NEON Protocol:
NEON FSU Field and Lab Protocol for Ops CPER 2011: Tick-borne Disease

PREPARED BY	ORGANIZATION	DATE
Yuri Springer	FSU	3/25/2011

APPROVALS (Name)	ORGANIZATION	APPROVAL DATE
Becky Kao	FSU	9/29/2011

RELEASED BY (Name)	ORGANIZATION	RELEASE DATE
Anne Balsley	CCB ADMINISTRATOR/DCS	10/03/2011

See Configuration Management System for approval history.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
-	3/25/2011	ECO-00151	INITIAL DRAFT RELEASE
A_DRAFT	09/23/2011	ECO-00280	Update to new document number's/template throughout document.

TABLE OF CONTENTS

LIST OF TABLES

1 INTRODUCTION

1.1 Purpose

The primary purpose of this document is to provide change controlled version of Observatory protocols and is the version used for external review by subject-matter experts. This document provides the content for training and field-based materials for NEON staff and contractors. Content changes (i.e. changes in particular tasks or safety practices) 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 (i.e. how to drive a boat)*
- *site-specific safety practices (e.g. how to safely walk in a stream)*
- *general maintenance (i.e. fill the car with gas)*

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

1.3 Acknowledgements

If a protocol is based closely on the work of another program or author, note that here.

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Reference Documents

(If you want to reference other procedural documents (e.g. associated Protocol document), drawings, etc. then include filenames in the following sections.)

RD[01]	NEON.DOC.000008 NEON Acronym List
RD[02}	EHS Safety Policy and Program Manual
RD]03…]	<primary science design docs explaining/justifying this protocol/these procedures>
RD[04]	NEON Sampling Design Document
RD[05]	Training Plan
RD[05]	NEON.DOC.000243 NEON Glossary of Terms
	QA/PA Plan
	DOORS requirements
	ATBD
AD[01]	FSU Science Requirements
AD[02]	FSU Field Operations Plan
AD[03]	Data Products Level 1-3 Catalog

2.2 Acronyms

Insert table for definitions of acronyms used in this document.

NEON	National Ecological Observatory Network
FSU	The NEON Fundamental Science Unit at Headquarters
P&P	Procedure and Protocol

3 BACKGROUND AND OBJECTIVES

3.1 Background

This document describes the required protocols for conducting field sampling, making a human-mediated field observation, or operating an instrument to make measurements in the field, or any other activity that generates a Level 0 data product.

Briefly describe science rationale for selecting protocol. Specific details of methodology are described in standard operating procedures (SOPs) included as appendices. Recommended length <1 page.

3.2 Science Requirements

This protocol fulfills the following Observatory science requirements:
List science requirements from DOORS that are met by this protocol.

3.3 Data Products

List Level 0 data products measured by protocol.

Table 1 A summary of field and related lab measurements and the associated NEON Data Products

Measurement	Data Product

4 PROTOCOL

Summarize the science rationale (e.g. experiment design), include key citations. Briefly summarize the procedure included in this document and variations in how NEON is implementing this protocol in different locations throughout Observatory (e.g. above ground tree biomass for temperate vs. tropical zones). If the protocol is based on existing published procedures, reference those here (e.g. "These methods are based on the amazing work of John Updike (1964). No one has come up with anything better since then.").

A protocol is a formal summary description of a procedure and its related rational. A protocol 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; can also be called a method.

Read more:
http://wiki.answers.com/Q/What_is_the_difference_between_a_method_and_a_procedure#ixzz1FInck5Na

Identify assumptions or known-unknowns of the chosen protocol.

Identify and summarize quantitative aspects of the procedure (timing, # plots, # samples, location of sensors).

Provide a simple timeline diagram or table if pre-field activities occur the day prior to the field day, or if the field procedure is a multi-day task.

5 QUALITY ASSURANCE AND QUALITY CONTROL

Summarize QA/QC plan and reference QA/QC document.

6 DECISION TREE

Summarize for the field technician or manager any implementation decisions regarding the protocol.

7 SAFETY

Personnel working at a NEON site should be familiar with and practice safe field work as outlined in the EHS Safety Policy and Program Manual. 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.

Safety for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. While Lyme disease does not occur in Colorado, field personnel working at the Central Plains Experimental Range (CPER) site in spring 2011 may encounter species of ticks that vector other pathogens (e.g., *Dermacentor andersoni* bites can spread Colorado tick fever). Given this risk, personnel should conduct visual tick checks at the conclusion of each field day to ensure that they are not being bitten by any ticks (especially individuals in the nymphal stage). These checks should be performed slowly and meticulously as ticks are often small and can be difficult to see. Checks performed in pairs are recommended.
2. **** Note that the above are merely recommendations for safe implementation of the associated protocol(s) and that formal safety guidelines and procedures must and have yet to be developed, approved, and communicated by NEON's Environmental Health and Safety Department ****

Any safety issues specific to the procedure should be detailed here, along with references to any pertinent safety standards.

8 PERSONNEL REQUIREMENTS

Include special skills or subject matter expertise required (e.g. able to identify regionally specific plants by visual inspection, through use of dissecting microscope and through use of dichotomous key)

9 TRAINING REQUIREMENTS

Reference NEON Training Plan document relevant to this method.

10 FIELD STANDARD OPERATING PROCEDURE

10.1 Sampling Frequency and Timing

Sampling frequency and timing for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. Sampling bouts, each lasting less than 8 hours, will occur weekly (on the same day of the week) beginning the week of May 16 and ending the week of June 13. This results in a maximum total sampling effort of 5 bouts, 50 transects, and 5,000m^2 of surveyed area.

Based on sampling frequency information, list estimated dates that correspond with timing rules or estimated dates when timing rules are fulfilled for each NEON site where this procedure is implemented. Include range of scientifically acceptable sampling timing. If the procedure involves multiple sampling events, include the sampling frequency and timing for each measurement. You may wish to summarize in a table.

Table 2 The approximate sample dates for sampling

Domain	Date	Frequency
D10, CPER, Field Ops 2011	May 16-June 13	Weekly

10.2 Contingent decisions

Contingent decisions for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. See Appendix E

Summarize what-if decisions (how to accommodate site-specific or changing conditions).

Example: If it starts raining halfway through the microbe sampling, work must stop for the day. 24 hours after the rain stops, work can continue from the previous stopping point (i.e. work does not need to be repeated).

Example: If you are unable to begin checking small mammal traps prior to 9am, field technicians should open all traps to release animals and avoid heat-induced mortality. Work should start over that night by resetting the traps.

10.3 Field Procedure

Write the procedure as if a PDA were not available. This way, when the asteroid hits the earth and disrupts all electrical equipment, the field personnel can reference the "old school" procedure and collect data. These non-PDA procedures also help CI to define PDA and data ingest requirements, and provide sufficient information for an external reviewer to assess the procedure without the need of a PDA.

10.3.1 Equipment and Materials

Equipment and materials for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

- Computer with Microsoft Excel installed and/or a digital wristwatch with stopwatch feature
- Drag cloth: a $1m^2$ piece of white flannel or corduroy material (1m, or 3.3 ft on each side) with a 1m (3.3ft) long circular dowel (wood or PVC) attached to one end
- Compass
- Transect tape at least 100m (328ft) in length with marks at 20m (66ft) increments
- Forceps
- Sample storage vials
- Squirt bottle containing 95% ethanol
- Extra container of 95% ethanol to refill squirt bottle as necessary
- Reusable ice packs
- Tyvek long pants
- Fragrance-free laundry detergent
- Dish sponge
- Datasheets

Include all standard and unique equipment and capabilities required to execute the procedures in this document, including:

- *A detailed list of materials (e.g. equipment, sampling gear, sample containers, chemical preservatives) used in the field.*
- *Do not include materials used for separate but related activity; that will be included in the Procedure for that activity (i.e. lab vs. field materials).*
- *Describe the chemicals being used or as a preservative when samples are immediately returned to the field – exact chemical constituents and strength, and bottle size. Leave a place-marker in the draft if unknown.*
- *Illustrations of materials (e.g. sampling gear) – all in jpeg format, 3 inches wide*
- *Can be in bullet point or table format, but be consistent throughout the document.*

10.3.2 Preparation

Preparation for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. One to two days prior to sample collection, ensure that all necessary equipment and supplies, including consumables, are available and functionally ready for use.
2. The location of transect origin points will be determined by FSU. Prior to going into the field, use a map to identify the locations of the origin points at the site and determine how to access them.
3. For each transect origin point, a randomly-chosen transect heading value (compass bearing along which the associated pair of transects will be walked) must be generated. This should be done before going into the field using a random number generator in Microsoft Excel.
    a. In a blank spreadsheet fill the numbers "1, 2, 3, 4….360" down in column A. These represent all possible transect heading values (in degrees).
    b. In cell B1 type "=rand()" to generate a random number.
    c. Highlight all the cells in column B that have a corresponding transect heading value in column A (range should be B1 through B360) and then select "Edit > Fill > Down". This should populate the cells in column B with random numbers.
    d. Highlight columns A and B and select "Data > Sort" and select to sort by Column B and to sort "ascending" and click OK. This will randomly sort column A.
    e. Record the first ten transect heading values in column A (cells A1-A10), then highlight columns A and B again and repeat the sorting procedure four times so you have ten transect heading values recorded for each of the five transect origin points. Note that if during the process of recording the transect heading values you attempt to "copy" and "paste" the values into another Microsoft Excel worksheet or file you will need to select "Edit > Paste special > Values" rather than simply using the "Edit > Paste" command. Also note that each time you resort by column B, new random numbers will be generated automatically by Microsoft Excel.

    If for some reason randomly-chosen transect heading values cannot be generated using Microsoft Excel, or the printout of these transect heading values is not available in the field for some reason, transect heading values can be generated using a digital stopwatch.
    a. Start the stopwatch and after allowing it to run for some haphazard period of time (at least one minute) stop it without looking at the watch display.
    b. Multiply the number of seconds displayed on the stopwatch by six to generate a compass heading. For example, a stopwatch display showing 17 seconds would produce a heading of 102 degrees.
    c. Repeat the procedure until you have ten transect heading values recorded for each of the five transect origin points

- *Describe all activities that must occur prior to arrival in the field, for example equipment calibration or preparation.*
- *A detailed list of tasks, using the numbering format shown below. Be consistent.*

10.3.2.1

10.3.2.1.1

10.3.2.1.2

10.3.2.2

10.3.2.2.1

10.3.2.2.2

10.3.2.3

- *Break each step down into actionable steps*
- *Described and list the tasks in chronological order*
- *If pre-field tasks occur over multiple days, break Section 7.1 down further (e.g.:*
  - *One week prior to sample collection, do this*
  - *Two days prior to sample collection, do this*
- *Be explicit and use language geared toward 3rd yr undergraduate student. Assume the user has no previous knowledge of the activity.*
- *Include a description of what sampling gear, equipment, etc. they need to verify are in working order and properly packaged for the field day.*
- *Define safe practices (e.g. use gloves to mix chemicals in the fume hood), where necessary at each step. Do not assume this information is written elsewhere – include all relevant safety procedures in every document. Each document should be written as a stand-alone document.*
- *Illustrations or photographs of tasks that are complex or would benefit from an illustration – jpeg format, 3" wide.*

10.3.3 Sample Collection in the Field

Sample collection for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. Before heading to the first transect origin point in the field, put on Tyvek pants. These will make it easier to see ticks that have attached to your legs as you conduct fieldwork. Tuck pant cuffs underneath socks to prevent ticks from crawling underneath your pants.
2. Travel to the location of the first transect origin point using a handheld GPS preloaded with location waypoints or using maps and/or textual descriptions of the site. As you come within 100m (328ft) of the origin point note the path by which you arrive.
3. Once at the origin point, use the compass and your list of ten randomly generated transect heading values to determine the direction in which to walk the pair of transects. If the first transect heading value on your list is associated with a path that overlaps/intersects the one by which you arrived at the origin point then successively consider the nine other transect heading

values until you identify one that does not overlap/intersect the path by which you arrived at the origin point.

4. With a transect heading selected, one member of the team holds the free end of the transect tape and remains standing at the origin point while the other walks out along the transect heading vector for a distance of 100m (328ft), holding the transect tape spool and unspooling the tape as they go. When 100m (328ft) of transect tape has been laid out, pull the transect tape taught and lay the tape spool on the ground. The team member who unspooled the tape should then return to the transect origin point by walking directly on top of the transect tape.
5. Back at the origin point, perform an inspection of your and your partner's shoes and pants to remove all larval, nymphal, and adult ticks that may have become attached prior to the start of sampling. Store any ticks that you remove in an empty collection vial (not containing ethanol!) labeled "release" (for release following the sampling). This vial can be reused for the same purpose during future sampling.
6. Label a vial in which ticks collected on the pair of transects associated with the current transect origin point will be stored and add 95% ethanol (~½ the volume of the vial).
7. Standing at the transect origin point and looking down the transect tape towards the tape spool, the first transect begins at a start point 2m (6.6ft) to the left of the transect origin point. This distance can be measured using the dowel in the drag sampler, which is 1m (3.3ft) long. Place the drag cloth on the ground at the start point with the dowel perpendicular to the direction of the transect and then begin walking slowly along a path parallel to the transect tape, pulling the drag cloth behind you. Your pace should be equivalent to a leisurely stroll. One member of the team should pull the drag cloth while the other walks behind it. Endeavor to maintain a constant distance of 2m (6.6ft) from the transect tape as you walk.
8. Every 20m (66ft) along the transect both team members should stop and inspect the drag cloth and their shoes and pants for ticks. Remove each attached larval, nymphal, and adult tick, grabbing them by a leg with forceps and placing them into the labeled, ethanol-containing vial. Care should be taken to avoid crushing or otherwise damaging specimens with the forceps as this could complicate taxonomic identification. Make sure ticks are immersed in the ethanol and killed to insure that they are not able to crawl out of the vial. The team member who is not pulling the drag cloth should record the number of ticks collected (including the number in the larval, nymphal, and adult stages if they can be confidently distinguished) on the datasheet.
9. When you have travelled the full 100m (328ft) of the first transect and arrived at a spot perpendicular to the transect tape spool, perform a final check for ticks attached to persons and the drag cloth and deposit any collected specimens in the sample vial.
10. Turn 90 degrees to the right and walk 4m (13ft) so that you are positioned 2m (6.6ft) on the opposite side of the transect tape handle. Perform a quick tick check to insure that you have not picked up any ticks during this movement. Place any ticks you remove from your persons in the vial labeled "release" (for release following sampling).
11. Begin the second transect by walking back towards the transect origin point and repeating the protocol used for the first 100m transect.
12. Once you have returned to the transect origin point, all ticks from the second transect have been collected and stored in the labeled, ethanol-containing vial, and the vial closed, sampling

at this transect origin point has been completed. Record the sample vial label information on the datasheet.

13. Release ticks collected and stored in the vial labeled "release" as you depart from the transect origin point.
14. Sample vials containing collected ticks should be transported back to the lab in a cool container (e.g., back pack, ice chest) out of direct sunlight.

- *A detailed list of tasks:*
- *Break each step down*
- *Describe and list the tasks in chronological order*
- *List decision criteria used to implement procedure based on plot/sampling location conditions (i.e. sampling plot composition, stream width, etc.).*
- *If field tasks occur over multiple days or are complex, break this section down further (as shown in previous Section)*
- *Be explicit and use language geared toward 3rd yr undergraduate student*
- *Include detailed instructions on assembly of sampling gear, if gear is assembled in the field. If gear is assembled/disassembled in the Domain Office (e.g. not in the field), include that detail in the Pre- or Post-Field Task sections*
- *Include safety issues and practices*
- *Illustrations or photographs of tasks that are complex or would benefit from an illustration – jpeg format, 3" wide.*

10.3.4 Sample Preservation

Sample preservation for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. Sample vials contain ticks stored in 95% Ethanol.
2. In the lab, transfer sample vials into one of the following storage locations, listed in order of decreasing preference: a) -20°C freezer, b) 4°C refrigerator, c) flammables cabinet at ambient temperature.
3. Samples can be stored indefinitely in any of the aforementioned storage locations.

- *Detail the task in order from start to finish*
- *Include how long (time/days/yrs/indefinitely) sample can be preserved in this mode.*
- *Only include activities that relate to the Field Task.*
- *If a sample is processed at the Domain Lab, that work is a written in the next Section or as a separate document if complex.*

10.3.5 Sample Shipping (may not be applicable for all Field SOPs)

Sample shipping for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. No samples will be shipped as part of this exercise.

- *Provide detail on shipping specifics (e.g. wrap the sample containers in a plastic bag, seal the top. Place containers upright in cooler labeled "Elephant Samples", include four reusable ice packs. Seal the container.*
- *In addition to the shipping label, the following hazmat labels are required:*
- *Check with EHS for label requirements*

10.3.6 Data Handling (may not applicable for all Field SOPs)

Data handling for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. At the end of each field day, all information from field data sheets must be entered into and saved to the NEON database (likely a Microsoft Excel file) as directed by the Field Manager.

   Briefly explain data upload steps (e.g. enter data into excel file name "XXXXX", plug in PDA, etc., etc.).

10.3.7 Refreshing the Field Sampling Kit

Refreshing the field sampling kit for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. Inventory equipment and supplies, particularly consumables, and arrange for the purchase or acquisition of replacement and/or additional materials as necessary.
2. Refill ethanol squirt bottle and refill storage container as needed from stock stored in flammables cabinet.
3. Gather additional sample storage vials as needed.
4. Print new datasheets as needed.

   - *Provide detail on how to restock the sampling kit with non-perishable items. Best practice is to restock the sampling kit after the sample event, with a check at the start of each sample event that the kit is appropriately stocked*
   - *Reference the materials list, above*
   - *Be explicit and ensure information does not overlap or refute early info (ex. If preservatives used in the field have to remain cold, then the 'refreshment' of the preservative is a detailed in Section 7.2 and not here.)*

10.3.8 Equipment Maintenance, Cleaning, and Storage

Equipment maintenance, cleaning, and storage for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. If the drag cloth is dirty, wash it by hand using fragrance-free laundry detergent and immediately hang it to dry. If a laundry drier is used select a low heat setting to prevent the drag cloth from shrinking. Drag cloth dimensions must remain $1m^2$ to maintain standardized sampling effort.

2. Clean any other equipment as necessary using dilute laundry detergent and a dish sponge and once dry, store in a cool, dry container.
3. Store ethanol squirt bottle and refill container in a flammables cabinet.
4. Store drag cloths and other supplies in an out-of-the-way location in the lab.

- *Include maintenance of sampling gear as they relate to this Procedure, such as battery recharge.*
- *Do not include vehicle maintenance or maintenance of gear commonly used in the field such as a mosquito net or boots. Maintenance of common field items will be a different document.*
- *Include relevant safety issues and practices*
- *Be explicit*
- *Illustrations or photographs of tasks that would benefit from an illustration, jpeg 3" wide.*

11 LAB STANDARD OPERATING PROCEDURE

Write the lab procedures as if a PDA were not available. Use the same sections as the field protocol, above.

Separate the lab procedures into multiple sections and add on to the above title. For example:
11 Lab Standard Operating Procedure - Plant identification and drying
12 Lab Standard Operating Procedure - Plant mounting

11.1 Timing

Timing for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

Provide details on preferred timing of sample processing at the domain labs AND the maximum time between field collection and lab processing If the procedure involves multiple sampling events, include the sampling frequency and timing for each measurement. You may wish to summarize in a table.

11.2 Lab Procedure

11.2.1 Equipment and Materials

Equipment and materials for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.2 Preparation

Preparation for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.3 Sample Processing in the Lab

Sample processing for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.4 Sample Preservation

Sample preservation for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.5 Sample Shipping

Sample shipping for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.6 Data Handling

Data handling for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.7 Refreshing the Laboratory Supplies

Refreshing the laboratory supplies for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

11.2.8 Laboratory Maintenance, Cleaning, Storage

Laboratory maintenance, cleaning, and storage for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

1. There are no laboratory activities associated with this exercise.

12 DEFINITIONS

Define all protocol specific technical terms in alphabetical format.

13 REFERENCES

Use Ecology style

APPENDIX A Field Data Sheets

The following field data sheets serve as a backup procedure for times when electronic data collection devices (PDA) are not available.

Include copies of all data sheets – jpg format
(data sheets are useful for CI to define PDA and data ingest requirements)

APPENDIX B Lab Data Sheets

The following data sheets serve as a backup procedure for times when electronic data collection devices (PDA) are not available.

Include copies of all data sheets – jpg format
(data sheets are useful for CI to define PDA and data ingest requirements)

APPENDIX C Considerations for implementation

Indicate activities that could result in equipment damage, degradation of sample, or possible invalidation of results; listed here and at the critical steps in the procedure.

Describe any component of the process that may interfere with the accuracy of the final product.

Discuss how to avoid common errors in sampling or common ways samples can be contaminated.

Clearly flag things that might impact their work or the scientific data that aren't covered in the procedural pieces (stupid examples: "We're measuring nitrates, if you are exposed to or using nitrates at home on your lawn, trace amounts might contaminate our data"; "If it's raining, sky water getting into the samples before you seal them could alter results")... i.e. call out weird issues and folklore explicitly. See: http://en.wikipedia.org/wiki/Phantom_of_Heilbronn

APPENDIX D Procedure Checklist

APPENDIX E Contingent Decisions

Contingent decisions for the 2011 field ops exercise at the D10 Central Plains Experimental Range (CPER) site *(TBR)*:

Delay Duration	Action	Adverse Outcome?	Outcome for Data Products
hours	Note duration and cause of the delay. Resume normal sampling at the conclusion of the delay. Although not ideal, drag sampling can be conducted after rains when ground is wet	Could bias sampling if there are strong diurnal patterns in tick questing behavior	Could bias sampling if there are strong diurnal patterns in tick questing behavior
1 day	Note duration and cause of the delay. Conduct sampling as normal at the conclusion of the delay. Although not ideal, drag sampling can be conducted after rains when ground is wet. Do not adjust (push back) dates for subsequent sampling bouts.	Consistent temporal interval of time series data interrupted (minimally)	Compromise statistical analysis of temporal trends in the data
2-10 days	Note duration and cause of the delay. Conduct sampling at conclusion of the delay. Although not ideal, drag sampling can be conducted after rains when ground is wet. Do not adjust (push back) dates for subsequent sampling bouts.	Consistent temporal interval of time series data interrupted (moderately)	Compromise statistical analysis of temporal trends in the data
11-13 days	Note duration and cause of the delay. Contact appropriate scientific lead(s) on the FSU team for guidance. Cancel the	One sampling bout is missed	Reduction in sample size as sampling bouts are missed

	impacted sampling bout. Resume sampling at next scheduled sampling bout. Do not adjust (push back) dates for subsequent sampling bouts.		
2 or more weeks	Note duration and cause of the delay. Contact appropriate scientific lead(s) on the FSU team for guidance. Resume sampling at first scheduled sampling bout following the conclusion of the delay. Do not adjust (push back) dates for subsequent sampling bouts.	One sampling bout is missed for every delay of 15 days	Reduction in sample size as sampling bouts are missed