

APPENDIX B
Forested terrestrial protocol and datasheets

**STANDARD OPERATING PROCEDURE
FOR THE QUICK ASSESSMENT PROTOCOL:
FORESTED TERRESTRIAL**

**IN SUPPORT OF
U.S. ENVIRONMENTAL PROTECTION AGENCY**

**UNDER
RCRA ENFORCEMENT, PERMITTING, AND ASSISTANCE (REPA3)
ZONE 2 - REGION 5**

CREATED FOR USE BY EPA REGION 5

**FORESTED TERRESTRIAL SOP, REVISION NO. 3
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1.0 Scope and Application

Knowledge of ecosystem health and quality is an important component of successful ecosystem management. Ecological assessments are increasingly used in support of adaptive ecosystem management and informed resource management. Rapid ecological assessment is a common technique that is most often used to objectively assess the biological diversity of a relatively unknown ecological area. However, this assessment technique can also be used to evaluate ecological characteristics other than diversity.

The purpose of this standard operating procedure (SOP) is to detail a rapid ecological assessment protocol for evaluation of the condition of forested terrestrial ecosystems. This forested terrestrial protocol is one of four protocols originally drafted as a product of a workshop held in June 2003. It was then revised after being field tested by the participants of a second workshop held in spring 2004. When using this SOP, the associated Quality Assurance Project Plan (QAPP) should be consulted. The QAPP serves as a generic plan for all data collection activities conducted under the SOP and offers guidelines for ensuring that data are of sufficient quality and quantity to support project objectives. Decisions regarding the application of data collected while using this SOP should consider the precision, accuracy, and other statistical characteristics of these data.

2.0 Method Summary

This SOP provides instructions for a rapid ecological assessment of forested terrestrial ecosystems, using fauna surveys, flora surveys, and soil sampling of a 300-m by 300-m study plot. Generally, the optimal season for implementing this protocol is during the growing season. Late spring offers the best opportunity for sampling nesting birds in most temperate locations; however, this will not be the ideal time to identify all plants. It is most important to sample all sites in a relatively small window (e.g., mid-May to mid-June, depending on latitude and other climatic factors) to make comparisons across sites. The protocol is intended to be completed in approximately four hours and requires a four-person team working together in pairs, as a fauna/soil crew and a flora crew.

The fauna/soil pair conducts the fauna and soil portions of the protocol. Fauna surveys include: 1) 20 minute periods of bird observation from two different observation points within the plot; 2) traversal of three transects, along which crew members look for fauna signs such as scat, and examine coarse woody debris for invertebrates and other fauna; and 3) up to three holes excavated to determine earthworm presence or absence. This field crew also looks for evidence of natural and human disturbances, and pushes soil cores to determine depth, color, and composition of soil horizons.

The flora crew conducts flora surveys at nine flora nodes. During these surveys, 1) trees are surveyed by the point quarter sampling method; 2) saplings are surveyed in 5-m x 5-m quadrats; and 3) understory vegetation is surveyed in 10-m x 10-m quadrats. Detailed procedures are provided in Section 7.0.

3.0 Definitions

Coarse woody debris (CWD): Defined as: “sound and rotting logs and stumps, and coarse roots in all stages of decay, that provide habitat for plants, animals and insects and a source of nutrients for soil structure and development; material is generally greater than 7.5-cm in diameter.” (Source: Stevens 1997).

Canopy class: Also referred to as “crown class”; the relative position of an individual tree or shrub crown with respect to competing vegetation, and the amount of light received by the tree or shrub. (Modified from USDA FS 1989). For the purposes of this protocol, canopy classes are dominant, co-dominant, or non-dominant.

Co-dominant: Trees or shrubs with crowns receiving full light from above, but comparatively little from the sides. Crowns usually form the general level of the canopy. (Modified from USDA FS 1989).

DBH: The diameter of a tree at breast height, or at 4.5 ft (1.37 m) above the forest floor on the uphill side of the tree. For the purposes of determining breast height, the forest floor includes the duff layer that may

be present, but does not include unincorporated woody debris that may rise above the ground line. (Source: USDA FS 1989).

Disturbance: A natural or human-induced (anthropogenic) environmental change that affects an ecosystem's floral, faunal, or microbial communities. Disturbance may include, but is not limited to: roads, gravel, asphalt, trails, berms, ruts in the soil, eroded areas, evidence of digging, hydrologic modifications (e.g., ditches, weirs), evidence of mowing or tree felling, wind throw mounds, evidence of fire, litter, tires, refrigerators, manure, and pig ruts.

Dominant: Trees or shrubs with crowns receiving full light from above and partial light from the sides; usually larger than the average trees or shrubs in the stand, and with crowns that extend above the general level of the canopy and that are well developed but possibly somewhat crowded on the sides. A dominant tree is one which generally stands above all other trees in its vicinity, but the dominant canopy class could also include a smaller tree that still receives full light from above and partial light from the sides. (Modified from USDA FS 1989).

Fauna signs: Indications or signs that fauna are, or have recently been, present. May include, but are not limited to: calls, tracks, mounds, burrows, holes, nutshells, scat (e.g., deer-pellet clumps), runways or trails, browse lines, and tree rubbing.

Non-dominant: Trees or shrubs with crowns that may or may not reach the canopy level, but that receive little or no direct light from above and none from the sides. (Modified from USDA FS 1989).

Saplings: Woody plants with diameters ranging from 2.5 cm to 10 cm.

Snags: Standing dead trees.

Stand: A standing growth of trees or plants.

Stand initiation: The first successional stage that occurs after a major disturbance. During this stage, species are invading and the environment, growth pattern, and size of each plant are rapidly changing. (Modified from Oliver and Larson 1996).

Steady state: A successional stage; a stand in the steady state stage is composed entirely of trees that have developed in the absence of disturbance. (Modified definition of "true old growth" stands from Oliver and Larson 1996).

Stem exclusion: A successional stage; a stand enters the stem exclusion stage when trees reoccupy all growing space and exclude new woody plants from becoming established. (Modified from Oliver and Larson 1996).

Successional stage: One of the sequence of communities that replace one another in a given area in the orderly process of plant community change called ecological succession.

Trees: Woody plants with diameters >10 cm.

Understory: Vegetation including woody seedlings (diameters <2.5 cm), shrubs, and herbs.

Understory reinitiation: A successional stage that occurs several decades after stem exclusion begins and is characterized by the development of a forest floor stratum of herbs and shrubs. (Modified from Oliver and Larson 1996).

4.0 Health and Safety

Health and safety concerns for field workers in the forested terrestrial ecosystem include:

- slips, trips, and falls;
- thermal conditions such as excessive heat or cold;
- inclement weather, especially lightning;
- biological hazards, such as insects or other taxa that may bite and plants that may contain substances causing allergic reactions; and
- hunting (depending upon land use designations).

Field workers should wear closed shoes, long pants and long sleeves, but are individually responsible for selecting footwear, clothing, gloves and outerwear as appropriate to the situation at hand. Field workers should use insect repellent, as appropriate, and take care to avoid holes, fallen trees, and other obstacles that may cause slips, trips, and falls. Workers should increase attentiveness to potential hazards during pre-dawn activities. Workers should also determine potential hunting or other human activities that could put them at increased risk, and take steps (such as wearing orange vests and notifying park rangers or other relevant law enforcement agencies of their location) to mitigate these risks.

5.0 Personnel Qualifications

5.1 General Qualifications

This protocol requires a two-person fauna/soil field team, and a two-person flora field team, with one or more of these team members performing pre-visit preparations. For both pairs, one of the crew members must be an expert (bird and tree, respectively) whereas the other crew member can be a generalist. An expert must be able to identify most or all of the common taxa found in the area to be surveyed and be able to collect appropriate and sufficient field data on less common taxa to enable their later identification. Regardless of their respective areas of specialization, all team members must have had some forest field work experience. Before formally collecting data in the field, all team members should practice the protocol at least once in a convenient forest habitat to make sure they are clear on how to collect the data and complete each of the datasheets.

The individual(s) performing the pre-visit preparations should be generally familiar with the flora and fauna found in the specific ecoregion. Preferably, this individual should have an educational background in biology or ecology.

5.2 Fauna/Soil Crew

At least one of the two crew members must be an expert in field identification of birds, both by sightings and by their behaviors (e.g., calls, flight). Also, at least one of the fauna/soil crew members must be generally familiar (not necessarily at the species level) with other vertebrate and invertebrate fauna found in the specific ecoregion, such as mammals, snakes, turtles, lizards, salamanders, frogs, toads, beetles, ants, isopods, centipedes, and millipedes. Lastly, at least one of the fauna/soil crew members must have a familiarity with the performance of basic soil sample collection survey techniques. One of the two fauna crew members should also have experience with global positioning systems (GPS).

5.3 Flora Crew

At least one of the two flora crew members must have extensive knowledge of plant species, especially those trees and understory species likely to be encountered in ecoregion-specific forest types. In addition, at least one of the flora crew members must have training in conducting forest-specific surveys and data recording methods. At a minimum, the other flora crew member must be familiar with botanical nomenclature, have knowledge of common forest plant species, and have experience with surveying and data recording methods. One of the two flora crew members should also have experience with global positioning systems (GPS).

6.0 Equipment and Supplies

6.1 General Equipment Needed

- Driving directions to the study plot
- Pens and markers with permanent, waterproof ink markers
- Insect repellent
- First aid kit
- Water
- Two digital cameras with zoom and panorama capabilities
- Two high capacity (at least 128MB) digital data cards appropriate for the digital cameras being used

- Two global positioning system (GPS) units with 2-way radio capabilities and recharger for DC power socket in automobile
- Two sets of red and blue flagging
- Two clipboards
- Two hand lenses
- Calculator
- Two thermometers
- Two measuring tapes (30 m each)
- Two hand-held compasses
- Two sets of aerial photos and maps with scale legends and printed on waterproof paper
- Two copies of this SOP, printed on waterproof paper
- Two accurate watches
- Two backpacks to carry equipment

6.2 Additional Equipment Needed for Fauna/Soil Crew

- Bird, mammal, reptile & amphibian, spider & insect, and animal tracks field guides
- Two pairs of binoculars
- Two flashlights
- Spray water bottle
- Soil probe and wet & dry probe extensions
- Munsell soil chart
- Hand trowel
- Stainless steel shovel
- Light colored tarp or cloth
- Fauna reference lists, printed on waterproof paper
- Fauna/soil crew datasheets (F1 to F6), printed on waterproof paper

6.3 Additional Equipment Needed for Flora Crew

- Tree, shrub, forb, and grass and plant field guides
- Metric DBH tape (5 m)
- Convex spherical crown densiometer
- Clinometer and case
- Flora reference lists, printed on waterproof paper
- Flora crew datasheets (F5 to F10), printed on waterproof paper

7.0 Procedure

This protocol requires a four-person field team who will work together in pairs to evaluate a 300-m x 300-m plot. The protocol is intended to be completed in approximately 4 hours. One pair (the fauna/soil crew) will conduct the fauna and soil portions of the protocol, while the other pair (the flora crew) will conduct the flora portion of the protocol.

The first activity conducted at the plot is bird data collection, which is performed by the fauna/soil crew and should begin half an hour before sunrise (or during the period when birds are typically the most vocal). In order to create the least amount of disturbance prior to and during bird data collection, the flora crew should not enter the study plot until after the fauna/soil crew has completed the first of the two 20-minute bird observation periods. The two field crews will then work simultaneously for the remainder of the four-hour evaluation period.

7.1 Pre-Visit Preparations

Listed below are the steps that must be completed before the start of the field event.

- Step 1. Obtain aerial photographs and maps of the site and surrounding area. These materials will familiarize the field team members with the area and provide them with a context for the site.
- Step 2. Determine the pre-assigned four-character site ID number for the study site. The first character of the site ID number should be “F” for forested terrestrial ecosystem, the second character identifies the state in which the site is located (i.e., 1 = Ohio, 2 = Michigan, 3 = Indiana, 4 = Illinois, 5 = Wisconsin, and 6 = Minnesota); and the last two characters should be digits assigned sequentially from 00 to 99.
- Step 3. It may be necessary to obtain permission or a formal permit to access the study site. Check with the land owner or manager to determine the need for such permission or permits. The minimal sample collection envisioned for this protocol will not include vertebrate species and is not expected to require a scientific collecting permit. This should be verified with fish and wildlife, and other environmental agencies, as appropriate.
- Step 4. Create reference lists of local flora and vertebrate fauna species from available databases and resources. For all species: (1) categorize as native or non-native, (2) include state and federal status, and (3) categorize as invasive or non-invasive. Fauna species should also be categorized as regionally common or rare.

Useful information sources for determining species status include:

- Illinois Department of Natural Resources:
<http://dnr.state.il.us/esp/datelists.htm> – state list of threatened and endangered (T&E) species.
- Illinois Natural History Survey:
<http://www.inhs.uiuc.edu/cbd/ilspecies/ilsplist.html> – list of flora and fauna occurring in Illinois, including state and federal listing status.
- Indiana Department of Natural Resources:
<http://www.in.gov/dnr/fishwild/endangered/e-list.htm> – lists of T&E fauna;
<http://www.in.gov/dnr/naturepr> – lists of rare, threatened or endangered (RTE) species by county and a list of Indiana’s RTE vascular plants;
<http://www.in.gov/dnr/fishwild/endangered/frogs.htm> – list of frogs and toads in Indiana;
<http://www.in.gov/dnr/invasivespecies/innatcom03.pdf> – lists of characteristic species found in a variety of community types.
- Michigan Department of Natural Resources:
http://www.michigan.gov/dnr/0,1607,7-153-10370_12142---,00.html – links to T&E lists and a rare plant reference guide;
http://www.michigan.gov/dnr/0,1607,7-153-10370_12145---,00.html – links to fauna information;
http://www.michigan.gov/dnr/0,1607,7-153-10370_12146---,00.html – links to flora information.
- Minnesota Department of Natural Resources:
<http://www.dnr.state.mn.us/ets/index.html> – Minnesota’s list of endangered, threatened, and special concern species.

- Ohio Department of Natural Resources:
<http://www.ohiodnr.com/wildlife/resources/default.htm> – links to a variety of wildlife resources, including T&E lists for fauna;
<http://www.ohiodnr.com/forestry/Education/ohiotrees/treesindex.htm> – list of Ohio’s tree species.
- Wisconsin Department of Natural Resources:
<http://www.dnr.state.wi.us/org/land/er/> – includes lists of state and federal T&E species occurring in Wisconsin, county maps that list known occurrences of T&E species, and a searchable database of T&E species occurrences in Wisconsin.
- U.S. Fish and Wildlife Service:
<http://www.fws.gov> – links to a discussion of the endangered species program and a list of Federally threatened and endangered species.

Useful sources of information on invasive species include:

- Indiana Department of Natural Resources: <http://www.in.gov/dnr/invasivespecies>
- Michigan Invasive Plant Council:
<http://forestry.msu.edu/mipc>
- Minnesota Department of Natural Resources:
<http://www.dnr.state.mn.us/exotics/index.html>
- Wisconsin Department of Natural Resources:
<http://www.dnr.state.wi.us/org/land/er/invasive>
- National Park Service, Alien Plant Working Group:
<http://www.nps.gov/plants/alien/factmain.htm#p1lists>
- US Department of Agriculture: <http://www.invasive.org>

- Step 5. Print reference lists developed in the previous three steps and the field datasheets on waterproof paper. (Waterproof paper is commonly available from field equipment suppliers.)
- Step 6. Assemble information needed for the field crew to efficiently and accurately determine the correct location of the study plot. This will include developing driving directions to the study plot vicinity; developing a strategy for convenient access to the study plot; determining the study plot corner nearest to the access point (this will become fauna/soil survey point A); recording the corresponding Universal Transverse Mercator (UTM) coordinates of this corner on datasheets F1 and F7; and recording the UTM coordinates of fauna/soil survey points B, C, and D on datasheet F3 and of flora survey nodes 1 to 9 on datasheet F7.
- Step 7. Ensure that all geospatial coordinates on aerial photographs and maps are represented in UTM. Convert any latitude/longitude or other geospatial coordinates into their UTM equivalents for ease of navigation and reference in the field.
- Step 8. Assemble field equipment and check it against the list in Section 6.0.
- Step 9. Measure standard walking pace of each team member and adjust to 1 m per pace so that team members can consistently and accurately navigate within the study plot, since GPS readings should be expected to be sporadic and unstable under most forest canopies. Additionally, team members will find pacing off the longer transects and larger quadrats more convenient and faster than trying to generate them with measuring tape, which is generally impractical in a forest setting.

Step 10. If not exceptionally proficient at estimating tree heights, the flora crew should spend time prior to the sampling day, honing their skill at estimating tree heights by sight. This is to be conducted by measuring a wide range of tree heights with the clinometer and visually and mentally noting the respective heights. (Instructions regarding the use of a clinometer are in section 7.3.3.4.) After several trials, the flora crew is to reverse the order by first estimating various different tree heights and then verifying the accuracy of their tree height estimates with the clinometer. Prior to conducting their work at the study plot, the flora crew must be able to consistently achieve visual estimates with an accuracy of +/- 20% of the measured tree heights (e.g., produce estimates between 24' and 36' for a 30' tree).

7.2 Fauna/Soil Crew Activities

This section describes the steps to be completed by the fauna/soil crew, including study plot set-up activities, data recording, fauna surveys, and soil characterization.

7.2.1 Data Recording

- The fauna/soil crew should use datasheets F1 through F6. Table 1 describes each of the datasheets and provides cross-references to SOP instructions. Use as many copies of each sheet as necessary to record all fauna observations. Note that all fauna sightings during the 4 hour sampling period should be recorded, regardless of the activity being performed at the time of the sighting.
- Before entering the study plot complete the header information on the datasheets, including location, site ID number, UTM coordinates, date, and names of investigators.
- Do not fill out the species categorization columns (e.g., native or non-native, etc.) of the datasheets until all other field activities are completed. If time permits, these columns should be completed in the field using the fauna reference lists. Otherwise they can be completed back in the office.
- For datasheets F3 and F5, the number of sheets required will vary from plot to plot depending on the numbers of observations and photographs. These sheets should be numbered in the spaces provided at the tops of the sheets (i.e., Page ___ of ___) by the field crew members. Numbering the pages will help keep sheets in order and allow verification that all sheets are present and accounted for at the conclusion of field activities.
- Take photographs of any features (whether fauna, fauna signs or habitat, or disturbances) deemed as being potentially meaningful. When in doubt, take the photograph.
- Before taking the first photograph, be sure that the time set in the camera is the same as the time set on field team members' watches so that time can be used to associate the photographs with the appropriate observation point.
- Keep a record of all photographs taken in the photo log on datasheet F5. Include the time the photograph was taken, the subject of the photograph, the direction the photographer was facing while taking the photograph, and a description of the location of the photograph.
- More specific data recording instructions are included in the sections that follow, and on the datasheets themselves.

7.2.2 Field Set-Up

- Perform reconnaissance of the study plot the preceding afternoon, if possible, to ensure it can be found in the dark and to select a parking area.
- Before arriving at the parking area near the study site coordinates, arrange materials in the car so that vehicle can be exited quietly and quickly when it is parked.
- Synchronize the watches of all field team members and the time displayed on the two digital cameras to make sure they all show the same time of day.

- The access point should be located at or near one of the four study plot corners. The directional identity of this corner is to be indicated on datasheet F1 by circling NW, NE, SE, or SW.
- Establish the corner of the study plot nearest to the access point (i.e., fauna/soil survey Point A) using topographic features or other landmarks. If a GPS reading can be obtained, verify the UTM coordinates of Point A as indicated on the aerial photographs, maps, and fauna/soil datasheets. If the measured UTM coordinates agree with the projected UTM coordinates, place a check mark next to the UTM coordinates listed on datasheet F1. If a GPS reading cannot be made at or near Point A, record “NS” for no signal next to the UTM coordinates listed on datasheet F1.
- Mark this starting corner with red flagging and write “F/S Point A” on the flagging, using permanent marker. Establish the direction of the plot boundary lines by placing blue flagging 5 m north or south of the corner, and 5 m east or west of the corner (direction depending on the orientation of plot with respect to the first corner).
- Regardless of which corner is nearest to the study plot access point, the combined fauna/soil transect from Point A to Point D is to be oriented diagonally from the starting corner through the center of the study plot (Figure 1). When proceeding from Point A to Point D, leave flagging periodically to make the return traversal easier and faster.
- To establish the first bird observation point (i.e., Point B), the fauna/soil crew should pace 140 m from Point A diagonally toward the study plot center, using a compass to navigate (Figure 1).

7.2.3 Field Data Collection

7.2.3.1 Bird Observations from Points B and C (adapted from Ralph et al. 1993)

- Commence bird data collection approximately half an hour before sunrise. Make as little noise and other types of disturbance as possible before and during the observation period. Ideally, birds will be surveyed at Point B just prior to sunrise and just after sunrise at Point C.
- Bird observation Points B and C should be located 140 m apart and 140 m and 280 m, respectively, from Point A (Figure 1).
- Use datasheet F1 for data recording for this first exercise of the study plot assessment. Complete the weather conditions section and note the start time immediately before bird observations begin.
- Working together at bird observation Point B, both fauna/soil crew members should observe birds over a 20-minute observation period, using binoculars and bird reference lists as needed. The more experienced crew member is responsible for identifying birds, while the other crew member should record data. Record species that are seen or heard and the approximate number of individuals for each observation of a species on a separate line in the form.
- Do not double count individuals that may be moving around their territory.
- Record the time at the end of the 20-minute observation period.
- Flag and label Point B in the same manner as Point A. To avoid disturbing birds before their presence has been observed and recorded, flagging and labeling are to be conducted after the 20-minute observation period.
- Using a compass for navigation, pace the 140 m from Point B to Point C.
- At Point C, repeat the bird observation procedures as described for Point B above.

7.2.3.2 Fauna & Disturbance Observations from Transects CD, CB, and BA

- Conduct fauna (including birds), habitat features, and disturbance observations along three 140-m transect lines (i.e., Transects CD, CB, and BA as shown in Figure 1) according to the instructions that follow.

- Note the time and temperature at the beginning and at the end of the traversal of each transect, on datasheet F3.
- Since the second bird observation period at Point C will just have been completed, survey fauna and disturbances between Points C and D first, i.e., Transect CD. From Point D, reverse traversal of Transect CD will be required in order to traverse Transect CB followed by Transect BA.
- Associate all features, whether fauna, fauna signs, fauna habitat (e.g., CWD, brush piles, snags), or disturbances with a single transect (i.e., Transect CD, CB, or BA). Associate features visible from more than one transect with whichever transect is closest. If no one transect is closest, then associate the observation with the transect along which it was first observed.
- Enumerate and record on datasheet F2 any vertebrates or signs of vertebrates visible or audible from each transect. Vertebrate signs include tracks, mounds, burrows, holes, nutshells, scat (e.g., deer-pellet clumps), runways, browse lines, and tree rubbing. Identify vertebrates as precisely as feasible, to species level if possible. Also, record the means used to identify the presence of vertebrates (e.g., individual, scat, track, skin, or mound).
- Enumerate and record on datasheet F3 the presence of habitat features such as CWD, brush piles, and snags visible from each transect. Also, enumerate and record on F3 invertebrates observed along the transects or associated with habitat features. Invertebrates should be identified to the taxonomic level indicated on F3. If any habitat features or invertebrates are too numerous to count (e.g., ants in an ant colony), estimate their numbers as orders of magnitude.
- Categorize CWD as logs having a maximum diameter of either <30 cm or >30 cm. Measure the DBH of snags and categorize them as having a DBH of <30 cm or >30 cm.
- Examine the CWD, brush piles, snags, and any other noted features more closely to look for fauna and fauna signs. Closer examination of CWD includes “log rolling” of up to four logs per transect to search for snakes, lizards, salamanders, newts, frogs, beetles, ants, isopods, centipedes, millipedes, and other invertebrates. Return any material that is disturbed to its previous position and orientation after examination is complete.
- Record fauna presence and numbers for each rolled log and each closely examined brush pile and snag. If possible, associate fauna signs with a particular type of animal.
- Record on datasheet F6 any evidence of anthropogenic or natural disturbances visible from each transect. See F6 for examples of disturbances. Record the number and type of each disturbance per transect. Also record any invasive or otherwise notable plant species on F6.
- At Points C and B, the digital camera should be used to take a full 360 degree panorama of photographs, starting with the first shot toward the north. Record each photograph on datasheet F5.

7.2.3.3 Soil & Earthworm Data Collection

- Record soil and earthworm data on datasheet F4.
- Sample the soil at Points D, C, and B (Figure 1) by completing the following steps:
 - Step 1. Offset the soil sampling location 2 meters to the north of each Point so that the location sampled will not be compacted by previous team activities.
 - Step 2. Collect data on soil sampled at each of the three points by driving the sampler vertically into the ground until either refusal or a 4-foot depth is reached, whichever is experienced first. Record the soil depth reached.
 - Step 3. Measure and record the soil core horizon depths (including the litter layer depth or “O-horizon”).

- Step 4. Compare soil horizon colors to a Munsell chart and record the hue, value, and chroma of each horizon.
- Step 5. Determine soil horizon composition by a combination of visual inspection and moistening a small palm-full of soil with water from a spray bottle and rolling in into a ball about the size of a large marble. Classify and record the soil as: “sandy” if the ball will not hold together, “clay” if soil can be rolled into a ball and molded into a cube, or “loam” if soil can be rolled into a ball but cannot be molded into a cube.
- Step 6. Return the soil core to the ground in or near the hole from which it was taken.
- Test for earthworm presence at Points D, C, and B (Figure 1) by completing the following steps:
 - Step 1. Dig one 30.5-cm x 30.5-cm x 30.5-cm hole 1 m north of the soil sampling location (i.e., 3 m north of the bird observation point). This results in the extraction of 1 cubic foot of soil from an uncompacted location associated with each point.
 - Step 2. Deposit and spread out the soil on a light-colored tarp or cloth.
 - Step 3. Record the number of earthworms observed. Once earthworms are found, either by digging holes or examining CWD, discontinue any searching for earthworms (if earthworms are found anywhere in the study plot, they can be assumed to be present throughout).
 - Step 4. Return the soil to the hole from which it was removed.

7.3 Flora Crew Activities

This section describes the steps to be completed by the flora crew, including plot set-up activities, data recording, flora surveys using a variety of methods, and human impacts characterization.

7.3.1 Data Recording

- The flora crew should record observations from outside of the quadrats around the 9 flora nodes on F6, and from within the quadrats on flora datasheets F7 through F10. Table 1 describes each of the datasheets and provides cross-references to SOP instructions. Use as many sheets as necessary to record all required data.
- Before entering the study plot complete the header information on the datasheets, including location, site ID number, UTM coordinates, date, and names of investigators.
- Do not fill out the species categorization columns (e.g., native or non-native) of the datasheets until all other field activities are completed. If time permits, these columns should be completed using the flora reference lists.
- For some datasheets (e.g., datasheet F8), the number of sheets required will vary from study plot to study plot depending on numbers of species observed. These sheets should be numbered in the spaces provided at the tops of the sheets (i.e., Page __ of __) by the flora crew members. Numbering the pages will help keep sheets in order and allow verification that all sheets are present and accounted for at the conclusion of field activities.

- Keep a record of all photographs taken in the photo log contained on datasheet F5. Include the time the photograph was taken, the subject of the photograph, the direction the photographer was facing while taking the photograph, and a description of the location of the photograph.
- More specific data recording instructions are included in the sections that follow, and on the datasheets themselves.

7.3.2 Field Set-Up

- The two-person flora crew should begin after the fauna/soil crew has completed the first of its two early morning bird surveys. This will enhance the likelihood of vertebrate fauna being observed by the fauna team.
- Begin flora observations and measurements at flora node 1 and proceed sequentially to flora nodes 2 through 9 (Figure 2). Flag and survey each flora node according to instructions in Section 7.4.3.
- Navigation to the 9 flora nodes is to be accomplished by using a compass and pacing off distances. The GPS unit is useful as a confirmatory navigational tool but, due to common interference of the GPS signal by some forest canopies, it cannot be relied upon as the primary means of navigation.
- As illustrated in Figure 2, center the 10-m x 10-m quadrats for surveying the understory around each flora node and nest the 5-m x 5-m quadrats for surveying saplings in the southeast corner of each 10-m x 10-m quadrat. Consequently, the northwest corner of each 5-m x 5-m quadrat will be anchored by the respective sampling node (Figure 2).
- Upon first arriving at flora nodes 1, 3, 5, 7, and 9, use the digital camera to take a full 360 degree panorama of photographs, starting with the first photograph toward the north. It is crucial that photography is the first activity conducted at these flora nodes in order to photo-document the existing environmental condition prior to disturbance by surveying activities. Additional photographs can be taken at any flora node whenever there is something deemed potentially important to photo-document. Unidentifiable flora should also be photo-documented for potential subsequent identification. Record the relevant information for each photograph on datasheet F5.

7.3.3 Field Data Collection

Collection of data on flora is done in a series of nested plots. At each flora node, it is important to survey the flora in the following sequence: understory, saplings, canopy cover and associated measurements, and lastly trees. This sequence, especially the collection of understory data before all other data, is important to avoid trampling the understory before it has been characterized.

7.3.3.1 Survey Understory in the 10-m x 10-m Quadrats

- In each of the nine 10-m x 10-m understory quadrats, estimate percent cover separately for each species of shrubs, seedlings, herbaceous groundcover, and bare ground. Experience has shown that a 10-m x 10-m quadrat is too large to visually evaluate as a single unit. Therefore, percent cover estimation is to be accomplished by visually inspecting five 2-m x 2-m subquadrats located at the four corners and the center of the 10-m x 10-m quadrat.
- Later, in the office, the respective percentages of the three understory plant types and of the bare ground can be averaged to estimate the relative percent cover of each type over the 10-m x 10-m quadrat. Each of these averaged percent covers is then to be expressed as the matching Braun-Blanquet cover class (see table of Braun-Blanquet cover classes and associated percent cover ranges on the back side of datasheet F-9). Note the sum of the percent cover values at any given location may be greater than 100 percent, because some cover types (e.g., herbaceous groundcover and shrubs) may be overlapping.
- The respective Braun-Blanquet cover classes can be recorded on datasheet F7 at a later date.

7.3.3.2 Survey Saplings in the 5-m x 5-m Quadrats

- Categorize saplings by species.
- Use datasheet F8 to record the DBH of every sapling stem occurring in each of the nine 5-m x 5-m quadrats.

7.3.3.3 Describe Canopy Cover, Vertical Foliar Structure, Community Type, Successional Stage, and Presence of Water

- On datasheet F9, describe and record the presence of water and water-related features such as standing or flowing water and their marks (e.g., dry drainage channels and ephemeral pool footprints) and riparian zones within or adjacent to the 9 flora nodes.
- Measure canopy cover at the 9 flora nodes using a convex spherical crown densiometer according to the following 3 steps (modified from C DPR 2003a). Record the percent canopy cover on datasheet F9.

Step 1. Hold the densiometer level (indicated by the round level in the lower left hand corner), and far enough away from your body that your head is just outside the grid (12 to 18 inches away).

Step 2. There are a total of 24 squares on the grid. Count and record the number of squares showing open canopy. Partially filled squares can be added to make a complete square.

Example: 4 completely open squares + 3 half-open squares + 5 quarter-open squares = total of 6.75 open canopy squares.

Step 3. Calculate the percent overstory density with the following equation:

$$\% \text{ Overstory density} = 100 - (\text{number of open canopy squares} \times 4.17)$$

Example: with 10 open squares, the overstory density is 58.3%

- Count the number of foliar layers at the 9 flora nodes, from the top canopy to and including the herbaceous groundcover. Record the number of foliar layers on datasheet F9.
- Determine the forest community type at the 9 flora nodes, as the two to three most dominant species in the canopy. List the species in order of decreasing dominance (e.g., Beech-Maple, Maple-Beech-Birch). Record forest community types on datasheet F9.
- Characterize successional stage at the 9 flora nodes according to the Oliver and Larson (1996) four-phase method. The successional stages are: stand initiation, stem exclusion, understory reinitiation, and steady state (see definitions in Section 3.0). Record the successional stages on datasheet F9.

7.3.3.4 Survey Trees

Conduct point quarter surveying on trees at each of the 9 flora nodes, by using the following three steps. Record all data on datasheet F10.

Step 1. Establish a north-south and an east-west axis with the sampling node in the center.

Step 2. Select the tree in each of the four quadrants that is closest to the sampling node.

Step 3. Record the following data for each of the four trees per sampling node: species, distance to the sampling node, DBH, tree height (see bulleted item immediately below), and canopy class (i.e., dominant, co-dominant, or non-dominant).

The preferred method of determining tree heights is through trained visual inspection as discussed in section 7.2. Use of the clinometer in a time limited assessment and with obstacles which potentially will preclude a clear line of sight, is not recommended. The five-step instructions (modified from

CDPR 2003b) appearing below, for determining tree height using a clinometer are primarily provided for the practice sessions recommended in section 7.2. The clinometer can also be used to verify a tree height that is questionable.

- Step 1. Choose a location that is level with or up slope from the tree of interest.
- Step 2. Look through the clinometer to sight the top of the tree (Figure 3). Read the angle (% A) and record. Repeat, sighting the base of the tree and record (% B).
- Step 3. Measure the distance from where the clinometer reading was taken to the base of the tree.
- Step 4. Calculate tree height according to the following equation:
Tree height = (% A + % B) x distance
Note that this equation uses angles measured as percentages, not degrees.
- Step 5. If the top of the tree is not visible from the ground, but height can be roughly estimated based on surrounding trees, record the height with an “E” qualifier to signify that the height has been estimated. If height can not be estimated within a 20 percent margin of error, record “NM” on the datasheet, to indicate that the tree height could not be measured.

7.4 Exiting the Study Site

- Remove all flagging, stakes, and other material transported to the study site by the field teams.
- Check all field equipment against the equipment list to ensure that no equipment is inadvertently left at the study site.

7.5 Post-Visit Activities

The following activities should be completed back in the office after the field event.

- Using the reference lists developed during pre-visit preparations (Section 7.2), complete any of the flora and fauna species categorization fields (e.g., native or non-native) that were left blank by the field team. Using sources recommended in Section 7.2, determine and record appropriate categories for species that were observed in the plot, but not included in the reference lists.
- Identify any “Bird Conservation Regions” designated avian species of concern and record on F1.
- Where field team members have listed common names of species, add corresponding scientific names to the datasheets.
- Complete any taxonomic verification by consulting taxonomic data sources as necessary.
- Verify overstory density and tree height calculations performed by the field crew on datasheet F10.
- On datasheet F7, calculate the average cover class for each of the three understory plant types and bare ground at each of the flora nodes.

8.0 **Data and Records Management**

Data collected in this project will be made publicly available through an EPA centralized database. Completed datasheets will be kept within ORD according to standard data and records management protocols.

9.0 Quality Assurance Procedures

A Quality Assurance Project Plan (QAPP) is associated with this SOP. It is hereby incorporated into this document by reference. The QAPP should be referred to for details regarding quality assurance protocols associated with this field program.

While analytical assessments conducted in the laboratory can be verified in a number of ways, the accuracy of flora, fauna, and human impact assessments in the field cannot be objectively verified with the same degree of precision. Nonetheless, the use of two-person field crews will allow each crew member to verify the observations and documentation of the other. Photographs taken between fauna/soil points A and D and at 5 of the flora nodes will provide additional verification of the data collected.

10.0 References

California Department of Pesticide Regulation (CDPR), 2003a. Standard Operating Procedure: Instructions for the Calibration and Use of a Spherical Densimeter. SOP Number FSOT.002.00. Environmental Monitoring Branch.

California Department of Pesticide Regulation (CDPR), 2003b. Standard Operating Procedure: Determining Height and Slope Using the Brunton Clino Master®. SOP Number FSOT.003.00. Environmental Monitoring Branch.

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Oliver, C.D. and B.C. Larson, 1996. *Forest Stand Dynamics*. New York: Wiley. 520 pp.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. *Handbook of Field Methods for Monitoring Landbirds*. Gen. Tech. Rep. PSW-GTR-144. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. pp. 30 - 35.
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Stevens, V., 1997. The ecological role of coarse woody debris: an overview of the ecological role of CWD in B.C. forests. Res. Br., B.C. Min. For., Victoria, B.C. Working Paper 30/1997.

U.S. Department of Agriculture Forest Service (USDA FS), 1989. *Interim Resource Inventory Glossary*. June 14, 1989. File 1900. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 96 pp.

Table 1: Descriptions of Datasheets

Datasheet #	Datasheet Title	Description of Datasheet Items	Related SOP Section Numbers
F1	Forest Bird Observation Data	Bird species, categorization (e.g., threatened, invasive), numbers observed at observation points	7.2.3.1
F2	Fauna Transect Data for Vertebrates	Table 1: Mammal species, categorization, numbers observed in transects, behaviors observed, identification method (e.g., by tracks or scat) Table 2: For each transect, numbers and characteristics of faunal signs observed Table 3: Herpetofauna species, categorization, numbers observed in transects, behaviors observed, identification method (e.g., by tracks or scat) Table 4: Bird species, categorization, numbers observed in transects, behaviors observed	7.2.3.2
F3	Fauna Transect Data for CWD, Snags, and Brush Piles	Numbers of herpetofauna and invertebrate taxa observed in coarse woody debris (CWD), snags, and brush piles in the fauna transects	7.2.3.2
F4	Soil and Earthworm Data	Soil horizon depth, color, and composition; numbers of earthworms	7.2.3.3
F5	Photo Log	Descriptions of photos taken by both crews	7.2, 7.3
F6	Invasive Species/Human Impacts and Activities	Descriptions/numbers of invasive species and disturbances observed in each transect, and plants observed outside of quadrats.	7.2.3.2, 7.3.1
F7	Understory Data	Braun-Blanquet cover class for shrubs, seedlings, herbaceous groundcover, and bare ground	7.3.3.1
F8	Sapling Data	Sapling species, categorization, numbers of stems, and DBH of each stem	7.3.3.2
F9	Community Data	Canopy cover data, number of foliar layers, community type, successional stage, and description of water and/or water-related features. Braun-Blanquet scale.	7.3.3.3
F10	Point Quarter Sampling Tree Data	Tree species, categorization, distance to node, DBH, height, and canopy class, surveyed by point quarter sampling method	7.3.3.4

Figure 1. Fauna/Soil Survey Scheme. For purposes of this illustration, the study plot corner nearest the access point is assumed to be the northwest (NW) corner; see section 7.3 for further explanation.

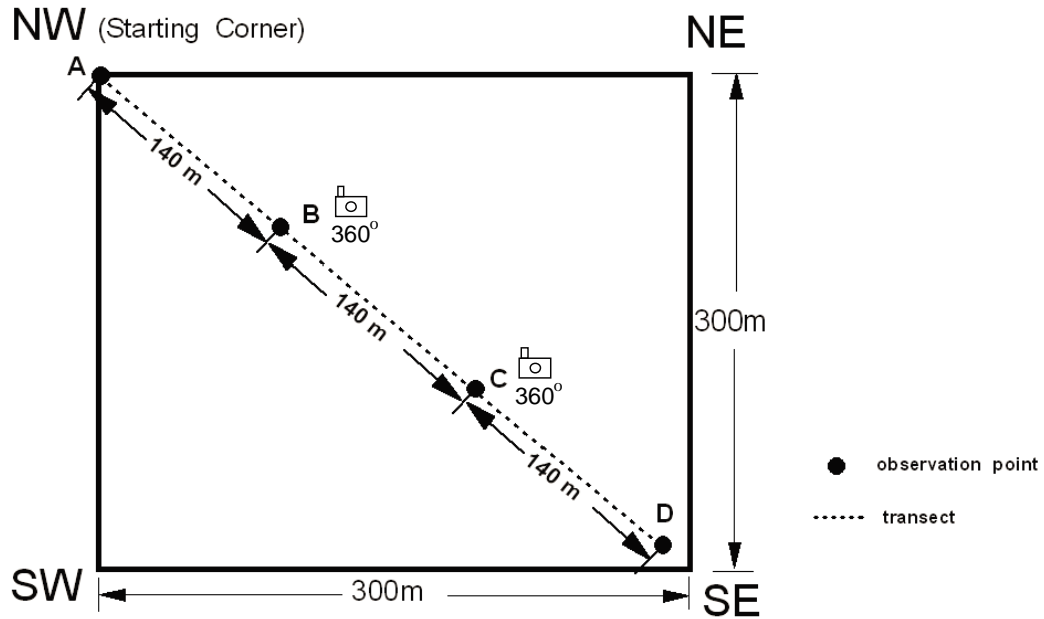


Figure 2. Flora Survey Scheme. For purposes of this illustration, the study plot corner nearest the access point is assumed to be the northwest (NW) corner; see section 7.4 for further explanation.

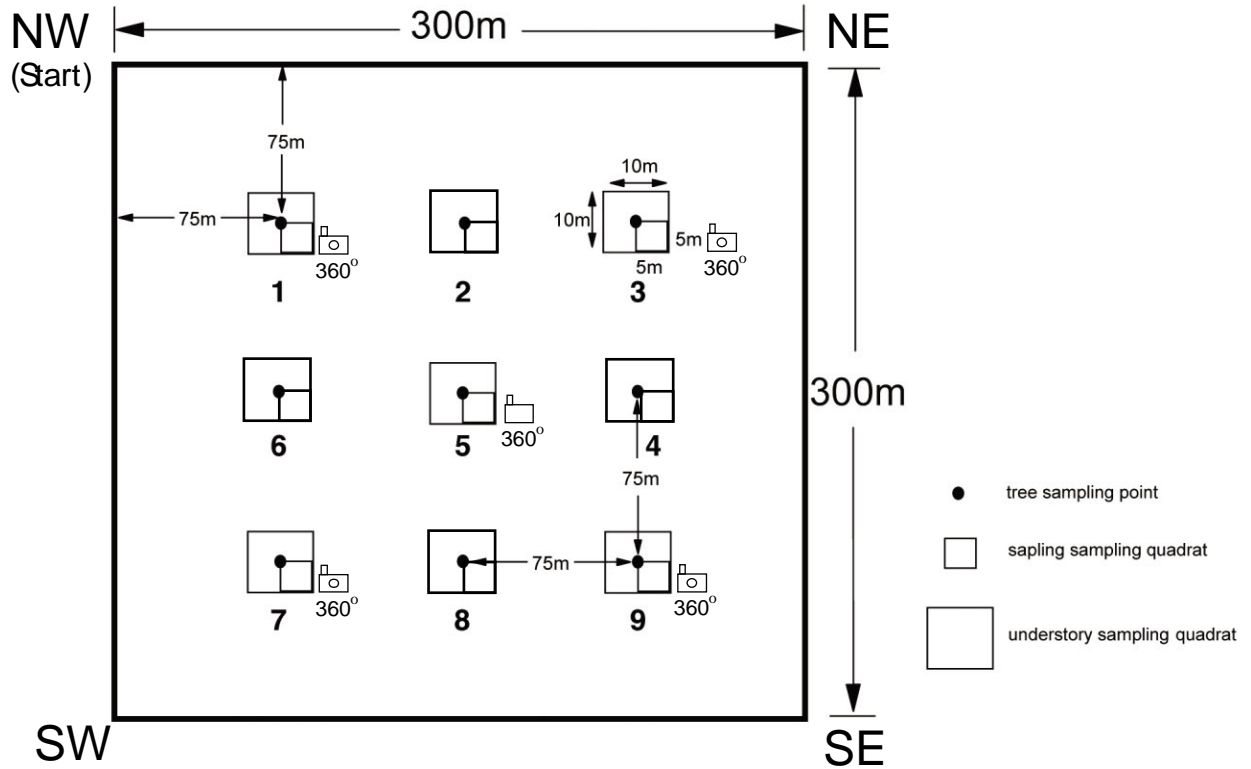
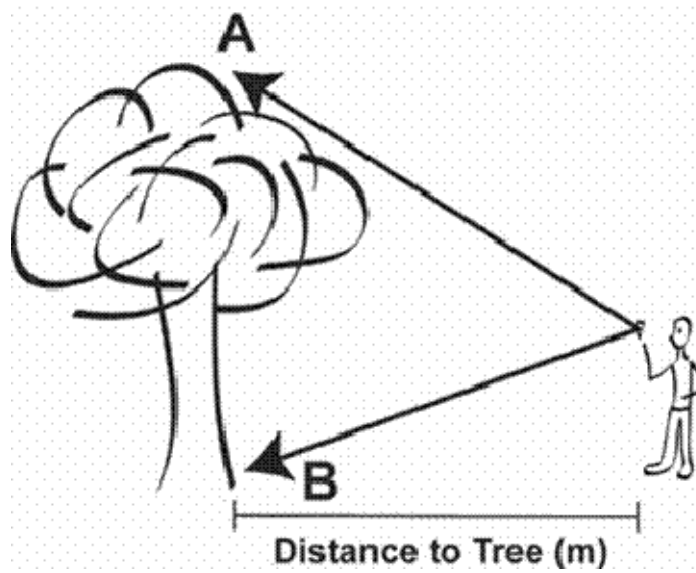


Figure 3. Illustration of Measurements Taken to Estimate Tree Height



F1: FOREST BIRD OBSERVATION DATA

Page ____ of ____

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
Fauna and Soil Crew Names:	
UTM Coordinates at four study plot corners (circle corner nearest to plot access point) and observation points:	
NW Corner:	NE Corner:
SW Corner:	SE Corner:
Point B:	Point C:

Weather Conditions At Start of Sampling <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> ____% cloud cover <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> clear/sunny <input type="checkbox"/> showers (intermittent) Air Temperature ____ °C	Weather Conditions At End of Sampling <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> ____% cloud cover <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> clear/sunny <input type="checkbox"/> showers (intermittent) Air Temperature ____ °C
--	--

Comments:

Bird Species	Species Categorization				Bird Numbers	
	Native (Yes/No)	Invasive (Yes/No)	Regionally Common or Rare (C/R)	T&E Status*	Point B	Point C
					Start Time	Start Time
					End Time	End Time

F1: FOREST BIRD OBSERVATION DATA

Bird Species	Species Categorization				Bird Numbers	
	Native (Yes/No)	Invasive (Yes/No)	Regionally Common or Rare (C/R)	T&E Status*	Point B	Point C
					Start Time	Start Time
						End Time

*T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

F2: FAUNA TRANSECT DATA FOR VERTEBRATES

Faunal Signs

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
F/S Crew Names:	

Comments:

Faunal Signs	Transect		
	CD	CB	BA
Browse Line	<input type="checkbox"/> Present <input type="checkbox"/> Absent Height _____ cm Associated Fauna: _____ _____	<input type="checkbox"/> Present <input type="checkbox"/> Absent Height _____ cm Associated Fauna: _____ _____	<input type="checkbox"/> Present <input type="checkbox"/> Absent Height _____ cm Associated Fauna: _____ _____
Holes	Diameter _____ cm Diameter _____ cm Diameter _____ cm Diameter _____ cm Associated Fauna: _____ _____	Diameter _____ cm Diameter _____ cm Diameter _____ cm Diameter _____ cm Associated Fauna: _____ _____	Diameter _____ cm Diameter _____ cm Diameter _____ cm Diameter _____ cm Associated Fauna: _____ _____
Nutshells	Total Number _____ Tree Species: _____ _____ Associated Fauna: _____ _____	Total Number _____ Tree Species: _____ _____ Associated Fauna: _____ _____	Total Number _____ Tree Species: _____ _____ Associated Fauna: _____ _____
Tree Rubbing	<input type="checkbox"/> Present <input type="checkbox"/> Absent Associated Fauna: _____ _____	<input type="checkbox"/> Present <input type="checkbox"/> Absent Associated Fauna: _____ _____	<input type="checkbox"/> Present <input type="checkbox"/> Absent Associated Fauna: _____ _____
Other: (describe/enumerate)	Notes: _____ _____ Associated Fauna: _____ _____	Notes: _____ _____ Associated Fauna: _____ _____	Notes: _____ _____ Associated Fauna: _____ _____

F2: FAUNA TRANSECT DATA FOR VERTEBRATES

Mammals

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
F/S Crew Names:	

Comments:									
Mammal Species	Species Categorization					Numbers Observed			
	Native (Yes/No)	Invasive (Yes/No)	Common or Rare in Region (C/R)	T&E Status*		Transect			Other
						CD	CB	BA	
					Individuals				
					Scats				
					Tracks				
					Mounds				
					Other				
					Individuals				
					Scats				
					Tracks				
					Mounds				
					Other				
					Individuals				
					Scats				
					Tracks				
					Mounds				
					Other				
					Individuals				
					Scats				
					Tracks				
					Mounds				
					Other				
					Individuals				
					Scats				
					Tracks				
					Mounds				
					Other				

*T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

F2: FAUNA TRANSECT DATA FOR VERTEBRATES

Birds

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
F/S Crew Names:	

Comments:

Bird Species	Species Characterization				Numbers Observed			
	Native (Yes/No)	Invasive (Yes/No)	Regionally Common or Rare (C/R)	T&E Status*	Transect			Other
					CD	CB	BA	

*T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

F2: FAUNA TRANSECT DATA FOR VERTEBRATES

Herpetofauna

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
F/S Crew Names:	

Comments:									
Herpetofauna Species	Species Characterization					Numbers Observed			
	Native (Yes/No)	Invasive (Yes/No)	Common or Rare in Region (C/R)	T&E Status*		Transect			Other
						CD	CB	BA	
					Individuals				
					Scats				
					Tracks				
					Skins				
					Individuals				
					Scats				
					Tracks				
					Skins				
					Individuals				
					Scats				
					Tracks				
					Skins				
					Individuals				
					Scats				
					Tracks				
					Skins				
					Individuals				
					Scats				
					Tracks				
					Skins				

*T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

F3: FAUNA TRANSECT DATA FOR CWD, SNAGS, AND BRUSH PILES

Page ____ of ____

Information to be filled in prior to site visit	Location Name:	Location ID#:
Form Completed By:	Date	F/S Crew Names:
UTM Coordinates: Point A:	Point B:	Point C: Point D:

Comments:							
Transect: <input type="checkbox"/> CD <input type="checkbox"/> CB <input type="checkbox"/> BA Note: Do not use this page for more than one transect.							
Weather Conditions At Start of Sampling			Weather Conditions At End of Sampling			Start Time: _____ <input type="checkbox"/> AM <input type="checkbox"/> PM	
<input type="checkbox"/> storm (heavy rain)		<input type="checkbox"/> ____% cloud cover	<input type="checkbox"/> storm (heavy rain)		<input type="checkbox"/> ____% cloud cover	End Time: _____ <input type="checkbox"/> AM <input type="checkbox"/> PM	
<input type="checkbox"/> rain (steady rain)		<input type="checkbox"/> clear/sunny	<input type="checkbox"/> rain (steady rain)		<input type="checkbox"/> clear/sunny		
<input type="checkbox"/> showers (intermittent)		Air Temperature _____°C	<input type="checkbox"/> showers (intermittent)		Air Temperature _____°C		
Feature	Invertebrates		Herpetofauna*				
	Taxa	Numbers	Taxa (list species)	Numbers (by ID method)			
				Ind	Scat	Track	Skin
Characterize and enumerate (as appropriate) features:							
<input type="checkbox"/> CWD			Beetles				
<input type="checkbox"/> Max DBH ≤ 30 cm _____			Ants				
<input type="checkbox"/> Max DBH > 30 cm _____			Isopods				
<input type="checkbox"/> Snag			Centipedes				
<input type="checkbox"/> DBH ≤ 30 cm _____			Millipedes				
<input type="checkbox"/> DBH > 30 cm _____			Snails and Slugs				
<input type="checkbox"/> Brush Pile			Spiders and Ticks				
Length _____ cm Width _____ cm			Earthworms				
Height (describe) _____ cm			Termites				

* Numbers recorded here should be added into herpetofauna totals for each transect recorded in F2.

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F4: SOIL AND EARTHWORM DATA

Information to be filled in prior to site visit	
Location Name:	Location ID#:
Form Completed By:	Date:
Fauna & Soil Crew Names:	

Soil Horizon		Observation Point		
		D	C	B
O	Depth range from surface (cm)			
A	Depth range from surface (cm)			
	Color (from Munsell chart)	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____
	Composition	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay
E	Depth range from surface (cm)			
	Color (from Munsell chart)	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____
	Composition	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay
B	Depth range from surface (cm)			
	Color (from Munsell chart)	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____
	Composition	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay
C	Depth range from surface (cm)			
	Color (from Munsell chart)	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____	Hue_____ Value_____ Chroma_____
	Composition	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay	<input type="checkbox"/> Sand <input type="checkbox"/> Loam <input type="checkbox"/> Clay
Depth (m) reached by sampler*				
Number of Earthworms				

*As described in Section 7.2.3.3, Step 2.

F5: PHOTO LOG

Page ____ of ____

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Camera Type/Number		
Comments		

Time	Subject	Data Sheet #	Location*	Direction	File Name [†]

*For the Location field, record the observation point, transect, etc., where the photo was taken.
[†]File name to be entered after returning from field and downloading pictures.

F6: INVASIVE SPECIES/HUMAN IMPACTS AND ACTIVITIES

Page ___ of ___

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Comments		

Table 1. Invasive Plants

Plant Species*	Tally	Total Number of Occurrences
In Designated Land Cover Type:		
In Other Land Cover Types:		

*Note: List each species on a separate line. Use as many sheets as necessary.

F6: INVASIVE SPECIES/HUMAN IMPACTS AND ACTIVITIES

Page ___ of ___

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Comments		

Table 2. Disturbance and Human Management Practices in the Designated Land Cover Type

Map ID Number(s)*	Disturbance Indicator*	Description*	Total Number of Times Encountered	Photo Taken? (Y/N)*
	Paths			
	Car/Vehicle Tracks			
	Off-road vehicle tracks not on well-worn paths			
	Loud noise			
	Bright, artificial lights			
	Evidence of human management practices			
	Trash (appliances/tires)			
	Litter (paper/plastic scraps)			
	Hydrologic modifications (e.g., ditch, weir)			
	Evidence of mowing, tree felling			
	Oily or Soapy Surface Water			
	Other*			

*Notes: Use as many sheets as necessary.
 Map ID numbers should be assigned D1, D2, etc. Use these numbers to identify disturbances drawn on the plot sketch.
 Other disturbance indicators are included in Section 3.0 of the Forested Terrestrial SOP.
 Descriptions of disturbance indicators should include more detailed information about the disturbance, how frequently it was encountered in the plot, and if appropriate, the size of the affected area.
 List any photos taken on F5 (photo log); include the Map ID number in the Subject field of the photo log.

F6: INVASIVE SPECIES/HUMAN IMPACTS AND ACTIVITIES

Page ___ of ___

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Comments		

Table 3. Plants observed outside of sample quadrats.

Plant Species*	Tally	Total Number of Occurrences
In Designated Land Cover Type:		
In Other Land Cover Types:		

*Note: List each species on a separate line. Use as many sheets as necessary.

F6: INVASIVE SPECIES/HUMAN IMPACTS AND ACTIVITIES

Page ___ of ___

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Comments		

Table 4. Description of other special features in plot.

Feature	Description
Visual variation in vegetation occurring in the plot	
Streams and riparian zones Water sample(s) collected? <input type="checkbox"/> Y <input type="checkbox"/> N How many? _____ (list sample ID numbers in space at right)	
Other surface water Water sample(s) collected? <input type="checkbox"/> Y <input type="checkbox"/> N How many? _____ (list sample ID numbers in space at right)	
Fauna/Fauna remains (list species if known)	

F6: INVASIVE SPECIES/HUMAN IMPACTS AND ACTIVITIES

Page ___ of ___

Location		
Site ID#	UTM-E	UTM-N
Investigators		
Form Completed By	Date	
Comments		

Figure 1. Sketch delineating areas of human disturbance, land cover types, surface water bodies, and other features in plot.

F7: UNDERSTORY DATA

Page ____ of ____

Information to be filled in prior to site visit				
Location Name:		Location ID#:		
Form Completed By:		Date:		
Flora Crew Names:				
UTM Coordinates:	Node 1 E: N:	Node 2 E: N:	Node 3 E: N:	Node 4 E: N:
Node 5 E: N:	Node 6 E: N:	Node 7 E: N:	Node 8 E: N:	Node 9 E: N:

Comments:										
Understory Vegetation	Visual Estimates of Relative Cover (%)									
	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Node 9	
Bare Ground	NE Corner									
	NW Corner									
	SW Corner									
	SE Corner									
	Average									
Class*										
Check one: <input type="checkbox"/> Shrub <input type="checkbox"/> Seedling <input type="checkbox"/> Herbaceous Species: T/E? Invasive?	NE Corner									
	NW Corner									
	SW Corner									
	SE Corner									
	Average									
Class*										

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F8: SAPLING DATA

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Information to be filled in prior to site visit			
Location Name:	Location ID#:	Date:	Form Completed By:
Flora Crew Names:			

Comments:									
Sapling Species	Native (Yes/No)	Invasive (Yes/No)	T&E Status*	Saplings in Quadrats					
					Node 1	Node 2	Node 3	Node 4	Node 5
				Total # of Stems					
				DBH of each stem (cm), separated by commas					
				Total # of Stems					
				DBH of each stem (cm), separated by commas					
				Total # of Stems					
				DBH of each stem (cm), separated by commas					
				Total # of Stems					
				DBH of each stem (cm), separated by commas					

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* T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

Comments:								
Sapling Species	Native (Yes/No)	Invasive (Yes/No)	T&E Status*	Saplings in Quadrats				
					Node 6	Node 7	Node 8	Node 9
				Total # of Stems				
				DBH of each stem (cm), separated by commas				
				Total # of Stems				
				DBH of each stem (cm), separated by commas				
				Total # of Stems				
				DBH of each stem (cm), separated by commas				
				Total # of Stems				
				DBH of each stem (cm), separated by commas				

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F9: COMMUNITY DATA

Information to be filled in prior to site visit			
Location Name:	Location ID#:	Date:	Form Completed By:
Flora Crew Names:			

Comments:							
Sampling Node	Canopy Cover		Number of Foliar Layers	Community Type*	Stage*	Slope (°) & Aspect*	Describe Presence of Water and/or Water-Related Features
	Number of Open Squares	Overstory Density (%)*					
1							
2							
3							
4							
5							
6							
7							
8							
9							

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***Notes:** Overstory density is to be calculated as described in Section 7.4.3.3, Step 3 of Forested Terrestrial SOP.
 For community type, describe the community type present at each node as the two to three most dominant species in the canopy, listing the species in order of decreasing dominance (e.g., Beech-Maple, Maple-Beech-Birch).
 For stage, record successional stage: SI for stand initiation, SE for stem exclusion, UR for understory reinitiation, or SS for steady state.
 For slope/aspect, record the approximate grade and facing aspect, for example, 20° N-NE.

F9: COMMUNITY DATA

Information to be filled in prior to site visit			
Location Name:	Location ID#:	Date:	Form Completed By:
Flora Crew Names:			

Braun-Blanquet cover classes. From *Aims and Methods of Vegetation Ecology*, Muller-Dombois and Ellenberg, 1974.

Class	Range of Cover (%)	Mean
5	75-100	87.5
4	50-75	62.5
3	25-50	37.5
2	5-25	15.0
1	1-5	2.5
t	<1	-

F10: POINT QUARTER SAMPLING TREE DATA

Information to be filled in prior to site visit

Location Name:	Location ID#:	Date:	Form Completed By:
Flora Crew Names:			

Node	Tree	Tree Species (scientific name)	Species Categorization			Distance to Node (m)	DBH (cm)	Tree Height*			Canopy Class*
			Native (Yes/No)	Invasive (Yes/No)	T&E Status*			Angles	Distance to Tree (m)	Height (m)	
1	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
2	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
3	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
4	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
5	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			

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Node	Tree	Tree Species (scientific name)	Species Categorization			Distance to Node (m)	DBH (cm)	Tree Height*			Canopy Class*
			Native (Yes/No)	Invasive (Yes/No)	T&E Status*			Angles	Distance to Tree (m)	Height (m)	
6	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
7	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
8	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			
9	1							___%A ___%B			
	2							___%A ___%B			
	3							___%A ___%B			
	4							___%A ___%B			

* T&E Status Codes: FT= Federal Threatened; FE= Federal Endangered; ST=State Threatened; SE=State Endangered; list others as needed.

Tree height should be determined visually as described in Section 7.1 (Step 10) and, if necessary, it can be measured with a clinometer as described in Section 7.3.3.4 of Forested Terrestrial SOP (only use first two columns if necessary).

For Canopy Class field, record D for dominant, C for co-dominant, or N for non-dominant.