

The Biological Survey - status, updates, and direction



Our Mission

- To protect and enable research on the nation’s natural history collections at the NMNH.
- To serve Department of Interior as USGS research scientists with expertise in systematics, the classification of species, and genetic diversity.
- To produce authoritative checklists of North American vertebrates, and publish research on measuring species diversity.

Our Background

The USGS curates the North American collections of Mammals, Birds, Amphibians and Reptiles housed at the Smithsonian Institution’s National Museum of Natural History (NMNH).

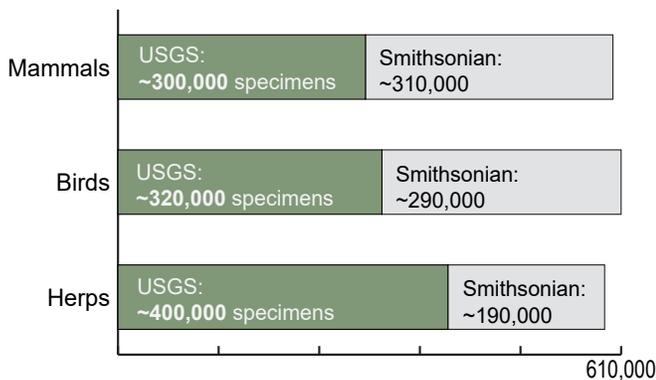
This partnership traces its roots to 1889, when the Biological Survey was formed to identify, preserve, and study our nation’s wildlife resources. We continue in this role today.

Our work spans centuries

The Biological Survey has described **1,293** species in its 130 year history, and curates over **one million specimens**.



Curatorial responsibility at the NMNH



Shared spaces, unique goals

USGS and Smithsonian staff serve unique but complementary roles at the NMNH. In exchange for curating over half of the NMNH’s collections in these groups, USGS has access to facilities, laboratories, and space within the Smithsonian at no cost to the bureau.

Key Accomplishments

- **Surveyed species** and potential disease vectors at overseas military bases.
- Identified **aircraft strike remains** in partnership with the Smithsonian, FAA, and DoD.
- **74 new species** described by current staff.
- Continued **research on genetic diversity** and population response to emerging infectious diseases (avian malaria, chytrid fungus).
- Published **authoritative checklists** of bird and herp species used to identify conservation priorities, regulatory frameworks (CITES, ESA), and enforcement (FWS Lacey Act).
- Used collection-based research to author identification guides essential to **documenting amphibian diversity**.

The Biological Survey - Research Highlights

USGS scientists stationed at the NMNH produced **23 publications** from **16 active research projects** in 2016-2017. Published research topics include distribution and description of species and investigations into basic natural history. Ongoing studies are focused on ecosystems health, genetic diversity, invasive species, and emergent disease vectors. Selected highlights include:

Describing genetic variability in two critically endangered species of Hawaiian bird

A staggering 13 species of Hawaiian honeycreepers are now extinct, and many others are endangered. The USFWS and State of Hawaii are currently working towards recovery of the Akeke'e and the Akikiki, species whose populations have crashed in recent years due to emergent wildlife diseases and habitat loss on the islands.

USGS is **evaluating if current sampling efforts adequately capture the genetic diversity** of these two species, and if changes in the geographic scope of sampling are needed. This research will guide management efforts to preserve these species.



Species surveys at overseas U.S. Military bases: Camp Lemonnier, Djibouti

The movement of equipment and personnel between bases overseas and the United States is a potential pathway for invasive species and associated diseases. USGS scientists and partners are examining specimens collected during overseas missions to **determine their genetic relatedness to invasive species** already present in the U.S., and other species which may easily become established if introduced. Current work focuses on obtaining genetic barcodes for as many species as possible to facilitate accurate identification and determination of source populations of invasives.

Our efforts also support research into whether species of cryptic vipers act as disease vectors for Middle East Respiratory Syndrome (MERS). This project exemplifies inter-agency cooperation, the value of specimens supporting multi-disciplinary research, and the role of the USGS conducting and facilitating innovative research to support human health and responsible environmental management at U.S. bases overseas.



Identification of aircraft wildlife strikes for FAA and DOD

Identifying which species are involved in aircraft strikes is critical for partner agencies to establish **effective mitigation strategies to avoid costly** (in 2016 > \$600,000) and potentially deadly incidents in the future.

Our staff's expertise, direct access to the collections at the NMNH, and resources such as the genomic and microscopy labs at the Smithsonian Institution allow us to respond to these agency needs both quickly and effectively. These identifications can be helpful for assessing conditions around an airfield, especially as military forces move into new terrain where changes in times and locations of flights might help to decrease or prevent these wildlife strikes from occurring.



The Biological Survey - The Species List: a vital tool for policymakers

The USGS creates and edits authoritative checklists of the vertebrate species of North America. Although these checklists may appear mundane, **every major policy decision involving wildlife in the United States relies on them**. In 2016-2017 we updated two essential checklists, and two NSF-funded projects continue this vital work.

How are lists used? From publications to policy

Our species lists are applied to large-scale informatics databases such as NatureServe, ITIS, GBIF, and the IUCN. This provides policymakers with consistent, coordinated, and authoritative information from which vulnerability assessments, identification of information gaps, and CITES/ESA enforcement are accomplished.

How are lists made? From specimen to species to publication



Current USGS staff have described **74 new species**.

- 1. Use Specimens** housed at NMNH through active curation of over 1.02 million vertebrates.
- 2. Identify Variation** through genetic and morphological analysis of specimens.
(4 active projects)
- 3. Describe Species** by compiling evidence and publishing results
(9 recent publications)
- 4. Publish Authoritative Checklists** in coordination with professional societies to review names, species status, and geographic scope.
(2 published in last year*; 2 in prep)



Why this matters:

- Regulatory efficiency:** The checklists are used by federal agencies - including Interior, Agriculture, Commerce, Homeland Security, and the U.S. Military as a 'one-stop shop' for authoritative species names and definitions when evaluating proposed regulations or enforcing existing law and treaty obligations.
- Scientific coordination:** USGS staff also serve in leadership roles on committees and councils that evaluate these lists. This keeps USGS in the loop with the scientific community beyond the Department, promoting collaboration and forward-looking proposals that address data gaps.
- Knowing who to call:** The Biological Survey serves as an indispensable USGS resource relied upon by federal partners. As an example, when CITES was signed into law, the Biological Survey was able to respond to Congress within weeks with authoritative species lists which are still updated today.

* **Chesser, R. T.,** K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Jr. Remsen, J. D. Rising, D. F. Stotz, and K. Winker. 2017. **Fifty-eighth supplement to the American Ornithologists' Union: Check-list of North American Birds.** Auk 134(3):751-773. Doi:10.1642/AUK-17-72.1