Survey agents E. W. Nelson (1855–1934), and his colleague E. A. Goldman (1873–1946), spent 14 years from 1892 until 1906 in most parts of Mexico, collecting 30,000 mammal and bird specimens. Both men made major contributions to understandings concerning the Mexican fauna, though the pressures of their various administrative duties with the Survey sometimes delayed publication of their findings. Nelson published *The Rabbits of North America* (1909) and *Wild Animals of North America* (1919), and was third Chief of the Biological Survey from 1916 to 1927. He was also President of the American Society of Mammalogists from 1920 to 1923. Goldman published *Mammals of Panama* (1920), *The Puma, Mysterious American Cat* (1946), and *The Wolves of North America* (1944), the latter two books with Stanley P. Young. He served as President of the American Society of Mammalogists in 1946. While his *Mammals of Mexico* was left unfinished, his *Biological Investigations in Mexico* was published posthumously in 1951.

As an example of the agency's accomplishments: at its founding in 1885, 343 mammal species had been described. Many zoologists assumed that most key information about North American mammals had already been published. Yet within fifteen years, with the invention of the cyclone trap (Fig. 4) plus improvements in collection and research methods by Merriam and others, the situation had changed radically, and the number of known mammals had more than quadrupled. Merriam himself ultimately described 660 new species. By organizing and training a group of efficient field collectors, many of whom had little formal preparation beyond a common school education, and by publishing important monographic studies of mammal species and genera in the Survey's *North American Fauna* series and elsewhere, he and his agents provided American mammalogy with a solid underpinning. (12)

Studies on distribution of plants and animal life had been known to Merriam most of his life—in particular, the work of Alexander von Humboldt in South America. But in the summer of 1889, Merriam chose to focus more closely on distribution. While exploring the San Francisco Mountain region in Arizona, he noted many climate zones of animal and vegetable life in microcosm (Fig. 5). In his 1890 expedition report, he introduced the new concept of Life Zones,

based principally on temperature and humidity, with temperature the controlling element. Initially, Merriam's conclusions were persuasive. Following four decades of additional study, however, most biologists by the 1930s had concluded the Life Zone theory was "overly simplistic," even though life zones do have some applicability in western states. More sophisticated biogeographic models, involving a wider range of environmental factors, superseded Merriam's Life Zones. (13)

After 1900, formal graduate and laboratory training in zoology increasingly became available in the U.S. Concerned because field investigation, his preferred research method, was losing priority, Merriam nonetheless persisted with field studies, with the continuing aid of the Survey's field agents whom he had carefully trained. (14)

When classifying mammals, Merriam was known as a "splitter" rather than a "lumper." He made very fine distinctions between mammal species based on skeletal, especially cranial features, because skins for examination were often lacking. Modern mammalogists, however, have rejected some of his conclusions. For example, he described eighty-six forms of brown and grizzly bears in North America, assigning five species to Alaska's Admiralty Island alone. Today, North American bear species number less than a handful. (15)

In 1899, E. H. Harriman, a wealthy railroad magnate, sought Merriam's aid in organizing a two-month vacation, hunting, and scientific expedition to Alaska for himself and his family. He invited several dozen scientists and artists—including Merriam—to accompany them. Later, Merriam spent 12 years editing and publishing a dozen volumes by other members of the expedition. Unfortunately, his own projected two volume contribution, an account of the mammals collected in Alaska, never appeared. (16)

While the Biological Survey's staff and duties continued to grow, the agency was consistently underfunded. After 25 years, annual appropriations totaled just \$62,000, and Merriam's salary was a mere \$3,000. Many congressmen failed to appreciate what he was trying to accomplish. But as historian Lawrence Mastroni has recently pointed out, "much of the needed

science was in a rudimentary stage of development, and it was impossible to divorce politics from the governmental decision-making process." (17)

In 1901, Congress delegated to Merriam's agency the enforcement of regulations to limit the importation of exotic animals and to protect game birds—as well as the investigation of game bird propagation and distribution with the collection of relevant statistics. The Survey also was required to provide advice to the Forest Service on predator and noxious rodent control. Merriam felt these tasks were impeding scientific research.

Some Congressmen resented Merriam's independent attitude. Whenever possible, he sent subordinates to testify before appropriation committees. He was less than happy when committee members pointedly asked which lines of the Survey's scientific work might soon be completed, or how the Survey was of any practical value to farmers. (18) House appropriation leaders finally lost patience with him in 1907, and eliminated the Survey's entire appropriation for 1908. Only prompt intervention by Merriam's good friend President Theodore Roosevelt restored this funding. (19)

Increasingly restless, Merriam at last resigned when given a plausible exit. In 1910, Mary Harriman, the widow of his longtime supporter E. H. Harriman, generously offered him an annual stipend of \$12,000 a year to cover his salary and research expenses for the remainder of his working life. Though colleagues now hoped that he would complete a long-anticipated major work on North American mammals (Fig. 6), Merriam insisted this would require more research. Although he continued his long-time interest in North American bears, many associates were surprised when he began spending most of his time studying California's disappearing Indian tribes, their languages, and their distribution. This happened despite Merriam's lack of any formal training in anthropology. (20)

After many years of pursuing Indian studies, Merriam's increasing infirmities led him to retire (Fig. 7). In March 1942, he died at age 86. In an editorial, the *New York Herald Tribune* quoted remarks made by former Interior Secretary James R. Garfield. When presenting Merriam in 1931 with the Roosevelt Medal for distinguished work in biology, Garfield declared that

Merriam had “brought the study of natural history out of the laboratory into the open spaces of field and wood and sky.” The editorial concluded that Merriam “was at once a modern scientist, an old fashioned naturalist,

and a man of wide vision.” Merriam and the Biological Survey still retain a major place in the history of the study of North American fauna. (21)

ENDNOTES

1. Jenks Cameron, *The Bureau of Biological Survey: Its History, Activities, and Organization*, Brookings Institution, Institute for Government Research, Service Monographs of the United States Government, Johns Hopkins Press, Baltimore, MD, 1929, pp. 18–21. Keir B. Sterling, *Last of the Naturalists: The Career of C. Hart Merriam*, (rev. ed.), Arno Press, New York, 1977, p. 56. Wilfred H. Osgood, “Clinton Hart Merriam, 1855–1942”, *Journal of Mammalogy*, vol. 24, no. 4, November, 1943, p. 425. This obituary was accompanied by a twenty-one page “Bibliography of Clinton Hart Merriam,” compiled by Hilda Wood Grinnell, widow of mammologist Joseph G. Grinnell, listing Merriam’s 490 publications.
 2. Sterling, *Merriam*, pp. 4–6.
 3. Sterling, *Merriam*, p. 7.
 4. Sterling, *Merriam*, pp. 8–13. Osgood, “Merriam,” pp. 421–436. Osgood stated (p. 436) that as of 1940, the mammal specimens in the Biological Survey collections begun by Merriam numbered 136,613.
 5. Sterling, *Merriam*, pp. 22–27.
 6. Sterling, *Merriam*, p. 26, 32–33, 143.
 7. Sterling, *Merriam*, pp. 28–35, 143, 321.
 8. Sterling, *Merriam*, pp. 39–44.
 9. Cameron, *Biological Survey*, pp 18–21; Sterling, *Merriam* pp. 58–61.
 10. Cameron, *Biological Survey*, pp. 22–24.
 11. Cameron, *Biological Survey*, pp. 24–30. William E. Cox, “Guide to the Field Reports of the U.S. Fish and Wildlife Service, circa 1860–1961,” 1986 finding aid, Archives of the Smithsonian Institution. Lawrence Mastroni, “The Conflicted Mission of the United States Biological Survey, 1885–1940, Wildlife, Uncertainty, and Ambivalence,” Ph.D. Dissertation., University of Oklahoma, 2012, p. 107. Following the establishment of the Carnegie Institution of Washington in 1901, its trustees advanced various proposals for research which might be funded “with income from [Andrew] Carnegie’s endowment.” Merriam served on a committee concerned with zoology. Roosevelt himself thought that an undertaking similar to the Biological Survey might be launched in the Philippines. A comparable proposal, recommended by Leonhard Stejneger and G. S. Miller, would have covered the Northern Palearctic Region (Europe and Asia). Merriam himself suggested a survey or surveys of Central and South America. But in the end, none of these plans were undertaken. Sterling, *Merriam*, pp. 237–238. James R. Glenn, “Edward William Nelson,” in K. B. Sterling, R. P Harmond, George Cevasco, and L. F. Hammond, eds., *Biographical Dictionary of American and Canadian Naturalists and Environmentalists*, Greenwood Press, Westport, Conn., 1997, pp. 571–573. William Cox, “Edward Alphonso Goldman” in Sterling et. al, *Biographical Dictionary of American and Canadian Naturalists*, pp. 312–314. K. B. Sterling, “Two Pioneering American Mammalogists in Mexico: the Field Investigations of Edward William Nelson and Edward Alphonso Goldman, 1892–1906,” in M. A. Mares and D. J. Schmidly, eds., *Latin American Mammalogy: History, Biodiversity, and Conservation*, University of Oklahoma Press, Norman, 1991, pp. 33–47.
 12. Wilfred Osgood, “Biographical Memoir of Clinton Hart Merriam, 1855-1942” *National Academy of Sciences of the United States of America Biographical Memoirs*, presented to the Academy at the Autumn Meeting, 1944, pp. 12–15. Merriam was elected to the National Academy of Sciences in 1905. Osgood, “Biological Memoir,” p. 17. Mastroni, in his “Biological Survey,” p. vii, 6–7, points out that because the Survey’s mission was to “both kill [through predator and rodent control] and protect wildlife, it could not build unequivocal, long lasting alliances with groups of constituents that would support [the work of] the Survey.” Stockmen supported rodent control but were critical of wildlife protection; sport hunters welcomed wildlife refuges but often opposed enforcement of hunting regulations; while scientists and conservationists endorsed wildlife protection but disapproved of predator and rodent control.
- Mastroni notes that Merriam established two precedents for the Survey: (1), “creating standards for species collection and identification,” and (2) “recruit[ing] people with a passion for natural history, educated or not, who gave years of dedicated service to the Survey.” Earlier Survey staff “exemplified the more generalized natural history tradition, while newer members tended to be non-specialized,” Merriam’s “passion for natural history inspired him to make the Survey a first-rate scientific agency,” but “his distaste for politics and frustration with finding a balance between his scientific interests and the need to demonstrate practical benefits limited

his effectiveness as a leader.” “Since the Survey had to [simultaneously] protect and kill wildlife, it was pulled in multiple directions, and had to address ambivalent views of wildlife.” “The ‘nature of the beast’ was the problem. Wild animals are mobile, difficult to study, and the conditions that govern them...such as the predator prey relation[ship] vary according to region and environment, thus making generalizations problematic.” “The federal government... placed expectations on the Survey, for the management of wildlife. The science needed for their management, however, was imperfectly understood, a perpetual problem...for managing wildlife.” Mastroni, “Biological Survey,” pp. 380–381, 389, 391–392.

Merriam authored *North American Faunas* 1, 2, 4, 8, 11, 16, and 41. He co-authored NAF 3, 5, 7 (which dealt with the Death Valley Expedition), and 10. NAF numbers 6 and 9 were never issued. Cameron, *Biological Survey*, pp. 227–228. One early popular account of the Survey’s work by an insider was “The Policemen of the Air: An Account of the Biological Survey of the Department of Agriculture,” by Henry Wetherbee Henshaw (1850–1930), who succeeded Merriam as Biological Survey Chief in 1910. Henshaw proposed that the Survey change emphasis “from research and pure science to applied science.” *National Geographic Magazine*, vol. XIX, No. 2, February 1908, pp. 79–118.

Mastroni, “Biological Survey,” p. 27. Merriam had been a co-founder of the National Geographic Society, and served as one of its trustees for 54 years.

The Cyclone Trap, designed by John and Thomas Morris, of Seward, Nebraska, received US Patent number 288,182 in 1883. See David Drummond, “‘The Delusion’ of John Morris: A Better Mouse Trap and its Makers,” *Nebraska History*, Summer, 1997, Nebraska Historical Society, no. 78 (1997) pp. 72–73. Sterling, *Merriam*, p. 69. (illus.)

13. Sterling, *Merriam*, pp. 212–219; see, for example, L. Kellner, *Alexander von Humboldt*, Oxford Univ. Press, London, 1963, pp. 93–96; Aaron Sachs, *The Humboldt Current: Nineteenth-Century Exploration and the Roots of American Environmentalism*, Viking Press, New York, 2006; Alexander von Humboldt and Aime Bonpland, *Essay on the Geography of Plants*, ed. and intro by Stephen T. Jackson, tr. by Sylvie Romanowski, Univ. of Chicago Press, 2009.

C. H. Merriam, *Results of a Biological Survey of the San Francisco Mountain Region and Desert of the Little Colorado of Arizona*, North American Fauna No. 3, Division of Ornithology and Mammalogy, US Department of Agriculture, Washington, D.C., September, 1890; C. H. Merriam, *Life Zones and Crop Zones of the United States*, Biological Survey Bulletin No. 19, U.S. Dept. of Agriculture, Washington, DC, 1898. There were seven life zones, and one thing critics noted was that “many species and subspecies in a given region fall short of, or

exceed, the ranges of the conspicuous forms which serve as an index to the zones.” Alexander G. Ruthven, “The Environmental Factors in the Distribution of Animals,” *Geographical Review*, vol. 10, pp. 241–248, New York, 1920. See also Vernon Bailey, *Biological Survey of Texas*, North American Fauna No. 25, Biological Survey, U.S. Department of Agriculture, Washington, DC, 1905. A. Brazier Howell contended that “species distribution cannot be reduced to a formula.” In “Theories of Distribution: A Critique,” *Ecology*, vol. 5, 1924, pp. 51–53. H. S. Sheldon, who headed up the Survey’s Public Relations Department in 1940, stated that life zones were merely “a valuable preliminary to...more detailed [ecological] studies.” Mastroni, “Biological Survey,” pp. 95, 99.

Merriam was obliged to leave the Death Valley Survey before it was completed in 1891, because President Benjamin Harrison asked him to serve on a four man British and American commission dealing with pelagic sealing issues in the Bering Sea. These responsibilities periodically took Merriam away from his Biological Survey tasks until final agreements between the two nations were signed in 1912. Sterling, *Merriam*, pp. 289–306.

14. The first American college level course in mammalogy was offered by Glover M. Allen (1879–1942) at Harvard around 1907. The first course in mammalogy offered by the University of California at Berkeley was in 1910–1911, and the first doctorate in the subject may have been the one awarded to Walter P. Taylor (1888–1972), later a member of the Biological Survey staff, at Berkeley in 1914. Sterling, *Merriam*, p. 374, note 50.
15. In 1917, Merriam admitted to a friend (Charles Sheldon) that the text of his review of bear species “has not gained maturity.” He had hoped that “it might escape until sufficient material had been gathered to insure reasonable maturity of results.” But “the ceaseless importunities of others [had] produced a cumulative pressure too severe for its powers of resistance. It makes therefore, no pretense to monographic completeness, being at best merely a report of progress to the year 1917, subject to correcting and revision in the light of material to come.” He was well aware that his views on the subject were controversial, because he invited interested skeptics to examine the Survey’s specimen collection for themselves. Osgood, “Biographical Memoir,” p. 23. Merriam later completed a popular version of his bear study for publication, but the editor at Doubleday, Page, in New York who had been working with him wanted credit as co-author. Because that individual had done none of the actual writing, Merriam refused, and the book was not published. Sterling, *Merriam*, pp. 184–186, Pers. Com., Zenaida Merriam Talbot to author, 10 February 1974, note 28, p. 370. On Merriam’s views concerning species, see C. Hart Merriam, “Suggestions for a New Method of Discriminating between Species and Subspecies,” *Science*, n.s., 14 May 1897, pp. 753–758; C. Hart Merriam, “Criteria for the

Reorganization of Species and Genera,” *Journal of Mammalogy*, 1 (November 1919), pp. 6–9.

16. Sterling, *Merriam*, pp. 119–123; William Goetzmann and Kay Sloan, *Looking Far North, The Harriman Expedition to Alaska, 1899*, Viking Press, 1982. “The scientists reported finding thirteen genera and six hundred species new to science, as well as thirty-eight new fossil species.” Maury Klein, “Going North,” in his *The Life and Legend of E. H. Harriman*, University of North Carolina Press, Chapel Hill, 2000, pp. 181–200. Kay Sloan, “For the Benefit of Others: The 1899 Harriman Alaska Expedition,” in Thomas S. Litwin, ed., *The Harriman Expedition Retraced: A Century of Change, 1899–2001*, Rutgers University Press, 2005, p. 17.
17. For the Survey’s cooperation with the Forest Service on predatory and noxious species control, see Cameron, *Biological Survey*, pp. 42–46.
18. Cameron, *Biological Survey*, pp. 13–14, discusses Merriam’s studies of the distribution of species. Osgood, “Biographical Memoir,” pp. 15–16.
19. Osgood, “Merriam,” p. 430. Part of Merriam’s difficulties with Congress in 1907–1908 reflected its opposition to certain of Roosevelt’s other policies. For some of the many Congressional queries concerning the utility of Biological Survey research to farmers, see Cameron, *Biological Survey*, pp. 37–42. With the passage of the Lacey Act of 1900, the Survey took on a regulatory and managerial role. It enforced a provision which prohibited the poaching of game in one state and selling it in another one, and endeavored to restore “declining bird populations.” Mastroni, “Biological Survey,” pp. 53, 63. Cameron, p. 135. Migratory bird refuges began operation in 1903, and big game refuges in 1909. Congress, however, provided only meager support for game law staff.

Other government departments helped enforce certain of the Lacey Act provisions. Treasury “helped formulate regulations for the importation of birds and mammals,” Interior had to assist with illegal game shipments from the Indian territories, Alaska and Hawaii, and Justice prosecuted violations of the relevant federal statutes. Several branches of Agriculture assisted with enforcement of the laws and permits for the entry of foreign birds and game. Sterling, *Merriam*, pp. 81–83. See also K. B. Sterling, “Builders of the Biological Survey, 1885–1930,” *Journal of Forest History*, vol. 33, no. 4, October 1989, pp. 180–187, and K. B. Sterling, “Zoological Research, Wildlife Management and the Federal Government in Science,” in Harold K. Steen, ed., *Forest and Wildlife in America: A History*, Forest History Society, Durham, NC, 1999, pp. 19–66.

By the 1930’s, Merriam “had reservations” concerning predator control. In a letter published in the *Journal of Mammalogy*, he wrote, “in certain places and at certain times” it was necessary,” but “when it comes to employing upward of three hundred men to distribute poisons broadcast over vast areas, I must confess that my sympathy is with the animals.” Merriam, letter to the editor, *Journal of Mammalogy*, vol. 13, February 1932, p. 97. (emphasis in the original). Mastroni, “Biological Survey,” p. 106.

20. Merriam had a small private income before he began receiving the annual subventions from the Harriman Fund. Mrs. Harriman died in 1932, at age 81, but Merriam continued to receive payments from her estate as before. These were reduced to \$11,000 annually in 1936 because the value of the Harriman Fund Securities had declined owing to the Depression. When Merriam’s active research ended in late 1939, and Zenaida Merriam was made her father’s guardian, this income from the Harriman Fund ended. Sterling, *Merriam*, note 55, p. 409.

In the years after he built a summer home in Lagunitas, California in 1911, Merriam, his wife Elizabeth (his former secretary, whom he had married in 1886), and their two daughters Dorothy and Zenaida began vacationing there. While Merriam became fascinated, and indeed very knowledgeable about motor cars, travelling to California by auto was problematical at first because roads west of the Mississippi River had not been designed for interstate traffic. Merriam’s wife died in 1936. Osgood, “Biographical Memoir,” p. 18. Sterling, “Merriam,” p. 316.

Merriam’s interest in California Indians grew out of the frequent vacations he spent there, and his growing realization that many tribes were disappearing. Osgood, “Biographical Memoir,” pp. 19, 22. Merriam spent his final years in retirement at a nursing home in Berkeley, California. It had been hoped that his entire library would go to the Museum of Vertebrate Zoology at Berkeley, but the necessary arrangements had not been completed by the time of his death. Thanks to intervention by E. R. Hall at the University of Kansas, Merriam’s library was purchased by philanthropist Ralph N. Ellis Jr. (1908–1945). In 1949, following protracted Ellis family legal proceedings, Ellis’ impressive collection of ornithological and mammalogical books (including the Merriam materials) were presented to the University of Kansas Libraries. Sterling, *Merriam*, p. 318 and note 55, p. 409. See also “Mark D. Hersey, ‘An Advanced Case of Bibliomania, October 8, 1949,’ KU History, University of Kansas.” accessed online, 30 April 2014. “History of Science, Kenneth Spencer Research Library, KU (Kansas University),” accessed online 2 May 2014.

21. Merriam’s health issues included diabetes beginning in the 1920s. Sterling, *Merriam*, pp. 315, 318.



Figure 1. C. Hart Merriam and his youngest sister, Florence, c. 1863. From the collection of Zenaida Merriam Talbot.



Figure 2. C. Hart Merriam's museum at Homewood, his father's home. Probably taken sometime in the early 1880s. From the collection of Zenaida Merriam Talbot.



Figure 3. C. Hart Merriam, April, 1878, age 22, while at the College of Physicians and Surgeons, Columbia University, New York City. Photograph provided by Richard Manville from the library of the Bird and Mammal Laboratories, United States Museum of Natural History.

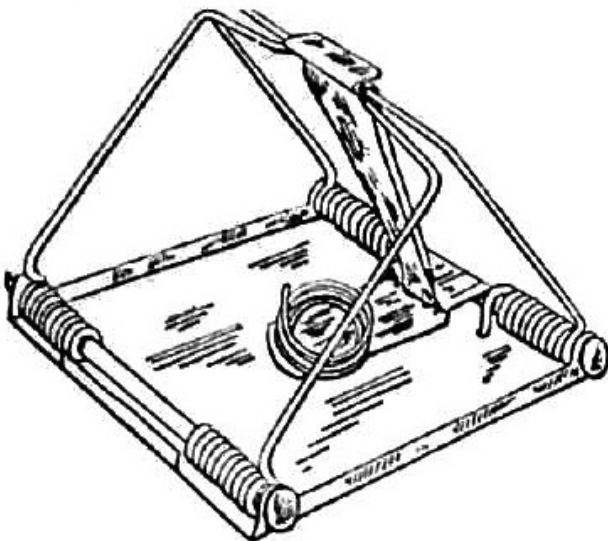


Figure 4. Cyclone trap that helped revolutionize the collection of small mammals. Taken from Gerrit S. Miller, Jr., and James Gidley, "Mammals" in *Warm Blooded Vertebrates*, Smithsonian Scientific Series, Washington, 1931, vol. 9, p. 238.



Figure 5. U.S. Biological Survey personnel in the San Francisco Mountains Arizona, 30 November 1889. Front row (L–R) Virginia Elizabeth Gosnell (Mrs. C. Hart Merriam); C. Hart Merriam; Vernon Bailey. Back row Leonard Stejneger (L) and Fred Knowlton (R). Courtesy SIA, Jackson files, RU 7172.



Figure 6. C. Hart Merriam (L) and Vernon Bailey (R) on horseback at Adler Springs, California, 5 September 1916. Courtesy of National Photographic Archives, Record Group (RG) 22-WB-0613.



Figure 7. C. Hart Merriam later in life, living in retirement in California. Courtesy USGS-PWRC, Biological Survey files.

VERNON BAILEY (1864–1942): CHIEF FIELD NATURALIST OF THE BIOLOGICAL SURVEY

David J. Schmidly

INTRODUCTION

When he started the Division of Economic Ornithology on 1 July 1885, with a meager budget of \$5,000, Merriam understood that he had precious few resources to carry out his ambitious scientific vision. His primary interests had to do with the geographic distribution of birds and mammals, and, when it became feasible, with an exhaustive survey of the nation's mammal resources.

Merriam soon realized that he could not do all of the work himself, including administering a new division and handling the political environment in Washington along with the scientific work, and that he would need some talented people to assist him (Sterling 1978, 1979). He especially realized that a survey of the mammal fauna in the United States could not be achieved without full-time people to work in the field and execute his strategy of mapping life zones and obtaining specimens and detailed descriptions of habitats and physiography. His record as administrator of the Survey was distinguished by his ability to attract a number of capable men, many of whom later became notable mammalogists in their own right, and whom he indoctrinated in the Merriam field method, which entailed sending out field parties to collect mammals (and also birds, reptiles, and amphibians) in the districts to be studied.

In the early days, before the Civil Service took a stand on the matter, Merriam hired young men as field agents, many of them with only spotty formal education, and subjected them to his own peculiar brand of on-the-job training. Fortunately for him, he was able to assemble an exceptional group of men with an interest in natural history, field work, and administering laws and policies to protect wildlife, and he was good at educating and training them for precise scientific and administrative tasks.

Since no college or university provided the kind of training required for field work with the Survey, Merriam preferred to "have the farmer's boy who

knows the plants and animals of his own home than the highest graduate in biology of our leading university." He felt that farm boys could be developed into sound general naturalists after learning about the fauna and flora of several districts (Merriam 1893). One such farm boy, Vernon Orlando Bailey, was discovered by Merriam himself and became one of, if not the greatest, of Merriam's protégés. The careers of these two men would become intertwined during the years that Merriam served as Chief of the Survey, and the mentoring and teaching that Bailey received would make him indispensable in Merriam's efforts to survey mammals in the western United States.

I became interested in Vernon Bailey as a graduate student in the 1960s working on Texas mammals. I made extensive use of his *North American Fauna* bulletin *Biological Survey of Texas* while working on both my Master's and Ph.D. research. Then, in the 1980s and 1990s, while completing a book, *Texas Natural History A Century of Change*, I had occasion to visit the Smithsonian Institution archives and explore firsthand the rich archival information about Bailey—his field notes, trip reports, specimens, and correspondence.

I also visited the American Heritage Center at the University of Wyoming which houses the most extensive archive about Bailey. Other major archives with Bailey material include the Library of Congress, The National Personnel Records Center, and the Merriam papers in the Bancroft Library at the University of California at Berkeley.

In 1989, Harriet Kofalk, a friend of Bailey's niece, Betty Hone, published a biography of Florence Merriam Bailey (Bailey's wife, the sister of C. Hart Merriam, and one of the leading women ornithologist of her times), which also included much information about Bailey. Kofalk and Hone (undated) also produced a draft biographical manuscript about Bailey but it was incomplete and lacked reference sources. Around 1990,

I reviewed this draft manuscript for the Texas A&M Press and remain in possession of one of the few copies that still exists. Unfortunately, both Kofalk and Hone passed away without ever completing or publishing their work (Kofalk and Hone undated). A copy of their manuscript now has been placed in the archives of the Southwest Collection at Texas Tech University where it is available for study.

Bailey's early career was studied extensively by a well-known historian of science, Robert E. Kohler, who in 2008 wrote a major article about his socialization and development as a scientist growing up on a family farm and then coming under the tutelage of Merriam. Kohler based his paper on the extensive letter exchange

between Bailey and Merriam (housed at the University of Wyoming) as Bailey began his career as a field agent for the U.S. Biological Survey (USBS).

All of this material is brought together in this paper to focus on five aspects of Bailey's life and career: 1) his early childhood years growing up in a log cabin on the western frontier in Minnesota; 2) his apprenticeship and mentorship under C. Hart Merriam while working for the USBS; 3) his marriage in 1899 to Florence Merriam (C. Hart's sister), who would become his constant companion on field trips and trusted confidant for over 40 years; 4) the remainder of his career at the USBS following the departure of Merriam as head of the agency in 1910; and 5) his retirement years.

BAILEY'S CHILDHOOD AND ADOLESCENCE

Vernon Bailey was born on 21 June 1864, in Manchester, Michigan, the fourth child of Hiram and Emily Bailey. In 1870, when he was about six years old, his father sold the Michigan farm and moved the entire family west about 700 miles in a horse-drawn wagon to the western edge of the frontier to live on an 80 acre homestead near Elk River, Minnesota. The large family was close knit and hard-working, and every family member worked together. The roots of Bailey's scientific skills and vocation would come from this productive, physically skilled environment where he lived with nature on a daily basis.

Education in this frontier setting was rudimentary and Bailey only completed seven years of public school and two years of high school. His education was embedded in family and community life, and his early education, haphazard as it was, gave him a respect for learning and teaching that would inspire all his subsequent work for the Biological Survey. As a child, he became an avid reader and had a flair for direct self-expression, and he became adept at self-teaching and learning by doing. (See Kohler 2008 for an extensive discussion of Bailey's socialization and training as a naturalist.)

Because of his work on the farm, Bailey became attracted to the outdoors and developed an interest in natural history early in his life. By the time he was a

teenager he was collecting birds, mammals, reptiles, as well as skeletons and plants. He learned taxidermy by himself and began to mount birds and mammals for which he made a nice profit by selling them to firms in Canada and Germany. He also became involved with the American Ornithologists' Union's bird census network.

Bailey developed a "passion" for shrews which were in abundance on the Bailey farm. He devised a way to trap them easily, but had difficulty identifying them. Solving this challenge would prove to be one of the greatest events in his life! Here is the story in Bailey's own words:

During the summer season work on the farm required all of the time we could well give between daylight and dark, but I found it possible to keep lines of little traps out in the woods and meadows. In winter the farm work was less pressing, and I devoted more time to collecting specimens, including many of the furbearing animals, squirrels, flying squirrels, rabbits and such of the mice as did not hibernate, and several species of small shrews. The shrews interested me especially, because I soon discovered that there were more different kinds than I had supposed or than anyone seemed to know about But the names of

these little animals were a mystery to me. The differences were evident, but what to call them was beyond my comprehension. I wrote to a taxidermist, John Morden, in London, Canada, asking if he knew of any way to find out the names of these little animals. He gave me the name of Dr. C. Hart Merriam, at Locust Grove,

Lewis County, New York, and suggested that I might get Dr. Merriam to identify specimens. I wrote him and received a prompt and courteous reply, offering to identify any specimens that he could and also asking if I would collect certain things for him that he needed. (Bailey in lit., box 13).

THE INFLUENCE OF C. HART MERRIAM AND HIS EARLY YEARS WITH THE USBS

Bailey was eager for scientific information, so the two men began a significant correspondence. Their first letters in 1885 concerned their common interest in mammals: Merriam's desire to purchase first-rate specimens of Minnesota mammals and Bailey's wish to serve and learn from a distinguished naturalist. Merriam was greatly impressed with Bailey's talent for finding rare species and preparing specimens and began to instruct him on ways to improve his work and how to properly prepare specimen labels, catalogues and field notes as well as learn the Linnean names for species (Sterling 1973, 1974). Merriam offered to buy specimens from him and the prices seemed fabulous to the young farm boy—25 cents for mice and a dollar for woodchucks and skunks. In 1886 Bailey mailed in 495 skins, 575 skulls, and 10 pickled specimens, for which Merriam paid him \$268.55 (equivalent to \$4,056 in today's currency).

In another letter, Merriam asked Bailey to get him some shrews to which Bailey replied, "How many do you want?" and Merriam said "all you can get" (Osgood 1943). Sometime later, Bailey sent him no fewer than 60 shrews! It was probably at that time that Merriam began to realize what a special talent he had discovered and how valuable he could be for what Merriam envisioned would be the mission of the infant Biological Survey.

In 1886, following extensive correspondence and the purchase of some of Bailey's specimens, and after seeing his improvements in note taking and specimen preparation first hand, Merriam proposed to send him on a collecting trip to the western plains as soon as he had the money. Bailey was young (22 years old) and unmarried, and he could go anywhere and stay as long as he liked. As he wrote to Merriam:

I have plenty of good steady work at home on our farm, but I like collecting better as I then have a chance to study a little and I like to collect for you as I get much besides money for my work (Bailey in lit., box 13).

Without ever having personally met him, in 1887 Merriam appointed Bailey as the first field agent of the Biological Survey at a starting salary of \$40/month, and sent him to collect in the northern Great Plains (Dakota Territory and Minnesota) and Rocky Mountains (Fig. 1). Thus began an apprenticeship between collector and mentor. Bailey would write Merriam regularly and send in specimens, catalogues, and notes. Each shipment from the field brought by return mail a long letter from Merriam, identifying and naming Bailey's specimens (or correcting his identifications), providing information about what species he could expect to find at his next stop and where to look for them, and critiquing his specimen preparations and reports. A regular exchange of reports, feedback, and revised itineraries was essential to efficient fieldwork, and these directives were focused on continuing Bailey's training as a naturalist (Kohler 2008).

In the five years between May 1887 and April 1892, Bailey was in the field for almost four years. One trip kept him on the move and away from home for 22 months straight. Bailey's travels took him to just about every corner of the American West, which gave him a broad and deep knowledge of the American West and the ability to master new regions and faunas quickly (Sterling 1989). In 1890 he was given the title of Chief Field Naturalist, which he held until his retirement in 1933, and which no other person has held since. The greatest volume of collecting in the Survey during the period when Merriam was the Chief was done by Bailey.

The living conditions on these trips were harsh and austere. For a day's subsistence in the field, stipends ranged from as low as ten cents to about 50 cents (Sterling 1978). But Bailey thrived, for the most part on the work. He was sending in thousands of specimens and information about the fauna of the southwestern and western states that were contributing to the taxonomic and faunal surveys being published in the new journal of the Survey, the *North American Fauna*.

Working for the meticulous Merriam was a grueling experience. He could be quick to admonish mistakes and slow to offer praise, as well as being a "petty tyrant" about expenses (Sterling 1973). Merriam never ceased to correct Bailey's species identification and to blame him for leaving a place too quickly when Bailey failed to get species he especially wanted. Once Bailey was chastised—for not staying longer to get a species that was said to be abundant and that Merriam especially desired. But Bailey could defend himself when he felt unjustly accused: "I am sorry that I made so many mistakes," he wrote to Merriam, "but please do not credit me with any more than belong to me. I am willing that fault should be found where it exists but it is more pleasant if expressed civilly" (Kohler 2008).

Merriam's tone gradually softened as his protégé became more and more adept at his work, and it became obvious that he was pleased with his progress. In uncharacteristic words of praise, he told Bailey how he felt. "Your collection from St. Mary's Lake is one of the most interesting ever received from a single locality. Your mammal report is unusually full and correspondingly interesting" (Kofalk and Hone, undated).

Merriam occasionally took an avuncular tone with his men, fussing over their diets and their health in much the same manner as he might once have done with his patients. For example, he once told Bailey: "So long as you will persist in drinking grease and eating things unfit for human stomachs I don't see how you can hope to remain well for any length of time. Both you and Dr. Stejneger need guardians" (Bailey in lit., box 1).

He also was quick to recommend mental treatment, if one of his men made judgments that he found incomprehensible. Here is one example to Bailey in 1906:

You had better go at once to the hospital in Albuquerque, or some other handy place, where you can find a good medical expert and have your head examined. I have just had a letter from you in which you state that unless a wolf can be killed inside of three minutes he might as well not be killed at all. Inasmuch as no sane man could possibly make such an absurd and utterly preposterous statement as this you are obviously in need of mental treatment. Trusting you will come out all right in the end... (Bailey in lit., box 2).

Merriam had little tolerance for outward expressions of doubt about his concepts. For example, when Vernon Bailey was doing field work, Merriam encouraged him to pay special attention to altitude, since it is correlated with temperature and thus provided evidence for his life zone theory. On one occasion, Merriam told Bailey, "Of course you have found out that altitude has more to do with limiting the distribution of species than any other single cause." When Bailey presented evidence or made suggestions that conflicted with the life zone theory, Merriam corrected Bailey or dismissed the evidence as anomalous. He told Bailey, "you overdid yourself" by suggesting slightly different contours for one of the life zones. He dismissed this evidence that ran contrary to his theory as just a "faint tinge" that has "been detected here and there..." (Bailey in lit.).

The Survey sponsored two special field expeditions early on—1889 to the San Francisco Mountains in Arizona and 1891 to Death Valley—that were crucial to the development of Merriam's life zone theory. Both Bailey and Merriam participated in these trips along with A. K. Fisher and T. S. Palmer (Merriam 1890; Death Valley Expedition 1893). By 1891 Bailey was himself put in charge of the field work, as well as training the increasing number of green recruits for the Survey under Merriam's overall supervision. Because of his patience and previous experience, Bailey excelled at this, and it would become an increasingly important part of his responsibilities at the Survey. He trained younger men like Ned Hollister who went on to gain fame as a mammalogist and as head of the National Zoo.

Beginning in 1892, Merriam began to bring Bailey to Washington for instruction in taxonomy, as

well as to improve his writing and editorial skills (Fig. 2). By now, Bailey had become a close friend, and he stayed at the Merriam home on most occasions when he was in D.C. But despite this friendship, Bailey always kept himself secondary to Merriam, even though a few years later he would become his brother-in-law. He never saw Merriam as a role model; though Merriam was just nine years older, the difference in life experience as well as social and scientific standing was just too great (Kohler 2008).

Bailey enjoyed living in a big city, which as a young farm boy he had never experienced before. He continued his development as a naturalist, publishing more and more and achieving election to the Biological Society of Washington where he regularly attended seminars and social events. But he was always happier in the field. In his own words, “I feel cooped up here in town and am anxious to get out in the country. I look forward to the summer’s collecting with some pleasure and feel quite confident of success” (Kofalk and Hone undated). Though he took great pains to teach Bailey the necessary technical skills, Merriam did not school him in the social skills of being a professional and making a career. These Bailey had to learn for himself, gradually and haltingly (Kohler 2008).

Kohler (2008) has postulated that when he first went to work for the Survey, Bailey did not consciously fashion himself as a career naturalist. Rather, he worked his way into the role, acquiring a new identity while serving his apprenticeship under Merriam. Merriam almost certainly had a clearer idea of Bailey’s future as a career naturalist than the young man had himself—because he knew that Bailey was indispensable to his grand project of a national faunal survey (Fig. 3).

Bailey always seemed to feel a little out of place among the professional scientists with their college degrees, and his lack of formal education and academic training was a constant sore spot with him (Kofalk 1989). Working side-by-side with well-educated and experienced naturalists also taught him things he could not learn on his own or from books and helped to gradually convince him that he too was or could be a career naturalist. He was especially drawn to the herpetologist Leonard Stejneger, with whom he worked in the Southwest, and the botanist Frederick Coville, one of

his companions in Death Valley (Kohler 2008). He also learned a great deal from T. S. Palmer and A. K. Fisher, two of his contemporaries at the Biological Survey. He saw in these men what it would be like to be a career naturalist. His instinct was to regard them, along with Merriam, as teachers and to see in them the qualities that he most admired and wished to have himself, most notably a formal education and broad learning.

Here is what he had to say about Palmer and Fisher in a letter sent to his parents while on the Death Valley Expedition in 1891:

Palmer is a quiet, pleasant fellow. He has a good classical education, is clear headed and has a talent for managing men – is better at that than at managing horses. He is a good worker but does hate to get up in the morning. He is a little younger than I am, I don’t know just how old. Is just beginning to raise a moustache and has a boyish look.

Dr. Fisher is about 35. He is always joking till his face has settled down to a funny, dry smile, except when he rides horseback. Then it wears an expression of painful endurance. He is about my size, light complexioned, and is, all round, a jolly fellow to be with. (Kofalk and Hone undated).

Bailey was always excited about going into the field with Merriam. “He is a grand old chap,” Bailey once mused, “but a splendid fellow to camp with, always does his share and never shirks the dirty or hard work” (Kofalk and Hone undated). Bailey especially enjoyed the trips when Merriam’s wife was along because apparently it took some of the steam out of Merriam’s rough edges.

Merriam obviously grew to have great confidence in Bailey. When he reorganized the Biology Survey into a Bureau in 1905, he placed him in charge of investigations in geographic distribution (Fig. 4), one of three major responsibilities of the Survey, the only one Merriam had created, and the one that sustained most of Merriam’s interest during his years as Survey Chief (Bailey in lit., box 2). A 1896 memo by Merriam, in which he recommends a raise for Bailey, described his working conditions as well as his impressions about

his performance, "Mr. Bailey's duties are such that he is obliged to furnish, at his own expense, a wagon and pack outfit with horses or mules or both, and to hire a man as teamster and cook." ... "Mr. Bailey has filled the position he now holds for a number of years and is universally recognized as the most competent man in America for the place."

Howard McAtee, a fellow employee at the Biological Survey, was quite harsh in talking about Bailey, noting that he was kept on despite some egregious errors because he was "a perfect toady to Merriam" and also because he was married to his sister (McAtee in lit., box 46). McAtee saw Bailey as essentially a field collector who trained others in the art but never rose above that status in ability. A. K. Fisher, who served in the field with Bailey on the Death Valley Expedition, had this to say about him:

Even with these shortcomings and being handicapped by insufficient foundation, he deserves a great deal of credit in advancing forward in the study of mammals of the U.S. Of course his brother-in-law C. H. Merriam was a great guide and assistant to him in this line of work. His wife also undoubtedly was of great assistance to him in working out his zoological problems (Fisher in lit., box 40).

Others have generally given Bailey high marks as a man, describing him as scrupulously honest and fair, and a model of integrity who was quietly generous and admired by all who knew him (Sterling 1974).

Bailey remained with the USBS for the rest of his career, and his scientific work tracked that organizations ups and downs. After Merriam chose to retire in 1910, the survey's work—and Bailey's—became more strictly economic (predator extermination, fur farming, wildlife education). He wrote, often in a popular vein, about animal life history. He remained the survey's premier field naturalist, always happiest and most at home in the field.

As he became famous for his work with mammals, he won various nicknames indicative of his pursuits (Chesnut 1929). Theodore Roosevelt called him "Wolf" Bailey because of his efforts to protect farmers and cattlemen of the West against this predator. "Gopher Jim" Bailey was applied to him after his first bulletin on pocket gophers. "Beaver" Bailey was earned during his research on their natural history and potential to be raised profitably on farms.

Roosevelt and Bailey had become acquainted when the former was Civil Service Commissioner. After becoming President, his son (Theodore Junior) came under Bailey's tutelage. He taught him the art and skill of trapping wild mammals and how to skin and prepare them for specimens (Chesnut 1929). Young Ted joined Bailey in some field work in the spring of 1902. Merriam wrote Roosevelt that Bailey felt the boy was "made of the right stuff, remarkably well informed and eager to learn," and that he does not "get discouraged when (Bailey's party) fails to catch anything." Roosevelt replied that "Ted had a heavenly time with you" (Sterling 1973).

BAILEY'S MARRIAGE AND RELATIONSHIP WITH MERRIAM'S SISTER

Given the close relationship between Bailey and Merriam, it is not surprising that their friendship extended rather naturally to Merriam's sister, Florence. There is every indication that Merriam himself strongly encouraged their friendship and growing relationship. Things intensified in the 1890s as Bailey spent time out West where Florence was recovering from a serious bout with tuberculosis. In 1893 they spent some time together in the summer field season in Nevada, and when Bailey was in Washington, D.C., he often stayed at the Merriam home where he would see her.

In the summer of 1898, Florence served as a field assistant in Merriam's expedition to study the flora and fauna of Mount Shasta, California. Bailey, then the Chief Field Naturalist of the Biological Survey, was also a member of that party, and they spent time together in the field and began to develop a deep fondness for one another.

The next summer Bailey informed his family of his intentions, writing:

I have been trying to keep a secret all summer... But I can't keep it any longer. I have a message to deliver. Other people are finding it out and I wouldn't have you hear it first from someone else. I wanted to wait till I came home so I could tell you what a noble, sweet souled woman had promised to be my wife. It is worth all the lonely years I've waited to know such a soul, such love at last (Kofalk and Hone undated).

On 16 December 1899, Florence Augusta Merriam and Vernon Orlando Bailey were married in Washington, D.C., 36 and 35 years of age, respectively, and then headed for the American Southwest on a field trip for their honeymoon (Fig. 5). From April to September, they traveled by train to Texas where they studied the wildlife to the Mexican border and then into the territory of New Mexico. Their interests, while overlapping and complementary, took separate avenues: Vernon studied mainly mammals, and Florence kept to birds. Over the next 30 years they would work together in Texas, California, Arizona, the Pacific Northwest, and the Dakotas. Mrs. Bailey wrote up her ornithological observations made on all these trips, and they appeared for the most part in a long succession of papers in *The Auk*, *Bird-Lore*, and *The Condor* (Figs. 6 and 7).

By all accounts their marriage was a happy and productive one (Fig. 8). According to Florence's grandniece, Vernon was perfect for her, a very simple gentleman. She fussed over details he wouldn't have. Vernon was very outgoing and everyone adored him. "Auntie Florence basked in his glory" (Kofalk 1989). They occasionally published together, Vernon on the mammals of a region and Florence on the birds. Their entire married life of more than 40 years was governed by the principle of working together and working for others, whether in natural history studies, or in any field—social, educational, or humane—that called for cooperative effort (Preble 1942). The Baileys were listed among the forty-nine "notable couples" in science before the 1940s. Clearly, their marriage and relationship sustained one another, both personally and professionally. As Olaus Murie said, after visiting them in their Washington, D.C., home "Here lived a congenial pair of naturalists of the old school, at peace with Nature, and with Mankind" (Kofalk 1989).

They made their permanent home in Washington, D.C., first at the Merriam's on 16th Street, then at a residence on the corner of 19th and California streets, and finally at the home they built on an oak-wooded site at 1834 Kalorama Road. Their home on Kalorama Road was a mecca for naturalists of all breeds and varieties. The dinner parties they held there became legendary in the scientific community as well as among visitors. According to one account:

No one who ever visited that home in the old days will forget it; for it was the home of two devoted naturalists—devoted to Nature and to each other—and every room, every nook and corner, was a testimonial to that devotion. It was a place where many kindred souls foregathered (Kofalk 1989).

One visitor spoke of a hibernating bat, known as "Copernicus," which at precisely 5:00 each evening would awaken and fly upstairs to Vernon's desk, where he would feed it fresh insects, or on occasion assign the task to visiting young people (Kofalk 1989). A kangaroo rat occupied a well-equipped cage on the library table, and an emerald-tinted lizard lived in a glass bowl on top of Vernon's desk. For years Bailey maintained a number of small mammals in the basement of their Washington home, including kangaroo rats, which he avowed kept the cockroaches under control.

Vernon and Florence married late compared to the custom of their time and were never to have children, although Florence is known to have suffered several miscarriages. Despite this disappointment, both Vernon and Florence were devoted to young people. Working with the Boy Scouts was of particular interest to the Baileys, and Vernon served as a scoutmaster for many years.

Mrs. Bailey was a warm-hearted, straight-laced lady who consistently refused to collaborate on any writing project with anyone but her husband (Kofalk 1989). Her moral standards were of the highest, and she refused to include the works of one government ornithologist in her bibliographies because she disapproved of his life style. Both she and Vernon took pleasure in correspondence, regularly writing one another and coworkers as well as family and close friends.

She shared her husband's discipline of keeping Sundays free of work, using time to catch up on correspondence.

In 1931, Mrs. Bailey was awarded the Brewster Medal of the American Ornithologists' Union for her work, *Birds of New Mexico*. She was the first woman to receive the honor, and two years later the University of New Mexico awarded her an honorary LL.D. degree "in recognition of the educational and scientific value of her work on *Birds of New Mexico*." Vernon's companion work on *Mammals of New Mexico* was published in the North American Fauna in 1931. The

two works together form a landmark in western natural history. (As an aside, Vernon Bailey was nominated for an honorary degree at UNM but, although promised, it was never officially granted.)

When Bailey retired in 1933, the couple originally planned to spend their winters near San Diego, California, but soon found that it was easier to remain in Washington, D. C. After Vernon died in 1942, Florence kept on at the Bailey home, but she survived her husband by only six years. She died in Washington on 22 September 1948.

BAILEY'S CAREER AT THE USBS AFTER MERRIAM'S RETIREMENT

Merriam reached the apex of his career as a government official in the years 1901–1909, when he enjoyed the friendship of President Theodore Roosevelt, a fellow naturalist (Sterling 1974). This also was a period of great productivity and achievement for Vernon Bailey.

With Teddy Roosevelt leaving office and Merriam's retirement in 1910, the Biological Survey began to shift away from biogeographic and taxonomic work toward more strictly economic activities (predator extermination, fur farming, wildlife education) and ways to help farmers. It gradually took on the role of a regulatory agency, with its research functions much reduced in scope. As Congress passed wildlife laws, it charged the Survey with enforcing them as well as more practical problems associated with nuisance wildlife, predator control, wildlife management, and even the use of wild species of mammals for profits on farms and ranches (Mastroni 2012).

With this shift, Bailey's role within the agency also shifted (Fig. 9). While he continued to do some field work, particularly at some of the newly designated national parks (Grand Canyon, Carlsbad Caverns, and Glacier), he also received special assignments to investigate the status of large game mammals and other species of economic importance. In 1912 and 1913 Congress appropriated \$50,000 to the Survey to cope with the elk problem, and Bailey was dispatched into the west to determine the status of elk populations. In 1925 he was sent to Pennsylvania at the request of their

Game Commission to investigate a massive die off in the deer populations associated with crop depredation. His report to the Commission was instrumental in establishing a complete closure on the hunting of antlered bucks for the 1928 season and an open season on antlerless deer. The success of this program began to change public opinion about opposition to hunting antlerless deer, and deer management began a move toward sound scientific principles (Dunlap 1988).

Over a five year period in the 1920s, Bailey spent considerable time overseeing and conducting biological investigations of beavers with reference to control measures, breeding habits, food requirements, and possibilities for domestication to foster a beaver farming industry along the upper peninsula of Michigan (Fig. 10). He spent considerable time assisting landowners to establish experimental colonies in this region and published a bulletin suggesting that within ten years beaver farming would become a big industry in the upper peninsula that could add considerable value to the income of producers (Bailey 1927). He also published several papers on the life history of these furbearing mammals in the years 1925–1927 (see bibliography herein). The live trap that he patented in 1926 to catch them live and uninjured in order to relocate them for farming purposes received second prize in the alive and unharmed class of the 1931 annual trap contest of the American Humane Association (Anonymous 1931). He also spent a considerable amount of time advising landowners along the coast of Louisiana about the possibilities of muskrat farming.

In 1915 the Survey was handed the responsibilities for predator and rodent control. The job was forced on the Bureau by Congress because of pressure from livestock interests, particularly those in the western plains and Rocky Mountain states whose senators or representatives held powerful positions on congressional committees. This would usher in an era of extreme scientific controversy about the pros and cons of predator control. As an employee of the Bureau, Bailey would not be immune from the controversy and criticism. Even before Merriam had left the agency, Bailey had become embroiled in the issue. The Forest Service in 1905 had begun hiring trappers to kill wolves in the national forests, and it arranged with the Survey for Bailey to find out where the wolves lived and bred. In 1907 Bailey reported that each wolf and mountain lion cost ranchers \$1,000 a year, bears \$500 apiece, and coyotes and bobcats \$50 per animal. Ranchers began to call for the complete extermination of all predators.

This situation placed Bailey in a compromised position. On the one hand, he felt a need to support of the mission of the Survey, which did include predator control, and much of their budget was for this work. On the other hand, Bailey favored trapping and relocating offending predators rather than killing them. After many years as a field naturalist, he was even more convinced of the need and value of methods to live-trap animals so predators could be moved to a habitat where they were less threatening to agriculture and ranching.

But at the Survey, scientific studies and the conservation of wildlife had become less important than a high kill of “varmint,” causing many people to feel that science had been discarded in favor of wildlife destruction (see the paper by Robinson in this volume). In the 1920s mammalogists, profoundly concerned with wildlife, made the first organized attempts to change government policy toward predatory animals. Their target was the Biological Survey’s poisoning program. This created much stress between the newly organized American Society of Mammalogists (ASM) and the Survey where many of the ASM leaders worked. Discontent became open opposition at the 1924 ASM meeting where several members debated predator control policy with some of the Survey’s biologists. The Society directed its President to appoint a committee to report on the Survey’s predator-control work. Bailey

was one of five members of the committee, but the committee members could not reach agreement on the predator control problem and presented two separate reports. (For a complete discussion of the ASM/USBS conflict over predator control, see Dunlap (1988) and Robinson (2005).)

In 1930, Bailey prepared a report on “The Use of Poison in Controlling Predatory Animals in Montana” (Bailey in lit., box 14). In the conclusion section, he defended the use of poison:

There is little harm done by poison when used by our own trained men and at certain times of year it is more effective and no more destructive to other wild life than steel traps. Until we have much better and more humane traps for catching such animals as coyotes I would not recommend giving up the use of poison.

But feelings remained strong and in January 1931 Merriam and Bailey had a mild argument about the results of poisoning coyotes plus other animals by the Biological Survey’s predator control service.

By this time, however, Bailey was spending less time in the field trapping and more of his efforts toward the development of humane traps and ways to use them to salvage wildlife (Bailey 1934). He invented both a beaver trap for the Biological Survey, which was used in restocking operations, and the so-called foot-hold trap, which instead of rigid steel jaws had a chain circle, released by a spring, that would catch and hold without breaking the leg of the animal caught in it (Fig. 11). The foothold trap was developed for use in capturing a variety of mammals and birds. He received prizes from the American Humane Association for both inventions. With the able help of his patent attorney, Bayard H. Christy, philosophically a kindred spirit, the first “VerBail trap” was patented in 1931.

Success stories of use of the traps added fuel to Bailey’s desire to see such traps accessible on a larger scale. With the assistance of Lucy Furman, a retired school teacher who led a campaign against the cruelty of trapping, the Animal Trap Company of America began to manufacture Bailey’s device as a commercially viable product (Dunlap 1988).

BAILEY'S RETIREMENT YEARS

On 3 July 1933, Bailey received a letter from the Bureau Chief, Paul Redington, advising him that he was going to be separated from the service effective 31 July "due to the necessity of reducing bureau forces because of greatly reduced appropriations for the fiscal year 1934" (Bailey in lit., box 5). Redington's letter went on to express his regret that the action was necessary because of the Depression and the need to cut back on the staff. The official announcement was followed on 5 July by a personal letter from Redington to Bailey expressing appreciation for his 46 years of service to the agency and for standing up in defense of the Bureau's predator control program (Fig. 12).

On 7 July, Bailey wrote in response to Redington a handwritten letter that expressed his appreciation and admiration for his career at the Survey:

Dear Mr. Redington: My notice of retirement is received and also your very kind letter of the same date. For over forty-six years my whole life and work and interest has been centered in the Biological Survey of which my field reports and specimens and publication are a permanent part and it is needless to say that the best interest and development of the Survey along scientific and practical lines has been and always will be my highest interest and ambition. My separation from the official service at this time, a little earlier than I had expected, is not great hardship and Mrs. Bailey and I both feel that it is better for us to go than for some of the younger employees to whom it would have been far more serious. We appreciate the spirit of fairness in which you have acted and also your expression of confidence and friendship. This change will in no way lessen our loyalty to the Survey nor our high regard for you and your most estimable family... (Bailey in lit. box 5).

Bailey's personnel file in the National Archives and Record Administration in St. Louis contains the personal letter from Paul Redington (5 July 1933), then Chief of the Survey, thanking him for his service of 46 years. An excerpt from that letter stated:

Your reputation as a painstaking investigator, as a lover of all forms of wild life, as an explorer, and as a very friendly soul has already been written in the records. I cannot add much to this statement except to hope that you and Mrs. Bailey may keep on in the splendid nature work which has appealed to both of you, and that in your years of retirement you may continue to have the peace of mind that is one of your characteristics (National Archives and Records Administration).

There has been speculation that Bailey may have been "forced out" of the Survey because he had changed his position on the predator control problem, favoring humane treatment instead of extermination, and because of rumors that Mrs. Bailey had contacted Eleanor Roosevelt asking her to intervene with her husband and end the program (Robinson 2005). The major reference to support this comes from Stanley Young's manuscript on the history of predator control, a work completed in the 1960s toward the end of his life but never published. Young neglected to note the all-important date or the name of the First Lady's informant, making it impossible to confirm the speculation.

Bailey's remaining years were as notable as those that went before—in writing, in motion picture photography, in humane work, in lecturing and counseling, and in continuing field work as a consultant for the Biological Survey (Fig. 13). Although retired as a full-time employee, he was soon added back on a part-time basis to continue his field work and special projects that had not been completed. In August 1935, he received a letter from the Chief authorizing his temporary appointment, including salary, as a collaborator. This was followed by another letter with travel instructions and authorization for per diem (Bailey in lit., box 5). Practically every season of his involvement with the Survey after retirement was marked by field work in some part of the United States, including intensive biological work in Texas, New Mexico, North Dakota, and Oregon, as well as many other studies described in other publications and in the popular articles he wrote so effectively for *Nature Magazine* and other periodicals.

Bailey was elected as President of the American Society of Mammalogists, serving in that role in 1933 and 1934. Bailey was an active contributor to the ASM until his death in 1942. One of the key organizational meetings to form the Society in 1919 was held at the Bailey's home on 5 December 1918 when Bailey presided over the topic of forming a society for the study of mammals. He attended the first 22 meetings of the Society and presented papers at all but six of those meetings. He published in the first issue of the *Journal of Mammalogy* and in half of the first 22 volumes of the journal. He served on the "life histories of mammals" and the "life histories and ecology" committees for a decade. He was elected to the Board of Directors in 1927–29 and again in 1929–31.

Bailey died suddenly from pneumonia at his Washington home on 20 April 1942, almost one month after Merriam had passed. At the time of his death, he was planning an expedition to Texas as a collaborator for the Fish and Wildlife Service. His widow wrote to his sister, Anna, the next day:

Dear Sister Anna, How can I tell you? It is heartbreaking news. After a short illness, with pneumonia, Vernon passed away yesterday. The service is to be in the house tomorrow afternoon. Of course we should think of all his long life has stood for, of the wonderful influence for good that it has been. But the heart-ache is here just the same. Your sorrowing Sister Florence (Kofalk and Hone undated).

The funeral, at his home in Washington, was a gathering of the faithful. One of his relatives described the funeral as a:

...notable gathering of scientists most all were grey-headed. The minister was a friend of Vernon's from Boston. The casket was loaded with the nicest of flowers. The house was packed with his friends. Even the policeman on the sidewalk was a friend of Vernon's. What a lot of friends he had (Kofalk and Hone undated).

At his services, the Reverend Dr. John Van Schaick eulogized him by quoting from the Eighty-fifth Psalm:

Mercy and truth have met together. Truth he honored and discovered in field investigations in every State of the Union and in Mexico and Canada, in studies that formed the basis for writings that are listed in numerous publications. Mercy, in its most practical forms, he practiced through many years of work for conservation and gentle, patient, but persistent agitation, years that included his own accomplishments in designing and promoting the use of traps that make their captures alive and unhurt.

He was interred at the Merriam family cemetery in Locust Grove, New York, along with Florence who died six years later in 1948 (Kofalk and Hone undated).

BAILEY'S LEGACY

Vernon Bailey had a fascinating life and career. Growing up on a farm on the western edge of the American frontier, and without much formal education, he would distinguish himself as one of the leading field naturalists to ever live, earning recognition not only for his scientific achievements but also for the quality of his personal character and demeanor and for his devotion to American wildlife. In looking back at his life, one clearly sees that Bailey was born at the right time and place—a time when the frontier was wide open and there was great public interest in natural history.

Two major developments impacted his life and career. One was growing up on a farm on the western frontier in Elk River, Minnesota, where his parents moved when he was about six years old and where, as a young lad, he developed a strong interest in natural history by collecting mammals in his surroundings. The second development was meeting and coming under the tutelage of C. Hart Merriam at the U.S. Biological Survey at a time when a career in natural history was fully possible. In 1887, Merriam appointed Bailey as a field naturalist for the Survey and he worked for the

Agency until his retirement at the rank of Chief Field Naturalist.

Unlike Merriam, Bailey was entirely self-taught and learned by doing. No one showed him how to trap small mammals or taught him the taxidermist's art. As a teenager he began collecting birds and mammals and selling the specimens for a nice profit. Thanks to Merriam's preference for men who grew up on the farm, as well as his willingness to devote the time necessary to see that he was properly mentored and trained in the skill of field work, Bailey's career did not suffer because he lacked formal education.

Bailey's scientific legacy includes publishing more than 200 scientific papers, contributing about 13,000 specimens to the USBS mammal collection, and describing 78 taxa of mammals (see list below). He clearly was one of Merriam's greatest students and protégés who played a major role in Merriam's vision to describe the mammal habitats and fauna of the western United States. During his career, he worked in every state of the Union, in Canada, and in Mexico. Probably no one in North America knew more about its native mammals. Bailey also designed and perfected the Survey's live "beaver trap" and the "foothold trap" for which he was awarded prizes by the American Humane Association.

He became legendary for his ability to humanely trap mammals alive as well as handle and tame them without harm. He successfully developed live traps for small mammals (mice and rats), beaver, and large carnivores and constantly experimented to improve them. He was known for his "uncanny" ability to handle live animals taken directly from his traps (Figs. 14 and 15). He presented a paper at the annual meeting of the American Society of Mammalogists in Denver, Colorado, in 1940 which included remarkable film footage of him removing wild animals from traps (Bailey in lit., box 22). Also, the archives at the University of Wyoming and the Smithsonian Institution contain many photographs of him holding live gray foxes, bobcats, beaver, and other mammals just removed from traps. I found at least two newspaper articles in which he talked about how to tame bats (Bailey in lit., box 17) and rodents (Bailey in lit., box 22) to become household pets,

and the *Denver Mountain News* contains a fascinating account "Naturalist, 76, catches bobcats barehanded and says 'only tenderfoot has adventures'" (Kofalk and Hone undated). Lawrence Palmer (1957) reported his account of training captured grasshopper mice to use exercise wheels and after being released into the wild they would return "voluntarily to their cages for exercise in spite of the freedom offered by the great outdoors." Bailey's publications (see below) include no fewer than 17 papers about trapping and handling wild mammals (numbers 66, 70, 71, 85, 121, 154, 166, 173, 174, 176, 183, 192, 195, 196, 197, 199, 201), most of which were published after his retirement. He prepared a leaflet for Cornell University's rural education department titled "Trapping Animals Alive" with more than 90,000 copies printed (Bailey 1933).

Finally, Harriet Kofalk recorded an incident in which Bailey took a live wild beaver that he had tamed to a meeting of the Biological Society of Washington. He sat on a little table before 200 people and fed the beaver sweet potatoes and some crusty rolls and let everybody come around and feel of his fur and his tail and see his big teeth without making a bit of fuss (Kofalk and Hone undated).

Bailey was highly respected among his scientific peers and became affiliated with many professional organizations and associations. He was a founder and the 8th President of the American Society of Mammalogists (1933–34), member of the American Ornithologists' Union, President of the Biological Society of Washington, President of the Audubon Society of the District of Columbia, fellow of the American Association for the Advancement of Science, life member of the National Geographic Society, and member of the Cooper Ornithological Club, Washington Academy of Sciences, the American Forestry Association, and other societies interested in wildlife and conservation. At the meetings of these organizations he was always a focus of enthusiasm. His papers and comments never failed to rally attention, and his consideration for the younger members was for them an outstanding benefit of the meetings (Zahniser 1942). In recognition of his important contributions and career achievements, 13 taxa of mammals were named after him by his scientific colleagues (see list below).

On a personal level, Bailey was known to be scrupulously honest and fair, and a model of integrity (Fig. 16). He was quietly generous and admired by most all who knew him. He met, courted, and married a woman with similar professional interests and together they shared a deep, abiding love of nature and the outdoors. They became one of the great scientific couples of the country.

Science changed during the times that Bailey lived, moving from a focus on field work, natural history, and taxonomy to a concentration on theory supported by laboratory experiments and ecological work. He was among the last generation of naturalists to be made entirely in the field and by any measure one of the greatest field naturalists to ever live.

Interestingly, no extensive obituary of Bailey appeared in the *Journal of Mammalogy*. Brief accounts of his death and accomplishments appeared in *Science* (Zahniser 1942), *The Auk* (Palmer 1947), and *Nature Magazine* (Preble 1942). The *Journal of Mammalogy*

(volume 23, page 244, 1942) mentioned his passing in a brief unsigned paragraph, but the promised longer piece on this former President of the American Society of Mammalogists was never published. As mentioned earlier in this article, his niece, Harriet Kofalk, prepared an account of Bailey's life but it was never fully completed or published because of her tragic death in an automobile accident.

In a brief obituary published in *Science* in 1942, Howard Zahniser listed 244 articles published. A file of his papers at the University of Wyoming, American Heritage Center, contained a "cut and paste" version with 202 titles. An exhaustive search over the past three years has produced a list of 234 papers as depicted below. The list includes many outstanding scientific publications as well as articles for general readers. Among his most significant publications were accounts of the life zones and mammals in the states of Texas (Bailey 1905), New Mexico (Bailey 1913, 1931), North Dakota (Bailey 1926), and Oregon (Bailey 1936).

PUBLICATIONS BY VERNON BAILEY

1. Bailey, V. 1888. Report on some of the results of a trip through parts of Minnesota and Dakota. Pp. 426–454 in Report of the Commissioner of Agriculture for 1887. U.S. Government Printing Office, Washington, D.C.
2. Bailey, V. 1889. Queer food for rodents. *Forest and Stream* 31:474.
3. Bailey, V. 1893a. The five-toed kangaroo rats. *Forest and Stream* 40:271.
4. Bailey, V. 1893b. Notes on some of the spermophiles and pocket-gophers of the Mississippi Valley. Pp. 185–193 in Report of the Secretary of Agriculture for 1892. Government Printing Office, Washington, D.C.
5. Bailey, V. 1893c. The prairie ground squirrels or spermophiles of the Mississippi Valley. U.S. Department of Agriculture, Division of Ornithology and Mammalogy, *Bulletin* 4:1–69.
6. Bailey, V. 1895. The pocket gophers of the United States. U.S. Department of Agriculture Division of Ornithology and Mammalogy *Bulletin* 5:1–47.
7. Bailey, V. 1896a. List of mammals of the District of Columbia. *Proceedings of the Biological Society of Washington* 10:93–101.
8. Bailey, V. 1896b. Occurrence of the native wood rat at Washington, D.C. *Science* 3:628.
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MAMMAL TAXA NAMED BY VERNON BAILEY (WITH CURRENT TAXONOMIC ATTRIBUTION)

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2. *Sorex obscurus neomexicanus* Bailey, *Proceedings of the Biological Society of Washington* 26:133, 1913. (= *S. neomexicanus*)
3. *Tatu novemcinctum texanum* Bailey, *North American Fauna* 25:52, 1905. (= *Dasyopus novemcinctus mexicanus*)
4. *Ochotona nigriscens* Bailey, *Proceedings of the Biological Society of Washington* 26:133, 1913. (= *Ochotona princeps*)
5. *Lepus pinetus robustus* Bailey, *North American Fauna* 25:159, 1905. (= *Sylvilagus robustus*)
6. *Citellus tridecemlineatus hollisteri* Bailey, *Proceedings of the Biological Society of Washington* 26:131, 1913. (= *Ictidomys tridecemlineatus hollisteri*)
7. *Spermophilus spilosoma arens* Bailey, *Proceedings of the Biological Society of Washington* 15:118, 192. (= *Xerospermophilus spilosoma canescens*)
8. *Spermophilus spilosoma marginatus* Bailey, *Proceedings of the Biological Society of Washington* 15:118, 1902. (= *Xerospermophilus spilosoma marginatus*)
9. *Callospermophilus lateralis arizonensis* Bailey, *Proceedings of the Biological Society of Washington* 26:130, 1913. (= *Callospermophilus lateralis lateralis*)
10. *Eutamias atristriatus* Bailey, *Proceedings of the Biological Society of Washington* 26:129, 1913. (= *Tamias canipes atristriatus*)
11. *Eutamias cinereicollis cinereus* Bailey, *Proceedings of the Biological Society of Washington* 26:130, 1913. (= *Tamias cinereicollis cinereus*)
12. *Eutamias cinereicollis canipes* Bailey, *Proceedings of the Biological Society of Washington* 15:117, 1902. (= *Tamias canipes canipes*)
13. *Thomomys bottae minor* Bailey, *Proceedings of the Biological Society of Washington* 27:116, 1914. (= *T. b. minor*)
14. *Thomomys apache* Bailey, *Proceedings of the Biological Society of Washington* 23:79, 1910. (= *Thomomys bottae aureus*)
15. *Thomomys aureus lachuguilla* Bailey, *Proceedings of the Biological Society of Washington* 15:20, 1902. (= *Thomomys bottae lachuguilla*)
16. *Thomomys canus* Bailey, *Proceedings of the Biological Society of Washington* 23:79, 1910. (= *Thomomys bottae canus*)
17. *Thomomys fulvus texensis* Bailey, *Proceedings of the Biological Society of Washington* 15:119, 1902. (= *Thomomys bottae texensis*)
18. *Thomomys mearnsi* Bailey, *Proceedings of the Biological Society of Washington* 27:117, 1914. (= *Thomomys bottae mearnsi*)
19. *Thomomys nevadensis atrogriseus* Bailey, *Proceedings of the Biological Society of Washington* 27:118, 1914. (= *Thomomys townsendi*)
20. *Thomomys fuscus loringi* Bailey, *Proceedings of the Biological Society of Washington* 27:118, 1914. (= *Thomomys talpoides loringi*)
21. *Thomomys talpoides bullatus* Bailey, *Proceedings of the Biological Society of Washington* 27:115, 1914.
22. *Thomomys fuscus saturatus* Bailey, *Proceedings of the Biological Society of Washington* 27:117, 1914. (= *Thomomys talpoides saturatus*)
23. *Thomomys pryori* Bailey, *Proceedings of the Biological Society of Washington* 27:116, 1914. (= *Thomomys talpoides pryori*)
24. *Thomomys talpoides caryi* Bailey, *Proceedings of the Biological Society of Washington* 27:115, 1914.
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33. *Castor canadensis mexicanus* Bailey, Proceedings of the Biological Society of Washington 26:191, 1913.
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35. *Peromyscus pectoralis laceianus* Bailey, Proceedings of the Biological Society of Washington 19:57, 1906. (= *Peromyscus laceianus*)
36. *Peromyscus taylori subater* Bailey, North American Fauna 25:102, 1905. (*Baiomys taylori subater*)
37. *Peromyscus truei preblei* Bailey, North American Fauna 55:188, 1936.
38. *Sigmodon hispidus major* Bailey, Proceedings of the Biological Society of Washington 15:109, 1902. (= *Sigmodon arizonae*)
39. *Sigmodon hispidus microdon* Bailey, Proceedings of the Biological Society of Washington 15:111, 1902. (= *Sigmodon toltecus*)
40. *Sigmodon hispidus saturatus* Bailey, Proceedings of the Biological Society of Washington 15:111, 1902. (= *Sigmodon toltecus*)
41. *Sigmodon hispidus tonalensis* Bailey, Proceedings of the Biological Society of Washington 15:109, 1902. (= *Sigmodon mascotensis*)
42. *Sigmodon alleni* Bailey, Proceedings of the Biological Society of Washington 15:112, 1902.
43. *Sigmodon melanotis* Bailey, Proceedings of the Biological Society of Washington 15:114, 1902. (= *Sigmodon fulviventer*)
44. *Sigmodon minimus goldmani* Bailey, Proceedings of the Biological Society of Washington 26:132, 1913. (= *Sigmodon fulviventer*)
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54. *Evotomys nivarius* Bailey, Proceedings of the Biological Society of Washington 11:136, 1897. (= *Myodes gapperi*)
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56. *Microtus insularis* Bailey, Proceedings of the Biological Society of Washington 12:86, 1898 and *Microtus nesophilus* Bailey, Science 8:783, 1898, a renaming of *M. insularis*. (= *Microtus pennsylvanicus*)
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61. *Microtus nevadensis* Bailey, Proceedings of the Biological Society of Washington 12:86, 1898. (= *Microtus montanus nevadensis*)
62. *Microtus nevadensis rivularis* Bailey, Proceedings of the Biological Society of Washington 12:87, 1898. (= *Microtus montanus rivularis*)
63. *Microtus montanus caryi* Bailey, Proceedings of the Biological Society of Washington 30:29, 1917. (= *Microtus montanus nanus*)
64. *Microtus montanus arizonensis* Bailey, Proceedings of the Biological Society of Washington 12:88, 1898
65. *Microtus californicus constrictus* Bailey, North American Fauna 17:36, 1900
66. *Microtus californicus vallicola* Bailey, Proceedings of the Biological Society of Washington 12:85, 1898
67. *Microtus angusticeps* Bailey, Proceedings of the Biological Society of Washington 12:86, 1898. (= *Microtus longicaudus angusticeps*)

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70. *Microtus pinetorum auricularis* Bailey, Proceedings of the Biological Society of Washington 12:90, 1898.
71. *Microtus pinetorum nemoralis* Bailey, Proceedings of the Biological Society of Washington 12:89, 1898.
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73. *Zapus luteus australis* Bailey, Proceedings of the Biological Society of Washington 26:132, 1913. (= *Zapus princeps luteus*)
74. *Canis nebracensis texensis* Bailey, North American Fauna 25:175, 1905. (= *Canis latrans texensis*)
75. *Conepatus mesoleucus telmalestes* Bailey, North American Fauna 25:203, 1905. (= *Conepatus leuconotus telmalestes*)
76. *Cervus canadensis nelsoni* Bailey, Proceedings of the Biological Society of Washington 38:188, 1935.
77. *Odocoileus virginianus ochrourus* Bailey, Proceedings of the Biological Society of Washington 45:43, 1932.
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MAMMAL TAXA NAMED AFTER BAILEY (WITH CURRENT TAXONOMIC ATTRIBUTION)

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2. *Castor canadensis baileyi*, Nelson. Proceedings of the Biological Society of Washington 40:125, 1927. (= *Castor canadensis baileyi*)
3. *Dipodomys baileyi*, Goldman. Proceedings of the Biological Society of Washington 36:140, 1923. (= *Dipodomys spectabilis baileyi*)
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5. *Lynx baileyi*, Merriam. North American Fauna 3:79, 1890. (= *Lynx rufus baileyi*)
6. *Microtus longicaudus baileyi*, Goldman. Journal of Mammalogy 19:492, 1938.
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8. *Neotoma baileyi*, Merriam. Proceedings of the Biological Society of Washington 9:123, 1894. (= *Neotoma floridana baileyi*)
9. *Perognathus baileyi*, Merriam. Proceedings of the Academy of Natural Sciences, Philadelphia 46:262, 1894.
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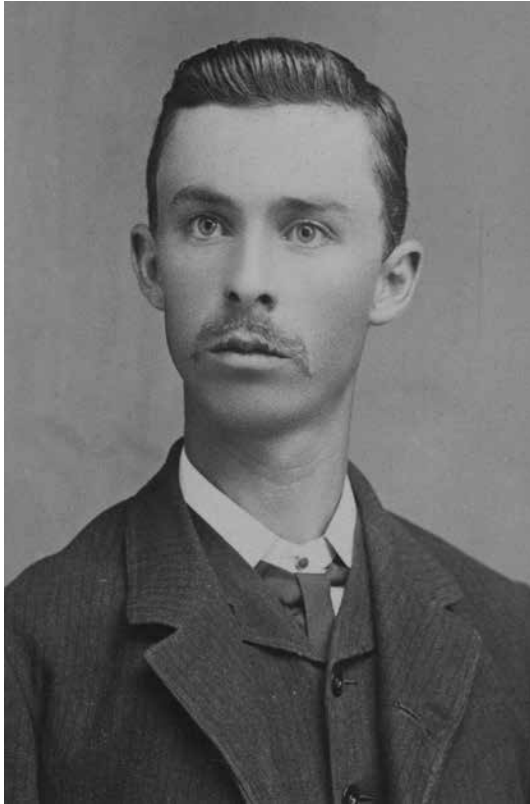


Figure 1. Vernon Bailey as a young man in 1887, just after going to work for the Biological Survey. Courtesy American Heritage Center, Bailey Papers, University of Wyoming.



Figure 2. (L to R) A. K. Fisher, E. W. Nelson, W. H. Osgood, and Vernon Bailey, working at the National Museum of Natural History in Washington, D.C., early 1900. Courtesy University of Wyoming.

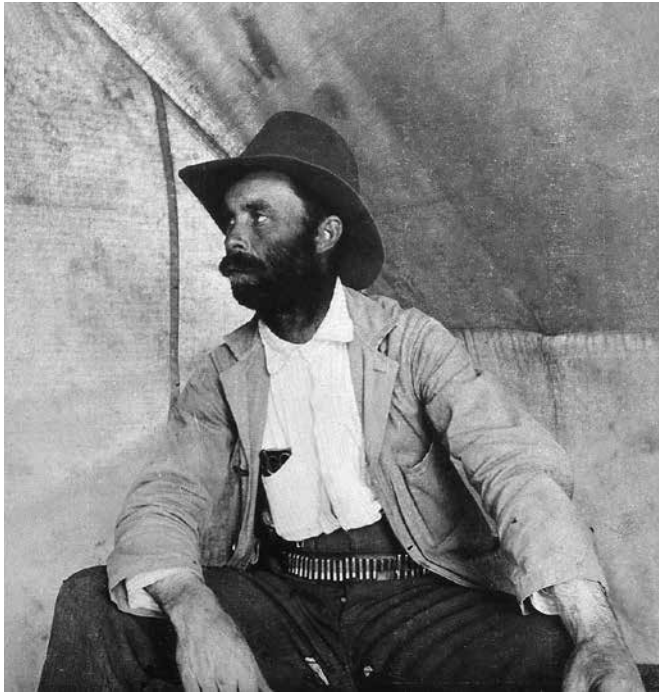


Figure 3. Vernon Bailey in the field as a young man in 1905. Courtesy USGS-PWRC, Biological Survey files.

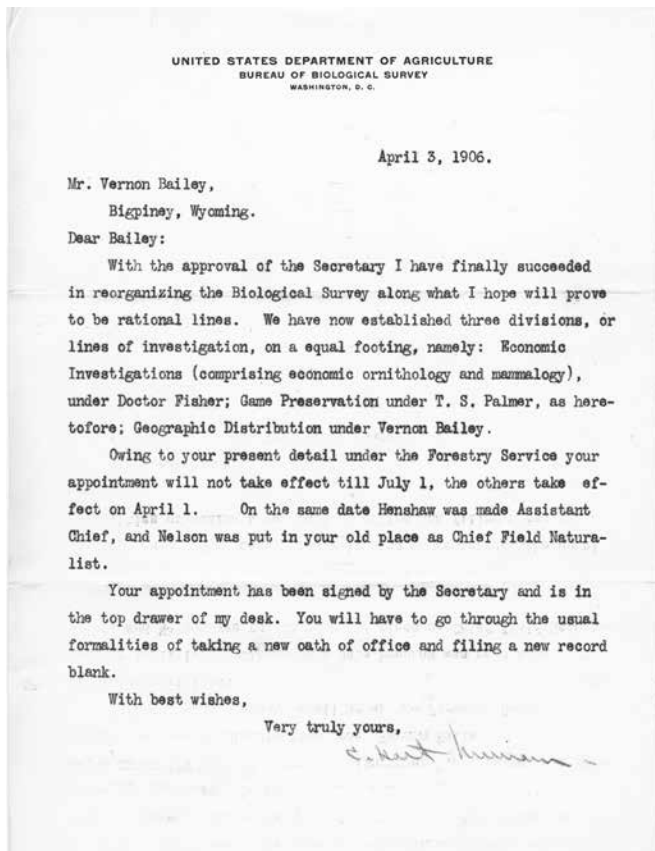


Figure 4. April 3, 1906, letter from C. Hart Merriam to Vernon Bailey informing him of organizational changes at the Biological Survey. Courtesy University of Wyoming.



Figure 5. (L) Florence Merriam Bailey, as a young woman, prior to her marriage to Vernon Bailey. (R) Vernon Bailey, 1903, shortly after the marriage. Courtesy University of Wyoming.



Figure 6. Florence Merriam Bailey conducting field work on horseback in the Big Bend region of Texas. Courtesy University of Wyoming.



Figure 7. Florence Merriam Bailey camped in the field in the Guadalupe Mountains, New Mexico. Courtesy University of Wyoming.



Figure 8. Vernon Bailey and Florence Merriam Bailey feeding gulls along the Oregon coast, 1920. Courtesy University of Wyoming.



Figure 9. Vernon Bailey in 1910, a few years after having been promoted to Chief Field Naturalist of the Biological Survey. Courtesy University of Wyoming.



Figure 10. Vernon Bailey holding a wild beaver just removed from a live trap in Conrad, Pennsylvania, on 17 April 1926. Courtesy University of Wyoming.



Figure 11. Vernon Bailey demonstrating his VerBail leg-hold trap for bears. Courtesy University of Wyoming.



Figure 12. Biological Survey staff, front row center (L to R) A. K. Fisher, Walter Henderson, Vernon Bailey, Paul Redington, and T. S. Palmer on the occasion of Bailey's and Palmer's retirement. 21 July 1933. Courtesy SIA, Jackson files, RU 7172.



Figure 13. Vernon Bailey with his movie camera in 1942 just a few months before his death. Courtesy University of Wyoming.



Figure 14. Vernon Bailey holding two wild foxes just caught at Lyons Fall, New York, in September 1940. According to Bailey, "These two gray foxes were caught in No. 1 chain loop [VerBail] traps and kept over night in the house, then taken out and let go for moving pictures. They were not hurt and were very gentle and quiet but made good time when released." Courtesy University of Wyoming.



Figure 15. (L) Bobcat captured in a Verbaile leg-hold trap in Merriam Valley, California on 26 January 1936. Courtesy University of Wyoming. (R) Vernon Bailey, the next day, bringing home the bobcat in a sack on his back. Courtesy University of Wyoming.



Figure 16. Vernon Bailey toward the end of his career. Exact date unknown. Courtesy Smithsonian Institution Archives (SIA), Jackson files, Record Unit (RU) 7172.

MERRIAM'S MEN: THE FEDERAL AGENTS OF THE BIOLOGICAL SURVEY (1885–1910)

David J. Schmidly

INTRODUCTION

While Merriam distinguished himself as a scientist/administrator and in the process earned an esteemed reputation, many of the naturalists hired and trained by him were lesser known and have been largely forgotten today. Some of them did not work with the Survey for long and worked on subjects other than mammalogy, but the majority of these men became well known naturalists and mammalogists of their era and many worked their entire career for the Survey.

In 1935 at a celebration of the 50th anniversary of the agency, several of the “old guard” returned to Washington for a special banquet in honor of the occasion. Their remembrances about the early days were chronicled in *The Survey*, the official newsletter of the Bureau of Biological Survey (see Henderson and Preble 1935, McAtee 1935, and Bailey 1935). Merriam himself was there for the banquet and gave a brief address that also was published in *The Survey* (Merriam 1935). In his remarks, Merriam noted (p. 43):

Without attempting an enumeration of the many contributors to knowledge made by the Biological Survey during the fifty years of its existence—or even for the twenty-five years during which I personally shaped its operations—let me . . . point with pride to the long series of revisions of groups of mammals, and the volumes on the natural history of little-known parts of the United States, Canada, and Mexico, by such well-known naturalists as Vernon Bailey, Merritt Cary, A. K. Fisher, E. A. Goldman, Ned Hollister, Arthur H. Howell, Hartley H. T. Jackson, C. Hart Merriam, Gerrit S. Miller, E. W. Nelson, Harry C. Oberholser, Wilfred H. Osgood, T. S. Palmer, and E. A. Preble.

These are the individuals who should be considered as the key members of Merriam's team. Many of them ended up working for the Survey for decades, far

beyond Merriam's tenure as head of the agency. Most played a pivotal role in advancing the science of mammalogy. The contributions and legacy of Vernon Bailey, E. W. Nelson, and A. Goldman are highlighted in other papers in this volume. The purpose of this paper is to chronicle the accomplishments of the other naturalists who worked under Merriam's leadership during his tenure at the agency, as well as after he had departed.

One other long-term employee of the Survey, Waldo L. McAtee, although he never worked with mammals, also deserves mention. McAtee (1879–1962) worked for the Survey in the summer of 1903 and then was employed continuously from 1904 until his retirement in 1947 (Henderson and Preble 1935). During his career, he became well known for his scientific work in economic ornithology and food habits research. But he also chronicled much about the history of the Survey and the personalities of its personnel.

When E. W. Nelson decided upon a wholesale disposal of old Biological Survey records shortly before he succeeded Henry Henshaw as Chief in 1916, McAtee and others vigorously protested, although to no avail (Sterling 1973). A large collection of correspondence and other papers was dumped as waste paper. McAtee was able to save only a fraction of this material, but thereafter he began to meticulously save and archive material about the work of the Survey and its personnel. He recorded anecdotes and personal remembrances and impressions of staff associated with the Survey which he sent to the Library of Congress (see preface). His donation included a provision that the material would be restricted for use until any individual treated was dead.

In the discussion of personnel that follows, a brief biography and description of the background and accomplishments of Merriam's key personnel is provided. For some individuals, comments from the McAtee archives have been included. For those honored upon their death by the publication of an official

obituary published in a referred scientific journal, the author and citation of the obituary is provided to the right of the dates of birth and death, and official docu-

mentation is provided in the literature cited section at the end of this volume.

MERRIAM'S MEN: THE BIG FOUR

Early on, Merriam brought in a group of four people who would form the core of his leadership team. Three of these individuals (A. K. Fisher, T. S. Palmer, and Vernon Bailey) joined his staff shortly after it opened, and remained on it during his 25 years as head of the agency. Each of them would serve the agency for more than four decades. All three worked closely with him in various capacities; all were indebted to him for having established them in their careers; and they willingly remained in a position of dependence (Sterling 1974). They would be joined by a fourth member of the leadership team, E. W. Nelson, who joined the Survey in 1890 and also served for 40 years, including 11 years as Chief beginning in 1916.

All four of these individuals were giant figures inside the agency and each played a prominent role in its mission and accomplishments, but Bailey and Nelson were especially important because of their talent for field work. Without the specimens and information from the field, it was not possible for Merriam and the other field agents and scientists in Washington to deliver on the scientific research mission of the agency.

When the Survey was designated as a Bureau of the Agriculture Department in 1905, Merriam placed Fisher, Palmer, and Bailey in charge of the three major organizational divisions reporting directly to him (Cameron 1929). Thus, Fisher was placed in charge of economic relations, Palmer of game management and wildlife protection, and Bailey of field investigations. Three of these four individuals (Fisher was the exception) would eventually be elected President of the American Society of Mammalogists (see Layne and Hoffmann 1994), although Palmer declined to serve for some unknown reason.

All of the Big Four participated along with Merriam in the Death Valley Expedition of 1891, which in many respects was the most elaborate and important field research expedition conducted by the Biological Survey during Merriam's tenure (Sterling 1973).

Palmer was in charge during Merriam's absence on Bering Sea seal fisheries business in the summer and fall of 1891 and Bailey was in charge for about ten days during the spring of the next year. Almost all of the work was done by horseback and a kind of mystique developed about the expedition's hardships and accomplishments (Bailey 1940). The results of the Expedition were published in 1893 by multiple authors with Fisher providing the report on birds, Merriam the reports on desert trees, shrubs, cactuses and yuccas, and Palmer a list of localities (Death Valley Expedition 1893). Some 5,000 mammal specimens were collected as a part of the expedition but an account of the mammals was never officially published.

Albert K. Fisher (1856–1948; Figs. 1–4)

Uhler 1951, Oehser 1948, Perry 2007

Dr. Albert Kendrick Fisher was born in Ossining, New York, on 21 March 1856, the son of Hiram and Susan E Fisher. His father operated an extensive mercantile business in New York City. Their home, on a beautiful hill overlooking a tidal section of the Hudson River, had spacious grounds and a surrounding countryside that stimulated his interest as a boy in natural history. His early schooling was obtained at Holbrook's Military High School in Ossining. Then he trained for the medical profession and graduated from the College of Physicians and Surgeons of New York in the class of 1879, where he met and befriended C. Hart Merriam.

Merriam convinced Fisher to give up further thought of practicing medicine and join him in the new Section of Economic Ornithology when it opened in 1885. Fisher helped out with field work but especially in administration and as the liaison between the Survey and the Congress. In 1891 he served as ornithologist for the famous Death Valley Expedition and prepared an extensive report on the birds observed there (Fisher 1893b). In that same year he published his monumental

work on hawks and owls of the United States (Fisher 1893). He also took part in the Harriman Alaska Expedition in 1899 and was a member of the Pinchot South Seas Expedition in 1929. Numerous bird skins were added to the research collections of the Biological Survey as a result of his efforts on these expeditions.

For nearly a quarter of a century, Fisher was in charge of economic investigations and the Biological Survey's programs for controlling predatory animals and noxious rodents. Also, he continued as the major liaison between the Survey and Congress. His ability in dealing with members of Congress, as well as with his fellow workers, played an important part in successfully administering the continually broadening scope of the Survey. Merriam detested the time and energy required for Congressional testimony and glad-handing for which Fisher was talented and more than happy to provide (Sterling 1973, 1974).

Fisher was also the "peace-keeper" among the many conflicts that occurred between Merriam and the other staff. According to McAtee:

...happy family status of the Biological Survey in the early days was not due to Dr. Merriam according to my observations but more the congeniality and common interests of the staff, and if to the leaven of any one individual, to that of A.K.F. (McAtee in lit., box 47).

McAtee went on to describe Fisher "as highly social and with those he liked, playful and inclined to practical jokes. As a male, he was the life of the party." The author of one of his obituaries, Paul H. Oehser, noted that "few men had a wider circle of friends in all walks of life than did Dr. Fisher. To most of them he was affectionately known as A. K." (Uhler 1951).

Fisher was regarded by the employees who worked in his Division (Economic Investigations) as an excellent administrator. According to McAtee, he:

...was no admirer of 'red tape' and was fond of 'cutting corners' to get things done. He made a point of supporting and defending the employees of his Division and got all necessary supplies and equipment for them as far as he could bring it about. The natural result

was intense loyalty—such as no other division chief in the organization could command (McAtee in lit., box 47).

McAtee continued about his political acumen:

On Plummers Island, in the Biological Survey, and in the American Ornithologists' Union, Dr. Fisher attracted as friends some of the leading scientists of the day and other prominent people. He made a point of cultivating those who could be useful to the Bureau and through him we met and became acquainted with notables we otherwise never would have known. This was a very great advantage that worked for us not only in Washington but everywhere in the country that we did field work (McAtee in lit., box 47).

He was very widely known and liked and to some degree as much of a politician as a scientist. Oehser (1948), in writing about Fisher for the Cosmos Club newsletter, talked about his capacity for friendship, his dependability, and his infectious good nature.

Dr. Fisher was involved in conservation movements from early manhood and became a personal friend of such outstanding conservationists as Gifford Pinchot and Theodore Roosevelt. He brought an appreciation of nature to hundreds of acquaintances and enjoyed taking them on excursions to his favorite area, Plummer Island, and along the wooded shores of the Potomac River. He went regularly to the cabin of the Washington Biologists' Field Club for more than 45 years and was active in its management as well as the study of the fauna and flora on the Island.

Dr. Fisher remained with the Agency until he retired on 31 August 1931, completing 46 years and two months of continuous service—the longest in the history of the Biological Survey (Department of Agriculture 1931). He served for a time as assistant chief under Merriam. In many ways he became Merriam's alter ego in the Survey and never quite managed to get out of his shadow. But, after Merriam appointed his old friend Henry Henshaw as Assistant Chief in 1905, Fisher's productivity declined precipitously, and he produced little in terms of scientific research after Henshaw's arrival (Sterling 1973). Apparently, he

resented the fact that Merriam had not appointed him permanently to the position of his assistant.

Dr. Fisher's latter years with the Survey were somewhat controversial, especially with regard to his relationship with the Chief of the Survey at that time, Paul Redington, who felt that Fisher's productivity and administration of the Economic Investigations Division had slipped and sought his removal via early retirement. But Fisher balked and began to contact his many friends in industry and congress seeking relief. Finally, after much haggling, Fisher's employment was extended to 1931, but he was removed as Division Director and told to prepare a revision of his bulletin on the economic relations of hawks and owls, which he never completed (National Archives Record Center). Following his retirement he was appointed as a Federal Deputy to assist with enforcing federal game laws, and in 1936 he was continued in various capacities, without compensation, to assist with enforcing certain provisions of the Migratory Bird Treaty Act and its regulations.

Dr. Fisher died on 12 June 1948, at the age of 92. During his last years he resided at the Cosmos Club, which had many members of the scientific establishment in Washington. According to McAtee, "He was an agnostic and his wishes that there be no funeral service was respected. His ashes were deposited in Plummers Island a place dear to him for 45 years" (McAtee in lit., box 47). A memorial plaque was installed on the Island for this popular and much admired naturalist. Palmer and McAtee (1927) produced a list of his publications in 1927 that included 150 titles. Fisher published many papers about economic investigations of the relations of birds and mammals to agriculture, including a major one about predatory birds and mammals (Fisher 1909). His other publications covered topics on birds, reptiles, amphibians, and various invertebrates and biographic sketches.

Theodore Sherman Palmer (1868–1955; Figs. 5–7)

McAtee 1956, Wade and Oehser 1956

Theodore Sherman Palmer was born in Oakland, California, on 26 January 1868. He was the oldest son of Henry A. Palmer and sixth-generation paternal grandson of the American patriot Roger Sherman

(1721–1793), member of the Continental Congress and of the committees that drafted the Declaration of Independence, the Articles of Confederation, and the Federal Constitution. On his mother's side he was a great grandson of Jeremiah Day (1773–1867), noted writer and once president of Yale University.

His father, a bank president, had hoped that young Palmer would train for a business career. However, from early childhood he leaned toward natural history and spent many happy hours studying western birds and collecting birds and their eggs. These collections, later given to the California Academy of Sciences, were all destroyed in the 1906 San Francisco fire. After the family moved to Pomona, California, the youth worked in a bank but continued his natural history studies and also developed a lifelong interest in stamp collecting. He spent parts of several summers studying the flora and fauna at various altitudes of Mount Whitney and other mountains of the West. He graduated from the University of California at Berkeley in 1888 with the A.B. degree.

During various summer expeditions Palmer came under the influence of Dr. Merriam. In 1889 at the age of 21 he became the third key hire for the new division, by now called the Division of Economic Ornithology and Mammalogy, as an ornithologist working under Merriam. He early engaged in field studies and visited most parts of the United States, and for five months in 1891, as first assistant ornithologist, was acting in charge of the Death Valley Expedition. He was assistant chief of the Biological Survey from 1896 to 1902, and from 1910 to 1914 acted as chief over extended periods, including the time when Merriam was in Alaska as a member of the Bering Sea Commission. From 1900 to 1916, Palmer was in charge of the Survey's division of game preservation, and with the passage of the Lacey Act in 1900 he was placed in charge of the regulation of the importation of foreign birds and mammals.

His early years in Washington afforded him the opportunity for further education, and he received a M.D. degree from Georgetown University. Possibly that was in emulation of his cohorts Merriam and Fisher, both of whom had medical degrees, but Palmer never practiced medicine and apparently had no intention of doing so. He worked on both birds and mammals, although more with the former than

the latter. In addition to his field work on the Death Valley Expedition, he authored a treatise on jack rabbits in 1896 (revised in 1897) and a massive index to the genera of mammals, *Index Generum Mammalium*, in 1904 before turning to the field of conservation and game protection.

Palmer was known for his ability to handle administrative matters and some of his best known work was in Washington, D.C. working on wildlife laws, game management, and conservation. He spent much more time in the office than Bailey or Fisher, and may have found the going there more difficult than did his two associates. According to McAtee, Palmer gave the impression of being a bluffer, harsh to subordinates, and his "roundabout and underhanded" methods built up a store of ill-will in various official quarters over the years. Much of this resentment likely stemmed from Palmer's frequently being left behind to "mind the store" in Merriam's absence (McAtee in lit., box 48).

He prepared a number of important bulletins for the Survey, including reports on noxious animals and bounties (1897); introductions of noxious animals and birds (1899); hunting licenses (1904); private game preserves (1910); and a history of American game protection (1912). He also played a major role in reviving the National Association of Game and Fish Wardens in 1914, which is still in existence today and has become international in scope.

Palmer influenced much of the wildlife legislation passed from 1900 to 1924 and in some instances was the principal factor. He helped to write the legislation that resulted in the landmark Lacey Act of 1900 giving the Survey new regulatory and managerial responsibilities. He also drafted the preliminary version of the treaty governing the protection of Canadian and American migratory birds, and helped prepare the first federal regulations under the Migratory Bird Treaty Act of 1918. He was also involved in the creation of what became the National Wildlife Refuge Program, counseled innumerable state legislatures as they formulated their game laws, and was a director and vice president of the National Audubon Society for 30 years.

He had a flair for compiling and summarizing basic information and prepared a number of significant publications in this regard. Some of these were

trail-blazers, such as the 1899 paper on introductions leading to the Lacey Act of 1900, regulating the importation of noxious animals and prohibiting the transportation in interstate commerce of game killed in violation of local laws. But his greatest avocation had to do with compiling the necrology of members of the American Ornithologists Union (A.O.U.), of which he was secretary for several decades. This very useful activity earned him the somewhat dubious sobriquet of "Tombstone Palmer."

Through the A.O.U., Palmer became acquainted with George Bird Grinnell, who founded an Audubon Society that existed from 1886 to 1889; and then with William Dutcher, who was the main instigator of the association that later became the National Audubon Society. The first meeting of the Board of Directors was held 30 January 1905, and Palmer was elected second Vice President. In 1908 he was advanced to the first Vice Presidency, in which capacity he served until 1936. He was elected a member of the Board of Directors in 1907 and he continued on the Board until 1936, a period of 28 years. At the same time he did not neglect his home area, helping to found the Audubon Society of the District of Columbia in 1897, and serving as its President, 1924–1941. Upon his retirement from that office, he was named President Emeritus and so remained throughout life.

After 44 years of service Dr. Palmer retired from the Survey in 1933, the same year as Vernon Bailey. A reduction in force was necessitated by drastic curtailments of appropriations for the fiscal year 1934 (Department of Agriculture 1933). He continued to unofficially carry out many of his duties for the Survey without pay for a number of years. In retirement he spent much time in documentary research at the Library of Congress. He helped to organize, document, and index at the Library the unique Ruthven Deane collection of photographs of ornithologists. Later he extended this activity to building up comparable collections of photographs of foresters and park-men. He continued stamp collecting throughout his life. His accumulation of 54,000 varieties, with duplicates and associated materials, was presented to the U.S. National Museum. Like Fisher, Palmer too was a member of the Cosmos Club of Washington for sixty years. He died in 1955 at the age of 87.

MERRIAM'S MEN: OTHER SIGNIFICANT SURVEY NATURALISTS

Many key individuals joined the Survey after its inception and the Big Four had established its reputation. Included in this group are several people who remained with the Survey far beyond Merriam's tenure. Others moved on to "greener pastures" in other posts either because of reputation and working conditions or because they could not tolerate Merriam's mannerisms and dogmatic style (Sterling 1973, 1977). E. A. Goldman belongs with this group but his career is treated in another paper in this volume.

Edward Alexander "E. A." Preble (1871–1957; Fig. 8)

McAtee 1981

E. A. Preble was a naturalist and conservationist with the Survey who conducted field explorations of the birds and mammals of the northwest regions of Canada and the United States. He was born in Massachusetts and developed a strong interest in natural history during his youth. He attended high school from 1886 to 1889, but he had no formal college education.

Through an acquaintance with Frank Harris Hitchcock, he was appointed a field naturalist with the Survey in 1892 and worked there continuously until 1935. He began his field work on 1 April 1892, with Vernon Bailey in Texas, and worked in Georgia, Maryland, Oregon, Washington, and Utah, conducting life zone samplings.

In 1900 he began a major field exploration for the Survey with a trip to the Hudson Bay region of Canada where he worked extensively with his brother and Merritt Cary (Preble 1902). In 1907, he and Ernest Thompson Seton made a canoe trip to the Barren Grounds about Aylmer Lake, a region to the northeast of Great Slave Lake, along the Athabaskan peninsula (Preble 1908).

In 1914 Preble was sent with Wilford H. Osgood, a former colleague in the Biological Survey, but by then at the Field Museum of Natural History in Chicago, and George H. Parker, Professor of Zoology in Harvard University, as part of a federal commission to study and

report upon the fur seals of the Pribilof Islands. He was on furlough from the Biological Survey for this work from June 1914 to January 1915. The report of this group (Osgood, Preble, and Parker 1915) laid the basis for management of the fur seal herd that prevailed for many decades. Preble (1923) also compiled a biological investigation report of the Pribilof Islands. Preble's last major field exploration was an investigation of the status of water birds of the Athabasca and Peace River deltas with Luther J. Goldman in 1934.

While his research for the Survey resulted in faunal surveys and wildlife management reports, it included only a few systematic or taxonomical publications. He had a single systematic paper among the *North American Fauna* series, a revision of the jumping mice of the genus *Zapus* (Preble 1899). In his later years with the Biological Survey as senior biologist, Preble became very interested in wildlife management and conservation. Among other conservation services, Preble served on the Committee on Wildlife of the Division of Biology and Agriculture of the National Research Council, and for some years he was one of the judges in a contest for humane trap designs held by the American Humane Association.

One of Preble's greatest services was the editing of papers written by other members of the Division of Biological Investigations of the Biological Survey. One of the chief beneficiaries of this editing—Vernon Bailey—publicly acknowledged the aid (1939). In one paragraph, he says, "We ... felt safer when Preble went over our manuscripts ... and I welcomed this opportunity to express my own obligations for such help,—always cheerfully given even if his work suffered by delay."

Preble and McAtee befriended one another and spent time together in the field around the Washington area. According to McAtee:

Preble's main attribute in his own work and in his editing was thoroughness; he would go to any length to check a reference or verify a fact. His own publications, thus, were models of accuracy, and he was mainly responsible for

the high quality of those of his Division during the years that he edited them. And in this connection it must be remembered that he had little formal schooling! He was self-educated and very broadly so (McAtee in lit., box 34).

In 1925 Preble was appointed consulting naturalist for *Nature Magazine*, the publication of the American Nature Association, and in 1935 he retired from government service to become associate editor of that magazine. Until his death in 1957, he edited, reviewed, and wrote articles for *Nature Magazine*. He also served as chairman of the Editorial Committee of the *Journal of Mammalogy* from 1930 to 1935. He was a Charter Member and Honorary Member of the American Society of Mammalogists.

Gerrit Smith Miller, Jr. (1869–1956; Fig. 9)

Shamel et al. 1954, Dunnum and Cook 2012

Miller was born in upstate New York, coming from a wealthy family which afforded him the benefits of tutors, private education, and life on a large rural estate. He was shy and preferred his own company to that of other children, leading him to spend his time exploring the woods of the family estate. At an early age he developed an interest in the natural world and specifically, the natural history of animals.

He entered Harvard University in 1890 at the age of 21 and published his first mammal paper a year later in 1891, describing a new jumping mouse from Nova Scotia and New Brunswick (Miller 1891). During his time at Harvard, he published 19 papers on birds and mammals. Miller graduated from Harvard with an A.B. degree in 1894 and took a position with the Biological Survey where he served under the direction of Merriam and was surrounded by many of the prominent mammalogists of the time (Nelson, Osgood, Bailey). This experience was a watershed in terms of Miller's growth as a mammalogist, and his introverted personality was at the heart of his professional success. Because he was asocial, he craved the quiet museum environment where his curious, meticulous, and perfectionist tendencies

thrived. He was a very sensitive man who would never quarrel with anyone.

He left the Survey in 1898 after only four years, largely because he didn't take well to the strong personality of Merriam. Unlike his fellow co-workers, Miller was a man of independent means, enabling him to operate with greater freedom from the personal and professional pressures affecting most government scientists (Sterling 1973).

After leaving the Biological Survey, he took the position of Assistant Curator at the United States National Museum (USNM). He would become Curator of Mammals in 1909 and continue in that position until 1940 when he retired to become an Associate in Biology. His influence on European mammalogy was considerable. He introduced the American method (developed by Merriam) of making skins, setting lines of traps, and especially of assembling large series of specimens to show the extent of variation.

He possessed an extremely broad mammalogical knowledge base and described taxa from North and South America, Europe, Africa, and Asia. He utilized the vast resources of the public and private collections to facilitate his systematic work. Over the course of his lifetime, he published 400 scholarly works, including landmark efforts on the families and genera of bats (Miller 1907), a list of North American land mammals in the United States National Museum (Miller 1912), a systematic study of North American land mammals to the year 1900 (Miller and Rehn 1901), and a list of North American Recent mammals (Miller 1924). Over 300 taxa (1 family, 1 tribe, 7 subfamilies, 27 genera, 6 subgenera, 92 species, and 178 subspecies) that he described remain valid today (Wilson and Reeder 2005).

Miller passed away on 24 February 1956, and was widely regarded as one of the most outstanding American mammalogists of his generation. The "lists of specimens" that he included in his many taxonomic publications provided the essential link between the publication and the museum voucher specimens and remains a standard practice still in use today.

Arthur Holmes Howell (1872–1940; Figs. 10 and 11)

Schantz 1940, 1963

Arthur Howell was born and raised in New York where he grew up on a farm and developed a passion for natural history early in his life. He graduated from high school in Brooklyn but never attended college. He joined the A.O.U. in 1889 and at the annual meeting in New York City he met Harry C. Oberholser, who had just received an appointment with the Biological Survey.

In the spring of 1895, Vernon Bailey needed a field assistant and Oberholser suggested his Brooklyn friend. Thus, the young Howell received a temporary appointment in May 1895, and was sent into the field to assist Bailey in northwestern Montana. For four months the two men camped together in Montana, Idaho, Washington, Oregon, Colorado, and Utah before returning home later that year.

In May 1896, Howell received a second appointment of six months and at the end of this period he received a permanent appointment, at first as a special assistant. During his first few years, his work consisted of the preparation of scientific study skins and curating the collection of mammals. As time passed Howell's activities became more varied, and he eventually became one of America's outstanding ornithologists and mammalogists. Howell continuously worked for the Survey for 44 years until his voluntary retirement in 1940.

Howell published approximately 80 major papers and books on birds and mammals, largely resulting in part from extensive field work in Alabama, Arkansas, Florida, Georgia, Illinois, Kentucky, Louisiana, Missouri, Montana, New Mexico, and Texas. His major contributions in mammalogy included the descriptions of some 83 species and subspecies and revisions of numerous genera, published in the *North American Fauna* series, including revisions of two genera of skunks (1901, 1906), harvest mice (1914), marmots (1915), flying squirrels (1918), pikas (1924), chipmunks (1929), and ground squirrels (1938). His biological survey of Alabama (1921) was the only such product of the Biological Survey outside the Mountain West.

Howell and McAtee worked together on occasion and came to have mutual respect for one another, spending considerable time discussing the basic laws of temperature control. According to McAtee, "in the Biological Survey, in those days [when Merriam was Chief], life zones and life zone theory were things to be accepted, not questioned." The two of them talked about this after Merriam left the Survey. Howell said that the field men paid no attention to temperatures but relied upon "zone species" in identifying and tracing live zones (McAtee in lit., box 95).

In common with other survey naturalists, Howell was a self-made man who farmed and worked as a stock clerk before pursuing a career in natural history. He was known to be a modest and gracious man of exemplary character, thoughtful, and always willing to share his scientific knowledge with his colleagues of every rank. In addition to his reputation as a keen naturalist, he also was alert and fast with a shotgun. Finally, according to McAtee, Howell had a reputation for being a big eater. McAtee reports seeing him "consume seven sandwiches with dessert and drink at an ordinary luncheon in the office" (McAtee in lit., box 95).

Howell was a charter member of the American Society of Mammalogists, and served on the Society's editorial committee and the Board of Directors for a number of years. He worked on both birds and mammals, although probably his best known publication was *Florida Bird Life*.

Harry Church Oberholser (1870–1963; Fig. 12)

Aldrich 1968

Harry Oberholser was born in Brooklyn, New York. After attending elementary schools in New York and Massachusetts, he entered Columbia University in 1888 but withdrew in 1891 because of poor health. Later, after moving to Washington, D.C., to work for the Survey, he enrolled at George Washington University where he completed his A.B. and M.S. degrees in 1914, and Ph.D. degree in 1916. Among the Survey personnel, he had one of the best formal educations.

Dr. Oberholser joined the federal service on 1 February 1895, when he received an appointment as

an ornithological clerk in the Division of Economic Ornithology. Thus began a 46 year career with the Survey that did not end until his retirement in 1941 (Department of Interior 1941). For the first 15 years of his career, he worked under Merriam with principal duties including the identification of thousands of birds sent to the Survey. He was appointed Assistant Biologist for the Biological Survey in 1914, Biologist in 1924, and Senior Biologist in 1928.

In matters of classification, he became known for his reputation as a dedicated “splitter” (a person who described genera, species and subspecies of birds on very fine physical distinctions) long after “lumping” (the grouping of birds in much broader categories) had come into vogue. During his career Oberholser was responsible for reporting 11 new families and subfamilies of birds, 99 new genera and subgenera, and 500 new species and subspecies. His scientific papers totaled nearly 900. He belonged to 40 scientific and conservation organizations in various parts of the world.

Most of his fieldwork was done between 1895 and 1903, principally in the West. His lifelong interest in Texas bird life began with a biological reconnaissance of the state that he made in 1900 with Vernon Bailey. A persistent stomach disorder ended most of his career in the field.

Oberholser produced a three million word monograph on the birds of Texas that remained unpublished at his death. A much-cut version of this work, *The Bird Life of Texas*, edited by Kincaid and others, appeared in 1974. His splitting of bird taxa, particularly genera, led to major problems when his work was published. *Bird Life of Louisiana* (1938) was the other important work Oberholser published during his lifetime.

He was one of the first scientists to take part in the Federal Government's large-scale studies on the migration habits and distribution of North American birds. In 1920 he organized the Federal Government's bird-banding work and he later directed the first Nationwide migratory waterfowl inventories.

During his years with the Biological Survey, Dr. Oberholser became known in legal circles for his ability to identify species of wild birds by examining their

bones or feathers. He was frequently called into Federal and State courts as an expert witness in cases involving wild duck bootleggers and sellers of other migratory birds. Merriam once said that Oberholser thought himself “God, Jesus Christ, and the Holy Trinity when it comes to identifying birds” (McAtee in lit., box 48).

Dr. Oberholser also became well known as an educator and lecturer. He was appointed as Professor of Zoology at the Biltmore Forest School (North Carolina) during the summer sessions from 1904 to 1910 and as Professor of Zoology at George Washington University from 1920 to 1935. After retiring from government service, he spent the next six years as Curator of Ornithology at the Cleveland Museum of Natural History.

Oberholser was another person that McAtee had little use for, calling him a “sanctimonious son-of-a-bitch ... doubtless he had some human and likeable traits but in maturity they were crowded to the background.” He was known to be inhospitable to young visitors and to “hoard” his scientific specimens. McAtee also described him as “two-faced, and a thorough sycophant—a toady to any boss and a coat-tail rider” (McAtee in lit., box 48).

Wilfred Hudson Osgood (1875–1947; Fig. 13)

Sanborn 1948

W. H. Osgood was born in Rochester, New Hampshire, on 8 December 1875, where he attended primary schooling. His family moved to California in 1888; he attended high school in Santa Clara and then they finally settled in San Jose. Osgood had become interested in birds and egg collecting and was involved in the organization of the Cooper Ornithological Club in San Jose, which subsequently became a major professional organization.

After graduating from high school, Osgood accepted a teaching position in a small school in Wilcox, Arizona, for a year and then entered Stanford University shortly after its founding. There he came under the influence of the eminent zoologist David Starr Jordan, then president of the university. It was at Jordan's suggestion that he leave Stanford before completing his B.A. degree in order to take a position in 1897 with

Merriam at the Biological Survey. Eventually he was awarded his degree in 1899.

In his formative years he was greatly influenced by his association with Merriam, not only working for him but living in his house in Washington where he met and interacted with many of Merriam's influential friends and other workers at the Survey (such as Vernon Bailey). His careful and thorough training was largely due to Merriam. He was clearly one of "Merriam's men" and continued in a broader sense with his work and ideas.

He spent over a decade with the Survey, publishing a number of papers in the *North American Fauna* series, culminating in his monographic revisions of the genera *Perognathus* (Osgood 1900) and *Peromyscus* (Osgood 1909). While with the Survey he was sent five times to Alaska, and once each to California, Utah, Maine, and Canada, and various other places in the western United States. He left the Survey and went to the Field Museum in 1909 where he served as Assistant Curator of Mammals and Birds (1909–1920) and Chief Curator of Zoology (1921–1941).

Much of his scientific career and many of his greatest achievements came while at the Field Museum. There have been suggestions that he too left the Survey to escape Merriam's heavy-handed, domineering ways and to develop his own scientific thoughts and reputation. However, McAtee opined that Osgood left the Survey because he did not want to be subordinate to Nelson, following Merriam's departure, whom he [Osgood] described as "the most unreasonable man the Lord ever let live" (McAtee in lit., box 48).

Osgood was among the best educated and theoretical members of the Survey staff. His revision of the genus *Peromyscus* is still considered one of the classic works in mammalian systematics. A total of 14 new genera and subgenera and 263 species and subspecies of mammals were described by Osgood, and his total publications numbered 205.

McAtee and Osgood knew one another for 44 years and, according to McAtee, the two of them never had a controversy as "he was little inclined that way and seldom said anything critical of anyone" (McAtee in lit., box 48).

When the American Society of Mammalogists was formed, he served as Vice President from 1919 to 1923 and as President from 1924 to 1926. He also served for long periods on the Bibliography, Conservation, and Nomenclature committees. He died a bachelor on 20 June 1947.

Ned Hollister (1876–1924; Figs. 14 and 15)

Osgood 1925, Perry 2007

Ned Hollister was born on 26 November 1876, in Delavan, Wisconsin, to Kinner Newcomb and Frances Margaret (nee Tilden) Hollister. He attended Delavan High School but never officially graduated because a collecting trip conflicted with the last few days of his senior year. At age 12 he became interested in birds while under the influence of Ludwig Kumlien, who was a professor at Milton College. He published his first paper in ornithology at the young age of 16. At 18 he was elected to the A.O.U.

An avid hunter throughout his life, he became a boyhood friend of Hartley H. T. Jackson who also became a well-known mammologist (see below). As word spread of his acumen with specimen preparations and collecting ability, in 1902 he was invited to join a Biological Survey party in Texas as assistant to Vernon Bailey. He worked with Bailey for a time and came to have great admiration for him. Soon proving competent for independent assignments, he made important collections of mammals and birds at many places in Texas and New Mexico. In 1903, he served as a Field Assistant on a Survey trip to Alaska. In 1904, he served as a representative for the Survey on a hunting trip to Louisiana, and in that same year he was appointed full-time to the field staff of the Survey where he remained continuously employed until 1910. During his time with the Survey, he traveled and collected in Utah, Nevada, Oregon, California, Arizona, and New Mexico, the latter in 1905. In 1909, he went back to California, and in 1911 he was the leader of a group working in the Canadian Rockies for the U.S. National Museum. Throughout his career he was known for the quality of his specimen preparations and their care subsequent to preparation.

In 1906 after many years of field work, he was brought to Washington and authorized to do something

other than field work. His genius in the museum was immediately recognized and he was placed in charge of the care and arrangement of the huge mammal collection brought together by the Survey. By the age of 30, largely self-taught and with the experience mainly of field work, he began to delve into the literature of mammalogy and to show a capacity for matters pertaining to classification and nomenclature that was surprising given his lack of formal training.

Late in 1909, Hollister accepted an offer of the position of Assistant Curator of Mammals in the U.S. National Museum and took up his duties there at the beginning of 1910. Gerrit Miller, the Curator of Mammals at the U.S. National Museum, was absent in Europe, and Hollister found himself with the entire responsibility for moving, installing, and rearranging the great research collection into the newly completed natural history museum. He excelled in collection management and built a reputation for his curatorial abilities.

In 1916 Hollister was appointed Superintendent of the National Zoological Park, a position he held until his death. During his administration the collection of living animals became larger and more varied than at any previous time, and attendance increased until it reached a total of 2.4 million visitors in 1923. Despite the distractions of administrative positions, he still found time for research and he produced many significant papers, including taxonomic revisions of American muskrats (Hollister 1911), minks (Hollister 1913), grasshopper mice (Hollister 1914), and prairie-dogs (Hollister 1916) as well as his three-volume work on East African Mammals (Hollister 1918, 1919, and 1924). He was a charter member of the American Society of Mammalogists and served as the first editor of the *Journal of Mammalogy* during the first five years of its existence.

Hollister was highly esteemed and respected as a person as well as a mammalogist. A. K. Fisher had this to say about him:

He was an agreeable young man with a good working knowledge of birds and mammals in their native haunts. He was one who lived an unassuming and natural life, and one who had little difficulty in making friends with those with whom he came in contact...When alone

with anyone, who had common interest, he was very entertaining in relating many interesting experiences from early boyhood to recent occurrences (A. K. Fisher in lit., box 40).

Following his death in 1924, the Board of the American Society of Mammalogists held a special meeting and passed the following memorial resolution to express their feelings about his service:

In the death of Ned Hollister, charter member and editor of our JOURNAL since its establishment, the American Society of Mammalogists has sustained an irreparable loss. But most of all each of us mourns the departure of a warm personal friend. We shall long miss him for his congenial companionship, his ready helpfulness, his unvarying patience, his keen intellect, his scientific skill, his sterling worth. Therefore we, representatives of the Society, hereby record our deep grief in the loss of our friend and co-worker, and our keep appreciation of his rare qualities as a scientist and as a man; and we extend to his bereaved widow, his mother, his brothers and sister, our heartfelt sympathy in the greater sorrow which is theirs (Journal of Mammalogy 6:12, 1925).

Merritt Cary (1880–1918; Fig. 16)

Compared to the other naturalists who worked for the Survey during Merriam's tenure, little is known about Merritt Cary. No scientific or educational obituary exists, although he was listed by Merriam (1935) as a key staff member of the Survey during his tenure. From his meager government personnel file and from information provided by the University of Nebraska natural history museum, I have been able to learn a few significant aspects about his life and career.

He was born 21 December 1880, and grew up in Neligh, Antelope County, Nebraska. His parents were James Richardson Cary and Mary Mathews. He studied at the University of Nebraska in Lincoln under Myron Swenk, the university's ornithologist/entomologist, who in his later career also published on Nebraska mammals. Cary married Eirene I. Young and had two sons Harold J. (1906) and Walter M. (1909).

His government personnel records (National Archives and Records Administration, St. Louis, Missouri) show that he joined the Survey in 1902 and worked off and on at various capacities until his final resignation in June 1917. His annual salary was \$1,200 from 1902 to 1909 and was increased to \$1,800 per annum from 1910 until 1912. Thereafter he was paid on an hourly or monthly basis. He participated in field work in many western states, especially Colorado and Wyoming, and Canada and also worked on food habits research (National Archives and Record Administration).

McAtee and Cary took the same Civil Service exam and Cary outscored him slightly. They also shared a room at a boarding house for a brief time, and according to McAtee, "he was a worthy young man, rather prim" (McAtee in lit., box 95). He resigned in 1917 because of ill health and died not long afterward in 1918. According to McAtee, he suffered from a very serious case of "bone tuberculosis" that likely caused his death (McAtee in lit., box 95).

His most important published works were his biological survey of Colorado (Cary 1911) and life zone investigations of Wyoming (Cary 1917).

Hartley H. T. (Harrod Thompson) Jackson (1881–1976; Figs. 17 and 18)

Aldrich 1977

Hartley Jackson was one of the last of the professional staff employed just as Merriam was leaving the Survey, and he went on to have a long and illustrious career with the agency as well as in mammalogy. Born 19 May 1881, in Milton, Wisconsin, Hartley Jackson was the youngest of eight children and the only one born in this country to his English parents, Harrod and Mary Thompson Jackson. He graduated with honors from Milton High School and continued his education at Milton College where he received his B.S. in Zoology and chemistry in 1904. While at Milton College, Jackson played football and developed a reputation for being a tough, but fair player. After graduation, he was offered the first Rhodes Scholarship at Oxford University, but he turned it down because he wanted to do his post-graduate work at an American university.

Before going to the University of Wisconsin to work on his M.A. degree, Jackson spent the school year of 1904–05 teaching at Carthage Collegiate Institute in Missouri. He was public school principal at Juda, Wisconsin, in 1905–06, and a high school teacher at Waukegan, Illinois, the following year. From 1908 to 1910 he studied zoology, anatomy, and botany at the University of Wisconsin to earn his M.A. He obtained his Ph.D. in zoology at George Washington University in Washington, D. C., in 1914.

Jackson developed his interest in natural history at an early age and when 11 years old he started a collection of birds. By the time he was 14, his interest began to focus on mammals which remained his primary interest throughout the rest of his life. He published his first paper, on screech owls, at age 16. His first mammal paper, on the meadow voles of Wisconsin, appeared in 1903.

On 16 February 1910, shortly before Merriam departed from the agency, Jackson joined the research staff of the Bureau of Biological Survey as "an expert in the Biological Survey" at a salary of \$1,400. In his biographic notes, Jackson recalled reporting for work 1.5 hours early and shortly afterward being greeted by Merriam:

'Oh, Jackson. I'm so glad you are here. I don't know what we would have done if you had not come to us.' Vernon Bailey, Chief of the Division of Geographic Distribution, was called in and nearly two hours of conversation followed, during which I was told that my work would be in that Division under Mr. Bailey's supervision, that I should become familiar with the work of the Survey in general, and of the Division in particular, but that most of my work at the present would be on the immense Biological Survey research mammal collection housed in the new National Museum building the construction of which had just been completed (Jackson in lit., box 16).

During his early years with the Survey, he conducted field work, including the collection of mammals and birds, in Arizona and Wisconsin. In 1917, E. W. Nelson, then Chief of the Biological Survey, arranged

with the Wisconsin Geological and Natural History Survey for a cooperative study of the fauna of Wisconsin with Jackson designated as principal investigator. For the next decade he conducted field work for this project which would result in the major publication of his career. He was able to finish it only after being relieved of all administrative duties and promoted to "Senior Biologist" in 1949. His work appeared as a well-illustrated book, *The Mammals of Wisconsin*, in 1961. In the introduction Jackson defended the Life Zone concept of C. Hart Merriam and his other Biological Survey associates, against the then current trend of criticism by ecologists. He also became well known for his taxonomic revision of American moles (Jackson 1915) and of shrews of the genera *Sorex* and *Microsorex* (Jackson 1928).

In July 1925 he was promoted to the position of chief of the Division of Biological Investigations and from 1917 to 1935 was in charge of taxonomic mammalogy. An administrative reorganization with the Bureau of Biological Survey in 1934 ended most of Jackson's personal research because of greatly increased supervisory responsibilities. He was made chief of a new unit in the Division of Wildlife Research in 1936 that became known as the Section of Wildlife Surveys, and he remained in that position until his retirement. That unit, with somewhat changed responsibilities, became known many years later as the National Fish and Wildlife Laboratories of the U.S. Fish and Wildlife Service, Department of the Interior, with headquarters in the National Museum of Natural History, Washington, D.C.

During World War II, Dr. Jackson served on two War Production Board committees and supplied them with a volume of important information. He also assisted the Office of Strategic Services in obtaining important information on Alaska.

Jackson played a prominent role in the formation of the American Society of Mammalogist and became a devoted member of the society throughout his life. He served ASM in various capacities, including Editor of the *Journal of Mammalogy*, Vice President, and finally President (1938–1940). He was elected to Honorary Membership of the ASM in 1952. He joined the Washington Biologists' Field Club in 1925 and served as President from 1945 to 1948. He was also President of the Biological Society of Washington from 1931 to 1933.

Jackson retired on 31 May 1951, after 41 years of government service. He was the last of the Merriam men to die, succumbing at his home on 20 September 1976. In his bibliography of over 400 titles, about three-fourths were abstracts and literature notices, whereas about 100 are original contributions to science. In his various taxonomic publications he described as new 42 mammals, principally insectivores and carnivores. He developed many techniques and methods of field study and introduced numerous innovations in the care and preservation of study specimens. His service to mammalogy as well as to the American Society of Mammalogists was substantial.

OTHER BIOLOGICAL SURVEY NATURALISTS WHO WORKED FOR THE SURVEY

In addition to the personalities mentioned by Merriam and discussed above, there were a number of other men who worked in the Survey at various times during Merriam's tenure. They were more like seasonal or temporary employees and only worked for a few years. Mostly they were employed as assistant field agents to support the work of the scientific staff of the agency. Included in this group noteworthy of mention are the following men (Henderson and Preble 1935 provide summary information about each of these individuals).

Clark P. Streator (1866–1952; Fig. 19).—Clark Streator, already well known for his field work in the West Indies and in British Columbia, joined the Survey as a participant in a field expedition to south-central Idaho in 1890. He remained with the Survey for several years, and did important work in various parts of the United States, mainly on the West Coast, including British Columbia and southern Alaska, but also in Colorado, California, Nevada, and Texas. His service terminated in 1896. His specimens, judiciously selected

and well prepared, were always as representative as possible of the local fauna. Streater became an authority on the mammals of California and visited the type localities for almost every mammal species in the state.

Basil Hicks Dutcher (1871–1922; Fig. 20).—Basil Dutcher was the son of William Dutcher, the longtime president of the National Audubon Society (Hume 1942). At the age of 19 he was appointed a field assistant in the Division of Ornithology and took part in the biological reconnaissance of Idaho under the direction of Merriam in 1890. In the following summer he became a member of the Death Valley Expedition and would go on to work in several other states including California, Montana, and Wyoming. Shortly after receiving his medical degree he secured an appointment in the army as an assistant surgeon with the rank of 1st Lieutenant. During his 25 years of service he was stationed at several posts in the Southwest, in the Phillipines, Puerto Rico, and Panama, and during World War I he was in charge of a hospital in Brest, France. According to McAtee, Dutcher was “a good and brave man” (McAtee in lit., box 95). While working for the Survey, he did considerable field work with Vernon Bailey and the two became close lifelong friends. He died at Walter Reed Army Hospital in 1922 at the relatively young age of 51 and is buried at Arlington National Cemetery (Hume 1942).

J. Alden Loring (1871–1947; Fig. 21).—Loring was a field naturalist with the Survey from 1892 to 1897, participating in field surveys in many regions of the United States as well as Canada and Mexico. He left the service in 1897 but was reemployed for special duties on several occasions, notably in 1920, when he spent the summer on the great waterfowl breeding grounds in central Canada. He was another of the field agents trained by Bailey. He served as curator of animals of the New York Zoological Park from 1897 to 1901 and in 1903 was sent to Alaska to study mountain sheep and bears. In 1909 he accompanied President Theodore Roosevelt on his scientific expedition and hunting trip to East Africa, representing the Smithsonian Institution as a field naturalist. After his return from Africa, he established a lecture series, “Through Africa with Roosevelt” which had a forward by President Roosevelt (Loring 1910). In 1916, Loring was commissioned to go to South Africa to purchase wild animals

for the zoological parks in New York, Philadelphia, and Washington, D. C. He returned early the next year with 200 birds and mammals (New York Times).

James Gaut (1879–1914; Fig. 22).—Gaut worked as a field agent for the Survey from 1896 to 1906 collecting in many areas of North America including Virginia, Maryland, California, New Mexico, Texas, Coahuila (Mexico), Chihuahua (Mexico), Oklahoma, and Colorado. He collected over 3,860 mammals. His employment at the Survey was terminated in 1906, and he died in an automobile accident in 1914 at the age of 35. McAtee described him as follows:

He was essentially a field collector and was known as a go-getter being sent hither and yon for topotypes or other much-wanted material, usually delivering the goods (McAtee in lit., box 47).

McAtee went on to describe him as having:

...a reckless disposition and in the horse-and-buggy days managed to have an accident that cost him an arm. Naturally when automobiles came along, with this more efficient means, it was not long before he was involved in a fatal crash.

A. Brazier Howell (1886–1961; Fig. 23).—Although he did not work for the Survey during Merriam’s time and was only with the organization for a brief period (1922–1928), Howell deserves mention because of his role in the predator control controversy that rocked the agency in the early years of the Depression. Known as a “dollar-a-year-man” because that yearly salary was necessary to justify him occupying an office, he became the most vocal critic inside the agency about the predator extermination program (see Robinson paper in this volume). He also was a critic of the life zone concept that the agency continued to use to explain plant and animal distributions (Howell 1924). Howell was independently wealthy and had the financial means to pursue his own agenda (Little 1968). Among his major scientific contributions while at the Survey were taxonomic revisions of the genera *Phenacomys* (A. B. Howell 1926) and *Synaptomys* (A. B. Howell 1927). In 1928 he moved to Baltimore to

accept a faculty position in the Department of Anatomy, Johns Hopkins Medical School. Howell served as the 13th President of the American Society of Mammalogists (1942–1944) and was an ardent supporter of the Society, establishing an endowment for a graduate student award—the A. Brazier Howell Graduate Student Honorarium (Birney and Choate 1994).

In addition to these men, who primarily collected in the field for Merriam and spent some time with scientific work in Washington, a few other individuals worked for the Survey and went on to distinguished careers outside of the agency. Notable among the many individuals who briefly worked with the Biological Survey as collectors or field agents over the years were Frank H. Hitchcock, who became postmaster general in the administration of President Howard Taft; Frederick Funston, a congressman's son who later became an army officer, won the Congressional Medal of Honor

in the Philippine insurrection, and became a major general; Clarence Birdseye, who would later invent a process that developed the frozen-food industry; and Alexander Wetmore, who rose to become secretary of the Smithsonian Institution.

Ernest Thompson Seton, a British-born naturalist and artist long resident in Canada, collected specimens for Merriam from the 1880s to about 1908. In 1907, he made a 2,000 mile canoe trip in northern Canada with Preble as his traveling companion. He learned how to describe animals properly from Merriam, and he completed a number of illustrations for publications put out by the Biological Survey, as did Louis Agassiz Fuertes, who participated with Bailey and Oberholser in the early field studies of wildlife in Texas and New Mexico. Fuertes and Seton were probably the two leading animal artists of their generation.

WORKING CONDITIONS AND RELATIONS AT THE SURVEY

Working for Merriam was not easy, as he was known to be strong willed, opinionated and a petty tyrant when it came to expenses. Throughout his tenure, the Biological Survey staff remained small and their salaries modest because the budget was modest. Total salaries never rose above \$17,500 annually between 1885 and 1910, and the total annual appropriation remained under \$62,000. Merriam was no politician, and he loathed the annual round of budget hearings on Capitol Hill; thus, many of his people had to be hired on a seasonal or part-time basis. Some employees began working at salaries of \$480 per annum or less in the early days. Many earned only between \$1,200 and \$1,800 into the early 1920s, and Merriam's own salary stood at \$2,500 for years (Sterling 1989)

Biological Survey men typically traveled to their field sites alone using railroad vouchers issued by the government for their fares (Sterling 1978). Once in the field, an agent paid his day-to-day costs out of pocket, since in those days the government did not reimburse Department of Agriculture employees for per diem expenses. In 1895, for example, a field agent might have hired a camp man for \$20–25 a month and board. The typical camp man might provide a wagon to carry the field equipment, take care of the horses, protect the

site while the field agent was out collecting, prepare meals, and provide some human companionship (Fig. 24). Provisions for the agent and camp man might have come to \$20 a month, although Merriam claimed that he was able to get along on \$6 for this purpose. One field agent asserted in 1893, however, that no one could live decently in the west for less than \$2 a day. Camp outfits, which included tents, cooking gear, a horse, saddle, and similar *impedimenta*, also had to be provided by the field agent, and these might come to \$50 or more (Sterling 1989).

The field agent's job was to collect typical plants and animals native to the area where he was working and determine the life zones encountered (Sterling 1989). He would usually set out traps in a systematic manner, remaining in one place long enough to be reasonably certain of getting a representative collection of each species of mammal, reptile, or other animal (Fig. 25). He then had to prepare skins and other specimens for shipment to Washington, where they could be studied at leisure. He had to take thorough notes about the areas covered so that adequate biogeographic summaries could later be compiled. A field agent might cover part of a state in depth or cover several states in the course of a collecting season.

A few of the more capable field agents were brought to Washington for museum work and to learn the scientific aspects of taxonomy and systematics. Under the tutelage of Merriam, these men would “work up” the material from the field agents in the form of a scientific report of the region including the descriptions of new forms and later generic revisions and biogeographic surveys. For the first 20 years that Merriam was in charge, the Survey had no editor. Merriam, a clear and forceful editor, did all of the critical editing himself. He used an emphatic blue pencil and his style of editing has been described as “drastic.” He edited a manuscript of Nelsons’ so severely that he threatened to resign and many thought he took “a sadistic delight” in butchering other men’s work (McAtee in lit., box 47).

Merriam had definite ideas concerning the manner in which the work of the Biological Survey was to be done and the standards of performance he expected from his field workers (Sterling 1973). He had to be rigorous, since the scope of the work he wanted done was vast, and the manpower and fiscal resources at his disposal were slight. Many of his staff and agents thought he was a most extraordinary character, dynamic, productive, and original but full of contradictions (Osgood 1943, Sterling 1977). He was not very worldly and not very diplomatic although his personal charm and personality, his whimsicality, and his forthrightness contributed much to his success. If he respected you, he could be warm-hearted, very generous, and very sympathetic. But without his respect these qualities were not too greatly exercised. He was not very tolerant of sloth, incompetence, or insubordination, and he did not take kindly to those who maintained and acted upon their independent scientific views. As a result, he had difficulty retaining many of his most talented men, and several left the Survey convinced that he was fundamentally cruel and arbitrary in his dealings with them. He was also seen as being quite patronizing toward his staff, including his long-time men such as Palmer, Fisher, and Bailey. McAtee, who did not particularly care for Merriam, said this about him:

Dr. Merriam was one of those who think they must be martinets in relation to subordinates and I often heard men say they would rather “take a sickness” than to have an interview with him (McAtee in lit., box 47).

Working relations among the field agents and staff were generally good. Several of them rented rooms and took meals together at local boarding houses, and a few (notably Osgood and Bailey) would occasionally stay at the Merriams’ home while in Washington. The field agents worked almost entirely in the field and seldom visited headquarters. A few key men, most notably Vernon Bailey, long in charge of field work in mammals, and A. K. Fisher, who performed essentially the same role with birds, circulated about, supervising the younger biologists and collectors (Sterling 1974). Almost to a man the agents and staff had great respect and admiration for the ability and demeanor of both Bailey and Fisher. The scientific staff, including the Big Four, spent time in both Washington, D.C., and in the field, although Palmer and Fisher mostly did administrative work at headquarters, while Nelson was in the field in Mexico. Bailey went back-and-forth but spent more time in the field during Merriam’s tenure as Chief.

The scientific staff interacted both professionally and socially. Many of them belonged to the Washington Biologists’ Field Club. Formed in 1900 and incorporated as a society in 1901, the Club was comprised of persons interested in the biological sciences, with most of its members coming from the Biological Survey and the National Museum of Natural History (Perry 2007). A major goal of the Club was to conduct research on the local fauna and flora of the region. For this purpose, as well as to facilitate social interaction among its patrons, a cabin was constructed on Plummers Island where the Club held its functions. Social highlights of the Club, in which many of the Survey staff participated, included an annual shad bake (initiated in 1904) and oyster roast (started in 1911). With the exception of Palmer, Preble, Howell, and Oberholser, all of the early Survey staff were members, and both Fisher and Osgood served as Presidents of the Club.

Most of the professional staff in D.C. were elected to membership and regularly attended the meetings and seminars hosted by the Biological Society of Washington, established in 1880 to “encourage the study of the biological sciences and to hold meetings at which papers were read and discussed” (Aldrich 1980). Beginning in 1892 a peer reviewed journal, *Proceedings of the Biological Society of Washington*, was published and almost all of the scientific staff regularly placed

papers in it. Merriam, Palmer, and Hollister served as editors of the journal, and Merriam, Nelson, Hollister, Bailey, Oberholser, and Goldman served as presidents of the society.

A few of the more socially inclined “movers and shakers” of the Survey became affiliated with the prestigious Cosmos Club, a private social club in D.C. founded by John Wesley Powell in 1878 (Washburn 1978). The purpose of the Club was “the advancement

of its members in science, literature, and art,” and its members included U.S. presidents, vice presidents, Supreme Court justices, and Nobel Prize winners. Theodore Roosevelt was a long standing member, and was well acquainted with many of the Survey staff. Of the Biological Survey staff, both Fisher and Palmer had long-standing affiliations (more than 50 years in both cases) with the Cosmos Club, and the organization published lengthy obituaries of both men upon their deaths.

SURVEY NATURALISTS AND THE FOUNDING OF THE AMERICAN SOCIETY OF MAMMALOGISTS (ASM)

There can be no doubt that the leadership for establishing and organizing a new society devoted to the study of mammals came directly from the naturalists hired and trained by Merriam during his tenure as Chief of the Biological Survey. Serious discussions about organizing a society for mammalogists, led by Jackson, Goldman, and Walter P. Taylor (who had joined the Survey a few years after Merriam had left the agency), began in 1915 and 1916. Late in 1918, nearly a month after the WWI armistice, at a regular meeting of the Survey staff in the home of the Baileys in Washington, Bailey led a discussion about whether or not the organization of a society “for the promotion of the study of mammals” would be desirable. At this session, Jackson was appointed to head a committee consisting of Howell, Hollister, Preble, and Taylor to determine whether the project might have the support of American mammalogists (see Hoffmeister and Sterling 1994 for a detailed account of the formation of the ASM).

In a letter dated 7 February 1919, to Major Goldman, who was then in France supervising rat control for the American Expeditionary Forces of World War I, Jackson wrote:

We've started organization plans for the American Society of Mammalogists. It started in a Survey Staff meeting held at (Vernon) Bailey's early in December. I was appointed chairman of the Committee and along with me were (A. H.) Howell, (N.) Hollister, (E. A. Preble) and (W. P. Taylor). We have added (W. H.) Osgood, (J.) Grinnell, (W.) Stone, G.

M. Allen and J. A. Allen to the committee and have a pretty good start toward a *real* foundation (Journal of Mammalogy 28:111; 1947)

When it was decided to move forward, Jackson was selected to serve as Chairman of the Organizing Committee of ASM in 1919, and he along with Walter P. Taylor devoted considerable time and energy to see that the Society was successfully established. The first meeting of the American Society of Mammalogists, often referred to as the Organizational Meeting, was held on 3 and 4 April 1919, at the U.S. National Museum. About 60 persons attended the meeting, and Merriam, who played no part in the preliminary efforts to get the Society under way, was elected President, with Nelson and Osgood vice-presidents, Jackson as corresponding secretary, Taylor as Treasurer, and Palmer and Preble as Council members (now Board of Directors). A complete account of the first meeting along with a group photograph of the meeting attendees is provided in the volume commemorating the 75th anniversary of the ASM (Birney and Choate 1994; Fig. 26).

With the establishment of the ASM, and the continued scientific study of mammals started by Merriam and his naturalists, it can be said that mammalogy came to fruition as a bona fide area of scientific study in the United States. But, shortly after its formation, in the early 1920s, members of the ASM who were profoundly concerned with wildlife, began to ask questions about the role of the Biological Survey and its policies toward the control of predatory animals. As this became more and more an issue within the ASM, the first organized attempts to change government policy toward predatory

animals came into play. This would bring the ASM into direct conflict with the Survey and created much stress between the two organizations (discussed in Robinson's paper in this volume).

Because feelings among its members were running so high on the predator control issue, it was proposed at one stage that the mammal society dissociate itself altogether from the Survey and discontinue cooperating with it (Sterling 1973). But to terminate friendly relations with the Survey would involve cutting off access to the use of its collections and to other vital sources of information. The ASM suffered a slight attrition of membership during the mid-thirties, which was probably a lingering effect of the dispute, since some Survey men objected to the Society's official stance (Sterling 1973).

Despite these philosophical arguments and differences, the early naturalists who were hired and trained by Merriam at the Survey would go on to have consid-

erable influence on the ASM. In addition to Merriam who served as the first president of the Society, Nelson was the 2nd president (1921–1924), Osgood the 3rd (1924–1926), Bailey the 8th (1933–1935), Jackson the 11th (1938–1940), and Goldman the 15th (1946–1947) (Layne and Hoffman 1994). Palmer was elected President in 1933 but for some unknown reason declined to serve. Five of the naturalists were elected to Honorary Membership, the highest honor bestowed by the Society, including both Nelson and Merriam (1930), Miller (1941), Palmer (1951), and Preble (1952). Today, two of the ASM's highest awards are named after Merriam (for outstanding research contributions) and Jackson (for outstanding leadership to the Society). Hollister served as the founding editor for the *Journal of Mammalogy*, and Preble served as chair of the editorial committee for several years. Many of the early naturalists served at various times on the Board of Directors. The Survey also had considerable influence with the *Journal of Mammalogy*, as many of its scientists contributed articles on a regular basis.



Figure 1. A. K. Fisher at Fort Huachuca, Arizona, 1892. Courtesy Library of Congress, MSS 20268, A. K. Fisher Papers.



Figure 2. A. K. Fisher bird hunting. Courtesy SIA, Jackson files, RU 7172.



Figure 3. (L to R) F. E. L. Beal, A. K. Fisher, A. H. Howell, Henry Oberholser, Mrs. Morrison, and H. M. Judd on the steps of the Agriculture Building in Washington, D C. Courtesy SIA, Jackson files, RU 7172.



Figure 4. A. K. Fisher working at his desk, 1921. Courtesy SIA, Jackson files, RU 7172.



Figure 5. T. S. Palmer getting a haircut from a Native American woman during the Death Valley expedition, 1891. Courtesy SIA, Jackson files, RU 7172.



Figure 6. T. S. Palmer sitting with his collie dog, no date. Courtesy SIA, Jackson files, RU 7172.

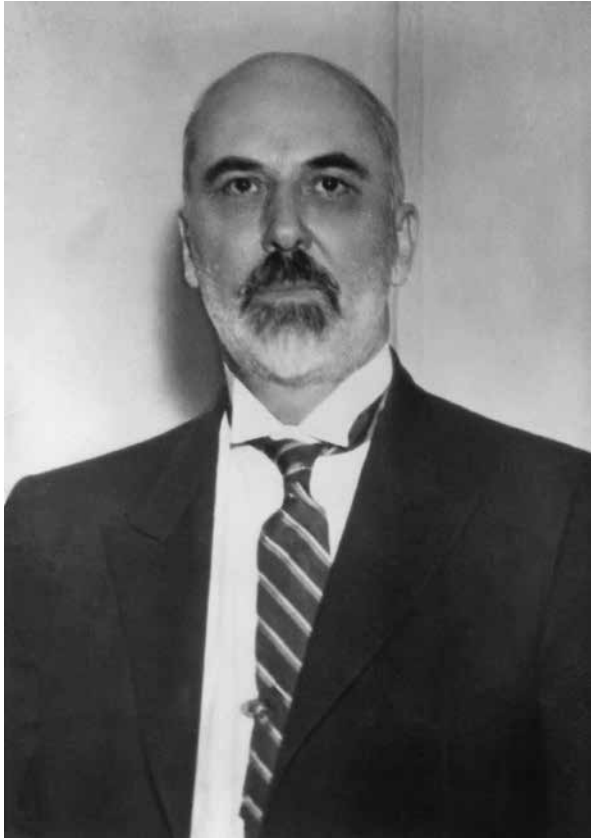


Figure 7. T. S. Palmer toward the end of his career at the Biological Survey. Courtesy USGA-PWRC, Biological Survey files. 8 May 1925.

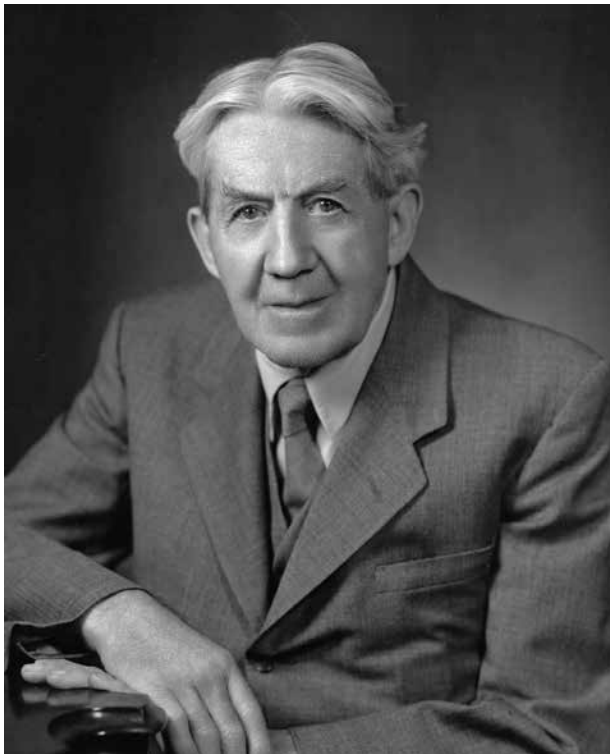


Figure 8. E. A. Preble later in life while serving as editor of *Nature Magazine*. Courtesy USGS-PWRC, Biological Survey files.



Figure 9. Gerrit Miller, 1897, while working at the Biological Survey. Courtesy SIA, Jackson files, RU 7172.

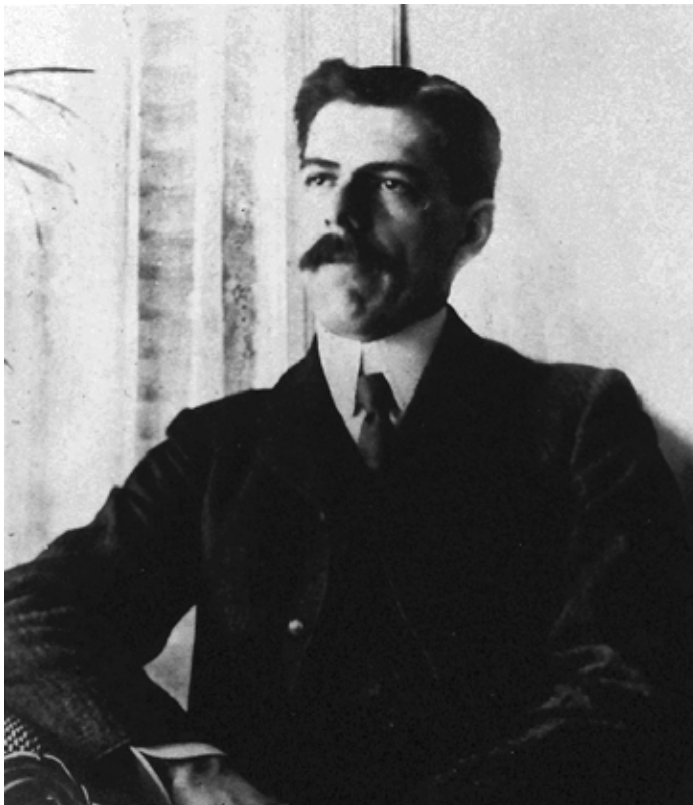


Figure 10. Arthur Holmes Howell, 1903. Courtesy USGS-PWRC, Biological Survey files.

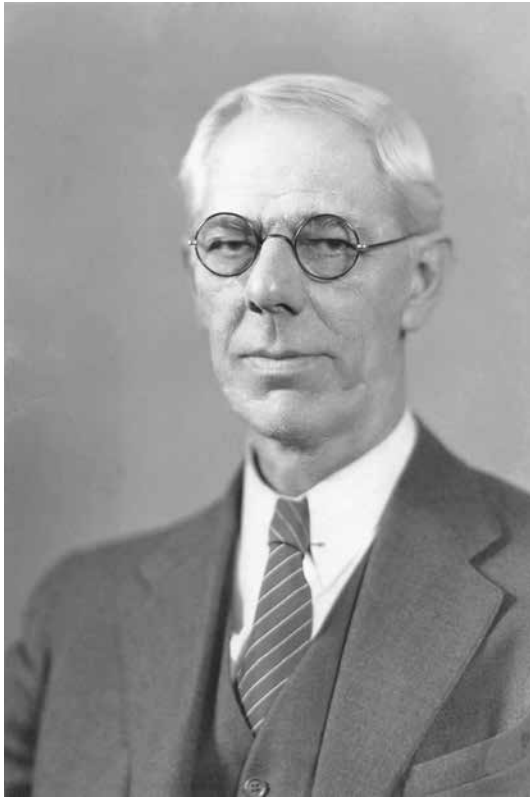


Figure 11. A. H. Howell, later in life. Courtesy USGS-PWRC, Biological Survey files.

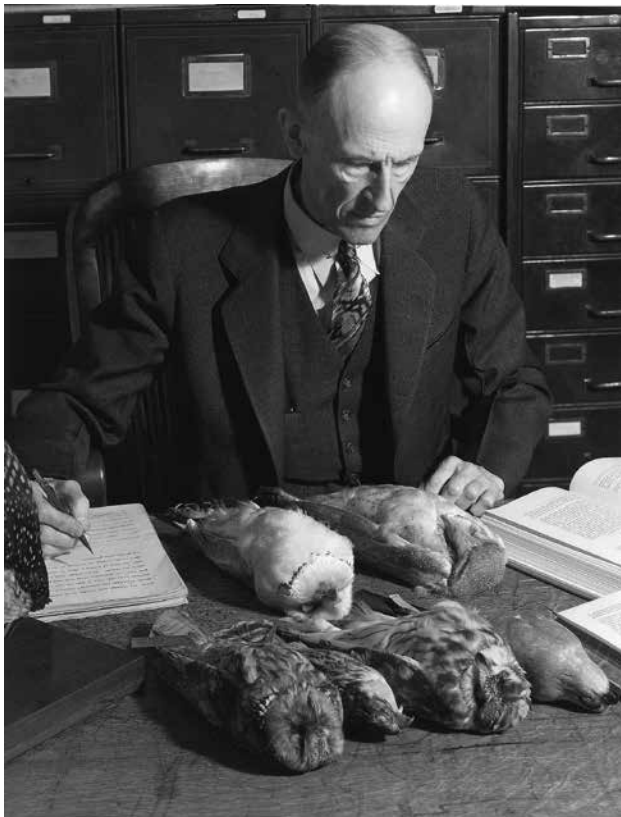


Figure 12. Harry Church Oberholser examining bird specimens at the U.S. National Museum in 1937. Courtesy USGS-PWRC, Biological Survey files.



Figure 13. Wilfred H. Osgood, 1929. Courtesy SIA, Jackson files, RU 7172.



Figure 14. W. H. Riley (L) and Ned Hollister (R) in Canada, 1911. SIA, Jackson files, RU 7172.



Figure 15. Ned Hollister, 1922. Courtesy USGS-PWRC, Biological Survey files.



Figure 16. Merritt Cary in Canada, 1903. Courtesy National Photographic Archives, RG 22-WB-46.



Figure 17. Hartley H. T. Jackson fishing. Courtesy SIA, Jackson files, RU 7172.



Figure 18. Hartley H. T. Jackson as a young man. Courtesy SIA, Jackson files, RU 7172.



Figure 19. Clark Streater, 1930. Courtesy National Photographic Archives, RG 22-WB-46.



Figure 20. Basil Hicks Dutcher, date unknown. Courtesy Library of Congress, MSS 35428, T. S. Palmer Papers.



Figure 21. John Alden Loring, 1913. Courtesy Library of Congress, MSS 35428, T. S. Palmer Papers.

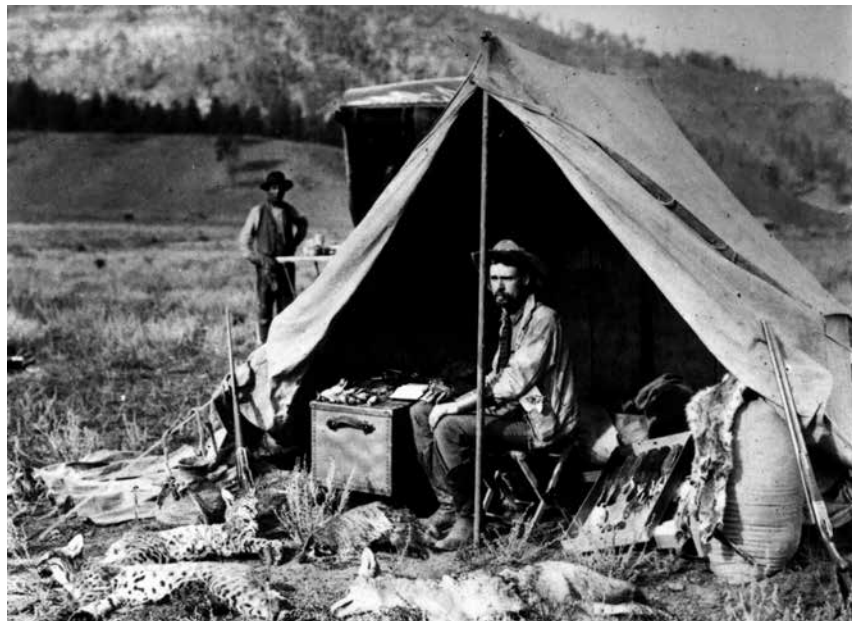


Figure 22. James Gaut, preparing specimens at camp in New Mexico, 1904. Courtesy USGS-PWRC, Biological Survey files.



Figure 23. A. Brazier Howell, 1916, with his hunting dog. Courtesy SIA, Jackson files, RU 7172.



Figure 24. Hartley H. T. Jackson (L), Walter Taylor (C) and Bert Luzon (R) preparing specimens at a camp in the Grand Canyon, 1916. Courtesy USGS-PWRC, Biological Survey files.



Figure 25. Field agents on horseback near the entrance to one of the Painted Caves, Val Verde County, Texas, 1901. Courtesy National Photographic Archives, RG 22-WB-30.



Figure 26. First meeting of the American Society of Mammalogists, Washington, D.C., 4 April 1919. Courtesy SIA, American Society of Mammalogists file.

THE INFLUENCE OF E. W. NELSON AND E. A. GOLDMAN ON MEXICAN MAMMALOLOGY

Xavier López-Medellín and Rodrigo A. Medellín Legorreta

INTRODUCTION

Mexico and adjacent southwestern United States have a long and complicated history: wars, shifting geographical boundaries, poignant migrant stories, brilliant biological discoveries, enhanced international cooperation, and complex biological history. Two individuals—Edward William Nelson and Edward Alphonso Goldman—contributed more than most naturalists to the knowledge, understanding, and documentation of the biota of this region and of Mexico to the south.

Over the course of 14 years at the turn of the 20th Century, they carried out an impressive biological survey of this vast area. Their accurate and detailed field notes document not only the mammals and birds they encountered and collected, but also contain information on the ecosystems and landscapes, the peoples they encountered, and the social turmoil that was to develop into the Mexican revolution. During that period (1892–1906), they collected many thousands of specimens, and discovered and described dozens of new species and subspecies. Their influence goes well beyond mere specimen collection. Goldman helped negotiate the first-ever environmental treaty between Mexico and the United States—the Convention for the Preservation of Migratory Birds and Game Mammals—signed in Mexico City in 1936.

One can only imagine the degree of intertwining friendship and kinship that would develop between these two men, 18 years apart in age, embarking on such a 14-year-long adventure with additional collaborations later on. The two men met serendipitously in 1891 when Nelson, then 36 years old and working in California for the Division of Economic Ornithology and Mammalogy, headed by C. Hart Merriam, stopped at the ranch of Jacob Goldman to seek repairs on his buckboard. Nelson mentioned to the senior Goldman that he wanted to hire a teamster and camp man, and Goldman recommended his 18-year-old son, Edward,

for the job. With little training other than his upbringing on a farm and a passion for hunting, young Goldman quickly impressed Nelson, who later trained him in the Merriam method of fieldwork. Although the two had different personalities (for a discussion, see Sterling 1991), they developed a mutual respect for one another and worked well together. They worked three months in California, and when Merriam dispatched Nelson to Mexico in January 1892, young Goldman was invited to accompany Nelson under the same arrangement they had established in California, with his pay drawn from Nelson's salary. On 1 March 1892, while in Mexico, Goldman became an official employee of the Survey.

Nelson and Goldman would become two of the more important mammalogists in America in the early 20th Century. Together or on their own, these men made several expeditions not only within the United States but in other countries as well where they recorded an amazing number of bird and mammal species, many new to science. Their legacy of valuable information comes not only from the specimens deposited in biological collections, but also from their detailed observations of the natural history, environmental, physiographic, geologic and climate features recorded during their extensive fieldwork in Mexico (Table 1).

Their contributions to the study and conservation of biodiversity go well beyond the collection and description of wildlife specimens. Both worked for the agency that became the U.S. Bureau of Biological Survey, and their knowledge and participation were crucial for the creation of new policies, regulations, and international treaties to protect wildlife. The impact of their work lives on, especially in Mexico where they sowed the seeds of the study of mammalogy. Mexican mammalogy, as we know it today, clearly contains the imprint of these two talented individuals.

BIOGRAPHICAL SKETCHES OF NELSON AND GOLDMAN

Edward William Nelson (1855–1934; Figs. 1 and 2)

Goldman 1935, Perry 2007

Nelson was born in the small village of Amoskeag near Manchester, New Hampshire, on 5 May 1855. The Nelsons lived in Manchester until his father joined the Union Army and his mother went to a hospital in Baltimore to be a nurse. Edward and his brother were taken to live with their maternal grandparents in the Adirondack Mountains in northern New York, where young Nelson attended a one-room rural school, learned to live the hard life on a small farm, and enjoyed the nearby forests with its wealth of wildlife.

His father was killed near the end of the Civil War and in 1868 the family moved to Chicago where his mother established a successful dressmaking business and Edward entered school. He enjoyed collecting biological specimens in and around the city and roamed the shores of Lake Michigan. Unfortunately, the Chicago fire of 1871 destroyed their home and business, and in the turmoil, a thief took Nelson's insect collection.

Nelson attended Cook County Normal School from 1872 to 1875 and made his first collecting trip at the age of 17 to Utah, Nevada, and California. He had the good fortune to meet Edward D. Cope, and he briefly worked for the latter in Wyoming during the summer of 1872 before continuing on to California. He continued his interest in natural history while teaching in Dalton, Illinois, from 1875 to 1876, but found field exploration more enjoyable than teaching.

Following his brief teaching career, and at the suggestion of Henry W. Henshaw, Nelson went to the Smithsonian Institution in Washington, D.C., but failed to get employment there. In 1877, Spencer Fullerton Baird recommended him for a position as a weather observer in Alaska, where he also would have the opportunity to study birds and mammals. The appointment required that Nelson enlist in the U.S. Army Signal Corps. From 1877 to 1881, with the assistance of Eskimos, dog sleds, and kayaks, Nelson explored places in Alaska where Caucasians had never traveled. Nelson returned to Washington, D.C., to prepare reports on his

birds of Alaska. Unfortunately, he developed tuberculosis and for six years in the late 1880s he and his brother lived in Arizona while his mother nursed him back to health. Although he recovered from tuberculosis, he suffered diminished lung capacity along with a heart ailment that plagued him for the rest of his life.

It was not until 1890 that he was able to resume active fieldwork. Having heard about Merriam's Death Valley Expedition, Nelson applied, and hired on as a Special Field Agent for the Survey in November 1890. He worked with Vernon Bailey, A. K. Fisher, and T. S. Palmer as well as with other naturalists on the expedition. Nelson would remain with the Survey for the next 40 years.

After completing his work in Death Valley, Nelson met and employed E. A. Goldman, and together they worked for almost 14 years in Mexico. Their work in Mexico, which would prove to be monumental, became a significant part of Merriam's scientific agenda to define life zones and document the vertebrate fauna of North America.

During his career in the Survey, Nelson served for 11 years (1916–1927) as the third Chief. As Chief he instituted the development of programs bearing upon the conservation and general administration of wildlife from a national standpoint. He was instrumental in the negotiations for the Migratory Bird Conservation Act, Migratory Bird Hunting Stamp Act, and the Alaska Game Law, all of which gave better protection for migratory birds, especially waterfowl. Also, during his tenure as Chief many of the controversies associated with the predator control program and policies of the Survey would come to public light, bringing much attention to the role of the agency.

McAtee was more critical of Nelson's personality and character than any of his other colleagues at the Survey, and the two men clashed repeatedly. McAtee found Nelson wanting in his dealings with people, and used terms such as "dictatorial, unreasonable, heartless, and self-centered" in describing his personality. In summarizing his assessment of Nelson, McAtee flatly states, "The conclusions I must draw as to E. W. Nelson

are that he was a pompous egotist and an instinctive tyrant without a drop of the milk of human kindness in him” (McAtee papers, Library of Congress).

E. A. Goldman, however, Nelson’s close friend and long-time field companion, wrote this in his obituary (Goldman 1935:136):

Nelson was a man of strong convictions, with a somewhat brusque manner, and a simple directness sometimes disconcerting to his associates, and not always pleasing to others on short acquaintance. As a result of this unfortunate mannerism comparatively few really came to know him well, but those who did, became deeply appreciative of his essential kindness, his peculiar genius, and the sterling qualities of his mind and heart.

Nelson received extensive recognition from his colleagues. He served as presidents of the American Ornithologists’ Union, the American Society of Mammalogists, and the Biological Society of Washington. He received an honorary M.A. degree from Yale and an honorary D.Sc. degree from George Washington University, both in 1920. His published works are extensive and include more than 200 titles, covering a wide range of subjects, mainly scientific in character. One genus and 19 species and subspecies of mammals were named in his honor. Among his most important works on mammals are a revision of Mexican and Central American squirrels (Nelson 1899), a revision of North American rabbits (Nelson 1909), and an account of the status of pronghorn antelopes (Nelson 1925).

Nelson retired from administrative work in 1927 and two years later at the age of 74 he retired from active work with the Bureau, following almost 40 years of service. He died six years later on 19 May 1934, at the age of 80. His close friend and colleague, E. A. Goldman, described him a year after his death as:

...a man who was not merely a specialist in ornithology or mammalogy, or completely classifiable as a zoologist, a botanist, or even as a biologist, but one who essentially combined all these branches—a naturalist in the widest

sense. Living things and natural phenomena of all kinds held for him an absorbing interest that never flagged (Goldman 1935:135).

Edward Alphonso Goldman (1873–1946; Figs. 3–5)

Jackson 1947, Taylor 1947, Young 1947, Perry 2007

Goldman was born in Illinois, grew up in Nebraska and eventually moved to a ranch in the San Joaquin Valley of California where he developed an interest in natural history at an early age, largely under the influence of his father. He was recruited to the Biological Survey by Nelson in 1891 at the age of 18. After proving himself worthy during a three-month survey in California, Goldman was appointed Assistant Field Agent for the Survey on 1 March 1892, over a month after arriving with Nelson in Manzanillo, Colima, on what was to become a 14-year-long biological survey of Mexico.

He and Nelson traveled to all parts of the Republic of Mexico, with a sojourn in southwestern Guatemala, during the ensuing 14 years collecting birds, mammals, and reptiles. In 1910, on special assignment to the U.S. National Museum of the Smithsonian Institution and funded by the War Department, he went to the Isthmus of Panama to survey the region around the Canal Zone while the Panama Canal was under construction. Results of his work were published by the Smithsonian Institution (Goldman 1920). In 1918, he served as a Major in the U.S. Army Sanitary Corps in France during World War I, working to protect food and other supplies from damage by rats.

When he returned to Washington, D.C., he resumed employment with the Biological Survey and from 1919 to 1925 was placed in charge of the Section of Biological Investigations. He became Chief of the Division of Game Reservations from 1925 to 1928 and was senior biologist in the Division of Wildlife Research, working in that capacity until 1940. Appointed an Associate in Zoology at the U.S. National Museum in 1944, Goldman officially retired. From then to the end of his life he was compiling information on his work with Nelson in Mexico; published posthumously in 1951 as *Biological Investigations in Mexico*.

In the 1930s, Goldman was assigned to assist in negotiations between the United States and Mexico to add Mexico as a signatory to the Migratory Treaty Act, which for purposes of the negotiations was called the Convention for the Protection of Migratory Birds and Game Mammals. At the time, Mexico was ruled by President Lázaro Cárdenas, a liberal who nationalized oil resources and created the Department of Forestry, Game, and Fisheries. Cárdenas put in charge a conservation visionary, Miguel Ángel de Quevedo, who pushed, among other things, the creation of Mexico's first National Park and the National Forestry Commission. Quevedo was on the job, and was the technical advisor from the Mexican side when President Cárdenas signed the Convention on 7 February 1936, in Mexico City. The exchange of ratifications and proclamation occurred in Washington, D.C., on 15 March 1937, with Goldman present (Young 1947:96). This was the first environmental treaty between the Republic of Mexico and the United States (Fig. 6).

Goldman was known to be fast and efficient in the field with an excellent sense of humor. One of his colleagues described him this way:

A pleasant camp companion, a considerate supervisor, a good naturalist, a keen diagnostician in the field of mammalian taxonomy, an excellent writer, a generous cooperater, a loyal federal employee, and a conscientious family man and citizen, Goldman was one of the Biological Survey's most useful and productive leaders (Taylor 1947:114).

Remembered by friends and colleagues as modest, understanding, generous, and even-tempered, he is reputed to have never had a single personal enemy.

Stanley P. Young, a close collaborator of his, described him as:

Kindly, patient, he was always willing to drop the most exacting research to aid any associate

or young naturalist who might contact him, all of which unselfishness often mitigated against his written production. One of Goldman's greatest assets was his ability to get along with everybody, never ruffled and seldom irritated (Young 1947:97).

Goldman described well over 300 forms of mammals, most of them subspecies, including a substantial number of pocket gophers. Most of his early studies focused on small mammals, particularly small rodents such as pocket mice and pocket gophers; however, later in life he published on wolves, pumas, bobcats, and tropical American monkeys. Goldman, often referred to as the real "Noah" of the Survey, had over 50 mammals, birds, plants, reptiles and mollusks named for him.

Goldman died on 2 September 1946, in Washington, D.C., and was buried with full military honors in Arlington National Cemetery. In April of that year, he had become President of the American Society of Mammalogists. As succinctly stated by Young (1947:98), "Educationally, he was very much self-made. He was of the type often referred to and flippantly so, by some, as from the school of 'range-raised naturalists and biologists.'" He completed grammar and high school and over the years took courses in rhetoric, proofreading, and the writing of manuscripts to assist him with his position, but he never received a post-secondary degree. His command of Spanish was near perfect. He also took up photography and became one of the best outdoor photographers in the Biological Survey. His published works, covering a span of 44 years, included 206 titles. Among his most significant taxonomic contributions are revisions of the woodrats (Goldman 1910), spiny mice (Goldman 1911), and rice rats (Goldman 1918), but his most popular work, published in 1951 after his death, was his account of the fieldwork he and Nelson conducted in Mexico.

NELSON AND GOLDMAN IN MEXICO

With Goldman as Nelson's assistant, at the ages of 18 and 36, respectively, they undertook a distributional

survey of the higher vertebrates of Mexico, emphasizing mammals, as a part of the large-scale program of

research on life-zones developed by Merriam. Almost near continuous fieldwork from 1892 to 1906 enabled them to visit all states of Mexico, most of its faunistically significant offshore islands, and a brief six-week incursion into southwestern Guatemala. Kier Sterling (1991) prepared a brief account of the history of the expedition, including experiences and accomplishments of the two men. However, because no comprehensive report of the collections has ever appeared, there is no record of the full extent of their discoveries, and many facts known to them independently entered the available literature only in subsequent years from the reports of other collectors. Lamentably, a portion of their knowledge gained during those 14 years was lost upon their deaths.

Nelson and Goldman sailed from San Francisco on the Pacific Mail Steamer *Acapulco*, arriving in Manzanillo, Colima on 4 January 1892. They had originally planned a three-month field season. However, the first mammals and birds they caught were less known to them than anticipated, and the first phase (1892–1895) of their explorations in Mexico ended four years later. As Goldman related in his *Biological Investigations in Mexico*:

A large, previously unknown, tropical woodrat (*Hodomys alleni*) [caught in Manzanillo, Colima, and described by Merriam in 1892] was taken the second day, and the collection of other new mammals soon followed. With the discovery of new species, some of which represented new genera as well, further interest was aroused (Goldman 1951:1).

As aptly related by Sterling (1991:38):

Goldman would remain in Mexico continuously for 58 months in which time he visited parts of 21 states and Guatemala, usually in company with Nelson. In later years, they would sometimes do fieldwork separately. They traveled by mule and horseback, stagecoach, rail, canoe, oxcart, sailboat, fishing boat, schooner, steamship, and on foot. By September of 1893, Nelson thought Goldman sufficiently well trained to handle the field work alone while Nelson left for two months in Washington.

By 1906, at the end of their fieldwork, both had visited every state and territory, some a number of times, as they crossed and recrossed Mexico (Figs. 7–13). The distances traveled in those 14 years are difficult to determine because distances often were estimates based on time traveled between points as foot miles or horseback miles (Jackson *in* Goldman 1951:xii). During these times, Mexico was in a phase of apparent social calm, progress, and happiness under the steely, firm grasp of Mexico's dictator, Porfirio Díaz. However, money and power were concentrated in the hands of a few politicians, aristocrats, and foreigners who ruled over a large majority of peasants and workers. Social discontent grew among the lower and working classes, who faced poor working conditions, inflation, inferior housing, low wages, and deficient social services, and soon protest movements were sprouting all over the country. The spirit of rebellion was in the air, and the Mexican revolution was brewing and would erupt in 1910. This was also the period when the famous Cervecería Cuauhtémoc was founded in Nuevo León (1890), a beer company that remains today among the largest in the world.

Many of the regions Nelson and Goldman visited in Mexico were mostly rural. Some of them still remain as such today, so they would most certainly have experienced the hardships of rural and pre-revolutionary Mexico. In those days, "everybody carried a six-shooter on his hip by day and kept it under his pillow at night" (Young 1947). On occasion, the two men had unpleasant experiences such as holdups that resulted in bodily injuries. The following account from Young (1947:98) describes an ambush by Mexican banditos:

Near Toluca, late one evening as Goldman was returning from field work, he noticed three men with serapes wrapped tightly about them, approaching toward him along a narrow pathway. The men exchanged greetings with Goldman, but just as they were passing, one of them pulled his hand from beneath his serape and struck Goldman above the temple with a stone he had been concealing. The blow knocked him unconscious, and he was left for dead, but not until these renegades robbed him of all his possessions, including a bag of traps, altimeter, and shotgun. However, in a

short time Goldman recovered sufficiently to stagger into town for help which was given to him. Later his belongings were recovered, following the rounding up of a gang of thieves in the immediate surroundings, and given back to him. The scar of that foul blow was carried on Goldman's left temple the rest of his life.

In various dispatches from Mexico between 1895 and 1897, Nelson commented on the difficulties traveling and the poor working conditions in the field. While the Death Valley survey was considered arduous by many of its participants, Nelson considered that experience a "pleasure trip" compared with some of the field conditions he and Goldman endured in Mexico. Sterling (1991) described several of the harrowing experiences the two men encountered while traveling in Mexico.

During the final stage of their explorations, Nelson and Goldman traversed the Baja California peninsula from north to south for 10 months covering over 2,000 miles (Figs. 11–12). They ended their expedition in La Paz, Baja California Sur, on 15 February 1906, and sailed back to San Diego. Some of their results were published as a memoir of the National Academy of Sciences entitled *Lower California and its natural resources* (Nelson 1921). Nelson narrated the beginning of the expedition (quoted by Ezcurra [2007:21–22] from Nelson's unpublished slide lecture notes) as follows:

After considerable trouble [in Ensenada, Baja California], however, we managed to secure four saddle horses, four pack mules, and two Mexicans who claimed to know the country for several hundred miles, as packers and guides. These men, with Goldman and myself made up the part for the expedition.

While outfitting in Ensenada we were favored with the comments of a volunteer corps of

advisers on the folly of such an attempt as we were planning. We were assured that no one had ever made such a journey. There were hundreds of miles of uninhabited, waterless desert to cross where there was no feed, and in addition to dying of thirst our animals would surely perish of starvation, while our own chances were scarcely worth mentioning. . . . With flour, dried deer meat and tea for provisions and a small tent for shelter when necessary we moved on from day to day with all the freedom of savages.

Nelson's report of their work in Baja California includes history, itinerary, and detailed observations on the natural history of the peninsula and the collection of an array of plants and animals for the U.S. National Museum. A collection of photographs from that extraordinary trip is in the Archives of the Smithsonian Institution in Washington, D.C. Along with these photographs, an unpublished manuscript, entitled "On horseback through the deserts of Baja California," was found by Pat Flanagan in 1976 and edited and published by Exequiel Ezcurra in 2007. The manuscript consisted of a text prepared by Nelson for a slide presentation of the glass-plate images Nelson and Goldman brought back from the trip through Baja.

In the early 1900s, the mostly desolate peninsula of Baja California was sparsely inhabited; the 1910 census indicated about 32,600 inhabitants (Nelson 1921:10). Nelson expressed his impression of the landscape of Baja California as:

Riding silently for hours by the radiance of a brilliant moon among the unbroken succession of grotesque forms, with the hush of night over it all, we seemed to be tracking through the unreal world of a fantastic imagination (Ezcurra 2007:32).

THE RESULTS OF THE NELSON AND GOLDMAN EXPEDITIONS IN MEXICO: A CORNERSTONE OF MEXICAN MAMMALOLOGY

The long-standing commitment of Nelson and Goldman to collect, process, and describe Mexican birds and mammals resulted in a total of 17,400 mam-

mal specimens and 2,400 birds collected between 1892 and 1906. Nelson named 72 Mexican mammal taxa, 53 in collaboration with Goldman and 19 by himself.

On his part, Goldman named an additional 117 Mexican mammal taxa, 5 in collaboration with Remington Kellogg, and 59 by himself (Figs. 14–15). They both published several articles on Mexican mammals: Nelson published 51 papers with a total of 89 citations; Goldman published 76 papers that have gathered a total of 248 citations. Other scientists have named Mexican mammals to honor both Nelson and Goldman. Seventeen taxa were named after Nelson and 16 taxa were named after Goldman, with the distinct and rare honor of having their names joined in the name of one mammal: *Nelsonia goldmani*, a scansorial wood rat endemic to western Mexico described by Merriam (1903).

Nelson and Goldman planned to publish the results of their collaborative work in Mexico by writing separately, with Nelson writing the report on birds and Goldman preparing the accounts for mammals. They agreed to jointly write up the information on their itineraries, physiography, biotic areas, and life zones. However, at the time of his death on 19 May 1934, Nelson (1921) had previously published a monograph on their trip to Baja California, *Lower California and its natural resources*, and was gathering his notes for a book on the birds of Mexico. For his part, Goldman had identified most of the Mexican mammals, and by 1940 he was working on a draft of “Mammals of Mexico: distribution, life history and status of all known spe-

cies.” However, due to the large amount of information they had collected, he changed the project to focus more on the itinerary and an alphabetic catalog of the localities they visited, with the proposed title: “Biological localities of Mexico: itineraries, descriptions of localities, life zones, biotic areas, and fauna notes of the Nelson-Goldman field explorations in Mexico.” He worked diligently on the project almost to the day of his death in 1946. The manuscript nearly complete, his long-time friend and Survey colleague Hartley H. T. Jackson reviewed, edited, and published Goldman’s report in 1951 with the title, *Biological Investigations in Mexico*.

The material Nelson and Goldman collected in Mexico has been used (and continues to be used as a rich resource) in the revision of many groups of birds and mammals. Robert Ridgway and Herbert Friedmann published the *Birds of North and Middle America* in 1941, Remington Kellogg published *Mexican Tailless Amphibians in the United States National Museum* in 1932, and Goldman himself published in 1916 *Plant Records of an Expedition to Lower California*. Accessible to anyone, Goldman’s *Biological Investigations in Mexico* provides a full record of Nelson and Goldman’s travels, with clues to all of the localities that puzzled students of Mexican birds and mammals in earlier years (Pitelka 1953).

CONCLUSIONS

No comprehensive study of Mexico’s biological resources had been attempted prior to the Nelson and Goldman survey. As pioneers in the biological exploration of Mexico, they could not have realized, at least at first, the staggering enormity of what they undertook in attempting to work out distributions of birds and mammals and to accompany this with an analysis of life zones (Pitelka 1953). In fact, their definitive reports on birds and mammals, ambitiously planned in earlier years, never appeared. They did publish several important papers, including a detailed sketch of the geography of Mexico accompanied by a larger section on life zones and biotic provinces. It included long lists of trees and shrubs, birds, and mammals present in each (Goldman and Nelson 1926). Goldman and Moore (1945) published a preliminary analysis of life zones as well as biotic provinces of Mexico. Goldman’s (1951) *Biological Investigations in Mexico* chronicles

their travel and field observations, and includes a collection of photographs, many showing conditions and scenes that no longer exist.

As Goldman (1951:2) aptly described:

Mexico, as a whole, is of outstanding biological interest, owing to peculiar configuration, varied topography, and geographic position, forming as it does the meeting ground of the teeming wildlife of the Tropics with that of more northern climes. Although our field work was planned to cover the country as thoroughly as possible, within the time and means available, it was nowhere exhaustive, and many important sections, essentially “biological islands,” were only cursorily treated.

Today, more than a century later, and after the efforts of additional fieldwork by many persons over the decades, and with collections of mammals easily totaling twenty to thirty times the numbers amassed by Nelson and Goldman, it has been possible to prepare a nearly complete account of the more than 500 species of mammals inhabiting Mexico (Ceballos 2013). Furthermore, mammalogy in Mexico has been advanced by the excellent work of Mexican mammalogists living

and working all over the country, and there now is a professional scientific society devoted to the study of Mexican mammals (AMMAC, Asociación Mexicana de Mastozoología, A.C.), founded 30 years ago. It is safe to say that Nelson and Goldman would be pleased to see both the fruits of their labors as manifested today along with the efforts to conserve the biological diversity of Mexico.

Table 1. States visited by Nelson and Goldman in their field seasons in Mexico, 1892–1906.

Year	States
1892	Colima, Jalisco, Guanajuato, Michoacán, Estado de México, Distrito Federal, Morelos
1893	Morelos, Estado de México, Hidalgo, Tlaxcala
1894	Veracruz, Tlaxcala, Puebla, Oaxaca
1895	Guerrero, Oaxaca, Chiapas, Tabasco
1896	Chiapas, Oaxaca, Veracruz, Distrito Federal, Hidalgo, Querétaro, Aguascalientes, Zacatecas, Tamaulipas, San Luis Potosí, Nuevo León, Durango, Chihuahua, Sinaloa, Sonora
1897	Nayarit, Sinaloa, Durango, Zacatecas, Jalisco, Distrito Federal
1898	Hidalgo, Puebla, Veracruz, Distrito Federal, Puebla, Guanajuato
1899	Sonora, Sinaloa, Durango, Chihuahua
1900	Tabasco, Chiapas, Campeche
1901	Yucatán, Quintana Roo, Veracruz, Tamaulipas
1902	Tamaulipas, Nuevo León, Coahuila, Zacatecas, Jalisco
1903	Jalisco, Michoacán, Guerrero, Morelos, Distrito Federal, Puebla, Guanajuato
1904	Distrito Federal, Veracruz, Oaxaca, Chiapas
1905	Sonora, Baja California
1906	Baja California, Baja California Sur



Figure 1. E. W. Nelson, Alaska, 1880s. Courtesy SIA, Nelson and Goldman Collection, RU 7364.



Figure 2. E. W. Nelson as a young man, 1890s. Courtesy SIA, Nelson and Goldman Collection, RU 7364.



Figure 3. E. A. Goldman as a young man working for the Biological Survey. Courtesy SIA, Jackson files, RU 7172.



Figure 4. E. A. Goldman, Major, Sanitary Corps, U. S. Army, WWI. Courtesy USGS-PWRC, Biological Survey files.



Figure 5. E. A. Goldman, 1937. Courtesy SIA, Nelson and Goldman Collection, RU 7364.



Figure 6. Exchange of ratifications of a treaty between the United States and Mexico for the protection of migratory birds and game mammals in Washington, D.C., 15 March 1937. Seated (L to R) Dr. Don Francisco Castillo Néjera, Ambassador to the United States from Mexico; Cordell Hull, Secretary of State; Henry A. Wallace, Secretary of Agriculture. Standing, in center: Major E. A. Goldman, Bureau of Biological Survey, who assisted in the technical phases of the negotiations for the treaty. Courtesy Library of Congress, MSS 35428, T. S. Palmer Papers.



Figure 7. E. A. Goldman preparing specimens in camp at La Salada, Michoacán, Mexico, March 1903. Photograph by E. W. Nelson. Courtesy of USGS-PWRC, Biological Survey files.

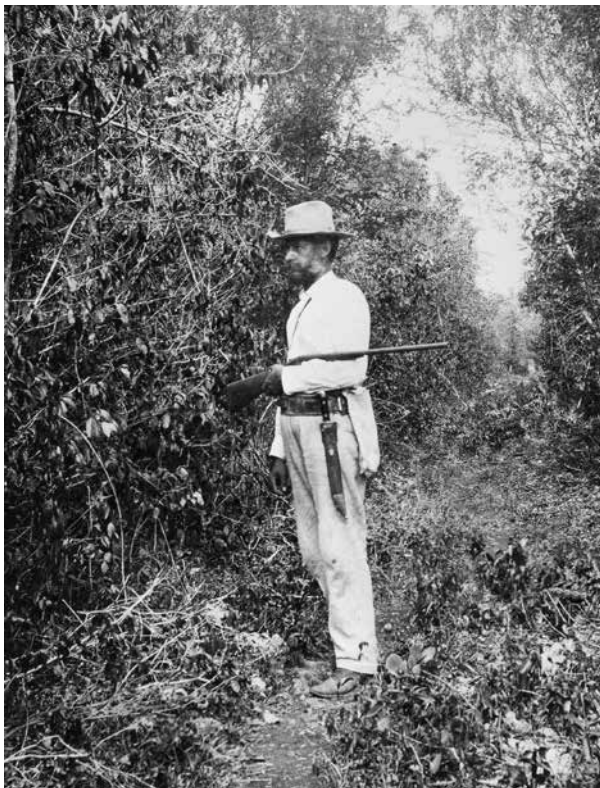


Figure 8. E. W. Nelson on Cozumel Island, Quintana Roo, Mexico, March 1901. Courtesy of USGS-PWRC, Biological Survey files.



Figure 9. E. W. Nelson in Baja California, 1895. Courtesy SIA, American Society of Mammalogy files.



Figure 10. Goldman and helper loading mules. Xalitla, Guerrero, 30 May 1903. Smithsonian Institution Archives, Record Unit 7364, Edward William Nelson and Edward Alphonso Goldman Collection.



Figure 11. On the road from Santo Domingo to Calmalli in Baja California, date unknown. Courtesy USGS-PWRC, Biological Survey files.



Figure 12. Nelson at work in camp near Yubay, Baja California, September 1905. Courtesy Smithsonian Institution Archives, Record Unit 7364, Edward William Nelson and Edward Alphonso Goldman Collection.



Figure 13. Boat used by Nelson and Goldman on trip from Cozumel Island to Progreso, Quintana Roo, Mexico, 1901. Courtesy of USGS-PWRC, Biological Survey files.



Figure 14. Subspecies and species (indicated by asterisks) of Mexican mammals, by state, described on the basis of specimens collected by Nelson and Goldman with descriptions published by Nelson and Goldman.



Figure 15. Subspecies and species (indicated by asterisks) of Mexican mammals, by state, described from specimens collected by Nelson and Goldman with descriptions published by other systematists.

ERADICATING PREDATORS AND RODENTS: THE BIOLOGICAL SURVEY OFFENDS SCIENTISTS TO SERVE THE LIVESTOCK INDUSTRY

Michael J. Robinson

NOTE: This material is largely drawn from research conducted for my book, *Predatory Bureaucracy: The Extermination of Wolves and the Transformation of the West* (University Press of Colorado, 2005); where not otherwise cited, sources are fully referenced in *Predatory Bureaucracy*. In addition to the sources I examined in writing *Predatory Bureaucracy*, I also benefited from reading Amity Shlaes' book, *Coolidge* (Harper Collins, 2013).

In the early twentieth century, the Bureau of Biological Survey transitioned to prioritizing agricultural service over scientific research and conservation. The transition was gradual but included several key decision points along the way demarcating the shift; some of these decision points marked the overcoming of heartfelt opposition by scientists who turned out to be no match against strong-willed men entrenched in a Federal agency, much less a match for the agency's backers in the livestock industry. Eventually, the agency's program to eliminate an increasingly broad array of wildlife would overshadow its programs to investigate and protect wildlife.

As the new century dawned, members of Congress pressed the Survey for economic benefits to its wide-ranging research on the taxonomy and distribution of species and their relations to life zones. The Survey responded with bulletins on the effects of wild animals on agriculture, and explaining means of destroying supposedly-noxious wildlife. In 1906, C. Hart Merriam appointed Albert K. Fisher to oversee the Survey's newly created Division of Economic Investigations to conduct such research, reflecting its growing importance and Fisher's longtime leadership in this field. The focus on practical results led to publication in 1907 of a booklet authored by Vernon Bailey jointly for the Biological Survey and the Forest Service, "Wolves in Relation to Stock, Game, and the National Forest Reserves," "to put in the hands of every hunter, trapper, forest ranger, and ranchman directions for trapping, poisoning, and hunting wolves and finding the dens of young." (1)

After Merriam's 1910 retirement from the Biological Survey, this trend to agricultural service gained

effect. In 1911, the Survey experimented on the efficacy of poisoning ground squirrels and prairie dogs. The next year, Congress appropriated funding for the Survey to poison ground squirrels on national forests in California. The following year Congress expanded that to a nationwide program. (2) This represented the beginning of a change for the Survey from its role conducting experiments albeit with economic aims, still firmly tied to its scientific roots, and disseminating the results, to organizing people to eradicate wildlife on a landscape-level scale (Fig. 1).

In 1915, in response to advocacy by the livestock industry, Congress took that one step further in the fiscal year 1916 Agriculture Department appropriations act, directing the agency to spend "not less than \$125,000 . . . on the National forests and the public domain in destroying wolves, coyotes, and other animals injurious to agriculture and animal husbandry." (3) This was a hefty sum at the time. In response, Fisher created nine districts, and appointed a Predatory Animal Inspector to oversee each; the inspectors hired and supervised collectively hundreds of hunters. (4) Within a few years, the hunters' and administrators' salaries would be paid not just through Federal appropriations but also through private, local- and state-appropriated or otherwise-allocated funds aggregated and spent by the Survey. That not only augmented revenues, but also built a potent political network and cemented the loyalties of the Biological Survey to its livestock industry patrons.

In 1916, Joseph Grinnell and Tracy Storer of the Museum of Vertebrate Zoology at the University of California at Berkeley suggested in an article in *Science* the preservation of carnivores in the national parks for the benefit of recreation and scientific research. (5) In

1918, several Survey scientists (including Albert K. Fisher and Vernon Bailey) met at Bailey's Washington home where they planned the founding of the American Society of Mammalogists. Merriam served as the society's first president just as he had previously served as the Biological Survey's first chief. Yet, even as the American Society of Mammalogists would continue to represent the scientific soul of the original Biological Survey, that already-venerable government agency was becoming subsumed by a newer Biological Survey whose loyalties to the livestock industry would strain relationships with its academic partners.

By the early 1920s, with nobody objecting, the Biological Survey's salaried hunters had trapped, poisoned, or eradicated the pups in the dens of most of the West's wolves that had survived a previous era of less-efficient persecution through payment of bounties (Fig. 2). Few wolves remained in the western United States, and the agency was boasting of their imminent extermination. With wolves all but gone and a system established of multi-agency funding through pooling of resources under their control, Survey officials then blamed coyotes for increasing depredations on livestock, and poisoned them extensively (Fig. 3). Other scavenging mammals such as bears, skunks, badgers, and weasels ate poison intended for coyotes and died in large numbers. Among them were valuable fur-bearers. Their destruction, especially in the summer when their pelts were worthless, aroused the opposition of private trappers who were aggrieved at the waste, not to mention the threat to one of their few sources of hard cash.

Many of the Biological Survey's scientific collaborators and personal friends at academic institutions also became alarmed at the looming extinction of some predators (Fig. 4), the Survey's avowed goal at least in the contiguous states. In 1924, the American Society of Mammalogists met at Harvard University in a symposium to discuss the growing concern over extermination of predators; the *Journal of Mammalogy* memorialized remarks. Lee R. Dice of the University of Michigan criticized the Survey's extermination program for foreclosing future research:

Every kind of mammal, as well as every other type of organic being is of great scientific significance, and the world can ill afford to permit the extermination of any species or subspecies. (6)

Milton P. Skinner suggested that predators "serve us well by removing weak and sickly animals, thus keeping the breeding stock vigorous and free from epidemics." (7) Charles C. Adams of the New York State Museum conceded predator destruction on national forests but suggested it be lessened in "remote regions" and banned entirely in national parks, which he said must be more numerous and better situated to serve as sanctuaries for predators (8) (an observation corroborated through the insights of the modern discipline of conservation biology). Major Edward A. Goldman of the Survey defended his agency: "Large predatory mammals, destructive to livestock and to game, no longer have a place in our advancing civilization." (9) The society formed a committee consisting of Goldman and Bailey of the Survey, Adams, Edmund Heller of the Milwaukee Museum, and Joseph Dixon of the Museum of Vertebrate Zoology to "formulate policies for the preservation of predatory mammals" and "recommend the location of certain wild life preserves suitable for the preservation of such animals." (10) Adams chaired the committee.

The Survey reassured critics in its 1924 annual report that although wolves and mountain lions were targeted for elimination within "certain areas," that would not mean their extermination "since they range over such a vast area in both North and South America." For wolves, the Survey stated that "in northern Mexico, Canada, and Alaska these animals still occur in considerable numbers and will long persist as picturesque elements of the fauna." (11) Its 1925 annual report renounced extermination and suggested that a "limited number of predatory animals" could be tolerated "in national parks and in wilderness areas remote from civilization, so long as they do not prove too destructive to the other wild life there." However, the annual report suggested again that wolves might only persist "in the wilder parts of Canada and Mexico." In fact, wolves would not persist indefinitely in Mexico because the previous year the Survey had begun assisting American ranchers south of the border to kill them there. (12) Nor did the Survey change its actual practices elsewhere to curtail their impacts, for example in limiting use of poisons (Fig. 5). Nevertheless, the change in tone reassured Adams and led the committee to proceed at, viewed in retrospect, an unduly leisurely pace precisely at a moment—perhaps a unique moment—when the Survey might have succumbed to public pressure

to reduce its reliance on poisons simply to avert the budget axe.

Calvin Coolidge, Vice President to Warren G. Harding, assumed the presidency upon Harding's death in 1923. Throughout his presidency (1923–1929), Coolidge inveighed on his appointees to cut spending, including through identifying government programs to terminate, and he vetoed authorization for agricultural subsidies that were passed by Congress. (13) A public battle during his administration over government poisoning of valuable wildlife conceivably could have cost administration support and federal financing. But the Survey's seeming openness to change, and the mammalogists' early hopefulness that their friends and colleagues would prove reasonable, forestalled such an eventuality. For most of Coolidge's term in office, the new committee (and hence the American Society of Mammalogists as a whole) took no public action. In 1927, on the verge of action, the committee further delayed issuing recommendations when Joseph Dixon launched an independent field investigation of the Survey's activities in Nevada. He decided that signing on to the committee's findings could tarnish the appearance of impartiality required for his study. Charles Adams agreed to delay the report to accommodate Dixon's schedule rather than proceed with Heller alone to negotiate a report. (14)

In 1927, the agency acquired a new chief to replace longtime insider Edward Nelson. Paul G. Redington, from the Forest Service, was the first Survey head appointed from outside the agency. His background was in public relations. The same day as Redington's arrival, Stanley P. Young, who led the Survey's predator-killing program in Colorado, was promoted to Washington as Fisher's assistant at the Division of Economic Investigations (15)—a move to establish and prepare him as Fisher's successor and serve as a bulwark against reform. Ultimately, the Survey stymied Dixon's investigation. (16) Not until 1928 did the American Society of Mammalogists predator committee issue its report that was authorized four years previously. Reflecting Bailey's and Goldman's influence, that report focused on general principles, equivocated on whether extermination was ever justifiable, and lacked important specificity as to where to protect predators:

The national parks of large acreages, such as the Yellowstone, Yosemite, Grand Canyon, Mt. McKinley, Crater Lake and Sequoia, and certain monuments, such as Katmai and Mt. Olympus, are today the most suitable area for the preservation of the larger predators—but if these areas are not adequate to guarantee the safety of the cougar, grizzly and the brown bears, wolverine, timber wolves, and similar large species, other areas if they may be located, should be set aside deliberately. (17)

Adams, Dixon and Heller separately signed a supplementary report pointing out the value of predators, and posing a host of questions, including “to what degree should public funds be used for protecting any special industry, as that of stock raising?” Their supplementary report broke with the committee's consensus report in advocating a “system of intelligent control” instead of “a general extermination policy.” But even though an earlier draft of their report had suggested the Kaibab Plateau in northern Arizona and the Gila National Forest in southwestern New Mexico as preserves for predators, for some reason those areas—still identified today as important for predators and particularly for recovery of endangered Mexican gray wolves—were not mentioned in their supplement. That year, also, Albert K. Fisher retired from leading the Survey's Division of Economic Investigations. He was replaced by Young, who convened a conference of the division's managers to develop policies and procedures—chief among them banning use of the word “exterminate,” to be replaced with “control.” Previously, those words as well as “eradicate” and “clean up” were used interchangeably to describe the Survey's activities and goals.

The delay in scientists broadcasting their disagreement with the Survey coincided with the Coolidge administration pressing all Federal departments to cut expenditures. Having weathered the muted criticism when most vulnerable, the Survey under Young's leadership turned to working with Congress. They sought to authorize a ten-year budget that would greatly increase its wildlife-killing funds. The thinly-veiled goal was to exterminate all mammalian predators. Once exterminated, there would be considerable budget reductions through obviating the need to keep killing them. Ultimately the bill, which was to pass

in 1931 and is known as the Animal Damage Control Act, provided less money than expected in part due to the vagaries of federal appropriations during the Great Depression. However, funding for predator and rodent control through different agencies during the New Deal more than made up the difference. But the authority that Congress was to convey in this bill for the survey's "control" activities proved at least as valuable in establishing the agency today known as Wildlife Services as a permanent presence in government and a widespread de-stabilizer of the predator-reliant natural ecosystems of the western United States.

The scale and the audacity of the ten-year budget bill shocked the mammalogists, who finally went public. In 1930, A. Brazier Howell of John Hopkins Medical School circulated a petition decrying "the destruction of American wild life" through "wholesale and largely indiscriminate use of poison at the hands of paid, and frequently irresponsible hunters" and calling for an end to poisoning as well as limits on "general destruction of any form of wild life, by trapping or other means." (18) The petition was signed by 148 scientists and sent to all members of Congress, the Secretary of Agriculture, Chief Redington and hundreds of newspapers and magazines. Howell, Tracy Storer, and E. Raymond Hall of the Museum of Vertebrate Zoology testified in Congress against the funding bill, whose approval was delayed in part due to their concerns. Senator Frederic C. Walcott of Connecticut requested that the Survey investigate its practices and include the mammalogists in its review. The American Society of Mammalogists held another symposium on Predatory Animal Control. Goldman, Bailey and Fisher, who at least sported impeccable credentials as mammalogists, as well as deputy chief of the Survey W. C. Henderson, an attorney, defended against criticism of its practices in the field and recriminations at the Survey's disingenuousness in pretending it was not engaged in extermination. (19)

As the Biological Survey prepared in 1930 for its field investigation with the American Society of Mammalogists into its predator control practices, Goldman was "confident that nothing will turn up." (20) Survey staff accompanied an investigator sponsored by the mammalogists and their allies in the fur industry, and found nothing untoward. Other mammalogists including E. Raymond Hall and T. Donald Carter

investigated on their own. Survey biologist Olaus Murie investigated as well. Carter visited fur trappers in Colorado who told him of diminishing catches following Survey poisoning. Meeting ranchers in that state, he found a divide between those raising cattle and sheep. Not surprisingly, sheep ranchers reviled coyotes and supported poisoning. But now that wolves were all but gone, cattlemen were more concerned about the prey of coyotes eating the forage they relied on for their cattle, than about the slight threat from coyotes themselves. All whom Carter spoke with opposed coyote poisoning as directly counter to their interests in keeping down the number of rodents. Many also had lost dogs to poisons intended for coyotes (as had sheepmen as well). Murie discovered the same divide between sheepmen and cattlemen. He could find few signs of wild creatures in habitats that he knew from his investigations in Yellowstone National Park should have been teeming. "I saw hardly any badger holes in the areas I visited and no tracks in snow areas except an occasional weasel track." The reason, he surmised, was his own agency's poisons. And as a naturalist and avowed "nature lover" who had joined the Survey's scientific arm through his friendship with Bailey, he sharply questioned not just the unintended destruction of animals that were not targeted, but also the justification for poisoning coyotes. Ultimately, members of Congress dismissed Carter's findings, and Murie's findings were not made public until after the Animal Damage Control Act became a law.

Having failed to curb the Survey through the administration's mid-1920's austerity, the mammalogists had little if any chance at stopping Congress from adding to its budget at the outset of the 1930's. The western livestock industry was by that time deeply invested in the Biological Survey's control program and the ranchers exercised tremendous sway with western members of Congress. Even cattlemen who opposed poisoning remembered and still appreciated the Survey's success a few years before at exterminating their nemesis, the gray wolf; they were loath to go public with their opposition. In comparison, the mammalogists had little clout, just their credibility. And that wasn't enough. After passage by Congress, President Herbert Hoover signed the Animal Damage Control Act into law on 2 March 1931, directing the Survey to "conduct campaigns for the destruction or control" of:

...mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jack rabbits, and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, fur-bearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals.

The American Society of Mammalogists, furriers and private trappers, and a new organization of wildlife proponents called the Emergency Conservation Committee fought the Biological Survey's control program even after passage of the Animal Damage Control Act. Within three years, in the depths of the Great Depression in 1934, their opposition induced the new administration of Franklin D. Roosevelt to propose slashing the Survey's budget for predator and rodent control. Roosevelt appointed Ding Darling, a cartoonist and longstanding activist for wildlife, to replace Redington as chief of the Survey. Darling undertook a re-organization designed to ensure that, following the mammalogists' longstanding recommendations, scientists had authority to check and modify the program for killing animals. But Young, working surreptitiously, mobilized the Survey's network of supporters to successfully persuade Congress to restore the cuts. He offered to assist in the reform, and when Darling gratefully accepted his administrative help, installed stalwarts of the control program to serve as the scientific gatekeepers overseeing it. After Darling's retirement in 1935, Young's protégé, the glib Ira N. Gabrielson, one of those gatekeepers, was appointed chief. In 1939, another reorganization turned the Biological Survey into the U.S. Fish and Wildlife Service. In the years after Roosevelt's death in 1944 the Service unleashed new poisons, Compound 1080 and Thallium Sulfate, and a new technique, aerial gunning, to its array of weapons deployed against coyotes and other wildlife. The only significant checks on federal killing of wildlife came in 1972, when President Richard M. Nixon banned poisoning on public lands and after 1973, when Nixon signed the Endangered Species Act into law. Although Presidents Ford and Reagan undid Nixon's poison ban, the authorities in the Endangered Species Act and their enforcement by environmental organizations led to curtailment of Federal poisoning and strict limits on the killing of endangered species.

During its heyday in the 1920's, the Biological Survey all but exterminated the gray wolf in the western United States, including the Mexican gray wolf in the Southwest, as well as grizzly bears, lynx, and wolverines in the Rocky Mountains; only small, fragmented and vulnerable populations of these species persisted in subsequent decades. In the 1930's, facilitated by New Deal resources, the Survey completed the destruction of the West's vast grassland ecosystems through the mass removal of prairie dogs and other rodents. After passage of the Endangered Species Act, Mexican wolves, blackfooted ferrets, and California condors—all wiped out in large part by the Survey—were to be bred in captivity and reintroduced.

While the landscape and biota of the West would only partly heal as a result of the Endangered Species Act and reintroduction projects with limited ambitions (wolves in the northern Rockies) or thwarted objectives (Mexican wolves in the Southwest), the awkward and even painful divide between the mammalogists and the Biological Survey did largely mend. E. Raymond Hall claimed that two men had physically attacked him one night on a Washington street, to keep him from testifying against the Survey's ten-year funding bill. Hall was not deterred. In 1931 after passage of the Animal Damage Control Act, long-retired C. Hart Merriam wrote in the *Journal of Mammalogy* aghast at his former agency's employment of "upward of three hundred men to distribute poisons broadcast over vast areas," confessing his "sympathy . . . with the animals" and decrying the livestock industry's "enormous influence in Congress." (21) According to a letter sent by A. B. Howell to Hall that was based on a report from another mammalogist, Goldman was "deeply grieved that he [Merriam] would be taken in and lend his support to such charlitanism [sic] or words to that effect." (22) But most of the disagreements were couched professionally and friendships were maintained despite strains. "I am greatly perturbed by the rumor that Mr. Bailey had criticized my report to me," wrote Olaus Murie to Howell in 1931 after his report on his investigation went public, continuing:

I hasten to assure you this is not true. Mr. Bailey and I corresponded on the predatory animal question and we disagreed on several aspects of it. But this correspondence was started by myself with the idea of letting him

know exactly how I stood personally. I value Mr. Bailey's friendship so highly that I did not wish to be appearing under false colors with him under any circumstances. It was out of respect for his precious friendship that I wrote to him in the first place. He, on his part, expressed himself clearly and forcibly but very courteously and in a friendly manner. As I remember it, he mentioned my report in about one sentence and I think this sentence included 'you gave a good report' with perhaps certain qualifications. (23)

The work of the American Society of Mammalogists and the Biological Survey remained closely intertwined. Ira Gabrielson, who had resigned from the society in 1931 to protest the mammalogists' opposition

to the Animal Damage Control Act, (24) spoke as chief of the federal agency at the society's 1937 annual meeting and assured them of his interest in conservation of wildlife and especially "those forms which seem now to be threatened with extinction." (25) Ultimately in 1985, Congress divested the U.S. Fish and Wildlife Service of its predator control function. It was placed back in the Department of Agriculture. The admittedly attenuated conservation ethic of today's Fish and Wildlife Service can be said to have been nurtured in exile (if not in outright captivity) in the intervening years since the 1920s, in part through the agency's ties with the scientific community and in particular the personal connections with members of the American Society of Mammalogists.

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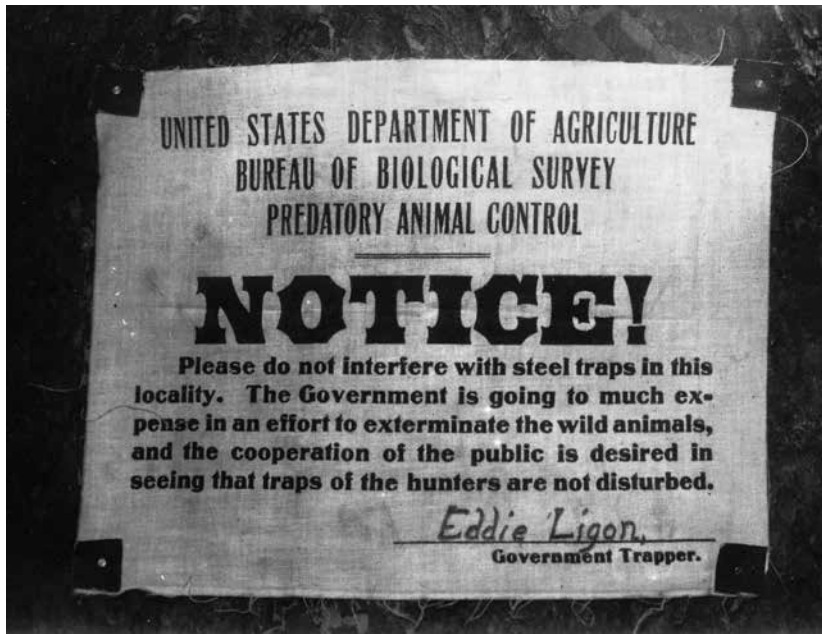


Figure 1. Biological Survey trap warning sign on tree. In the early 20th Century, the Bureau of Biological Survey metamorphosed from an agency that investigated the taxonomy and distribution of species and their relations to life zones to a service agency that killed wildlife on behalf of the livestock industry and other powerful agricultural interests. Courtesy Denver Public Library, Western History and Genealogy Department, Stokley Ligon Collection.



Figure 2. Female gray wolf about to be killed by the Biological Survey on the east fork of the Gila River in New Mexico. Note the absence of grass reflecting high numbers of livestock. Courtesy Denver Public Library, Western History and Genealogy Department, Stokley Ligon Collection.

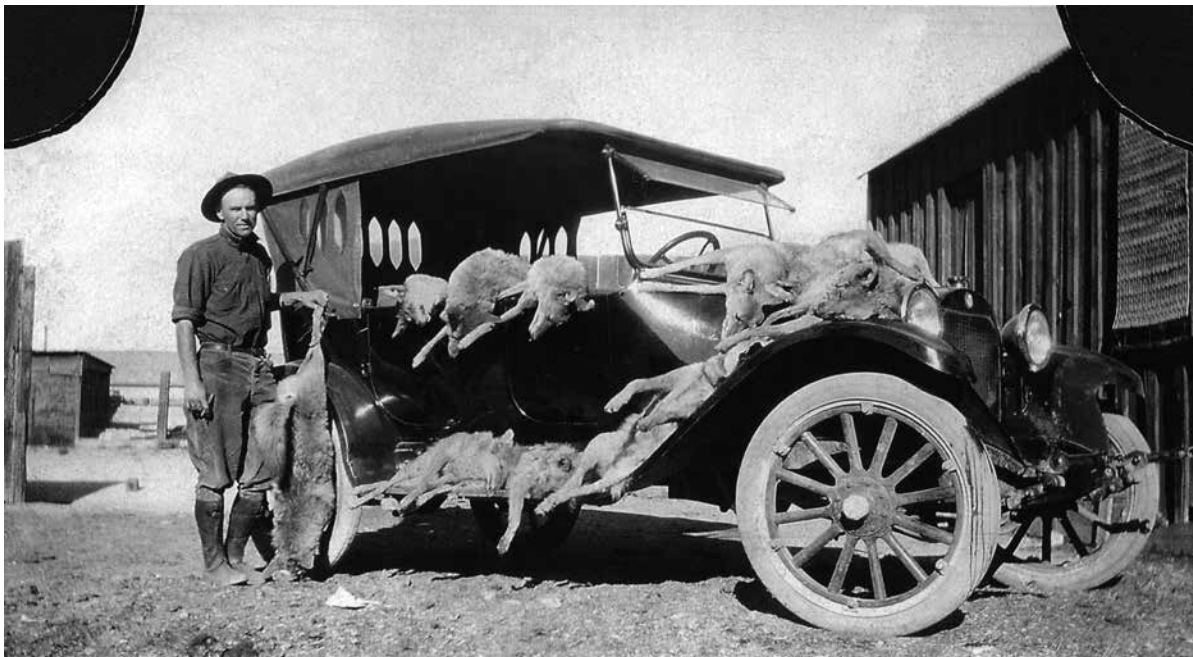


Figure 3. Biological Survey hunter and his catch of coyotes. Courtesy SIA, Record Unit 7174.



Figure 4. Biological Survey hunter Cleve Miller in Arizona, with mountain lions, 1922. Survey hunters took pride in exterminating predators, associating their work with the modernity and progress that the automobile represented. Courtesy USGS-PWRC, Biological Survey files.



Figure 5. Sharp-shinned hawks as lettering. Why and how the Biological Survey killed sharp-shinned hawks, which feed on small birds and rodents, is not clear, but the macabre placement of their carcasses to memorialize the slaughter demonstrates a federal agency whose values were diverging away from those of everyday Americans. Courtesy Denver Public Library, Western History and Genealogy Department, J. Stokley Ligon Collection.

THE LEGACY OF THE UNITED STATES BIOLOGICAL SURVEY – A SUMMARY

David J. Schmidly and William Tydeman

The United States Biological Survey started as a component of the Department of Agriculture's Division of Entomology with a small appropriation of \$5,000 in 1885. The agency was placed under the leadership of C. Hart Merriam for the first 25 years of its existence. During this time, Merriam nurtured the agency from a small division with few employees into a full-fledged bureau with hundreds of people employed.

Merriam established two important precedents as Chief of the Biological Survey. First, he set exacting standards for species collection, identification, and preservation of field data as well as for publication. As a result, he established the Survey as a scientific organization that earned high praise from other scientists. Second, Merriam recruited people with a passion for natural history, educated or not, who gave years of dedicated service to the Survey.

The most productive scientific years of the Survey were in the 1890s and 1900s when Merriam's grand biogeographic project still ruled and Bailey was in charge of field operations. Published results of the Survey's varied lines of research during this early period were numerous and notable. Besides the many contributions that appeared in the various departmental series – *Technical Bulletins*, *Farmers' Bulletins*, *Yearbook Articles*, *Circular*, and the *Journal of Agricultural Research*, and in reports issued by other departments. Three sets of publications, begun in the early days of the agency, were exclusive to the Survey. The most notable and enduring are those of the *North American Fauna* series. These treat mainly regional studies in natural history and technical monographs of groups of birds and mammals. In the period while Merriam served as Chief, thirty-one numbers of the *North American Fauna* were issued. The other two series were the *Biological Survey Bulletins* and the *Circulars*. They covered subjects devoted to distribution, migration, food habits and regional studies of birds and mammals as well as protective legislation on game birds and mammals, song birds, and fur bearers.

Merriam's scientific leadership, in combination with his determination and forceful personality, were instrumental in the early success and viability of the Biological Survey. His ability to organize and train able collector-naturalists and to develop new methods and standards for collecting and conducting field work helped to establish a solid underpinning previously lacking for American mammalogy. His vision for a nation-wide survey of the country's mammal fauna, the high standards he set for accomplishing this work, and his own field work and publications, form the justification for his recognition as the father of American mammalogy.

The young men who went to work for the Biological Survey while Merriam was Chief constituted a remarkable group. In the 19th Century, the boundary between professional and non-professional scientists was more porous than in the 20th Century. The Survey during Merriam's tenure included an interesting mixture of both types. The notable personnel hired at the Survey included two men who had medical degrees (Albert Fisher and Theodore Palmer) and three other individuals (Vernon Bailey, Edward Nelson, and Edward Goldman) who lacked college degrees yet played important roles. Their outstanding talent and devotion to work enabled them to make noteworthy advancements in the field of natural history and to place the Survey in the foremost ranks of the world's scientific organizations engaged in wildlife research. Their achievements laid the foundation for the further development of the Survey.

One of Merriam's greatest students, and the person who collected a large proportion of the specimens for his work, was Vernon Bailey. Bailey eventually became Merriam's brother-in-law. It was Merriam who found, nurtured, trained and mentored Bailey from a young man with potential but no experience. Under Merriam's tutelage, he became a seasoned naturalist who would achieve significant accomplishments despite his lack of formal education. Merriam had great

confidence in Bailey. When Merriam reorganized the Survey in 1905 as a separate Bureau, he placed Bailey in charge of investigations in geographic distribution. This was one of the three major responsibilities of the Survey, the only one Merriam had created, and the one that sustained most of his interest during his years as Survey Chief.

Between 1892 and 1906, E. W. Nelson and E. A. Goldman, two field biologists on the staff of the Biological Survey, also made significant contributions. They completed a pioneering study of Mexican biogeography and of its mammal and bird fauna. They utilized field methods developed by Merriam, but adapted these in light of the unique field conditions they encountered. Their field work resulted in collections of 17,400 mammals and 12,400 birds, together with many reptiles, amphibians, and plants. They described some 354 species and subspecies of vertebrates new to science. Their work extended the reach of the Survey beyond the United States and provided the impetus for the development of mammalogy in our neighboring country to the south.

It is remarkable that the field agents, with little formal training in biology, were generally able to handle their complex assignments competently. They built a legacy for collecting and recording data in the field that is basically still in use today by mammalogists. Thousands of biological specimens, collections, and archives would come from their efforts. Today these resources constitute an invaluable foundation for understanding and describing the dynamic changes in our fauna and flora. Their collections provided the specimens necessary to conduct the first extensive systematic and taxonomic revisions of American mammals. Today, the notes they recorded on the conditions and habitats of the United States are an invaluable resource as we begin to chronicle the impacts of human development and climate change on our wildlife fauna.

Two major scientific societies, the American Society of Mammalogists and The Wildlife Society, would spring forth primarily as endeavors encouraged and led by Survey scientists. They led the way in organizing the American Society of Mammalogists in 1919 and served in various ways for the next two decades, helping to establish the profession of mammalogy on a permanent

basis. Later, in the 1930s the Survey and some of its leadership also would play an instrumental role in the establishment and organization of The Wildlife Society.

Theodore Roosevelt, who served as the 26th President of the United States from 1901 to 1909, applauded the early work of the Survey personnel under Merriam's direction. Merriam and Roosevelt had become friends when both were young men, sharing an intense interest in natural history for more than a third of a century, and Roosevelt would play an important role in the success of both the Survey and Merriam as its leader during his two terms as President. Here is what Roosevelt said about the Survey in a 1907 article in *Science* magazine that was extracted from his State of the Union address in the same year:

The Biological Survey is quietly working for the good of our agricultural interests and is an excellent example of a government bureau which conducts original scientific research, the findings of which are of much practical utility and the results of these investigations are not only of high educational value, but are worth each year to the progressive farmers of the country many times the cost of maintaining the survey, which, it may be added, is exceedingly small. I recommend to congress that this bureau, whose usefulness is seriously handicapped by lack of funds, be granted an appropriation commensurate with the importance of the work it is doing.

The Survey began with an emphasis on research; however, after Merriam retired in 1910, it began to de-emphasize taxonomy and mapping flora and fauna. It focused on programs devoted to protecting and managing wildlife such as predator extermination, fur farming, and wildlife education. Many of these added activities, especially predator and rodent control, would prove to be controversial with many stakeholders. The Lacey Act passed in 1900 pulled the Survey in the direction of managing, rather than just studying wildlife, and also enforcing state and federal game laws. The protection of wildlife further expanded as an important part of the Survey's mission after Congress passed migratory bird protection laws in 1913, 1918, and 1929.

The controversy over predator control primarily erupted after Merriam left the Survey. It placed the agency in a difficult light with many stakeholders and eventually led to a clash with the American Society of Mammalogists, the very society its scientists had helped to establish. While the Survey claimed that its policy was one of benevolent control, its field policy was one of extermination to the last individual. Another serious difficulty was the fact that poisons put out for coyotes frequently killed furbearers, domestic pets, and other non-target animals. As a result of this program, predator populations were decimated all across the west. Feelings ran so high with some members of the ASM that it was proposed at one stage that the mammal society dissociate itself altogether from the Survey and discontinue cooperating with it. Despite the heat generated over this issue, no fundamental change in the policy of the Survey was forthcoming, leaving a negative image in the eyes of many scientists and conservationists.

Predator control remains a controversial issue even today. While the loss of substantial numbers of predators has been accurately documented, recent research has demonstrated that targeted predator control affects wildlife more broadly and in ways that are sometimes counter-intuitive. For example, studies using both traps and Compound 1080, have shown the phenomenon of “mesocarnivore release” in which suppression of coyotes is followed by increases of other carnivores from bobcats to striped skunks. Just as removal of wolves allowed coyotes to expand in range and number, reductions of coyotes apparently permits other generally smaller carnivores to increase (Robinson 1953, 1961; Linhart and Robinson 1972).

Regardless of the controversy associated with its policies on animal damage control, the Survey and the people who served its mission and accomplished its work deserve lasting remembrance. It reminds us that the challenge of history is to recover the past and introduce it to the present. Our hope is that this introduction is educational and enlightening.

In that regard, while perusing the McAtee files at the Library of Congress, we found the following

untitled poem, written by a person using the initials P. S. M., to honor and praise the agency and its personnel. It represents a tribute to the people who spent their lives in support of the Biological Survey and its mission:

*When you look up history that shall serve
the ages*

*Remember some of these men, have written
up the pages.*

They have traveled far and wide.

*From the depths of Death Valley, to the
heights of Mt. McKinley's side*

*They did also rally. And on the ocean's bil-
lows in calm or storm*

*On the desert wilds where danger gave
alarm*

In the air or northern mountain chains

*And the southern tropics, with their aches
and pains.*

*Should we search for men like these among
mankind*

*They are America's constant contribution of
learned mind.*

*Having lived up to date, yet within two
centuries past*

*Their work of Science, in nature, will surely
last.*

*As nations need help, they will these pages
seek*

*With their truths made plain, more helpful
than the Greek.*

*While these have labored hard, their pur-
pose to fulfill*

*We are proud to have known them, and that
they are with us still.*

*When life's labors are ended, with all our
victories won,*

*May our crown of honor, be the welcome,
Well Done.*

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