FIELD AND LAB PROTOCOL:
SMALL MAMMAL ABUNDANCE AND DIVERSITY

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1 DESCRIPTION

1.1 Purpose

The primary purpose of this document is to provide a change-controlled version of Observatory protocols and procedures. This document provides the content for training and field-based materials for NEON staff and contractors. Documentation of content changes (i.e. changes in particular tasks or safety practices) will occur via this change-controlled document, not through field manuals or training materials.

This document is a detailed description of the field data collection, relevant pre- and post-field tasks, and safety issues as they relate to this procedure and protocol.

1.2 Scope

This document relates the tasks for a specific field sampling or laboratory processing activity and directly associated activities and safety practices. This document does not describe:

- general safety practices
- site-specific safety practices
- general equipment maintenance

It does identify procedure-specific safety hazards and associated safety requirements such as safe handling of small mammals or safe use of required chemicals and reagents.

1.3 Acknowledgements

*My thanks to Jesse Dulberger who wrote the first version of this protocol. Best practices are based on recommendations in Wilson et al. 1996, as well as the small mammal abundance and diversity working group (*Guy Cameron, Bob McCleery, Bill McShea, Rebecca Rowe, Rob Swihart, Beatrice Van Horne).

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

Applicable documents contain information that shall be applied in the current document. Examples are higher level requirements documents, standards, rules and regulations.

AD [01]	NEON.DOC.004300	EHS Safety Policy and Program Manual
AD [02]	NEON.DOC.004316	Operations Field Safety and Security Plan
AD [03]	NEON.DOC.000724	Domain Chemical Hygiene Plan and Biosafety Manual
AD [04]	NEON. DOC.001155	NEON Training Plan
AD [05]	NEON.DOC.050005	Field Operations Job Instruction Training Plan

2.2 Reference Documents

Reference documents contain information complementing, explaining, detailing, or otherwise supporting the information included in the current document.

RD [01]	NEON.DOC.000008	NEON Acronym List
RD [02]	NEON.DOC.000243	NEON Glossary of Terms
RD [03]	NEON.DOC.000915	TOS Science Design Small Mammal Abundance and Diversity
RD [04]	NEON.DOC.005003	NEON Scientific Data Products Catalog
RD [05]	NEON.DOC.014051	Field Audit Plan
RD [06]	NEON.DOC.000824	Data and Data Product Quality Assurance and Control Plan
RD [07]	NEON.DOC.000911	NEON TOS Science Design for Vectors and Pathogens
RD [08]	NEON.DOC.014044	NEON Rodent-borne Pathogen Sampling Protocol

2.3 Acronyms

CDC	Centers for Disease Control and Prevention
NIOSH	National Institute for Occupational Safety and Health
PIT	Passive Implant Transponder
PPE	Personal Protective Equipment
HEPA	High-efficiency particulate air

2.4 Definitions

A **protocol** is a formal summary description of a procedure and its related rationale, and includes information on knowledge and resources needed to implement the procedure. A procedure is a set of prescribed actions that must take place to achieve a certain result, and can also be called a method. It differs from a science design in that science designs provide a more complete description of the rationale for selecting specific protocols. It differs from a training manual in that training manuals

provide materials in support of skills acquisition in the topic areas including information on how to best train staff rather than detailing only the steps of the procedure.

Opportunistic vs. Non-target (modified from the National Park Service)

OPPORTUNISTIC species include any animal whose capture is accidental or incidental, but whose capture can lead to valuable information. Examples include non-target species of small mammals whom if captured will be marked and released or vouchered, etc.

NON-TARGET species include any non-study animals directly or indirectly affected by the research. Examples include the potential to live-capture or kill non-target individuals (e.g., loss of offspring due to taking of one or both parents) or disturb/harass other species during the research activity (e.g., during sampling that employs airplanes and/or boats).

3 BACKGROUND AND OBJECTIVES

3.1 Background

Small mammals are widespread, sensitive to local environmental changes, and known to carry and transmit zoonotic agents; therefore they have been chosen as sentinel taxa for the Terrestrial Observation System (TOS) of NEON. From NEON's perspective, species-specific demography and population sizes, prevalence of pathogens important to public health, species richness, and relative abundances can be monitored simultaneously and ultimately linked to land use and climate changes, and therefore provide useful metrics of responses in biodiversity to these and other drivers (Kao et al. 2012). Small mammals as primary and secondary consumers interact significantly with plants and ground invertebrates (other NEON sentinel taxa), and generally represent size classes, life histories, and home range sizes that are distinct from the other NEON taxa (Kao et al. 2012). NEON will use mark-recapture methods to assess the dynamics of small mammal diversity and disease across time and space (Ostfeld and Parmenter 2008).

NEON small mammal sampling will assess the abundance and diversity of the nocturnal small mammal communities of North America, including the population dynamics of species that are competent reservoirs for infectious disease, at dozens of sites (depending on study design and associated logistics) throughout North America, Hawaii, and Puerto Rico for a period of 30 years. This represents a significant increase in the number and diversity of long-term datasets involving small mammals, and will also be unique in the degree of standardization across studies, as well as the availability of the data and archived samples to the scientific community and the public. This will allow NEON and the scientific community to address a diversity of questions, and the associated vouchering of specimens and tissue samples will provide critical resources for external PI-driven research to address an even wider range of questions.

Figure 1. What is a small mammal?

What is a small mammal?

While there is no established definition of the term 'small mammal' (Merritt 2010), it is generally used to refer to small rodents (voles and mice in the order Rodentia) and insectivores (shrews and moles in the order Soricomorpha), and sometimes squirrels (Rodentia: Sciuridae) and rabbits (order Lagomorpha), all with body masses less than 120g – 2kg, depending on the source. Here we define small mammals based on a combination of behavioral, dietary, and size constraints, as we are limited to species sampled by box traps, due to logistical constraints. We consider any mammal that is (1) nonvolant; (2) nocturnally active; (3) forages predominantly aboveground; and (4) is greater than 5 grams but less than approximately 500 g (one exception to this includes the bushy-tailed woodrat, *Neotoma cinerea*, males of which can weigh up to 600 grams). In North America, this includes cricetids, heteromyids, small sciurids, and introduced murids. It does not include shrews, large squirrels, rabbits, or weasels, despite the fact that individuals of these species may be incidentally captured.

3.2 NEON Science Requirements

This protocol fulfills Observatory science requirements that reside in NEON's Dynamic Object-Oriented Requirements System (DOORS). Copies of approved science requirements have been exported from DOORS and are available in NEON's document repository, or upon request.

3.3 NEON Data Products

Execution of this protocol procures samples and/or generates raw data satisfying NEON Observatory scientific requirements. These data and samples are used to create NEON data products, and are documented in the NEON Scientific Data Products Catalog ([RD04]).

4 PROTOCOL

NEON requires the study of live organisms in their natural setting to document the diversity, population sizes, and pathogen prevalence of small mammals through time, in relation to such critical drivers as climate change and land-use change. These parameters can be assessed through a mark-recapture live trapping study and associated tissue collection. All methods conform to standard methods used in the study of wild small mammals (see Wilson et al. 1996, Sikes et al. 2011).

Sherman live traps (H. B. Sherman, Inc., Tallahassee, FL, folding or non-folding, 3" x 3.5" x 9" or, if kangaroo rats (*Dipodomys spp.*) are present, 3" x 3.75" x 12") will be used to capture animals for the study. Trapping grids will be laid out with 100 Sherman live traps (10 m spacing – 10 rows – 10 columns). Three - eight grids will be trapped during each sampling period, depending on the area of the site and associated logistics. The grids will be distributed proportionally across the dominant vegetation types, collocated with a subset of the TOS Distributed Plots (see TOS Science Design for Small Mammal Abundance and Diversity – RD[03] – for additional details). Each grid will be trapped for 3 consecutive nights within a sampling period, and sampling will occur year-round at a monthly or every other month frequency, depending on the site designation (core vs. relocatables) and winter weather conditions. If possible, trapping should occur as close as possible to the new moon, as small mammal activity is thought to be restricted under high light conditions when predation risk is presumed higher (but see Prugh and Brashares 2010). This trapping effort attempts to document small mammal diversity at each site and allow for robust estimation of (1) population sizes using standard mark-recapture techniques and (2) intra-annual changes in pathogen prevalence. Four (2 teams of 2) or two personnel will conduct the sampling at each site, depending on the number of grids at a particular site. Each team will be comprised of at least one well-trained field technician who will be responsible for all of the handling procedures. The other technician will assist in trap setting and checking and data recording, and will assist in handling only if the technician is experienced in handling small mammals and has received all necessary training.

Within a sampling period, timing of trap setting is generally managed so that the last trap is set as the sun is setting and the first trap is checked the following morning, as soon as it is light enough to process animals (i.e., within 30 minutes of civil twilight). Local conditions can necessitate deviations from this general plan; these deviations will be specified in the site-specific appendices for this document, if necessary. The animals to be studied are nocturnal, and this routine ensures that traps are not set longer than necessary – particularly during the hottest parts of the year. Where possible, between consecutive nights of trapping, traps will remain *in situ* but closed during the day to prevent diurnal animals entering and becoming heat-stressed. Furthermore, when temperatures will be extremely high even in the early morning (i.e., >80 °F by 10:00), one team will focus solely on checking traps and placing traps with captured individuals under the protection of shade and a heat shield, until they can be processed by the second team. This procedure reduces the amount of time animals spend in direct sunlight, which can result in lethal heat stress.

Sherman traps are set and baited with a seed mixture (sunflower seeds -35%-and millet – 65%); high quality resources utilized by most target small mammal species (see Box 1 above). In cold weather conditions (overnight lows < 65°F), polyester or cotton batting for nesting will be placed in the traps, except at sites known to be dominated by rodents in the family *Heteromyidae* (e.g., Central Plains Experimental Range (CPER), Jornada Experimental Range (JORN)). These are burrowing rodents who are known to urinate on batting, thereby reducing its insulating properties, rather than building nests, and who will not consume peanut butter. Additional, high-calorie bait (e.g., peanut butter) can also be added in the event of extremely cold conditions at many sites, except where medium- to large- mammal (e.g., raccoons, bears) disturbance of traps has occurred or fire ants occur (e.g., Jones Ecological Research Center (JERC), Ordway-Swisher Biological Station (OSBS)).

Upon capture, individual small mammals will be processed in one of three ways, according to their classification as target, opportunistic, or non-target (see Box 2, and site-specific appendices for detailed species lists). All processing will take place in the field, to allow for quick release of captured individuals at the point of capture and to provide adequate ventilation for the technicians. Handling time per individual will be 15 minutes or less. All non-target species will be released immediately at the point of capture, without handling. If possible, the species identification of these individuals will be recorded. All opportunistic species will be handled as described below for target species, except that no pathogen-related blood sampling will be conducted on these individuals.

Individuals will be transferred from the trap directly into a disposable plastic handling bag for processing. If blood will be collected from a particular individual, the animal will be anesthetized before any handling, to decrease stress and reduce chances for injury during the blood collection procedure. The blood collection procedure is detailed in the NEON Rodent-Borne Pathogen Sampling Protocol – NEON.DOC.014044. If blood will not be collected, the individual will not be anesthetized prior to handling. No individual will spend more than 3-5 minutes in the plastic bag and will be in hand for only brief time spans (< 15 minutes / animal) using techniques to reduce injury, stress, and pain.

All individuals will be identified to species, reproductive condition assessed by examination of external genitalia, and have standard measurements taken (i.e., hind foot length and weight (using a spring-scale)). Additional measurements (e.g., ear length, tail length, and/or total length) shall be taken when relevant to species identification; these requirements are detailed in the site-specific appendices. All target and opportunistic species will be marked with either one numbered ear tag or a subcutaneous, RFID PIT tag (8 - 12mm), have tissue samples taken, and then released at the point of capture. Tissue samples to be collected from all individuals will include one ear tissue sample from the untagged ear for genetic analyses, and clipped whiskers and hair for potential isotopic analyses. Fecal samples will also be collected opportunistically from captured individuals.

Figure 2. Criteria for blood sampling

DO collect blood from:

1. All cricetids and murids that are >10.0 grams
    - If an individual's mass might be <= 10 g, be sure to weigh the individual prior to anesthetizing
2. Larger pocket mice - *Chaetodipus spp*. - that are >10.0 grams

DO NOT collect blood from:

1. Sciurids – chipmunks, squirrels, etc.
2. Soricids – shrews
3. Talpids – moles
4. Geomyids – pocket gophers
5. Dipodids – jumping mice (*Zapus spp.)*
6. Kangaroo rats – *Dipodomys spp.*
7. Small pocket mice – *Perognathus spp.*
8. Any rodent with significant injuries or deformities, particularly in the eyes

Mode of tagging will be based on the length of the external pinnae, as some species, such as voles (e.g., *Microtus spp., Myodes spp.*) and pocket mice (e.g., *Chaetodipus spp., Perognathus spp.*); do not have sufficient pinnae for securing ear tags. Shrews will not be marked. Individuals are marked to allow for the study of population dynamics, reproductive condition, timing of colonization of new individuals, longevity and movement, and a variety of other aspects of life history that require permanent individual marking. PIT tags are injected under the skin on the back of the animal. This placement does not impede movement. All needles and tags will be sterile. Disposable needles will be deposited in a sharps container immediately. In rare cases, if PIT tagging is deemed undesirable considering the condition of an animal (e.g., highly stressed), an animal may be released without tagging. Ear tags are small, metal, and uniquely numbered. Ear tags do not cause unnecessary pain when applied quickly and with sharp and correct application (using provided tool and placed in cartilage at base of external pinnae).

The condition of all captured individuals will be monitored closely throughout the handling period. Specifically, the rodent's rate of respiration, spontaneous movements, responses to tactile stimulation, and ability to retain sternal recumbency will be monitored, in order to gauge both the state of anesthetization (when relevant) and general condition of the animal. A small vial of 10% sugar in water will always be available and will be used to revitalize stressed, dehydrated, hypothermic or heat-stressed captures. Stressed individuals will be placed in a secure container containing bait and, in the case of hypothermia, a disposable hand warmer and batting. These individuals will be monitored every 15 minutes and released only when the animal exhibits normal behavior.

Figure 3. Summary of procedures per individual

- Identify to species
- If bleeding, anesthetize and collect blood samples first
- Mark individual
    - An ear tag in left ear OR
    - A subcutaneously implanted RFID tag
- Assess reproductive condition
- Measure:
    - hind foot length – for all species
    - ear length, tail length, and/or total length – if needed for species ID
- Collect samples:
    - Fecal - Fresh (from animal in hand) or Old (from trap)
    - Hair – a small tuft from the back of the head
    - Whiskers – snip at base; one from each cheek
    - Ear punch from the outer margin of the right (untagged) ear
- Weigh
- Put back in trap for transport back to point of capture for release

5 QUALITY ASSURANCE AND CONTROL

The procedures associated with this protocol will be audited according to the Field Audit Plan (RD[05]). Additional quality assurance will be performed on data collected via these procedures according to the NEON Data and Data Product Quality Assurance and Control Plan (RD[06]).

The QA/QC plan for Small Mammal Abundance and Diversity Sampling is in development, and all details will ultimately be found in the associated document.

The plan will include:

- Double-review of at least 10% of the entered data, if data are transcribed from paper datasheets, with error rates reported to the FSU Staff Scientist via JIRA.
- Hot checks in the field by HQ staff or contractor, if funding is made available.
- DNA barcoding of subset of samples to quantify error rates in taxonomic IDs.

When unexpected field conditions require deviations from this protocol, the following field implementation guidance must be followed to ensure quality standards are met:

Small mammal sampling can be performed under a variety of weather conditions. Care must be taken, however, to prevent conditions such that the trapped individual cannot thermoregulate properly, either in hot or cold conditions. Such conditions will result in the death of the trapped individuals. **Each mortality must be reported to the Field Operations Manager within 24 hours** of processing, to help ensure that all state- and site-specific permit requirements are followed. Please be aware that there are state- and site-specific permitting requirements detailed on permits provide by NEON EHS for reporting both live captures, as well as mortalities, of vertebrates captured, including either all species or, in some case, just the species with state status. It is imperative that the technician(s) leading the small mammal trapping is familiar with the languages detailed in the permits for the sites and states in their jurisdiction.

If, for any reason, ≥ 5 individuals on any given trapping grid during a single bout die, either in the trap or in hand**, the FSU Vertebrate Ecologist must be contacted prior to the next setting of traps at the site.** If weather or any other circumstances cause one night of trapping within the sampling bout to be missed, trapping may be resumed and continued as normal within 5 days of the latest night of trapping. If this is not possible, sampling should be resumed as soon as possible, while maintaining the timing of trapping relative to the new moon for the sites.

Cold conditions:

Given acclimation and regional variation in the conditions that threaten the survival of trapped rodents, guidelines for preventing mass mortality in cold conditions will be provided in the site-specific appendices.

Hot conditions:

When ambient temperatures are expected to exceed 80 degrees Fahrenheit by 10 a.m.:

- Extra effort must be made to ensure that all traps containing captured individuals are processed or placed in the shade as soon as possible.
- If you are unable to begin checking small mammal traps prior to 8 - 9 am, field technicians should open all traps to release animals and avoid heat-induced mortality. Work should start over that night by resetting the traps.

All conditions:

If there is any chance (i.e., >0%) that traps cannot be checked the following morning at dawn, traps shall not be set. For example, if trap locations are accessed via dirt roads that become impassable when wet, do not set traps if there is a possibility of rain overnight.

Predators:

If predators destroy >5 traps on a single grid on any given night, traps should be removed from the site and that sampling bout terminated prematurely. The Field Operations Manager shall be informed as soon as possible, and a problem ticket shall be entered. The Field Operations Manager should consult with the FSU Vertebrate Ecologist on future tactics to avoid predator damage.

Documentation:

1) Data from animals that die during the course of handling or trapping should be recorded on the datasheet, with a 'D' marked in the appropriate column.
2) If traps are not set on a particular grid as scheduled or if no individuals are captured, these should be recorded in the NOTES field as a line on the datasheet for that given date, grid, and bout combination.
3) If traps are damaged or disturbed overnight, note trap locations and code the nature of the disturbance on the datasheet in the NOTES field, with any other known details described in the 'add'l notes' cell.
   a) NOTES codes:

      1 – Traps not set

      2 – trap door closed but empty

      3 – trap door open with feces left behind

      4 – trap disturbed

      5—trap ID suspect (indicates uncertainty in trap coordinate – e.g., if two traps have the same coordinate, if smudging of marker creates uncertainty)

      6—no captures

Table 1. Contingency matrix of trapping actions and outcomes

Delay	Action	Adverse Outcome	Outcome for Data Products
Hours	If traps are set, the traps must be checked and any captured individuals processed or released without processing AS SOON AS POSSIBLE. Do whatever it takes (within safety limitations) to prevent mortality of study animals.	High mortality rates from trapping threaten the scientific and ethical integrity of the study.	Trapping-induced mortality violates the assumptions of the mark-recapture models that are used to estimate density.
1-10 days	Add additional days of sampling as soon as possible to sample all points.	If additional time is not available, fewer samples will be collected.	Fewer sampling points could result in less precise estimation of richness, diversity, or density. Capture-recapture models require recapture data from >1 night of sampling per bout to estimate densities.
11 or more days	Do not sample. Resume sampling as scheduled during the next month.	Miss target sampling window.	1. Species richness or demography due to changes in seasonal phenology could be influenced by significant changes in temporal sampling window. 2. Not completing all plots impacts diversity metrics and target sample size.

6 SAFETY

Personnel working at a NEON site must be compliant with safe field work practices as outlined in the Operations Field Safety and Security Plan (AD[02]) and EHS Safety Policy and Program Manual (AD[01]). Additional safety issues associated with this field procedure are outlined below. The Field Operations Manager and the Lead Field Technician have primary authority to stop work activities based on unsafe field conditions; however, all employees have the responsibility and right to stop their work in unsafe conditions.

Clothing and PPE

According to the NEON Operations Field Safety and Security Plan (AD[02]), whenever directly handling small mammals or working with equipment/supplies that have been in contact with small mammals, personnel are required to wear, at a minimum:

- Eye protection (wrap-around goggles to prevent splash hazards into or near eyes)
- Latex or nitrile gloves
- Long-sleeved shirt, Long pants, Close-toed shoes with socks
- A half-face respirator with P100 (HEPA-equivalent) particulate cartridge filters at designated sites.

In addition, a disposable or reusable (cotton) laboratory coat or apron can be worn to prevent potentially infectious small mammal excreta or body fluids (urine, feces, saliva, blood) from contacting clothing. Disposable safety sleeve-protectors may be worn in lieu of the disposable laboratory coat or apron. Cut/bite proof gloves or cloth gloves with rubber-tipped fingers may be worn to facilitate the handling of small mammals, and latex gloves will be worn on top of these to provide an additional, hydrophobic barrier against small mammal bites/scratches and infectious excreta and body fluids.

NEON will consider any items of clothing that have or may have been in contact with small mammal excreta or bodily fluids biohazardous. In such cases, clothing will be sterilized to ensure safety. According to the Centers for Disease Control and Prevention, decontamination can be accomplished by exposing contaminated clothing to UV for 4-6 hours or laundering in a washing machine using hot water and commercial laundry detergent. Spot treatment of personal attire or protective equipment using a spray bottle filled with quat cleaner will be performed in the field during sampling. . Contaminated clothing should not be washed with other personal or with family laundry. If washing cannot be performed immediately, potentially contaminated clothing will be stored in a biohazard bag.

Other personal protective equipment will be cleaned at the conclusion of each sampling day. Eye protection, respirators, and shoes will be wiped down with disinfectant, quat cleaner or 70+% alcohol. Gloves will be cleaned and disinfected. Disposable gloves will be discarded if they become torn or damaged while sampling, and after captures from each sampling grid have been processed. All items will be disposed of in a biohazard bag. Respirators will be fully cleaned in accordance with the NEON EHS Safety Policy and Program Manual (AD[03]).

7 PERSONNEL REQUIREMENTS

Trapping:

Technicians responsible for setting and checking traps must be willing and able to carry traps in bundles up to 40 pounds and wear the mandatory personal protective equipment (PPE) described in the NEON Operations Field Safety and Security Plan (AD[02]). Technicians who are responsible for checking traps but not handling captured animals must also be willing and able to (1) record data in neat, legible hand-writing, and (2) assist the mammal handler in any way (e.g., preparing tags for marking, handling or labeling blood samples after collection).

Handling:

The technicians employed to handle and process the small mammals must have prior experience handling wild small mammals or receive sufficient training prior to sampling, and must be able to correctly identify and safely process all small mammals potentially found within the domain. An identification key based on external features, and summary description of species expected in the study area, will be available for technicians in the field. All personnel shall thoroughly review the Guidelines of the American Society of Mammalogists for the use of wild mammals in research (Sikes et al. 2011) prior to field sampling.

8 TRAINING REQUIREMENTS

All technicians must complete required safety training as defined in the NEON Training Plan (RD[04]). Additionally technicians complete protocol specific training for safety and implementation of protocol as required in the Field Operations Job Instruction Training Plan (RD[05]).

The training plan for small mammal abundance and diversity will minimally include the following components:

1) A classroom session will be conducted prior to the field sampling to provide an overview of the procedure and the goals of the sampling. Review of the sampling equipment and the small mammal species of each site within a domain will be included.
2) NEON HQ staff or contractor will conduct hands-on training in the field prior to or throughout the first sampling bout. NEON HQ staff or contractor will perform hot checks of species ID on the NEON technicians involved in the data collection, if funding is made available.

All of the technicians will have access to the following materials:

1) Field guide to Mammals of North America
2) Electronic field guide to mammals of each particular domain
3) Dichotomous keys for small mammal species at each site
4) Equipment lists
5) Field Manual for Sampling and Observation

9 FIELD STANDARD OPERATING PROCEDURE

9.1 Sampling Frequency and Timing

Each core site will be sampled monthly, whereas each relocatable site will be sampled every other month, if weather allows and technician resources are available. Sampling bouts should occur as close as possible to the new moon, and the timing of sampling at each site should remain as consistent as possible with respect to the new moon over the course of NEON operations. This schedule is based on an assumption of 6 consecutive nights of trapping each month at the core site, 6 nights every other month at one of the relocatable sites, and 3 nights every other month at the remaining relocatable site. Six nights are envisioned as a means of accommodating three nights of trapping at two separate sets of grids. However, there is no scientific requirement to schedule the trapping in this way, if sufficient personnel are available to sample all of the grids in three nights. These details are left to the discretion of the Field Operations Field Operations Manager to be approved annually by Science Operations.

9.1.1 Criteria for Determining Sampling Dates

Sampling shall occur year-round, and sampling bouts should occur as close as possible to the new moon.

9.1.2 Sampling Frequency

Each core site will be sampled monthly, whereas each relocatable site will be sampled every other month. Where weather conditions prevent access to a site during particular seasons, sampling may be compromised. A minimum of 4 sampling bouts per year for relocatables and 6 for core sites shall be conducted.

9.1.3 Sampling Timing Parameters

The timing of sampling at each site should remain as consistent as possible with respect to the new moon over the course of NEON. Acceptable variation around this timing for the initiation of sampling from one sampling bout to the next is 1 – 5 days (relative to the new moon). Trapping at core and relocatable sites should occur within a 20 day window centered around the new moon (i.e., 10 days before the new moon – 10 days after). These details are left to the discretion of the Field Operations Field Operations Manager to be approved annually by Science Operations.

If weather or any other circumstances cause a night of trapping within the sampling bout to be missed, trapping may be resumed and continued as normal within 5 days of the latest night of trapping. If this is not possible, sampling should be resumed as soon as possible, while maintaining the timing of trapping relative to the new moon for the sites.

9.2 Equipment and Materials

A significant amount of specialized equipment is required to conduct surveys of small mammals. Therefore all field personnel must be familiar and comfortable with using all the equipment before heading into the field.

Table 2. Field Equipment List - Trapping

NOTE: Quantities are generous estimates per bout per site.

Maximo Item No.	Item Description	Purpose	Quantity per Bout	Habitat-Specific	Special Handling
MX - needed	Small Mammal Trap, Small, Folding, 3"x3.5"x9"	Trapping	1200	Domains 1-8 (not 4), 18, 19	
MX100702	Small Mammal Trap, X-Large, Folding, 3"x3.75"x12"	Trapping	1200	Remaining domains (not 20)	
Required	Black Oil Sunflower Seed	Trapping - bait	10 lb	all domains EXCEPT D20 and D4	
Required	White Proso Millet Seeds	Trapping - bait	20 lb	all domains EXCEPT D20 and D4	
Required	Batting, Cotton or Synthetic, For Small Mammal Trap bedding	Trapping - nesting material in cold temps	10 yd	all domains EXCEPT D20 and D4	
Required	5 x 4 x 21" 1 Mil Gusseted Poly Bags	Trapping - Trap collection bag	500	all domains EXCEPT D20 and D4	
Required	5% Carbaryl in powder form	Trapping- fire ant control	1 lb	order for domains: D2, D3, D7, D8, D11	Y
Suggested	Professional Model Tree Planting Bag with Split Bag	Carrying mammal traps	6	all domains EXCEPT D20 and D4	
Suggested	lumbar bags (or similar)	Trapping - bait carrying	8	all domains EXCEPT D20 and D4	
Suggested	>= gallon-sized bag secured to lumbar bag with carabiner	Trapping - batting carrying	8	all domains EXCEPT D20 and D4	
Suggested	Pencils - #3	Trapping - marking traps	6	all domains EXCEPT D20 and D4	
Suggested	Sharpies	Trapping - marking traps	6	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity per Bout	Habitat-Specific	Special Handling
Suggested	Wet erase markers	Trapping - marking traps	6	all domains EXCEPT D20 and D4	

Table 3. Field Equipment List - Handling

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	1-3 oz. amber glass bottle with dropper in lid	Anesthesia/ Euthanasia	2	all domains EXCEPT D20 and D4	
Required	Cotton Ball, Medium	Anesthesia/ Euthanasia	150	all domains EXCEPT D20 and D4	
Required	Isoflurane (Forane), Liquid, Halogenated Anesthesia,	Anesthesia/ Euthanasia	25 mL	all domains EXCEPT D20 and D4	Y
Required	Spoon, Stainless Steel, Tea Infuser, Spring Loaded	Anesthesia/ Euthanasia	2	all domains EXCEPT D20 and D4	
Required	Hand Warmer, Single use	Animal care	2	all domains EXCEPT D20 and D4	
Required	Sugar packets, small mammals	Animal care	2	all domains EXCEPT D20 and D4	
Suggested	Freeze-dried mealworms	Animal care - shrews	1-2 tbsp	all domains EXCEPT D20 and D4	
Suggested	Ventilated, folding cardboard carrier; approx.. 4 x 4 x 5 inches	Animal care	5	all domains EXCEPT D20 and D4	
Suggested	Nalgene screw top bottle (<5oz)	Animal care	2	all domains EXCEPT D20 and D4	
Required	Styptic Powder, 42g	Animal care (in case of open wound)	1 pack, 42 g	all domains EXCEPT D20 and D4	
Suggested	Freezer Bag, Resealable, 10" x 12" or 1 gal, 1.5 – 2 mil thickness	Handling	200	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Suggested	Freezer Bag, Resealable, 10" x 12" or 1 gal, 4 mil thickness	Handling	100	all domains EXCEPT D20 and D4	
Suggested	Shade/rain tent for processing rodents during inclement conditions, with ventilation and guy ropes and stakes	Handling	2	all domains EXCEPT D20 and D4	
Suggested	Backpack	Handling - equipment organization	2	All domains	
Suggested	Compartment box, polypropylene, clear, adjustable, 15 dividers, 9 1/8" x 4 15/16" x 1 3/8"	Handling - equipment organization	4	all domains EXCEPT D20 and D4	
Suggested	Compartment box, polypropylene, clear, adjustable, 20 dividers, 9 1/8" x 14 1/4" x 2"	Handling - equipment organization	2	all domains EXCEPT D20 and D4	
Suggested	Small Cat Sack With Full Underside Zip	Handling larger species	2	all domains EXCEPT D20 and D4	
MX100727	Small Animal Ear Tag, Approximately 0.5 in x 0.125 in, Laser-etched	Marking	200	all domains EXCEPT D20 and D4	
Required	Ear tag applicator	Marking	4	all domains EXCEPT D20 and D4	
Required	PIT tag portable reader capable of reading ISO 11784/11787 FDX-B and HDX PIT tags, simple data retrieval via USB port, Bluetooth	Marking	2	all domains EXCEPT D20 and D4	
Required	PIT tags + implanter - 8 - 12mm (prefer 9mm)	Marking	50	all domains EXCEPT D20 and D4	
Suggested	Multi-Tool, with Needle-nose Pliers, Knife, and Scissors	Marking	2	all domains EXCEPT D20 and D4	
Suggested	Diagonal Plier, 4 in	Marking (cutting off ear tags)	2	all domains	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	Metric Ruler, Clear Plastic, mm gradation, 12 inch length	Measurements	2	all domains EXCEPT D20 and D4	
Required	Ruler, Clear Plastic, Flexible, 6 in	Measurements	2	all domains EXCEPT D20 and D4	
Required	Scale, Spring, Tareable, Capacity 100 g maximum, Accuracy ±0.3%	Measurements	2	all domains EXCEPT D20 and D4	
Required	Scale, Spring, Tareable, Capacity 1000 g maximum	Measurements	2	all domains EXCEPT D20 and D4	
Suggested	Short (< 6 inches) piece of rope (550 paracord works well) for 1000 g scale	Measurements	2	all domains EXCEPT D20 and D4	
Required	Scale, Spring, Tareable, Capacity 30 g maximum, Accuracy ±0.3%	Measurements	2	all domains EXCEPT D20 and D4	
Required	Tissue Biopsy Punch, 2000 micron ID, clicker style	Sample collection	2	all domains EXCEPT D20 and D4	
Suggested	Scissors, fine-point, dissecting	Sample collection	2	all domains EXCEPT D20 and D4	
Suggested	Forceps, Fine Point, Stainless Steel	Sample collection	6	all domains EXCEPT D20 and D4	
Suggested	Label, Cryogenic, fits 1.2 -2 ml vials	Sample collection - labeling	500	all domains EXCEPT D20 and D4	
Required	Pen, marker, black, permanent, ultra-fine (0.3mm) Sharpie or equivalent	Sample collection - labeling	2	all domains EXCEPT D20 and D4	
Required	Pen, marker, black, permanent, ethanol safe 12 ea/ pkg	Sample collection - labeling	2	all domains EXCEPT D20 and D4	
Required	cooler + dry ice	Sample collection - storage and transport	2	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	1 – 2 mL cryogenic storage vials	Sample collection - storage of fecal samples and ear punches	500	all domains EXCEPT D20 and D4	
Required	Acid-free artifact identification tags + cotton string	Sample collection - vouchers	10	All domains	
Required	Archival coin envelopes, 2.25 x 3.5”	Sample collection - whiskers and hair	150	all domains EXCEPT D20 and D4	
Suggested	Cuticle clippers, 4" long, stainless-steel	Sample collection and ear tagging	2	all domains EXCEPT D20 and D4	
Required	Camera, Digital	Species IDs	2	all domains EXCEPT D20 and D4	
Required	Field guide, mammals	Species IDs	2	all domains EXCEPT D20 and D4	
Suggested	Hand lens, 10x, 7/16". Coddington type double lens magnifier	Species IDs	2	all domains EXCEPT D20 and D4	

Table 4. Field Equipment List - Cleaning and Sterilization

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	Butane Lighter	Sample collection - sterilizing tools	2	all domains EXCEPT D20 and D4	
Required	Wipe, Alcohol Pad, Individually Packaged	Sample collection - sterilizing tools	50	all domains EXCEPT D20 and D4	
Required	Plastic bottle with screw top + spray attachment (approx. 32 oz)	Cleaning - transporting quat	2	all domains EXCEPT D20 and D4	
Required	Biohazard bags, small	Waste disposal	10	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	Biohazard bags, large	Waste disposal	10	all domains EXCEPT D20 and D4	
Required	Tape for sealing biohazard bags (electrical tape or similar if autoclavable not needed)	Waste disposal	1 roll	all domains EXCEPT D20 and D4	
Required	Sharps container, portable, slip top, 1 qt, red	Waste disposal	2	all domains EXCEPT D20 and D4	
Required	Paper Towels, Basic	Cleaning - drying tools	2 rolls	all domains EXCEPT D20 and D4	
Suggested	Plastic tray for soaking tools in quat in the field	Cleaning – sterilizing tools	2	all domains EXCEPT D20 and D4	

Table 5. Field Equipment List - Personal Protective Equipment

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Required	Powder-Free Nitrile Exam Gloves, various sizes	Handling	30	all domains EXCEPT D20 and D4	
Suggested	Bite-proof, rubber-tipped gloves, various sizes	Trapping and Handling	8	all domains EXCEPT D20 and D4	
TBD	P100/Nuisance Organic Vapor Filter, Color Code Magenta, Bayonet Mount, For Use With 3M 6000/7000 Half and Full Face Respirator	Handling	10	TBD	
TBD	3M 6000/7000 Half Face Respirator	Handling	8	TBD	
Suggested	Disposable gown, one piece pullover, 1 mil thick, elastic sleeves	Handling	20	all domains EXCEPT D20 and D4	
Required	Safety glasses	Handling	10	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
TBD	P100 Particulate Respirator Mask	Handling	10	TBD	

9.3 Preparation

1) Make sure all traps and sampling equipment are functioning and sanitized.
2) Check functionality and cleanliness of all safety gear.
3) Field technicians should be prepared to identify all small mammal species in the area, but should also carry the keys provided and the field guide in the event of the capture of a rare species. Technicians also need to be very familiar with the grid coordinate system, so that capture locations are accurately documented:

Table 6. The grid coordinate system

↑ NORTH	A	B	C	D	E	F	G	H	I	J
1	A1	B1	C1	D1	E1	F1	G1	H1	I1	J1
2	A2	B2	C2	D2	E2	F2	G2	H2	I2	J2
3	A3	B3	C3	D3	E3	F3	G3	H3	I3	J3
4	A4	B4	C4	D4	E4	F4	G4	H4	I4	J4
5	A5	B5	C5	D5	E5	F5	G5	H5	I5	J5
6	A6	B6	C6	D6	E6	F6	G6	H6	I6	J6
7	A7	B7	C7	D7	E7	F7	G7	H7	I7	J7
8	A8	B8	C8	D8	E8	F8	G8	H8	I8	J8
9	A9	B9	C9	D9	E9	F9	G9	H9	I9	J9
10	A10	B10	C10	D10	E10	F10	G10	H10	I10	J10

4) Prepare a small vial of 10% sugar in water. This is used to revitalize stressed, hypothermic or heat-stressed captures. A clean eye drop bottle works well to administer the sugar solution. Always carry the bottle, and change the solution whenever mold growth is observed, at least monthly.
5) Transfer 1 – 3 ounces of anesthesia (isoflurane) into amber glass dropper bottle to carry into the field for blood sample collection, if planned, and/or in the event that an animal needs to be euthanized due to a serious trapping-related injury. Perform the transfer in a fume hood or well-ventilated location. Wear gloves whenever handling the anesthesia.
6) Prepare a small cooler of dry ice to be carried to processing station for field preservation of ear punch, fecal, and blood samples, if applicable.
7) Sterilize a sufficient amount of sunflower seeds and millet to prevent germination, and mix thoroughly (35:65 ratio – sunflower seeds: millet) to prepare trap bait.

a) Sterilization requires baking in a thin layer on a baking sheet for 45 - 60 minutes at 300°F.

8) Make sure all necessary permits and datasheets are in the field datum at all times.

9.4 Sample Collection in the Field

9.4.1 Trap Setting

1) Time sampling so that the last trap is being set as the sun is setting. Avoid setting traps > 2.5 – 3 hours before sunset, as this will increase the possibility of catching non-target, diurnal species such as chipmunks and ground squirrels.
2) At each grid station, place one Sherman trap.
   a) Adjust treadle **very carefully** (it will break otherwise) to reach the setting required to close the trap by a quick tap on the top of the trap.
3) Place at least 2 inches of batting in trap if appropriate – for some sites and conditions – consult site-specific appendices.
4) Toss bait into trap.
   a) Grab approximately 1 tablespoon (more if nighttime temperatures will be < 50 degrees Fahrenheit) of seed from lumbar bag. Toss seed into trap such that it is distributed from the front edge of the trap back.

9.4.2 Trap checking

1) A minimum of two technicians work as a pair to begin checking traps the following morning at dawn (i.e., as soon as it is light enough to see, typically within 30 minutes after civil twilight).
2) Check all traps in the sampling grid. Be sure to wear puncture resistant, rubber-tipped gloves.
   a) If the door of the trap is closed, VERY CAREFULLY PEEK inside to conduct rapid species identification, if possible. Many animals can escape surprisingly quickly. If the animal is definitively an individual of a non-target species, the animal should be released immediately at the site of capture. The capture should be recorded on the datasheet upon return to the processing station, including the trap location and species identification, at a minimum. If the species code is not known, be sure to explicitly define on the datasheet the code that is used in the interim.
   b) If the captured individual might be of a target or opportunistic species, mark trap with grid coordinate.
      i) Suggested method of marking: wet erase marker directly on the trap
      ii) Alternative method if damp: sharpie on plastic bag the trap is placed in (see step c below)
      iii) Alternative marking method when very wet: #3 pencil
   c) Place trap in plastic bag (e.g., 5 x 4 x 21" 1 Mil Gusseted Poly Bags) to prevent disease transmission among the mammals held in traps next to one another, and then transport bagged traps with captures back to processing station for the grid.
   d) If a trap door is closed, but there is no evidence that an animal visited the trap (i.e., no feces present), the trap may be re-used but the closed trap ID should be noted on the datasheet upon

return to the processing station. If there is evidence of an animal visit to a trap that did not result in successful capture (i.e., feces present), the trap should be marked, bagged, and removed from the grid for cleaning prior to redeployment.

e) Close empty traps for the day to avoid captures. Trap doors accidentally left open during the day will likely result in the capture and subsequent death of an animal due to heat stress.

i) If it is the last morning of sampling, remove all traps from the grid.

f) Check all traps in the grid before processing captures, so that all traps with captures can be placed in the shade in a timely fashion. Traps that are accidentally missed during the check will result in dead animals, and therefore extra effort should be made to prevent this.

3) Transport traps containing small mammals or small mammal sign to a processing station immediately adjacent to the trapping grid. Set-up the processing station, and be sure to wear the additional PPE specified in the NEON Operations Field Safety and Security Plan (AD[02]) for handling animals. Sample animals for population and pathogen data, as directed below.
4) Once processed and awake (if anesthesia has been used for pathogen sampling), return the individual to its respective trap and transport the trap to release the individual at the site of capture while wearing all PPE required for handling animals.
5) For each trapping station from which a trap has been removed, replace that trap with a sanitized new trap at any point, either prior to or during the trap setting effort in the evening. Bring all used traps back to the lab for cleaning.
6) Reset and re-bait all traps the following dusk. Clean traps that have been baited on previous trap nights will require a smaller amount of bait, but do still require some fresh bait to help lure the animals in.

9.4.3 Individual data collection

The following field methods are written in the order they should be completed for population and, if directed for the site, pathogen sampling. Species that do not need to be sampled for pathogens are not anesthetized (see Box 2 for bleeding criteria for species). Blood samples are collected according to the sample sizes and guidelines laid out in the Rodent-borne Pathogen Sampling Protocol (RD[08]).

1) All sampling is performed by a minimum of two technicians, one data recorder and one animal handler.
2) Set up all processing equipment in a small tray filled with quat, to sterilize instruments between individuals. Sterilizing equipment between individuals prevents disease transmission among captured mammals.
3) Record trap number (i.e., trapcoordinate, or 'PT') on the datasheet. Code the Notes column (15) with the corresponding code, if there are no animal data to record for that trap, or if the trap ID (e.g., E5) data has been compromised, thereby creating uncertainty in the trap location (Code 5 – trap ID suspect).
4) Very carefully peek inside the trap to assess whether the animal should be handled or not. Without attempting to handle, immediately release, in the vicinity of the processing station or site of

capture, any non-target mammal species, as well as birds and reptiles (possible, but extremely unlikely).

5) If the capture is of a target or opportunistic small mammal species:
   a) If the individual is clearly < 100 grams, place standard (1.5 – 2 mil), gallon-sized 'ziploc' bag over the end of the trap that opens, and turn trap over to deposit capture in bag.
   b) If the individual is > 100 grams, place 4 mil, gallon-sized 'ziploc' bag over the end of the trap that opens, and turn trap over to deposit capture in bag.
   c) If Sherman traps are of the folding variety, be sure to place the bag over the end without the pin sticking out to avoid snagging.
   d) If there is any uncertainty in the species identification, please note this in the idqCode column on the datasheet – using one of the codes below. Leave blank if there is not uncertainty.

idqCode	identificationQualifier Description*
CS	cf. species
AS	aff. species
CG	cf. genus
AG	aff. genus
CF	cf. family
AF	aff. family

* cf. roughly equals "not sure"; aff. roughly equals "similar to, but is not"

6) Place bag on the handling surface, and pin the animal in the bag behind the neck.
7) Immediately observe the animal for signs of stress, and continue to do so throughout the handling period.
   a) In the event that the animal shows signs of stress at any time:
      i) If the animal appears dead, closely examine for rigor and for respiration within the bag.
      ii) If the animal is clearly dead, collect the animal as a voucher specimen (see section 15.).
      iii) If there is no rigor and the animal may be overheated or dehydrated, wet the belly and administer sugar water via dropper.
      iv) If the animal appears hypothermic, place the animal in a secure container containing a disposable hand warmer, batting and bait. Check the animal every 15 minutes if possible, and release when the animal exhibits normal behavior.
   b) Dead animals should be processed only after all the live ones have been processed. Whisker, hair, and ear tissue samples are not collected from dead individuals.
8) Check capture for existing marking (ear tag or RFID tag).
   a) Determine if animal meets blood collection criteria.
      i) If the animal is both unmarked and meets the species-, size-, and condition-criteria described in the Rodent-Borne Pathogens Sampling Protocol (RD[08]), continue to the

instructions provided in that protocol. Once the blood sampling is complete, proceed with the following steps of this protocol.

ii) If the animal is marked and has not been bled within the same bout, proceed with bleeding as described in the Rodent-Borne Pathogens Sampling Protocol.

(1) Ear tags that do not have NEON laser-etched on them should be indicated by adding an 'O' for other in front of the ear tag id (e.g., OL1001).

iii) If the animal does not meet the criteria for bleeding, remove the non-anesthetized individual from the handling bag, and proceed with the following steps of this protocol.

b) NOTE: all steps of the following protocol should be followed for all individuals, including recaptures. Repeated measurements of the same individual are valuable. However, if time is limited during periods of unusually high capture rates, repeated size-related measurements of recaptures can be skipped.

9) If needed, mark the individual using an ear tag (one in left ear) or PIT (=RFID) tag.

a) Mode of tagging will be based on the length of the external pinnae, as some species, such as voles (e.g., *Microtus spp., Myodes spp.*) and pocket mice (e.g., *Chaetodipus spp., Perognathus spp.*); do not have sufficient pinnae for adequately securing ear tags. Shrews will not be marked.

b) Individual IDs will be of the form LXXXX (preferred, but RXXXX may be used), with L and R designating the left and right ear, respectively, and the Xs the unique tag numbers, when ear tags are used. If using a PIT tag, place one of the bar code stickers on the back of the datasheet, and record the LAST 6 digits of the serial number in the tag spaces provided on the datasheet. Be sure to indicate on the datasheet that the tag is new.

c) Once the individual is successfully marked, label all sample vials with the unique individual ID, as described below.

10) Note the estimated relative age of the animal:

a) juvenile (J)

b) sub-adult (S)

c) adult (A)

11) Note the sex and reproductive condition of the animal.

a) Males

i) Scrotal (S): testes may be descended (obvious bulging under the tail)

ii) Non-scrotal (N): testes not descended (abdominal)

b) Females

i) Vagina:

(1) Swollen (S) – indicates estrous

(2) Plugged (P) – (some use the term Perforate)

(3) Neither (N) – (some use the term Non-perforate)

ii) Nipples

(1) Enlarged (E)

(2) Not enlarged (N)

12) Take standard measurements to the nearest millimeter, using standard rounding guidelines:
    a) Right hind foot: measure the distance from the back of the heel to the end of the longest claw (beyond the fleshy toe). The 6 inch flexible ruler is the recommended tool for this measurement.
    b) Other measurements to be taken if useful for site-specific species discrimination (e.g., ear length for *Peromyscus spp.*, tail length for voles):
        i) Ear: Insert the end of the ruler in the notch at the base of the ear and measure the maximum length to the distal portion of the pinna (medial aspect), excluding hairs that project beyond the fleshy portion.
        ii) Tail length: Pin the animal onto the handling surface, belly down. Bend the tail up at a right angle. Measure from the bend on the back at the base of the tail to the tip of the fleshy part of the tail, excluding projecting hairs.
        iii) Total length:
            (1) If anesthetized and sufficiently drowsy: Place the animal flat on its back on the 12 inch rigid plastic ruler and hold it so that the body and tail are straight and taut, but not stretched. Measure the distance from the tip of the nose to the tip of the fleshy part of the tail, excluding any hairs which project beyond the tip.
            (2) If not anesthetized: Place animal, belly down, on the ruler (12 inch rigid ruler recommended) and hold it so that the body and tail are straight and taut, but not stretched. Measure the distance from the tip of the nose to the tip of the fleshy part of the tail, excluding any hairs which project beyond the tip.
13) Collect samples:
    a) All samples should minimally be labeled with the following data: tag ID (RXXX or PIT tag – last 6 digits), site code (e.g., RMNP), and date (YYYYMODD). Use pre-printed labels, if available. Use ethanol-safe pen for completing cryovial labels. Use an ultra-fine point Sharpie or equivalent permanent marker to write directly onto the cryovials. This pen or a permanent marker can be used to label coin envelopes.
    b) If possible, use different forceps for each sample. Forceps and biopsy punch (or scissors) used to collect ear tissue samples should be disinfected with quat or an alcohol wipe and then flamed with lighter in between processing individuals, to remove all traces of tissue.
    c) If the species belongs to the dominant genera at a site (see site-specific appendices):
        i) Use forceps to collect a tuft (approximately 5 hairs) of hair from the scruff of the individual, and use cuticle scissors (or similar) to clip off 2 whiskers – clip as close to the base as possible without injury – one from each cheek. Place these samples together in an archival coin envelope, and label.
    d) For all target and opportunistic captures:
        i) Collect any fresh, uncontaminated feces from the animal using either forceps or scooping the sample directly with the cryovial. If fresh feces are not available, collect “old” feces from the trap, if only one individual was captured in the trap. Put on dry ice until the samples can be placed in a -80 C freezer.

14) Collect one ear tissue sample – one from near the edge of the untagged (typically right) ear - using a clicker-style 2000 Micron (2 mm) tissue biopsy punch or fine-point dissecting scissors, and place in cryovial. Put on dry ice until the samples can be placed in a -80 C freezer.
15) Record the weight in grams using the appropriate, tared spring scale. Although the precision afforded by the different scales varies, weight should just be recorded to the nearest gram, using standard rounding guidelines. Return the animal to its trap, and then release at the point of capture as soon as possible.
16) Place ear tissue, blood, and fecal samples in a cooler with dry ice), labeled correctly, and entered on the datasheet.
17) **In between processing of individuals clean and disinfect processing station.**
    a) After an animal has been processed and returned to its trap, place all contaminated paper towels, plastic bags, gauze, and cotton in the biohazard bag.
    b) Place all used instruments in the tray filled with quat. Dry with paper towel before use, if necessary.
    c) Use quat and paper towels to carefully and thoroughly clean the larger reusable equipment (e.g., insulated cooler, squirt bottle containing quat).
    d) Always spray contaminated areas of clothing with quat as soon as possible.
18) **At the end of processing a grid:**
    a) Should there be any mortality, process these individuals after all the live animals have been processed.
    b) After all dead rodents are sampled; prepare voucher specimens.
        i) If the carcass is to be retained, label a specimen tag with the site code, animal ID number, sex, species, and date of capture.
        ii) Data on tags should be written with archival quality, ethanol-safe, permanent black ink (e.g., a Pigma pen) or, if this is not available, a hard lead pencil (#3) may be used.
        iii) Securely affix the tag to the right hind foot above the ankle, tying the tag as close to the leg as possible.
        iv) Place the animal in a gallon 'ziploc' bag and immediately place in the cooler. Avoid placing directly on dry ice.
        v) Note: If carcasses are not saved for voucher specimens (e.g., if they are in poor condition), they should be sprayed with disinfectant, placed in double biohazard bags, and disposed of in accordance with the Domain Chemical Hygiene and Biosafety Manual requirements (AD[03]).
    c) Dispose of all used bedding from dirty traps in biohazard bag.
    d) Pack up all supplies and equipment, once they are clean and dry.
    e) Close and seal the biohazard bag(s) containing the bulk of processing waste with tape (e.g., label or electrical).
    f) Clean PPE as directed, and dispose of final round of nitrile gloves and wipes into small biohazard bag. Close and seal the small biohazard bag with tape (e.g., label or electrical).

19) **At the end of a sampling day:**

a) Transport dirty traps in plastic bags in the bed of the pickup truck back to the Domain Support Facility, as dirty traps should not be reused until they have been cleaned and sterilized.

b) Transport vouchers back to the Domain Support Facility in the cooler, as soon as possible, and place in standard freezer until the disposition of the specimen is determined.

9.5 Sample Preservation

Transport samples intended for frozen storage from the field cooler to the appropriate freezer in the domain support facility within 5-8 hours of sample collection, depending on the longevity of the dry ice in the cooler.

Table 7. Sample collection and storage specifications

Sample	Storage container	Label	Field storage	Long-term storage
Hair/Whiskers	Archival coin envelope	Write on envelope	Ambient	25°C
Fecal	vial rated to -80°C	Label rated to -80°C	Dry ice	≤ -80°C
Ear punch	vial rated to -80°C	Label rated to -80°C	Dry ice	≤ -80°C
Vouchers	'ziploc' bag	Acid-free, archival tag	Dry ice	standard freezer (≤ 0 degrees but ≥ -20 degrees C)

9.6 Sample Shipping

The protocol for shipment to archival facilities is yet TBD 5/31/2013.

9.7 Data Handling

At the end of each field day or within two days of the completion of the sampling bout, all information from field data sheets must be scanned, transcribed to electronic datasheets and saved to the NEON server as directed by the Field Operations Manager. Data should be entered into the spreadsheet provided by the FSU staff scientist. Data should be made available to the FSU staff scientist within a week of collection, through the Cyber infrastructure-specified mechanism.

9.8 Equipment Maintenance, Cleaning and Storage

9.8.1 Field Clean Up

Cleanup should be done in the field to avoid contamination of laboratory facilities. If conditions are not conducive for this then transport potentially contaminated equipment back to the lab in one or more biohazard bags and clean them there.

All tools that come into contact with captured individuals (e.g., forceps, rulers, spring scales, etc.) are cleaned with quat cleaner and paper towels in between individuals. Similar methods are used to clean

any other non-disposable equipment that has been in contact with small mammals or associated excreta or body fluids, including the processing tables and chairs (if used). It is recommended that handheld tools be submerged in a plastic field container full of quat (at least 6 x 4 x 2" deep) in between individuals, and then wiped off with a paper towel before use.

All soiled disposable sampling items (e.g., trap bedding, paper towels), with the exception of sharps (e.g., PIT tag needles, heparinized microhematocrit tubes), are disposed of in a leak-proof autoclavable biohazard bag (red or orange bag with universal biohazard symbol or other bag tagged with red or orange universal biohazard symbol). At the end of each sampling day, the biohazard bags are transported in the bed of a pickup truck to the Domain Support Facility for storage until regularly scheduled removal.

All soiled disposable sharps (e.g., PIT tag needles, heparinized microhematocrit tubes) are immediately disposed of in a portable sharps container. Contaminated sharps must be discarded immediately or as soon as feasible in containers that are closable, puncture resistant, leakproof on sides and bottom, and labeled or color-coded in accordance with the standard ("Biohazard" or "Sharps"). Best practice also includes minimizing techniques that require the use of two hands, such as recapping needles or using a screw-top container (or any other 'make-shift' containers). To prevent needle sticks, needles will not be recapped or removed from syringes prior to discarding into the sharps waste container designated for biohazardous sharps. Use a 1 quart, slip-top, OSHA NIOSH/CDC compliant sharps container in the field, Store the Sharps container in a sealed plastic bag when not in use.

10 LABORATORY STANDARD OPERATING PROCEDURE

10.1 Sample Processing Timing

Cleaning of dirty traps occurs at the Domain Support Facility, at the earliest convenience of the domain staff. Cleaning should follow the guidelines provided in the NEON Operations Field Safety and Security Plan (AD[02]). Traps must be cleaned before re-deployment in the field. If stored for long periods, dirty traps must be stored in plastic bags in a well-ventilated area posted with Biohazard per Biosafety Level 2 requirements.

10.2 Equipment and Materials

Table 8. Laboratory Equipment List

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Suggested	Tubing, heat shrink, 3:1 shrink ratio, black, 6" length, wire range 12-6 AWG, 6 per pkg	Handling - for covering clamp teeth on spring scales	1 package	all domains EXCEPT D20 and D4	
Suggested	Bottle, spray, 480mL, PE bottle, PP spray, 6 ea./ cas	Cleaning traps	1 pack, 6	all domains EXCEPT D20 and D4	
Suggested	Brush, toilet bowl, stiff-bristled	Cleaning traps	6	all domains EXCEPT D20 and D4	
Suggested	Scrub Brush, Polypropylene bristle, Short Handle, 24.4 cm long x 7.6 cm wide brush head	Cleaning traps	1	all domains EXCEPT D20 and D4	
Suggested	Graduated Cylinder, Polypropylene, 25 mL, 0.5 mL graduation	Cleaning traps	2	all domains EXCEPT D20 and D4	
Suggested	Bucket, Plastic with Steel Handle, 5 gallon capacity, Round	Cleaning traps	10	all domains EXCEPT D20 and D4	
Required	Quaternary Disinfectant, Concentrated	Cleaning traps	1 bottle, 1 gal	all domains EXCEPT D20 and D4	Y
Suggested	Glove, Chemical-Resistant, Size 7, Flock-Lined	Cleaning traps	1	all domains EXCEPT D20 and D4	
Suggested	Glove, Chemical-Resistant, Size 8, Flock-Lined	Cleaning traps	1	all domains EXCEPT D20 and D4	

Maximo Item No.	Item Description	Purpose	Quantity	Habitat-Specific	Special Handling
Suggested	Glove, Chemical-Resistant, Size 10, Flock-Lined	Cleaning traps	1	all domains EXCEPT D20 and D4	
Suggested	Glove, Chemical-Resistant, Size 9, Flock-Lined	Cleaning traps	1	all domains EXCEPT D20 and D4	
Suggested	Glove, Chemical-Resistant, Size 11, Flock-Lined	Cleaning traps	1	all domains EXCEPT D20 and D4	
Suggested	Carboy, Round, LDPE, Wide-mouth with Spigot, and Screw Cap, 20 L (5.25 gal)	Cleaning traps	1	all domains EXCEPT D20 and D4	

10.3 Equipment Cleaning and Disposal Procedures

To reduce the risk of disease transmission to technicians and among captured small mammals, thorough cleaning and disinfection of equipment that is known to have been in contact with small mammals is required. Small mammal traps that have contained trapped animals will be removed from the trapping grid, transported back to the domain lab in a plastic bag, where dirty traps will be thoroughly cleaned, as described below. These traps will be replaced with clean traps before the next night of trapping.

When a trapping session is completed, all traps will be picked up and placed into a large plastic garbage bag. The bags containing traps will then be placed in the bed of a pickup truck, which is separated from the passenger compartment. Traps will then be soaked in, for a minimum of 10 minutes, and scrubbed out with quaternary ammonia solution (hereafter, 'quat') for sanitation. Traps will be rinsed thoroughly with water, to avoid damage and to remove as much of the disinfectant scent as possible.

All biohazard items will be disposed of in accordance with the NEON Domain Chemical Hygiene Plan and Biosafety Manual (AD[03]).

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Appendix A D1 – CORE - HARV (HARVARD FOREST)

Trapping Issues

- Slugs after rainfall events may fill traps
- Medium sized carnivore (e.g., fishers, raccoons) disturbance
- Do not trap when freezing temperatures are coupled with precipitation, or when there is sufficient snow on the ground (i.e., > 2-3 inches).

Use of bedding: Recommended when low temperatures are expected to be <65 ^{o}F.

Dominant genus for hair & whisker sampling purposes: Peromyscus

Species List and Abundance Estimates

This species list is based on Cardoza, Jones, & French, 2009. The abundance estimates were based on an average capture rate of 10%, as well as the species-specific relative abundances reported in *Degrassi & Ellison, 2013.*

Table 9. Site-specific species list (HARV)

Measurements: ear = ear length; TTL = total length; T = tail length; only if ID is questionable: (T tuft = tuft of hair at end of tail)

TARGET SPECIES (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Myodes gapperi	Gapper's Red-backed Vole	150 - 500	
Microtus pennsylvanicus	Meadow Vole	0 - 50	TTL + T
Napaeozapus insignis	Woodland Jumping mouse	0 - 50	
Peromyscus leucopus	White footed mouse	50 - 300	ear (T tuft)
Peromyscus maniculatus	N. American deer mouse	200 - 600	ear (T tuft)
Microtus pinetorum	Woodland Vole	0 - 20	TTL + T
Synaptomys cooperi	Southern Bog Lemming	0 - 20	TTL + T
Zapus hudsonius	Meadow Jumping Mouse	0 - 20	
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Blarina brevicauda	Northern Short-tailed Shrew	10 - 100	
Sorex cinereus	Masked Shrew	0 - 30	
Sorex fumeus	Smoky Shrew	0 - 30	
Tamias striatus	Eastern Chipmunk	10 - 100	
Glaucomys volans	Southern Flying Squirrel	0 - 20	
Sorex dispar	Long-tailed Shrew	0 - 20	

Sorex hoyi	American Pygmy Shrew	0 - 20	
Sorex palustris	American Water Shrew	0 - 20	
Glaucomys sabrinus	Northern Flying Squirrel	0 - 20	
Tamiasciurus hudsonicus	Red Squirrel	0 - 20	
NON-TARGET ANIMALS (Scientific and Common Name)			
Parascalops breweri	Hairy-tailed Mole	0 - 20	
Scalopus aquaticus	Eastern Mole	0- 20	

Appendix B D3 – CORE – OSBS (ORDWAY-SWISHER BIOLOGICAL STATION)

Trapping Issues

- Fire ants
  - If fire ant activity is present in the immediate vicinity of a trapping station, be sure to dust the ground under and around the trap with 5% carbaryl.
  - Traps can also be set closer to sunset and checked earlier, to minimize traps being open when ants are most active.
- Medium sized carnivore (e.g., coyotes, raccoons) disturbance
- Do not trap when freezing temperatures are coupled with precipitation, or traps are in any danger of becoming water-logged overnight.

Use of bedding: Recommended only when low temperatures are expected to be <65 ^{o}F

Dominant genus for hair & whisker sampling purposes: Peromyscus

Species List and Abundance Estimates

This species list is based on the Annotated Mammal Species List of the Ordway-Swisher Biological Station. The abundance estimates were based on an average capture rate of 10%, as well as the species-specific relative abundances reported by Dr. Bob McCleery at the University of Florida**.**

Table 10. Site-specific species list (OSBS)

Measurements: ear = ear length; TTL = total length; T = tail length; T tuft = tuft of hair at end of tail

TARGET species (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Neotoma floridana floridana	Florida wood rat	50 - 250	
Peromyscus gossypinus gossypinus	Cotton mouse	200 - 1000	ear and T
Peromyscus polionotus subgriseus	Oldfield mouse	100 - 500	ear and T
Podomys floridanus	Florida Deermouse	100 - 500	ear and T
Sigmodon hispidus hispidus	Hispid Cotton Rat	0 - 50	
Ochrotomys nuttalli	Golden Mouse	0 - 5	
Oryzomys palustris natator	Marsh rice rat	0 - 50	
Reithrodontomys humulis	Eastern Harvest Mouse	0 - 50	
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Blarina carolinensis	Southern Short-tailed Shrew	0 - 20	
Cryptotis parva floridana	Least shrew	0 - 20	

Sorex longirostris	Southeastern Shrew	0 - 20	
Glaucomys volans	Southern Flying Squirrel	0 - 20	
NON-TARGET ANIMALS (Scientific and Common Name)			
Geomys pinetis floridanus	Florida pocket gopher	0 - 20	
Scalopus aquaticus australis	Southern mole	0 - 20	

Appendix C D3 – RELOCATABLE – DISN (DISNEY WILDERNESS PRESERVE)

Trapping Issues

- Fire ants
  - If fire ant activity is present in the immediate vicinity of a trapping station, be sure to dust the ground under and around the trap with 5% carbaryl.
- Medium sized carnivore (e.g., coyotes, raccoons) disturbance
- Do not trap when freezing temperatures are coupled with precipitation, or traps are in any danger of becoming water-logged overnight.

Use of bedding: Recommended only when low temperatures are expected to be <65 ^{o}F

Dominant genus for hair & whisker sampling purposes: Peromyscus

Species List and Abundance Estimates

This species list is based on the Mammals of Florida | American Society of Mammalogists. The abundance estimates were based on an average capture rate of 10%, and, in the absence of existing data, estimates of captures are based on data for Ordway Swisher.

Table 11. Site-specific species list (DISN)

Measurements: ear = ear length; TTL = total length; T = tail length; T tuft = tuft of hair at end of tail

TARGET SPECIES (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Neotoma floridana	Eastern Woodrat	50 - 250	
Peromyscus gossypinus	Cotton Deermouse	200 - 1000	ear and T
Peromyscus polionotus	Oldfield Deermouse	100 - 500	ear and T
Podomys floridanus	Florida Deermouse	100 - 500	ear and T
Sigmodon hispidus	Hispid Cotton Rat	0 - 50	
Ochrotomys nuttalli	Golden Mouse	0 - 5	
Oryzomys palustris	Marsh Oryzomys	0 - 50	
Mus musculus	House mouse	0 - 50	
Rattus norvegicus	Norway rat	0 - 50	
Rattus rattus	Black rat	0 - 50	
Reithrodontomys humulis	Eastern Harvest Mouse	0 - 50	
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Blarina carolinensis	Southern Short-tailed Shrew	0 - 20	
Cryptotis parva floridana	Least shrew	0 - 20	
Sorex longirostris	Southeastern Shrew	0 - 20	
Glaucomys volans	Southern Flying Squirrel	0 - 20	

NON-TARGET ANIMALS (Scientific and Common Name)			
Geomys pinetis	Southeastern Pocket Gopher	0 - 20	
Scalopus aquaticus	Eastern Mole	0 - 20	

Appendix D D10 – CORE – CPER (CENTRAL PLAINS EXPERIMENTAL RANGE)

Trapping Issues

- Kangaroo rats require larger traps (12" long rather than 9"), to minimize trap-related injuries to their long tails.
- Coyote disturbance

Do not trap when freezing temperatures are coupled with precipitation, or when there is sufficient snow on the ground (i.e., > 2-3 inches).

Use of bedding: NOT recommended under any circumstances.

Dominant genus for hair & whisker sampling purposes: Dipodomys

Species List and Abundance Estimates

This species list is based on the Shortgrass Steppe LTER website (http://sgs.cnr.colostate.edu/species_list.aspx, accessed 2012). Abundance estimates were based on an average capture rate of 10%, and the species-specific abundances reported in Evangelista et al., 2008.

Table 12. Site-specific species list (CPER)

Measurements: ear = ear length; TTL = total length; T = tail length; T tuft = tuft of hair at end of tail

TARGET SPECIES (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Chaetodipus hispidus	Hispid Pocket Mouse	0 - 50	
Dipodomys ordii	Ord's Kangaroo Rat	300 - 1000	
Microtus longicaudus	Long-tailed Vole	0 - 50	TTL and T
Microtus pennsylvanicus	Meadow Vole	0 - 50	TTL and T
Neotoma cinerea	Bushy-tailed Woodrat	0 - 50	
Onychomys leucogaster	Northern Grasshopper Mouse	50 - 400	
Perognathus fasciatus	Olive-backed Pocket Mouse	0 - 50	T
Perognathus flavescens	Plains Pocket Mouse	0 - 50	T
Perognathus flavus	Silky Pocket Mouse	5 - 100	T
Peromyscus maniculatus	N. American Deer Mouse	25 - 300	
Reithrodontomys megalotis	Western Harvest Mouse	5 - 200	T

Reithrodontomys montanus	Plains Harvest Mouse	5 - 100	T
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Cryptotis parva	North American Least Shrew	0 - 20	
Spermophilus spilosoma	Spotted Ground Squirrel	0 - 20	
Spermophilus tridecemlineatus	Thirteen-lined Ground Squirrel	0 - 20	
NON-TARGET ANIMALS (Scientific and Common Name)			
Geomys bursarius	Plains Pocket Gopher	0 - 20	
Mustela frenata	Long-tailed Weasel	0 - 5	1

Appendix E D10 – RELOCATABLE – STER (STERLING)

Trapping Issues

- Coyote disturbance
- Do not trap when freezing temperatures are coupled with precipitation, or when there is sufficient snow on the ground (i.e., > 2-3 inches).

Use of bedding: TBD - depends on the relative abundance of heteromyid species

Dominant genus for hair & whisker sampling purposes: Peromyscus

Species List and Abundance Estimates

This species list is based on the North Sterling State Park website (http://www.parks.state.co.us/parks/northsterling/Pages/NorthSterling.aspx, accessed 2012). Abundance estimates were based on an average capture rate of 10%, and provided relative abundances.

Table 13. Site-specific species list (STER)

Measurements: ear = ear length; TTL = total length; T = tail length; T tuft = tuft of hair at end of tail

TARGET species (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Chaetodipus hispidus	Hispid Pocket Mouse	0 - 50	
Dipodomys ordii	Ord's Kangaroo Rat	0 - 50	
Microtus ochrogaster	Prairie Vole	0 - 50	TTL and T
Microtus pennsylvanicus	Meadow Vole	0 - 50	TTL and T
Mus musculus	House Mouse	0 - 50	
Neotoma cinerea	Bushy-tailed Woodrat	0 - 5	
Onychomys leucogaster	Northern Grasshopper Mouse	0 - 50	
Perognathus flavescens	Plains Pocket Mouse	0 - 50	T
Perognathus flavus	Silky Pocket Mouse	0 - 50	T
Peromyscus maniculatus	Deer Mouse	5 - 500	
Reithrodontomys megalotis	Western Harvest Mouse	5 - 100	T
Reithrodontomys montanus	Plains Harvest Mouse	0 - 50	T
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Cryptotis parva	Least Shrew	0 - 20	
Sorex cinereus	Masked Shrew	0 - 20	
Spermophilus spilosoma	Spotted Ground Squirrel	0 - 20	
Spermophilus tridecemlineatus	Thirteen-lined Ground Squirrel	0 - 20	

NON-TARGET ANIMALS (Scientific and Common Name)			
Geomys bursarius	Plains Pocket Gopher	- 20	

Appendix F D10 – RELOCATABLE – RMNP (ROCKY MOUNTAIN NATIONAL PARK)

Trapping Issues

- Cold temperatures, wind, and snow
  - Do not trap when freezing temperatures are coupled with precipitation, or when there is sufficient snow on the ground (i.e., > 2-3 inches).
- Bear and elk disturbance

Use of bedding: Recommended when low temperatures are expected to be <65 ^{o}F

Dominant genus for hair & whisker sampling purposes: Peromyscus

Species List and Abundance Estimates

This species list is based on Armstrong, 2008, as well as the NEON 2012 capture data. The abundance estimates were based on an average capture rate of 10%, with declining returns of unique individuals over the consecutive nights of a sampling bout, as well as the species-specific relative abundances reported in Maher, 2010.

Table 14. Site-specific species list (RMNP)

Measurements: ear = ear length; TTL = total length; T = tail length; T tuft = tuft of hair at end of tail

TARGET SPECIES (Scientific and Common Name)		Number to be Used Annually	Measure-ments
Myodes gapperi	Red-backed vole	50 - 200	
Lemmiscus curtatus	Sagebrush Vole	20 - 100	TTL and T
Microtus longicaudus	Long-tailed Vole	20 - 200	TTL and T
Microtus montanus	Montane Vole	20 - 200	TTL and T
Neotoma cinerea	Bushy-tailed Woodrat	0 - 50	TTL
Neotoma mexicana	Mexican Woodrat	0 - 5	TTL
Peromyscus maniculatus	N. American Deermouse	500 - 2000	ear
Peromyscus nasutus	Northern Rock Deermouse	0 - 50	ear
OPPORTUNISTIC ANIMALS (Scientific and Common Name)			
Sorex cinereus	Cinereus Shrew	0 - 25	
Sorex hoyi	American Pygmy Shrew	0 - 25	
Sorex merriami	Merriam's Shrew	0 - 25	
Sorex monticolus	Dusky Shrew	0 - 50	
Sorex nanus	Dwarf Shrew	0 - 25	
Sorex palustris	American Water Shrew	0 – 10	
Zapus princeps	Western Jumping Mouse	5 – 100	
Spermophilus elegans	Wyoming Ground Squirrel	0 - 50	
Spermophilus lateralis	Golden-mantled Ground Squirrel	5 - 50	
Spermophilus variegatus	Rock Squirrel	0 - 10	
Tamias minimus	Least Chipmunk	100 - 500	
Tamias quadrivittatus	Colorado Chipmunk	0 - 20	
Tamias umbrinus	Uinta Chipmunk	20 - 100	
Tamiasciurus hudsonicus	Red Squirrel	0 - 50	
NON-TARGET ANIMALS (Scientific and Common Name)			
Thomomys talpoides	Northern Pocket Gopher	0 - 50	

Appendix G PRIORITIZATION GUIDELINES

Table 15. Spatial replication and distribution priorities for small mammals, 2013

						Priority			NOTE
D	Site	Vegetation (NLCD 2006)	Size (km^2)	%	Target Number of Plots	1	2	3	
1	HARV	Woody.Wetlands	3.8898	8	2			2	2 training grids
1	HARV	Mixed.Forest	9.9477	22	2		2		
1	HARV	Evergreen.Forest	15.8256	35	3	3			
1	HARV	Deciduous.Forest	20.0349	44	3	3			
3	DSNY	Pasture.Hay	4.0068	10	3	1	1	1	
3	DSNY	Woody.Wetlands	39.5892	100	7	3	1	3	2 training grids
3	OSBS	Grassland.Herbaceous	1.719	8	2		1	1	
3	OSBS	Emergent.Herbaceous. Wetlands	3.4911	16	2		1	1	
3	OSBS	Woody.Wetlands	6.1776	29	3	3			
3	OSBS	Evergreen.Forest	11.8908	55	3	3			
10	CPER	Grassland.Herbaceous	62.6688	100	10	6	2	2	2 training grids
10	RMNP	Grassland.Herbaceous	19.2123	21	3	3			
10	RMNP	Evergreen.Forest	93.3093	100	5	3	2		2 training grids
10	STER	Cultivated.Crops	0.65	100	4	3	1		1 training grid

Temporal priorities

1. Current plan is for one bout of sampling every month at core sites and every other month at relocatable sites.
2. The 3 bleeding grids are always the priority for sampling. If necessary, the sampling could be reduced to only these grids for November through February.
3. All effort should be made within each sampling bout to conduct a minimum of 2 nights of sampling, as required to generate density estimates. Three nights are preferable, however, due to the significant increase in data quality and decrease in uncertainty around the density estimates yielded by the additional recapture data.

Appendix H EXAMPLE DATASHEET