NEON BIOREPOSITORY: SAMPLE USE POLICY

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See configuration management system for approval history.

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Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	10/15/2009	NEON.MGMT.NPR.000185.CRE	CCB approved initial release
B	09/26/2011	ECO-00283	Update to new document numbers/template throughout document
C	01/10/2022	ECO-06755	Significant updates to the entire document

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1 DESCRIPTION

The purpose of this document is to detail plans and policies regarding the use of samples and specimens (referred to below as *samples*) accessioned and held by the NEON Biorepository. This policy is intended to provide a structured and consistent process to maintain sample integrity and to enable necessary sample discoverability, access, and use by the scientific research community. The loan policies described here are based in part on those applied by the University of Colorado Museum of Natural History (ED[01]). They represent components of established natural history collections practices and policies that are specific to the NEON Biorepository.

We recognize and expect that it is not feasible to account for all future sample uses and circumstances in this document; indeed, a certain degree of pragmatism and flexibility is built in to serve its broad function. We commit to handling special cases openly, fairly, and with a focus on balancing short- and long-term benefits for the greater NEON research community.

1.1 Scope

This document applies to all samples collected by NEON during the course of operational sampling at all terrestrial and aquatic sites (excluding samples collected by NEON for external investigators under the NEON Assignable Assets program). This includes those associated with the Aquatic Observation System (AOS), Terrestrial Observation System (TOS), Aquatic Instrument System (AIS), and Terrestrial Instrument System (TIS).

1.2 Background

A key feature of NEON's science design is to establish a "…curated collection of organisms, key body parts of organisms, and substrates… open to researchers for analysis, both now and in the future as new technologies emerge." (AD[01]). The NEON Biorepository encompasses aquatic and terrestrial samples collected during annual sampling at NEON sites – i.e., voucher specimens, whole or partial organisms, tissues, and samples processed for chemistry, disease and genetics.

The overarching goal of the NEON Biorepository is to make reference material and replicate samples available to the science and education communities for future research and retrospective studies. The collected samples provide a rich resource for future research efforts, e.g., enabling scientists to identify organisms, analyze archived samples for viruses and other pathogens, and perform new isotopic, biogeochemical and microbial analyses. The concept of operations for the NEON Biorepository is detailed in a companion document (AD[02]).

1.3 Guiding Principles

1. The NEON Biorepository is one means for effective interaction and engagement with the research community to foster continental-scale ecology; as such, the NEON Biorepository should

be receptive and responsive to investigator requests. Close collaboration with the requestor will be a key to success.

2. While providing for the research needs of requestors, a balance will be struck between the immediate needs of an individual investigator and the desire to reserve a suite or subset/portion of samples to allow for decadal and broad geographic scale analyses.
3. Data handling and distribution resulting from the use of NEON samples will proceed in conformance with NEON's data use policy (RD[01]).
4. The cost of sample processing and shipping loans to requestors will be handled on a case-by-case basis. At present, the NEON Biorepository will cover routine sample processing tasks - prior to shipment and as indicated by the research request – as well as shipping costs, for small-scale or exploratory studies. Larger-scale and/or longer-term sample processing (e.g., imaging, analysis, subsampling) and shipping needs will typically have to be financed by the requestor.
5. When there are conflicting sample requests, the priority for loans will generally be as follows:
    a. NSF-BIO sponsored research
    b. Other NSF sponsored research
    c. Other, non-NSF research funding sources
    d. Educational applications
    e. For-profit research companies/commercial applications (not applicable to samples owned by the National Park Service unless specifically authorized)
6. The evaluation and approval of sample requests by the NEON Biorepository staff, in consultation with the NEON Biorepository Technical Working Group (TWG), will focus on technical and logistical criteria as well as scientific justification. The latter is not intended to subsume the scientific merit review that may have been conducted for the sponsoring agency, but, rather, is a means to ensure the highest and best use of this valuable but limited resource, as well as transparency and accountability to the greater research and collections communities.
7. Samples collected in units of the National Park System remain federal property under the authority of the National Park Service and, as such, are subject to a distinct set of guidelines.

2 RELATED DOCUMENTS, ACRONYMS AND DEFINITIONS

2.1 Applicable Documents

AD [01]	NEON Observatory Design https://www.neonscience.org/sites/default/files/NEON_Strategy_2011u2_0.pdf
AD [02]	NEON.DOC.004525 NEON Bioarchive: Concept of Operations

2.2 Reference Documents

RD [01]	NEON Data Use Policy https://www.neonscience.org/data-samples/data-policies-citation

2.3 External Documents

ED [01]	CU-Boulder Museum of Natural History Loan Policies https://www.colorado.edu/cumuseum/research-collections

2.4 Acronyms

Acronym	Definition
ASU	Arizona State University
DOT	Department of Transportation
IATA	International Air Transport Association
NEON	National Ecological Observatory Network
NPS	National Park Service
NSF	National Science Foundation
SEM	Scanning Electron Microscopy
TWG	Technical Working Group
USDA-APHIS	United States Department of Agriculture - Animal and Plant Health Inspection Service

2.5 Definitions

Term	Definition
Destructive use	Any procedure performed on a sample that results in destruction of a sample, such that the sample may no longer be suitable for future research.
Consumptive use	Any procedure performed on a sample that results in partial consumption of a sample, such that the remaining sample is expected to be suitable for future research.
Invasive use	Any procedure performed on a sample that may result in the alteration of the condition of that sample without consuming or destroying the sample.
Sample	Material acquired at one sampling location (such as a plot) during an individual sampling event. 'Sample' is used synonymously with 'specimen' herein.
Loan	Temporary transfer of samples from the NEON Biorepository to a requestor's institution for all uses except for destructive use (in which no viable sample remains to be returned).

3 General Loan Policies

NEON Biorepository samples are available for use for a diversity of scientific and educational purposes. Loans involve a temporary transfer of samples from the NEON Biorepository (or other host of NEON samples, namely Georgia Southern University where the ticks are housed) to a requestor's institution for all uses except for destructive use (in which no viable sample remains to be returned). Samples may be made available to established institutions, and requests are only considered from permanent staff or faculty members of universities, museums, and scientific organizations. Requests from students, postdoctoral fellows, or visiting researchers must be cosigned by a sponsor such as a faculty advisor or

resident curator/collection manager affiliated with the borrowing institution. Ultimate responsibility of the samples is assumed by the institution to which the samples are provided. Samples may not be transferred or moved to another institution without prior written permission from the NEON Biorepository.

Loans are typically granted for a 6-12 month period; a longer period may be accommodated if properly justified. Extensions should be requested *before* the current loan period expires. Delinquent loans may delay the processing of new requests and/or prevent future loan requests by the individual borrower or affiliated institution.

Ordinarily, not more than one-half of a sample or series of samples from a NEON site may be borrowed at any one time. The remainder may be requested upon the return of the first loan. Additional policies for loans for consumptive or invasive sampling or sacrifice of samples for destructive uses are subject to policies outlined in Section 4 below.

All loan requests, no matter the quantity, are considered on a case-by-case basis. Endangered taxa, fragile specimens, or samples which are deemed to be in limited supply are generally not considered for loans. However, researchers are strongly encouraged to inquire and to visit the NEON Biorepository to access these directly on site at Arizona State University, where collections, laboratory facilities, and specialized and supportive staff are available for visiting researchers.

For large or complicated requests of material, researchers should plan to visit the NEON Biorepository using their own funds to select specimens for sampling or to study them directly on site where suitable. Removal of material from samples selected by the researcher requires approval by NEON Biorepository staff. On-site visits reduce the demands on the limited Biorepository staff, allows the investigator to make more precise selections of material, and may enable investigators to accomplish an entire research task on site, eliminating both extensive pre-shipment sample processing tasks and costs and shipping and the associated risks to the integrity of the samples.

3.1 Care and Handling

Loaned material should be handled with great care. All labels, tags, and accompanying data are to be kept associated with samples. Loaned material should be stored in secure cabinetry in a secure, climate-controlled facility for the duration of the loan. Fluid-preserved specimens should be maintained in the proper fluid and kept moist in that fluid during examination (i.e., never transferred to water, even briefly).

Loan recipients are expected to have or acquire any needed permits to receive and ship samples – e.g., USDA-APHIS permits for soil samples. Some additional restrictions to sample access and use may apply, such as in the case of samples acquired on National Park Service (NPS) lands (see section 3.2).

Specimens may not be altered in any way without express written permission from the NEON Biorepository. Do not subject loaned material to any mechanical or chemical treatments or other

destructive, consumptive, or invasive uses without prior approval. Final disposition of any products of preparation by the researcher(s), such as genomic extracts, histological or karyotypic slides, shall be determined as part of the request process prior to the provisioning of samples and will be stipulated in writing to ensure mutual understanding.

All loans, and any agreed upon material being returned to the NEON Biorepository, shall be returned via commercial, high-quality carriers with tracking capability; United States Postal Service registered/insured priority mail is generally not acceptable. Loan materials should be carefully packed in a manner consistent with archiving needs, as specified in applicable loan agreements, adhering to all applicable IATA/DOT Dangerous Goods regulations.

Deposition of types. The ASU Natural History Collections house numerous type specimens of diverse organismal lineages. Holotypes and (where available) reasonably sized and varied series of paratypes being newly described or designated from NEON Biorepository samples should be deposited with Arizona State University. The specific collection coden will vary with sample type.

3.2 National Park Service Loan Guidelines

The National Park Service requires the following provisions be included in loans of NPS samples.

NPS samples:

1) are to be used solely for non-commercial scientific and/or educational purposes, as described in the user's proposal, unless commercial use is specifically authorized by the National Park Service (NPS);
2) will not be used in human subjects, in clinical trials, or for diagnostic purposes involving human subjects without the written consent of the NEON Biorepository and NPS;
3) are to be used only at the recipient organization and only in the recipient scientist's laboratory under the direction of the recipient scientist or others working under their direct supervision; and
4) will not be transferred to anyone else within or external to the recipient organization without the prior written consent of the NEON Biorepository on behalf of NPS and execution of an appropriate loan or other agreement.

The complete set of NPS conditions will be provided at the time of loan for signature by the receiving institution, along with the Sample Use Agreement provided by the NEON Biorepository (see section 6.2 for more information).

4 Destructive, Consumptive & Invasive Sampling

Permission must be granted to perform any type of destructive, consumptive, or invasive sampling on NEON Biorepository samples. This can include dissection, preparation for SEM photography, removal of tissues, DNA extraction or sequencing, pathogen analysis, clearing and staining, hair sampling, chemical analysis, or any similar procedure.

To balance the need to preserve NEON Biorepository samples for future use with the demand to conduct valuable near-term research, the following guidelines will be used:

1. To the extent possible, samples will be kept in their original condition during such procedures (e.g., storage temperatures maintained to the extent possible).
2. Any physical material remaining after the analysis will be returned to the NEON Biorepository unless otherwise agreed upon in writing. If remaining material requires storage in a container other than the original, the container must be labeled with the associated NEON sample identifiers, at a minimum, as well as determination and identification of contents, if possible. These data must also be provided to the NEON Biorepository electronically in a mutually agreed upon format. Remaining materials may include, but are not limited to:
   - Specimens and dissected parts (including stomach contents). Detached parts retained should be rehoused in vials or an appropriate container.
   - SEM stubs.
   - Histology and karyotypic slides (slides should be labeled with NEON sample identifiers and determination).
   - Unused tissues and samples (dry, frozen, or ethanol-preserved).
   - DNA and other nucleic acid extracts.

   If permission is granted in writing, any material retained by the researcher(s) should also be labeled with the associated NEON identifiers. The investigator shall notify the NEON Biorepository staff prior to discarding any of these materials.
3. Decisions to grant or not grant permission for destructive, consumptive, and/or invasive sampling will be made by the NEON Biorepository Project Manager in consultation with the Biorepository TWG. The criteria that will be considered for these decisions include:
   - Rarity of the species or sample and its representation within the NEON Biorepository collections. Procedures that will fully destroy specimen or associated sample of a rare species should be scrutinized for alternative, information-preserving solutions.
   - Degree of intended destruction, consumption, or invasiveness.
   - Physical condition of the specimen(s).
   - Significance of the proposed research relative to NEON's mission to enable continental-scale ecology.
   - Qualifications of the investigators.
   - Requests to consume NPS samples will also require NPS authorization.
4. If a request for destructive, consumptive, and/or invasive sampling is not permitted, the NEON Biorepository Project Manager will provide the rationale for the decision to the requestor. The

requestor may request that the NEON Biorepository Project Manager elevate the decision to NEON Leadership and the Science, Technology, and Education Advisory Committee.

5 Image Reproduction and Photography Policy

5.1 Image Reproduction

The Image Reproduction Policy of the NEON Biorepository pertains to original photography of collection objects, analog or digital, and derivative images made from existing transparencies, negatives, prints, and electronic media in the NEON Biorepository data portal (https://biorepo.neonscience.org/portal/). Typically, these images will be made available under the Creative Commons license CC0 1.0 Universal (https://creativecommons.org/publicdomain/zero/1.0/), with exceptions clearly indicated. The NEON Biorepository and/or individual author(s) should be acknowledged when using or reproducing these images.

5.2 Image Creation

Photographers creating images of NEON Biorepository samples are strongly encouraged to share these through the NEON Biorepository data portal under the CC0 1.0 Universal license. This policy is nevertheless respectful of other special licensing arrangements that may be in effect, depending on the origin and context of application.

6 Request Submission and Evaluation Process

Requests for NEON Biorepository samples can be submitted at any time with sufficient lead time to allow for evaluation, sample preparation, and shipping.

6.1 Request Template

All requests for samples will be made in writing and should be submitted online at https://biorepo.neonscience.org/portal/misc/samplerequest.php. Requests should contain the following information:

1. Full name of requestor (and sponsor, if applicable), institutional affiliation, mailing address, email, and phone number.
2. Sponsoring/funding agency and program.
3. NEON sample identifiers and complete taxonomic information (if applicable) of requested samples.
4. Proposed activities to be conducted using the loaned samples:
    a. Non-destructive: e.g., types of measurements to be taken.
    b. Destructive/Consumptive/Invasive Sampling:
        i. Proposed study and research methods.

ii. Specific techniques to be used, including previous experience and success of the researcher using such techniques. This includes the specific genes to be sequenced and the type of sequencing to be performed, if applicable.

iii. Quantity of tissue or sample requested.

5. Summary of the project, including the research question to be addressed or other desired outcome(s), its scientific merit, and the intended products (e.g., publicly available dataset, peer-reviewed publication, research proposal, new sample type, etc.).
6. Justification for use of destructive, consumptive, and/or invasive sampling techniques, with consideration of alternative approaches.
7. For loans, requested borrowing period of material (generally 6-12 months but may be extended).

6.2 General Steps in the Request Process

6.2.1 Preliminary steps for projects in the proposal preparation phase

Step A1. The requestor(s) submit a sample use request to the NEON Biorepository: https://biorepo.neonscience.org/portal/misc/samplerequest.php

Step A2. The NEON Biorepository staff makes an initial evaluation to assess feasibility and scientific justification, where appropriate with input from the NEON Biorepository TWG, and if approved, provides an initial cost estimate to fulfill the request, typically within two weeks.

Step A3. If approved, the researcher(s) submit(s) a proposal with a NEON Biorepository Letter of Collaboration (or similar) to the respective funding agency.

6.2.2 Steps for projects ready to execute

Step 1. The requestor(s) submit a sample use request to the NEON Biorepository: https://biorepo.neonscience.org/portal/misc/samplerequest.php. For projects that completed the preliminary step A1 above, the need for this step, in essence a second request, is contingent upon completeness of the information initially provided. Typically, investigators are not able to provide all necessary details described in Section 6.1 (e.g., exact sample identifiers desired) until their project is funded, thereby necessitating a second request.

Step 2. The NEON Biorepository staff reviews and communicates its approval of or clarifying questions for the request, typically within two weeks.

Step 3. If approved, the NEON Biorepository staff prepares a Sample Use Agreement with a final estimate of the cost to package and ship the requisite samples. If loan includes NPS samples, additional agreement terms will also be provided.

Step 4. Once the agreement is signed by both parties, necessary funds and/or other resources are provided to cover non-routine pre-shipment sample processing costs as well as shipment costs, either by the NEON Biorepository (small and exploratory samples) or by the research team or project (larger and complex samples or sample processing requirements).

Step 5. Upon receipt of funds/resources, NEON Biorepository staff prepare and ship the requisite (and appropriately processed) samples.

6.3 Roles and Responsibilities

NEON Biorepository PI (Principal Investigator – Nico Franz): Responsible for overall management of the NEON Biorepository including oversight of loan request and processing.

NEON Biorepository Project Manager (Kelsey Yule): Responsible for researcher engagement with the NEON Biorepository and creation and coordination of sample-based research, data practices, and products.

NEON Biorepository Collections Managers: Process owners and leads for loan request evaluations; seeking input from the NEON Biorepository TWG in the evaluation of individual requests. Ensure that all loan requests and transactions are fully documented and tracked.

NEON Biorepository Informaticians: Create, maintain, and further develop services through the NEON Biorepository data portal.

NEON Biorepository TWG: Members of the Biorepository Technical Working Group, volunteer external subject matter experts.

6.4 Operational Considerations

For most simple requests – a limited number of samples from a limited number of sites – the researcher(s) should plan on a 4-6 week turn-around time. Larger, more complicated requests may require 6-8 weeks or more, depending upon level of complexity, sample preparation requirements, and competing priorities. While the intent is to be as responsive as possible, requesters should plan sufficiently far in advance. Quicker turnaround times may be possible under favorable circumstances.

It is presumed that the agency sponsoring the proposed research will have performed a scientific merit review as part of the researchers' formal proposal to that sponsoring agency, e.g., the U.S. National Science Foundation (NSF). Scientific merit review of proposals planning to make use of NEON Biorepository samples remains the purview of the funding agency. As such, researchers should obtain a Letter of Collaboration for their proposed use of any such samples prior to submission of research proposals to the responsible funding agency.

Please note that the NEON Biorepository is an NSF asset, and all requests for use of NEON samples may be subject to NSF concurrence.

6.5 Sample Use Agreement

A standard Sample Use Agreement will be agreed upon by the NEON Biorepository and the researchers' institution prior to shipping. This agreement will define the roles and responsibilities of each party; terms and conditions of the loan; processing and delivery procedures and schedules; funding requirements; and other resourcing needs as appropriate. The Agreement will also specify funds needed to cover sample shipments, including the cost of supplies, materials, shipping and any special preparation or handling requirements.

6.6 Data Reporting and Citation

NEON encourages investigators using NEON Biorepository samples to make their research data freely and openly available as soon as possible (within two years of project completion); visit the following website for recommendations: https://www.neonscience.org/data-samples/guidelines-policies/publishing-research-outputs. This includes, but it is not limited to, copies of any ancillary data generated from loans such as images, computerized tomography scans, measurements, scale counts, sex and reproductive data, and genetic sequences. Any sequence data extracted from NEON Biorepository samples should be provided to GenBank, with GenBank accession numbers reported back to the NEON Biorepository for cross-referencing in the sample record.

Please refer to the NEON data policies at https://www.neonscience.org/data-samples/data-policies-citation for guidance on appropriate citation. Sample identifiers should be included in publications and other products resulting from the sample use. For publications referencing NPS samples, the citation should also include the following terms: "National Park Service Specimens and Material at NEON Biorepository at Arizona State University," park name, specimen name, NPS catalog number, applicable NPS Scientific Research and Collecting Permit number(s), and NEON Biorepository catalog number. Copies of publications resulting from work on material loaned must be sent to the NEON Biorepository (biorepo@asu.edu).