Exhibit Date: May-September 2010

Rats, bats, and a whole lot more: Expeditions by the Natural Science Research Laboratory, 1994-2008

The Natural Science Research Laboratory (NSRL) is a division of the Museum of Texas Tech University that conducts natural history research, maintains a collection of specimens for scientific study, and trains and educates students for careers in the natural sciences and museum science. Since the NSRL's inception in 1970, more than 240 Texas Tech graduate students, in addition to undergraduate students and students from other universities, other states, and other countries, have taken part in NSRL-led research expeditions to all corners of the world. This exhibit features a sampling of those expeditions, conducted between 1994 and 2008, ranging from local field trips within Texas, to Mexico, Central and South America, Eastern Europe, and Asia.

The Natural Science Research Laboratory, Museum of Texas Tech University.

Purpose and Value of a Natural History Collection

The primary purpose of the NSRL is to build and preserve a library of our planet's natural heritage for education and research purposes. Such collections serve as the foundation for our understanding of biodiversity and our appreciation of life, in all its forms, on the earth. Natural history collections serve as a historical reference for documenting changes in our environment and the effects of that change on wildlife and, ultimately, on humans. The causes and/or effects of animal-borne diseases, environmental pollutants, parasites, climate change, habitat loss, geographic isolation, and natural evolutionary processes and speciation are just a few examples of the investigations that can be conducted utilizing specimens and tissues archived in a natural history collection.

Traditional study skins, skulls, and skeletons (in boxes), housed within the Recent Mammals Collection at the NSRL.

Vials of frozen tissues housed in the ultra-cold freezers of the Genetic Resources Collection, NSRL.

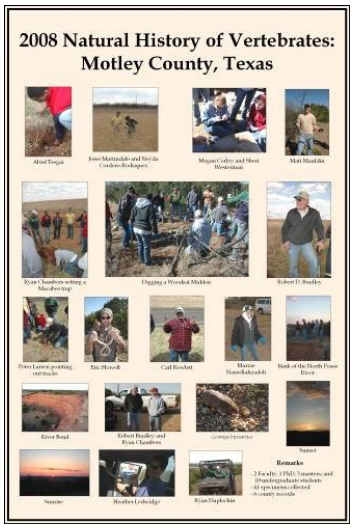
Specimen drawers of the Invertebrate Zoology Collection

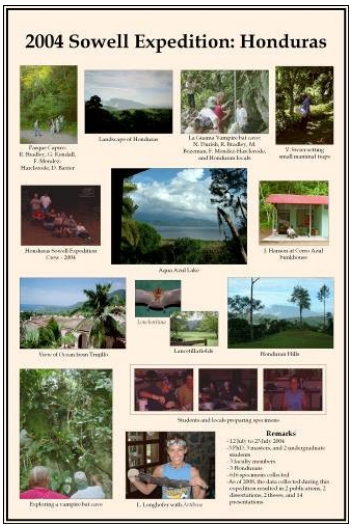
Specimen drawers of the Ornithology Collection

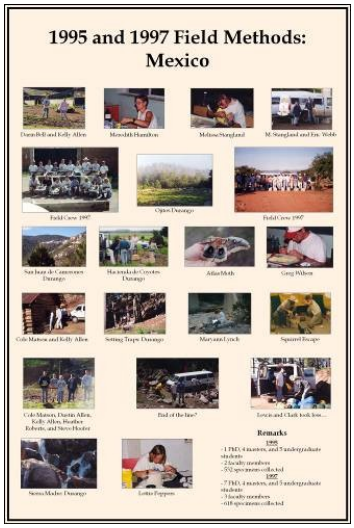
NSRL Facts

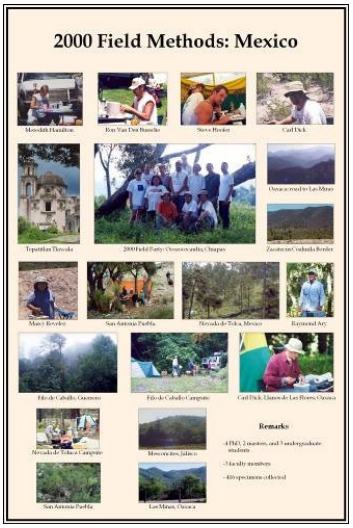
- The NSRL mammal collection was established by Robert L. Packard, who was hired in 1962 as the first mammalogist at Texas Tech University.
- The collection currently houses >110,000 mammal specimens.
- The mammal collection of the NSRL is the 5th largest academic collection and the 8th largest mammal collection overall in the U.S.
- The Genetic Resources Collection of frozen tissues and blood samples currently houses >240,000 samples representing >87,000 specimens.
- The NSRL also houses an Ornithology Collection of >4,700 specimens and an Invertebrate Collection of >4 million specimens.
- The collection includes >3,000 mammal specimens and associated tissues from the Chernobyl region of Ukraine; these samples are mildly radioactive and are housed in a separate, secured room within the NSRL.
- The data associated with the mammal collection is available online in a searchable database that includes the specimen ID number, species name, sex, collection locality, date of collection, collector name, and type of preparation.
- The specimens and associated tissues of the NSRL are available for study by research scientists and students from around the world through the NSRL's policy of loaning materials to qualified scientists.
- From 2000 to 2009, the NSRL made 280 specimen loans and 930 tissue loans to scientists for research purposes.
- Since 1970, at least 244 graduate students (M.A., M.S., and Ph.D.) in Biological Sciences and Museum Science have received education, training, and research experience through utilization of the resources of the Natural Science Research Laboratory. The majority of those students participated in field expeditions to collect natural history specimens and data.
- Since 2000, faculty and students associated with the NSRL have produced more than 240 scientific publications utilizing the specimens of the NSRL.

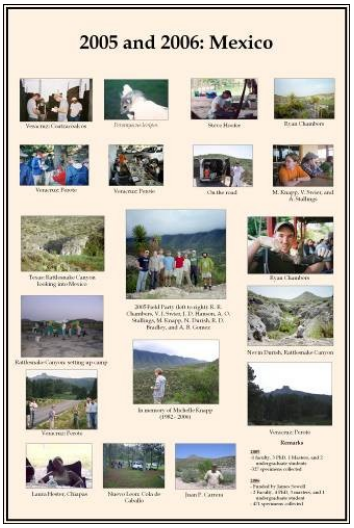
NSRL-led Expeditions, 1994-2008

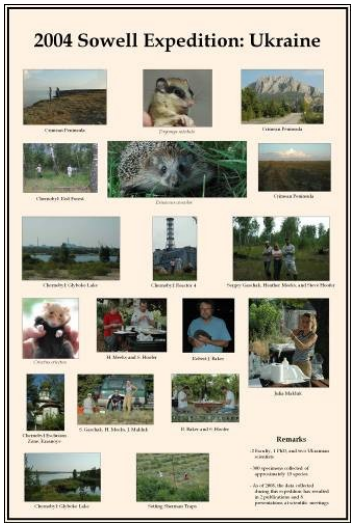


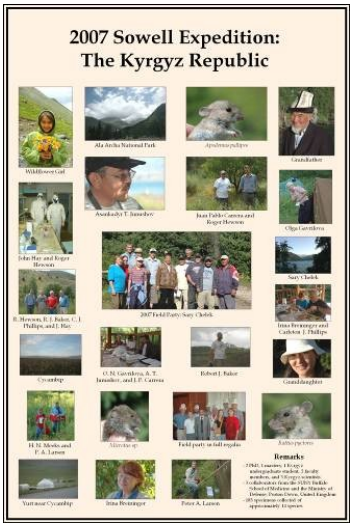


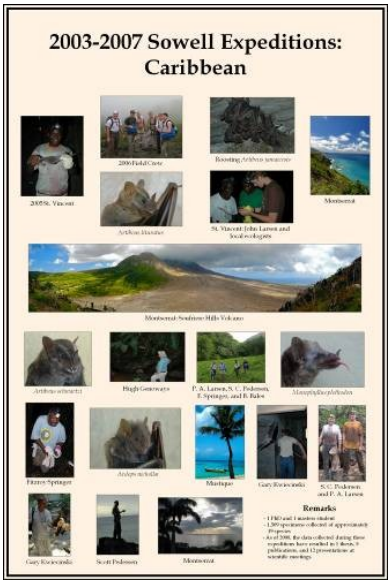


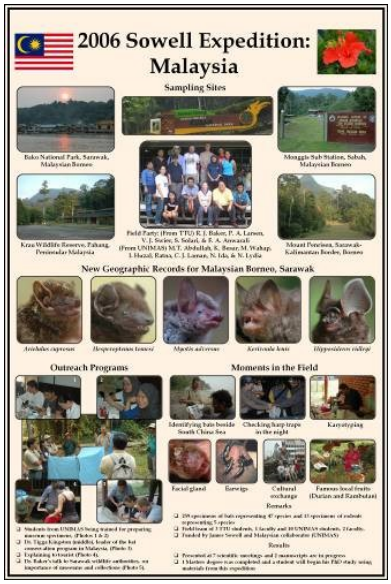












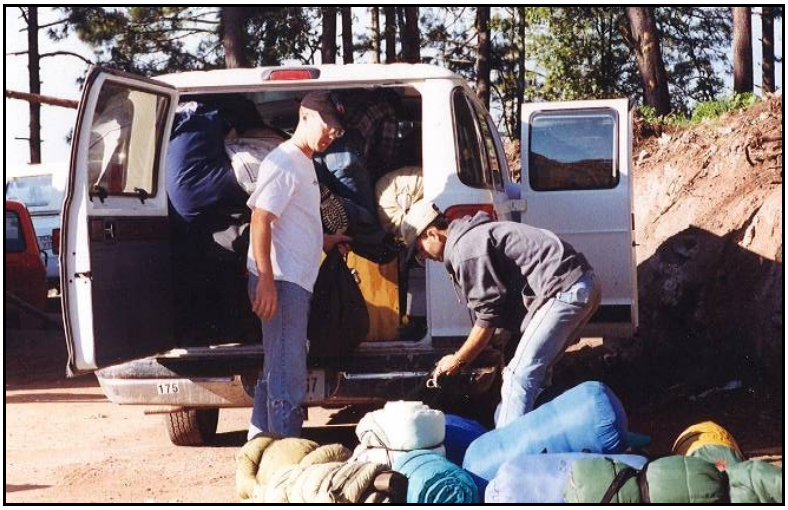
The primary objective of field expeditions is to collect mammals for research in order to document and better understand biodiversity, species distribution, systematics (how species are related), environmental toxicology, and animal diseases (particularly those that are transmittable to humans). Approximately 10,000 mammal specimens were collected for research purposes during the trips highlighted in this exhibit.

The specimens collected are utilized both for current research projects and preserved for future research purposes. The majority of the specimens are archived at the Natural Science Research Laboratory, while others are archived at museums in the country of origin. Most specimens are prepared as “skin, skull, and skeleton,” as shown here. Tissue samples, blood samples, and parasites also are preserved for genetic, ecotoxicology, disease, and parasite research.

Bat specimens resulting from NSRL expeditions.

Life in the Field

A typical mammal-collecting field trip involves a great deal of preparation, a tremendous assortment of supplies, and a dedicated crew of people who are willing to work long hours and to “rough it” for periods of several days to three weeks or more.



Loading up a small portion of the gear for a field trip.

Setting up camp in Rattlesnake Canyon, Texas.

Field camp in Nayarit, Mexico.

This display features a representation of a field camp where a collector has returned from trapping and is "field prepping" specimens for eventual deposition in the NSRL.

Setting Traps for Small Mammals

Most commonly, the collectors (students and faculty) set and bait Sherman traps each evening just before dark, in areas of suitable habitat for the species that are being targeted for collection. Each person usually sets 50-100 traps. Later that night, the collectors may set up bat nets, monitor them for several hours, and collect any bats that are captured. After returning to camp (often for a very late dinner), the collectors get a few hours sleep before rising at dawn to check the Sherman traps that were set the night before. All traps are picked up in the morning, to be re-set that night, usually in another location.

Heading out to set Sherman traps. Each box contains 50 traps. The bag contains bait.

Common traps for small mammals.

Sherman® trap (front right) – These light-weight, folding traps are the most commonly used trap for live-capturing small mammals such as rodents and shrews. The traps typically are set and baited, usually with grain or rolled oats, in the evening, then checked early the next day.

Havahart® trap (front left) – These traps are baited and utilized for capturing small- to medium-sized mammals alive. The trap shown here is appropriate for squirrel-sized animals.

Baker-Williams pocket gopher trap (back right) - This style of live trap was invented in 1972 by Robert J. Baker and Steven Williams of the NSRL. The collector digs into a gopher tunnel system and sets the trap at the newly opened end of a tunnel. The gopher becomes trapped when it attempts to plug the burrow in response to the light or air entering the burrow.

Macabee® gopher trap (front center) – This kill trap is the most effective trap available for gophers. It is commonly sold in stores and used by farmers, golf course operators, and homeowners to rid their land of gophers and the damage they cause. Like the Baker-Williams live trap, the Macabee trap is set in the burrow system, and the gopher is trapped when it responds to the disturbance of its burrow.

Pitfall trap (back left) – A coffee can, bucket, or other container is commonly used to create a pitfall trap for capturing shrews. The can or bucket is buried in the ground to create a "pit," and the can is baited with hamburger meat or dog food to attract the carnivorous shrews. The shrew simply falls into the bucket and cannot escape.

Museum Special® snap trap (not shown) - The skulls of mammals are especially valuable diagnostic tools for identifying the differences between mammals that are otherwise similar. Commercially available snap traps for mice and rats typically kill by striking and crushing the head of the animal. Museum Special® traps, however, are especially designed for museum collectors to trap the animal without striking the skull. The treadle of the trap and the wire bail are farther apart, thus striking the animal behind the head and preserving the skull without damage.

One night's haul of rodents by some dedicated Red Raiders, Mexico, 2008.

Capturing Bats with Mist Nets

Mist nets are used by bat biologists to harmlessly capture bats for research purposes. The nets are made of fine nylon or polyester mesh suspended between two poles. The size of the mesh varies depending on the size of the species targeted for capture.

The nets are typically placed where bats search for food, over water sources where the bats drink, and near the mouths of caves or other roosting locations to capture the bats as they leave their roost each evening. Trained personnel monitor the nets and promptly remove any captured bats as they become entangled in the fine mesh.

Removing a bat from a mist net. Black Mesa, Oklahoma, 2009.

A good night's work! Each bag contains a bat that was captured in a mist net.

Preparing Mammals in the Field

All animals that are trapped or netted during the night are identified to species, and animals needed for study are then "prepped" as museum voucher specimens. (A "voucher specimen" is any specimen that serves as a basis of study and is retained as a reference. It is deposited in a publicly accessible scientific reference collection, such as the NSRL.) Preparing a voucher specimen involves humanely euthanizing the animal, then skinning it. The skin is cleaned of all flesh and fluids, then stuffed with wire and cotton, and pinned on a board in typical fashion for a museum voucher specimen (front feet forward, rear feet backward, tail straight).

Prepping specimens back at camp. Student on the left is sewing a specimen closed. Student in the center is removing tissue samples and placing them in tubes.

Prepared specimens are pinned on boards to begin the drying process. The boards are stacked in boxes for transport from the field to the NSRL.

Heart, liver, kidney, lung, spleen, muscle, and blood samples typically are collected, placed in tubes, and stored in liquid nitrogen in the field. At the NSRL, these samples are archived in ultra-cold freezers, to be utilized later for genetic, ecotoxicology, and disease research.

Frozen tissues are stored in liquid nitrogen for transport. All specimens and corresponding tissues are bar-coded for inventory purposes.

Specimen Preparation Continues at the NSRL

The skull and skeleton of the animal are prepared for drying by wrapping each skeleton with string to keep the skeleton intact. When returned to the NSRL, the skeletal material is dried and thoroughly cleaned of all tissues. The skeleton is then placed in a box or vial and housed in the collection with its corresponding study skin.

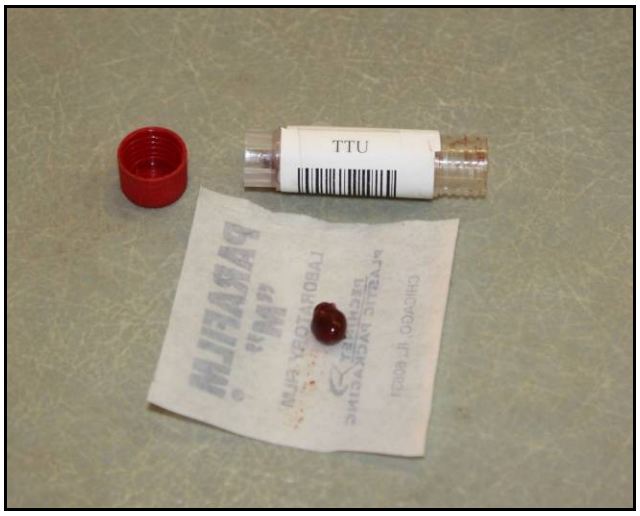
A skeleton that has been dried and is ready for cleaning.

Skeletons are cleaned by flesh-eating dermestid beetles that are maintained in colonies at the NSRL.

A skeleton after being cleaned by the dermestid beetles and further hand-cleaned by personnel.

Specimens are stored in metal cases in the Mammal Collection of the NSRL.

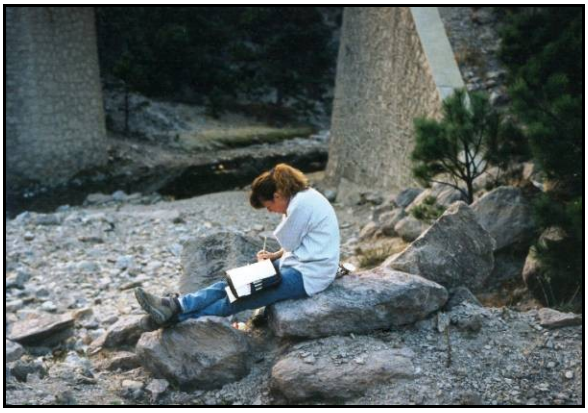
Tissues are stored in vials in ultra-cold freezers in the Genetic Resources Collection, NSRL.



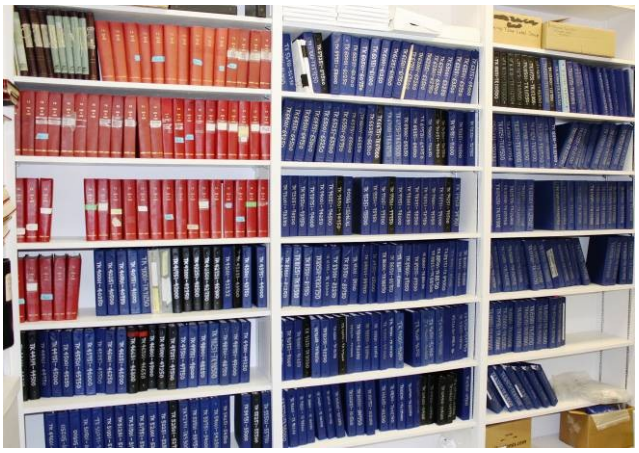
A frozen kidney sample, removed from its tube and ready to be subsampled for a research loan. Note the barcode label on the tube.

Data Collection

Thorough and accurate data entry is a vital component of all stages of field work. Each collector keeps a field catalog where they record their daily activities, itinerary, habitat descriptions, and all specimen data. The data recorded for each specimen includes: specimen ID number, species, sex, measurements, date of collection, exact locality where the specimen was collected, the type of preparation of the specimen, the types of tissues collected, the collector's name, and the collector's personal field collection number. In addition to being recorded in the field catalog, these data are recorded on the tags attached to the skins, skulls, and skeletons, and in books that are housed at the NSRL as a permanent record. These data are then entered into an electronic database that is available online and can be searched by species, locality, and specimen ID number.



Filling out the field diary with the day's notes.



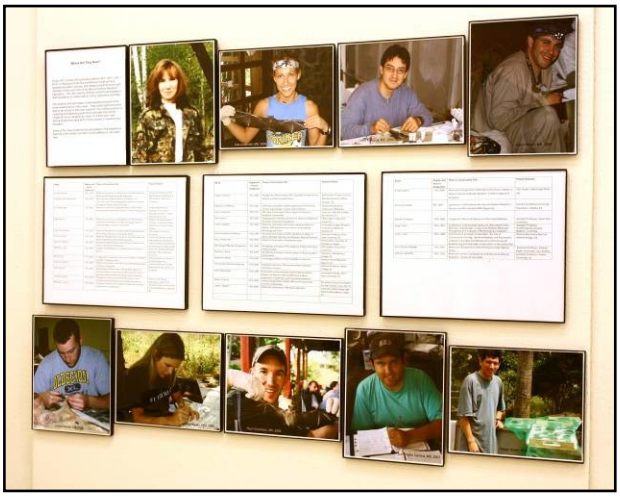
The TK books at the NSRL are a permanent record of data for every specimen in the collection.

Students – Where are they now?

Since 1970, at least 244 graduate students (M.A., M.S., and Ph.D.) in Biological Sciences and Museum Science have received education, training, and research experience through utilization of the resources of the Natural Science Research Laboratory. The vast majority of those students participated in field expeditions to collect natural history specimens and data.

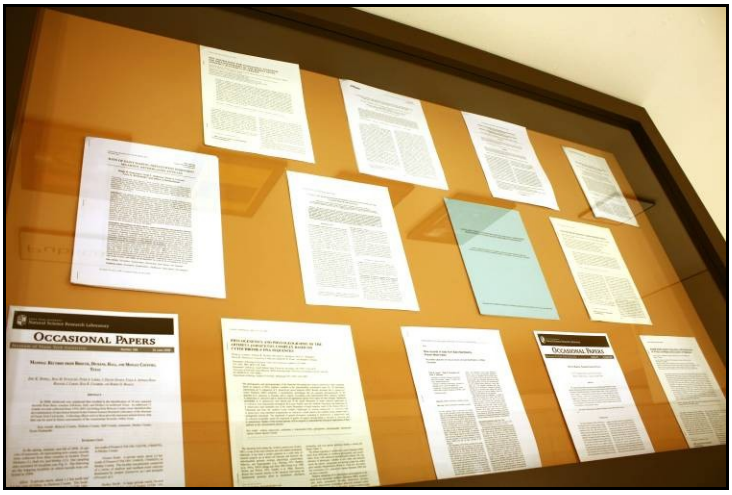
The students that participate in field expeditions benefit from those experiences in many ways. They collect specimens and data to be utilized in their own research, they further science by collecting and depositing specimens and data that can be utilized for future research by others, and they learn new skills and become prepared for future careers in research and education.

Some of the many students that participated in the expeditions featured in this exhibit, and their current affiliations, are listed here.



Publications

The publication of research results and thus the dissemination of new information is a critically valuable aspect of science. The expeditions featured in this exhibit have resulted in at least 70 scientific publications to date, most of which were co-authored by the faculty and students that took part in the expeditions. These publications include descriptions of new mammal species, descriptions of new rodent-borne diseases, faunal surveys that document the mammalian biodiversity of a region, and other scientific results that further our understanding of life on this planet.



A few of the recent publications resulting from the NSRL expeditions are highlighted in this display.