Region 1 Common Stand Exam and Inventory and Monitoring Protocols

March 12, 2019

R1 SUPPLEMENTAL APPENDICES

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Supplemental Appendix R1-A: Deriving Statistical Accuracy for Stand Exam Design

This section is now maintained in the *R1 SUPPLEMENT TO NATIONAL FSVEG/CSE USER'S GUIDE Chapter 2: Preparation and Design*.

Supplemental Appendix R1-B: Region 1 Sample Design

This appendix lists examples of Region 1 Sample Designs for the Tree Data Form, Vegetation Composition Form, Ground Surface Cover Form, and Down-Woody Materials Form.

B.1 Tree Data Form

Below are examples of several potential "plot sizes" and "sample trees" that would qualify for measurement given possible exam objectives.

For plots with a "BAF (Basal Area Factor)" listed, qualifying trees would be sampled using the appropriate variable-radius sampling techniques. When using non-standard BAFs, such as 25, the actual BAF is used (25.15 in this case), not the rounded BAF. See Appendix K, Variable Radius Plots for more information.

For plots with an "acre" listed, qualifying trees would be sampled using the inverse of the fixed-radius plot that is indicated.

Example 1:

- **Large Plot (40 BAF) –** 5.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.01- to 4.9-inches DBH, and live trees ≥ 0.5 feet tall

Default Sample Design Form(s)

Tree | Veg. Composition | Ground Surface Cover | Brown's Survey | Photo Series | Piece Count

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	40.0000		---	ALL	DBH	5.00	999.99	
FRQ	300.0000		---	ALL	DBH	0.01	4.99	
			OR	ALL	HGT	0.50	4.49	

Example 2:

- **Large Plot (30 BAF) –** 4.3-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 4.2-inches DBH, including seedlings ≥ 0.1 foot tall

Default Sample Design Form(s)

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	30.0000		—	ALL	DBH	4.30	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	4.20	
			OR	ALL	HGT	0.10	4.49	

Example 3:

- **Large Plot (20 BAF) –** 5.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 4.9-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		—	ALL	DBH	5.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	4.90	
			OR	ALL	HGT	0.50	4.49	

Example 4:

- **Large Plot (20 BAF) –** 3.5-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 3.4-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		—	ALL	DBH	3.50	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	3.40	
			OR	ALL	HGT	0.50	4.49	

Example 5:

- **Large Plot (20 BAF) –** 3.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 2.9-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		—	ALL	DBH	3.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	2.90	
			OR	ALL	HGT	0.50	4.49	

Example 6:

- **Large Plot (15 BAF) –** 3.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 2.9-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	15.0000		—	ALL	DBH	3.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	2.90	
			OR	ALL	HGT	0.50	4.49	

Example 7:

- **Large Plot (10 BAF) –** 5.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 4.9-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	10.0000		—	ALL	DBH	5.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	4.90	
			OR	ALL	HGT	0.50	4.49	

Example 8:

- **Large Plot (10 BAF) –** 3.0-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 2.9-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	10.0000		—	ALL	DBH	3.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	2.90	
			OR	ALL	HGT	0.50	4.49	

Example 9:

- **Large Plot (10 BAF) –** 2.5-inch breakpoint diameter
- **Small Plot (1/300th acre) –** all trees 0.1- to 2.4-inches DBH, or trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	10.0000		—	ALL	DBH	2.50	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	2.40	
			OR	ALL	HGT	0.50	4.49	

Example 10:

- **Large Plot –**
  - **(20 BAF) –** 5.0-inch breakpoint diameter for all live trees, and dead trees 5.0- to 8.9-inches DBH
  - **(10 BAF) –** dead trees ≥ 9.0-inches DBH
- **Small Plot (1/300th acre) –** all trees 0.1- to 4.9-inches DBH, and all live trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		—	LIVE	DBH	5.00	999.99	
			OR	DEAD	DBH	5.00	8.90	
BAF	10.0000		—	DEAD	DBH	9.00	999.99	
FRQ	300.0000		—	ALL	DBH	0.10	4.90	
			OR	LIVE	HGT	0.50	4.49	

Example 11:

- **Large Plot –**
  - **(20 BAF) –** 5.0-inch breakpoint diameter for all live trees
  - **(10 BAF) –** all dead trees ≥ 5.0-inches DBH
- **Small Plot (1/100th acre) –** all trees 0.1- to 4.9-inches DBH, and all live trees ≥ 0.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		—	LIVE	DBH	5.00	999.99	
BAF	10.0000		—	DEAD	DBH	5.00	999.99	
FRQ	100.0000		—	ALL	DBH	0.10	4.90	
			OR	LIVE	HGT	0.50	4.49	

Example 12:

- **Large Plot –**
  - **(1/4th acre) –** all trees ≥ 21.0-inches DBH
  - **(1/24th acre) –** all trees 5.0- to 20.9-inches DBH
- **Small Plot (1/100th acre) –** all trees 0.1- to 4.9-inches DBH, and live trees ≥.5 feet tall

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
FRQ	4.0000		—	ALL	DBH	21.00	999.99	
FRQ	24.0000		—	ALL	DBH	5.00	20.90	
FRQ	100.0000		—	ALL	DBH	0.10	4.90	
			OR	LIVE	HGT	0.50	4.49	

B.2 Vegetation Composition Form

Example 1:

- **1/100th-acre fixed-plot –** measure all live vegetation occurring within the plot perimeter, with a canopy cover of 5 percent or greater.

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
FRQ	100.0000		—	LIVE	CVR	5.00	100.00	

Example 2:

- **1/10th-acre fixed-plot –** measure all live vegetation occurring within the plot perimeter (to trace amounts).

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
FRQ	10.0000		—	LIVE	CVR	0.10	100.00	

Example 3:

- **Mixed sampling methods, based on lifeform-**
  - Line-intercept method to measure canopy cover of trees. Measured on 100' of transect.
  - Fixed area plot method, 1/24th acre, measure all live shrub, grass, and forbs occurring within the plot perimeter.

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
TRN	100.0000		—	LIVE	TRE	0.01	100.00	
FRQ	24.0000		—	LIVE	SHR	0.01	100.00	
FRQ	24.0000		—	LIVE	FRB	0.01	100.00	
FRQ	24.0000		—	LIVE	GRM	0.01	100.00	

B.3 Ground Surface Cover Form

Example 1:

- **1/100th-acre fixed-area plot –** measure ground surface cover types occurring within the plot perimeter.

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
FRQ	100.0000		—		SVC	0.10	100.00	

Example 2:

- **Point-intercept method –** measure ground surface occurring at each point along a transect. 100 points are measured at each "plot" (transect).

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
TPT	100.0000		—		SVC	0.10	100.00	

B.4 Down-Woody Materials Form

Example:

- **Brown's Protocol –** follow sampling procedures according to Brown's Protocol.
  - **7 foot-transect –** sample down-woody fuels for three diameter classes (0.01 to 0.24-inch; 0.25 to 0.99-inch; 1.00 to 2.99-inches)
  - **27-foot transect –** sample down-woody fuels ≥ 3.0 inches in diameter

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
TRN	7.0000	45	—	DOWN	DIA	0.01	0.24	
TRN	7.0000	45	—	DOWN	DIA	0.25	0.99	
TRN	7.0000	45	—	DOWN	DIA	1.00	2.99	
TRN	27.0000	45	—	DOWN	DIA	3.00	999.99	

Supplemental Appendix R1-C: Juniper Allegro

C.1. About the Juniper Allegro

The Juniper Systems Allegro CX & MX data recorders are designed for use in extreme field environments. Allegros will operate in temperatures ranging from –20 ºF to 130 ºF. The Allegro is water resistant and can be used in rain/snow and will maintain data integrity when submerged in water for short periods of time. Refer to the owner's manual for additional information. The manual can be found on disc, or here: http://www.junipersys.com/Juniper-Systems/support/Documentation/Allegro-Field-PC

One important note: the touchscreen can be locked (if you need to wipe it clean and don't wish to turn the unit off) by pushing (Blue Key + TS/BkSp for CX or Blue Key + . for MX)

C.2. Care for the Allegro

The Allegro is considered a rugged field PC, but has limitations as to what it can withstand. When not being used, Allegros should be stored in an office with the battery removed. Conditions to avoid are temperature extremes, shock, storing with other equipment (one was severely damaged as it rubbed against a hatchet in a pack all day). Padded cases should be used for day to day use.

The Allegro screens are fragile and can be scratched and broken. Take care not to expose the screen to course surfaces or impact the screen in anyway. Screen protectors should always be used. New style screen protectors are far superior to older style ones; they have less glare, last much longer, and don't peel off as easily.

The faceplate, over the keypad, can be removed by prying up from the slot near the bottom of the PDR. Clean out dirt and debris with a soft brush or compressed air can. Carefully replace the faceplate by ensuring that the keys go entirely through the keyholes. Keys that stick under the faceplate should be gently pressed until they work up through the faceplate. When you restart the Allegro you may get an error message that reads "stuck key failure." When this occurs, turn the Allegro off, and gently press and jiggle each key until the stuck key is free. The ports and the top of the Allegro (COM 1 and COM 2) should be periodically cleaned with a brush. The rubber caps for the ports should always be kept in place to protect ports from water, debris, and accidental impacts.

There should not be any debris inside the battery compartment, or the PC flash card compartment. A gasket protects these areas from dirt, dust, and water. If dirt is present in the battery or flash card compartment, blow it out with a compressed air can.

C.3 Turning the Allegro "On" and "Off"

To turn the Allegro on, briefly press the **on/off** key (don't hold it down). Allow the Allegro to boot up, and then the data recorder will be ready for use. To turn the Allegro off, press the on/off key again. This will not "shut down" the Allegro, but puts the Allegro in a "suspend"

mode. If you are entering data and you accidentally press the on/off key, data will not be lost. Just press the on/off key again and the program will resume where you left off.
If you press and hold the on/off key, the Allegro will perform a ***hard reboot*.** Hard reboots should be performed if the PDR freezes up, and no keys are working, but data will be lost since it was last saved.

Note: *For Exams software use, it is necessary to change PDR settings to the* ***Suspend/Resume mode*** *rather than the on/off mode, to help prevent the accidental loss of data. Refer to section C.5 below (Settings for Exams Software).*

C.4 Allegro Batteries Overview

Allegros are efficient and use little power. The Allegros have two types of main battery packs, an AA clamshell and NiMh rechargeable. There is also an internal lithium backup battery, and a super capacitor. Depending on your application and temperature, the light colored plastic "clamshell" holds 3 AA alkaline batteries and will last an average 2 to 8 hours. The black or dark gray NiMH (nickel metal hydride) battery packs are rechargeable and last 8 to 20 hours when batteries are in good condition and charged properly. The internal lithium backup battery powers the real time clock and the CMOS RAM. The super capacitor serves as the RAM backup and maintains the RAM while you change the main battery pack.

For all other battery information, refer to the manual that comes with each PDR.

C.5 Settings for Exams Software for Allegro CX

In order for **Exams software** to function correctly, the first time an Allegro CX is used, the following settings must be made:

- From the Taskbar select: "Start/Settings/Control Panel/Display/Appearance"
- Under Scheme, make sure it is set to Windows Standard, and that Item is set to Desktop.
- Hit Apply and then OK

For ActiveSync to work properly, the connection settings should be set to 57600 baud if using a serial cable, or to USB if using a dock.
To change this, follows these procedures:

- Go to "Start/Settings/Control panel/PC Connection"
- Select the PC Connection Tab.
- The box at the bottom of the screen should say.
  Connect using: 'Com1 @ 57600 baud' for serial cable use
- If the setting is not as above use the Change button to select this setting.
- Click OK, and then OK again.
- **If you are using USB cradles to move data, change the connection settings to USB.**

Warning: These steps are best done prior to loading the ExamsPDR software onto the PDR. If you reboot the PDR after you have loaded the software you may get an

error message that "ExamsPDR is not a valid Windows CE application". You should save the setting prior to reboot using Start/Programs/Utilities/Save Registry to avoid the PDR reverting to factory default settings after reboot.

C.6. Moving Coordinates from Garmin 76 series GPS and Bluetooth GPS to Juniper System AllegroCX Garmin

Set GPS Output

In the Main menu on the Garmin click on Setup then select the interface tab. Make sure the serial data format is set to NMEA and the Baud is set to 4800. If using another type of GPS, adjust these two settings and if possible adjust output to "8 data bits", "no parody", and "1 stop bit."

Set Juniper Systems Allegro

From the Juniper start menu click "Start" in the lower left corner of the screen, then control panel – PC connection. Under "Connect using" set to Com1 @ 57600 baud.

Making the Connection

Using the Garmin serial cable connect the Garmin to the Juniper Com 1 port (left side). Turn the Garmin on and acquire a position. Next, go to the appropriate plot form, select latitude or longitude/input form/get GPS. Exams will now start communicating with your GPS and automatically fill in the lat/long fields in the plot form. Select End GPS to return to the plot form. Note: if you use the averaging feature on the GPS (recommended), the averaged fields will be entered into the Juniper, whenever you break the connection by tapping on End GPS, is the last reading entered into the Juniper.

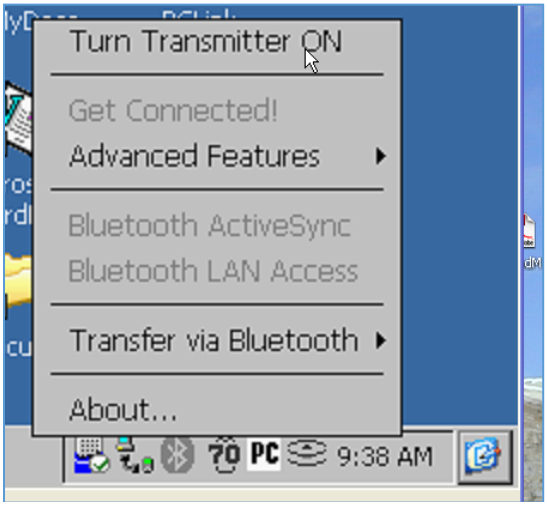
BlueTooth GPS

Note: If using multiple units when using Bluetooth GPS (BTGPS) to populate the lat/long fields in the plot form keep both the BTGPS and Allegros at least 25 feet apart when powered on, otherwise, *ALL* the Bluetooth transmitters will start communicating and cause problems.

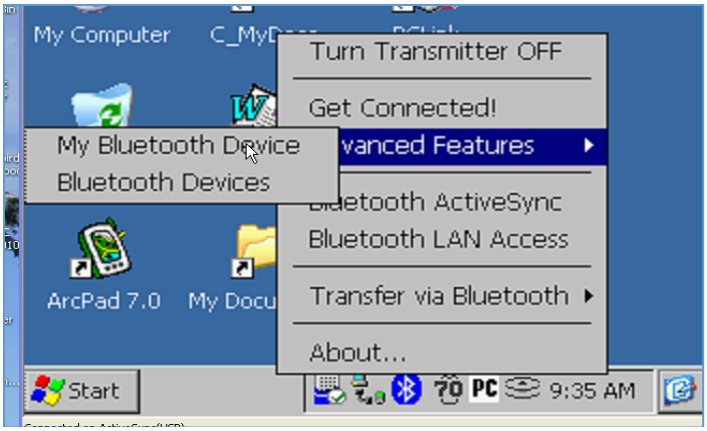
Set Juniper Systems Allegro

On the Juniper CX click the Bluetooth (BT) icon in the middle bottom of the screen:

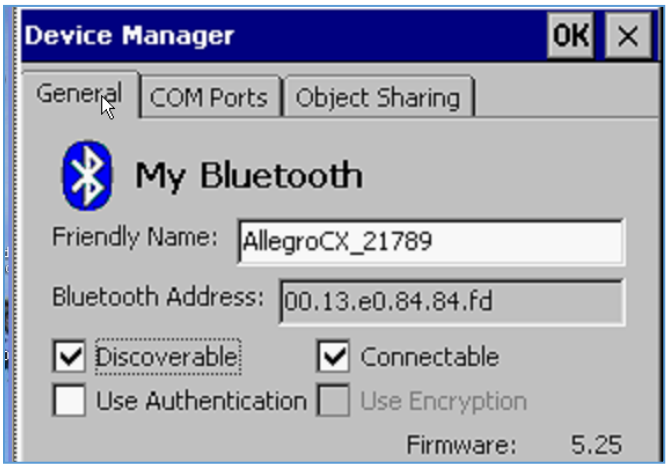
Select "Turn Transmitter On" if it is off:



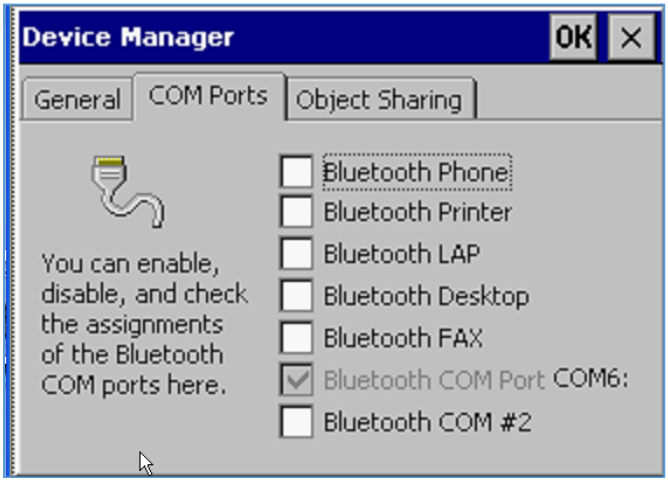
Next, select “Advanced Features” then “My Bluetooth Device”:



Under “General” select the boxes next to “Discoverable” and Connectable”:



Then select the “COM Ports” tab and make sure Bluetooth Com Port # 6 is selected:



Set the Exams Software
In the Exams software, go to Setup, user definitions, GPS Comm. Ports, make sure Com6 is selected (disregard the description).

Entering Coordinates With BTGPS

1. Turn the BTGPS on and notice that the blue LED blinks approximately every second.
2. Once in the plot form in Exams, click on the down arrow (next) to the longitude field and select input form.
3. Select “Get GPS.”
4. Select “Find”, wait for the Allegro to find the BTGPS.
5. In the Device Name window, select BTGPS and wait for service window to pass. Note: the blue LED on the GPS has slowed to blinking once every two seconds and the Bluetooth symbol in the Juniper system tray is subtly alternating color. If prompted to enter a pass code, it is 0183.
6. Once the lat and long fields are filled in, select “End GPS” and “OK” at the top of the screen.

C.7 Generalized GPS Operating Instructions

There are many makes and models of GPS that can be used to establish, re-measure and qualtiy check plot locations. Following are some guidelines on how to set up GPS units for this inventory. Before verifying the initial settings and navigation with the unit, become familial with installing batteries, the function of each key/rocker and using/connecting the power source by reading the owner’s manual and quick start guide. The proper initial settings are necessary for positioning and navigational accuracy and once selected, become the default values each time the GPS is turned on.

C.7.1 Settings

Turn the unit on and once the Warning screen appears, press the **PAGE** key. The unit will start acquiring satellites. Press **MENU** twice to navigate to the Main Menu. Toggle down using th

rocker pad to **Setup** and press **ENTER**. At the top of this screen there are 8 tabs that can be navigated through using the rocker pad. Verify the GPS settings using the information below:

General tab

- Mode = Normal
- WAAS = Enabled
- Backlight Timeout = 15 seconds
- Language = English

Altimeter tab

- Altimeter Auto Cal. = On
- Altimeter = On
- Pressure Units = Milibars
- Barometer Mode = Variable Elevation

Compass tab

- Compass = On
- Use GPS if Speed is Above = 10 mph
- Use Compass if Speed is Below 10 mph for at least = 1 ½ minutes

Time tab

- Time Format = 12 Hour
- Time Zone = Mountain
- Daylight Savings Time = Auto
- Current Date = Correct Current Date
- Current Time = Correct Current Time

Units– Note: these items may be found under different menus on different units.

- Coordinates: UTM
- Datum – NAD 1983 CONUS
- WAAS: Enabled
- North Reference: True

C.7.2 Collecting Points

Always average 30 points or more to collect PC, RP, or vehicle coordinates. Methods for doing this vary depending on unit, but generally select menu in the position screen and then select: average points.

C.7.3 Improving Satellite Reception

Use an external remote antenna to improve satellite reception when under heavy canopy/cloud cover, north facing slopes, or any other area that may have poor reception. An external antenna will improve the GPS performance by about 15-20%.

GPS Requirements and Tips:

- Use a GPS receiver that has the ability to obtain the stated accuracy of ± 10 meters (32.8 feet), for each plot, in the horizontal dimension. Plots must be within ± 10 meters (32.8 feet) of their recorded or provided coordinates 85% of the time.
- Elevate the GPS receiver off the ground and remove all obstructions that may block reception; use the external antenna if necessary.
- Use the **Averaging** option of the GPS to provide coordinates for the plot location.
- Acquire an almanac and assure a current position fix of three-dimensional "3D" status by remaining in the same location for at least 3 minutes (or longer if needed to acquire a minimum of at least 30 position fixes). After the almanac has been collected, proceed to collect and record the coordinates for PLOT LATITUDE (item 4.2.1) and PLOT LONGITUDE (item 4.2.2).
- For each point feature, at least 30 position fixes should be collected at an error of 50 feet or less.
- Point features are surveyed when the GPS antenna is at plot center for a period of time. During that time, 30 individual GPS position fixes are collected and averaged to give a single location for that point. While acquiring 30 fixes, the GPS receiver must not move as satellite signals are continuously received.

C.7.4 Obtaining an Averaged Location

- Averaged coordinates will be collected at the truck parking spot, reference point, and location center
- With the unit on, press and hold the Enter/Mark key for 2 seconds until the Mark Waypoint screen appears.
- Press the Menu key and a separate screen appears with average Location highlighted.
- Press Enter and the Average Location screen appear and if there is good satellite reception, the Measurement Count will start.

Supplemental Appendix R1-D: Supplemental Data Collection Forms

Vegetation Composition: Cover by Lifeform - Tree Canopy Cover

Region 1 Project Name: _____ Proclaimed Forest_____ District_____ Location_____ Stand: _____ Plot_____ Measure along two __' transects																				Total Cover (ft)	Canopy Cover (%)
Total Tree Cover		beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end		Add **Total Cover** from Transect 1 & 2
Transect 1	TOT																				
	Length																				
Transect 2	TOT																				
	Length																				
Tree Cover >6'Tall		beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end		Add **Total Cover** from Transect 1 & 2
Transect 1	TOV																				
	Length																				
Transect 2	TOV																				
	Length																				
Tree Cover ≤6' Tall		beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end	beg	end		Add **Total Cover** from Transect 1 & 2
Transect 1	TSA																				
	Length																				
Transect 2	TSA																				
	Length																				

Cover by Lifeform:

1. Calculate total canopy cover by each lifeform based on the area of the ground covered vertical projection of that lifeform i.e.; Shrubs (TOS), Forbs (TOF), Graminoids (TOG).
2. Calculate total canopy coverage of shrubs by layer (**ST**, **SM**, **SL**) in height categories within the plot. See Cover by Species below for more information on layers.

Lifeform	Layer	Code	Attribute	Canopy Cover % (CVR %)
Shrubs	**All**	**TOS**	Total Shrub	
	> 6.0 ft	**ST**	Total Shrub (> 6.0 ft)	
	1.6 – 6.0 ft	**SM**	Total Shrub (1.6 - 6.0 ft)	
	≤ 1.5 ft	**SL**	Total Shrub (≤ 1.5 ft)	
Forbs	**All**	**TOF**	Total Forbs	
Graminoids	**All**	**TOG**	Total Graminoids	

Cover by Species:

1. Record each plant species with canopy cover ≥ ___%, its lifeform, and record in remarks the layer that best represents where most of the cover tops out (based on area of vertical projection, not biomass).
2. Record all invasive species present in the 1/24th-acre subplot regardless of the canopy cover.
3. A circle ___ feet in radius represents ___% (approx. ___ ft²) of the total ____th-acre subplot area (____-ft radius).

Layer	Height Class
1	**0.0 - 1.5 feet**
2	**1.6 - 6.0 feet**
3	**> 6.0 feet**

Lifeform	Species	Cover % (CVR %)	Remarks (Layers)

DOWN-WOODY MATERIALS FORM

Project Name: _____
Owner: USFS Region: 1 Proclaimed Forest: _____ **District:** _____
Location: _____ **Stand:** _____ **Plot:** _____
Crew Names: _____ **Date:** _____

Measurement Direction and Distances		FWD			CWD	Litter/Duff	
		1-Hour	10-Hour	100-Hour	1000-Hour	FIRST DUFF	SECOND DUFF
Transect Direction	Odd# plot	°	°	°	° and °	°	°
	Even# plot	°	°	°	° and °	°	°
Length of Transect		to ft (_ ft)	to ft (_ ft)	to ft (__ ft)	entire transect (___ ft each)	__ ft mark	__ ft mark

Fine Woody Material (< 3.0 in.), Duff/Litter:

1-hour 0.01 - 0 .24 in. xxx	10-hour 0.25 – 0.99 in. xxx	100-hour 1.00 – 2.99 in. xxx		FIRST DUFF (in.) xx.x "	SECOND DUFF (in.) xx.x "

Coarse Woody Material (>3.0 in.):

Transect Azimuth	Piece Count xxx	Decay Class x	Diameter (in.) xxx.x "	Length (ft.) xxx.x '	Large End (in.) xxx.x "
Notes:					

Coarse Woody Material (>3.0in.)

Transect Azimuth	Piece Count xxx	Decay Class x	Diameter (in.) xxx.x "	Length (ft.) xxx.x '	Large End (in.) xxx.x "

Ground Cover Sample Form:

Project Name: _____

Owner: USFS Region: 1 Proclaimed Forest: _____

District: _____ **Location:** _____ **Stand:** _____ **Plot:** _____

Crew: _____ **Date:** _____

GROUND SURFACE COVER FORM

Cover Types	Subplot								Plot
	North		East		South		West		
	Hits	Total	Hits	Total	Hits	Total	Hits	Total	Total
ASH									
BAVE									
BARE									
CRYPT									
DEVP									
LICH									
LIT									
MOSS									
PEIS									
ROAD									
ROCK									
TRIS									
UNKN									
WATE									
WOOD									
TOTAL		25		25		25		25	100

Setting Reference Form

PROJECT NAME: (25 character) _

Region XX	Proc. Forest XX	District XX	Location (16-character)	Stand # XXXX	Owner XXXX	State XX	County XXX	Admin Forest XX	Date mm/dd/yyyy
_ _	_ _	_ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _	_ _ _ _	_ _	_ _ _	_ _	_ _ / _ _ / _ _ _ _

Photo ID (14-character)	Exam Level XXXX	Exam Purpose XX	Strata XXXXXX	Existing Veg. Ref XXX	Existing Vegetation XXXXXXXX	Potential Veg. Ref XXX	Potential Vegetation XXX	Structure XX	Capable Growing XXX
_ _ _ _ _ _ _ _	_ _ _ _	_ _	_ _ _ _ _ _	_ _ _	_ _ _ _ _ _ _ _	_ _ _	_ _ _	_ _	_ _ _

Fuel Model XX	Elevation XXXXX	Aspect XXX	Slope XXX	Slope Position XX	Acres XXXX	Examiner (12-character)	Precison Protocol XXXXXX	Radial Growth Inteval XX	Height Growth Inteval XX
_ _	_ _ _ _ _	_ _ _	_ _ _	_ _	_ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _	_ _	_ _

Fuel Photo Reference XXX	Setting User XXXX	Remarks (242-characters):
_ _ _	_ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Plot Reference Form

Region:____ Proc. Forest:____ District:____ Location:_____ Stand Number:_____ Crew:_____ Date:_____

Plot #	Lat	Long	Asp	Slope	Slope Pos	Slope Horiz Shape	Slope Vert Shape	Elev	Existing Vegetation	Potential Vegetation	Fuel Mod	Residue Desc. Code	Plot User Code	Dist. Seed Wall	Plot History	History Date
XXX	DDMMSS.S	DDDMMSS.S	XXX	XXX	XX	XX	XX	XXXXX	XXX	XXX	XX	15 Characters	XXXX	XXX	XXXX	YYYY
	.	.														
	.	.														
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	.	.														
	.	.														
Plot Remarks: (242 characters)																

Small Tree Tally Sheet

Project Name:	Proc. Forest	District	Location	Stand	Plot	Date

Species: _____	Tree Count	DBH <1.0"	Height	Crown Ratio	Crown Class
< 0.5 ft.					
Tot Tally			(ave)	(ave)	(ave)
1.0-4.0 ft.					
Tot Tally			(ave)	(ave)	(ave)
5.0-12.0 ft.					
Tot Tally:			(ave)	(ave)	(ave)
13.0-19.0 ft.					
Tot Tally:			(ave)	(ave)	(ave)
20.0+ ft.					
Tot Tally:					

Species: _____	Tree Count	DBH	Height	Crown Ratio	Crown Class
< 0.5 ft.					
Tot Tally			(ave)	(ave)	(ave)
1.0-4.0 ft.					
Tot Tally			(ave)	(ave)	(ave)
5.0-12.0 ft.					
Tot Tally:			(ave)	(ave)	(ave)
13.0-19.0 ft.					
Tot Tally:			(ave)	(ave)	(ave)
20.0+ ft.					
Tot Tally:					

Lynx Horizontal Cover Estimation Form

Project Name: _____

Region: 01 Proclaimed Forest: _____ **District:**_____

Location:_____

Stand ID: _____ **Plot:**_____ **Date:**_____

Crew:_____

Azimuth:	**0°**	**90°**	**180°**	**270°**
Quadrant 1 Cover %				
Quadrant 2 Cover %				
Quadrant 3 Cover %				
Quadrant 4 Cover %				
Sum of Quadrant Cover Q1 % + Q2 % + Q3 % + Q4 %				
Board Average Cover % $\frac{\text{Sum of Quadrant Cover}}{4}$				
Sum of Board Cover % (0°+90°+180°+270°)				
Plot Average Cover % $\frac{\text{Sum of Board Cover \%}}{4}$				

Supplemental Appendix R1-E: Measuring Tree Canopy Cover

Tree Canopy Cover

Canopy cover is the proportion of the forest floor covered by the vertical projection of tree crowns. Region 1 has a standard method for sampling canopy cover using line-intercept method. Transect length can be modified depending on: height of trees, variability within the setting, and necessary confidence intervals. Call someone on the R1 analysis team if you have implementation questions.

Implementation

There are two methods to indicate and record that you collected canopy cover using the line-intercept method.

If you are collecting information on the Vegetation Composition form, i.e. the Exam Level (Item 2.13) of the Vegetation Composition Form > 0, indicate that Tree Lifeform canopy cover is collected along a transect using the line-intercept method in the Sample Design Form for Vegetation Composition (see below, example indicates 100 foot transects).

Tree | Veg. Composition | Ground Surface Cover | Down Woody Material (Brown's Survey)

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
TRN	100.0000		—	LIVE	TRE	0.01	100.00	
FRQ	24.0000		—	LIVE	SHR	0.01	100.00	
FRQ	24.0000		—	LIVE	FRB	0.01	100.00	
FRQ	24.0000		—	LIVE	GRM	0.01	100.00	

Method two is used if you intend to collect tree canopy cover and no other vegetation composition information. This is the case where the Exam Level of the Vegetation Composition Form (Item 2.13) = 0. Use the following method: Enter CXXX or CXX in the Plot User Field where C denotes canopy cover is being collected and XX or XXX is a two or three digit number indicating the percent canopy cover of trees on the transect.

For Example, C76 indicates that there was 76 % percent canopy cover. Be sure to use all three digits when entering the canopy cover so the value is interpreted correctly by the post-load processor when moving this value into the Canopy Cover field in FSVeg.

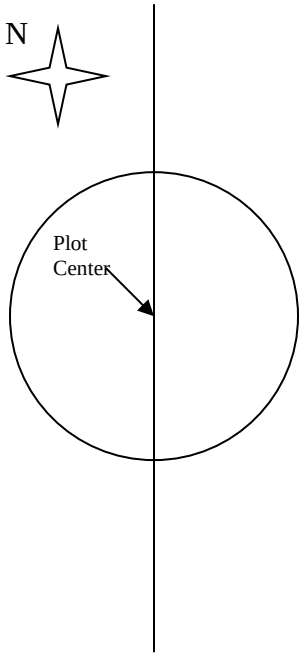
Plot Data for Setting: 011008350642_04/13/2017

Plot #	Latitude	Longitude	ASP	*Slp%	*PotVeg	UseF
1			324	22	621	C76

Protocols

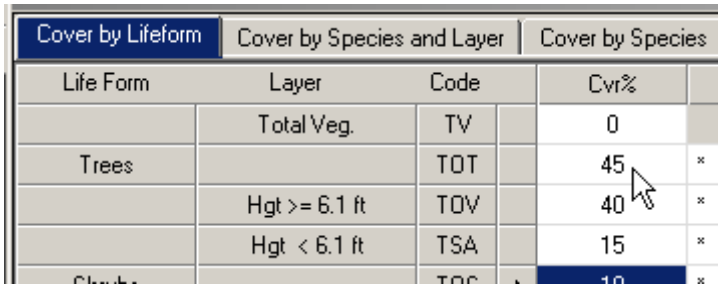
From the plot center lay out a transect centered on plot center such that half extends east and half extends west for even numbered plots and north south for odd numbered plots. Generally,

a 100 foot transect is used. If the slope exceeds 10 percent correct both the transect length and feet of canopy cover prior to entering a percent. See Appendix J for information on correcting for slope.



This is an example of an odd numbered plot. In this example, the plot is a fixed radius 1/24th acre plot (24 ft. radius). The transect extends 50 feet north and 50 feet south, if the plot were even numbered it would extend east/west.

Count linear feet of transect that has tree crown above it to the nearest foot. Work in whole feet such that you only subtract gaps in crown or crown itself if they are one foot or longer. If the transect extends past stand boundaries, bend 90 degrees in whatever direction will keep the transect within the stand you are working in. *Every* tree, regardless of height or diameter should be included. Sum up the total linear feet of covered transect and record in the Cover by Lifeform form next to TOT, total tree. Estimate the percent cover in TOV (trees >= 6.1 ft) and TSA (trees <= 6 ft) along the transect. Note that these two fields can add to a total greater than TOT because TOV and TSA can be layered. The screen shot below of the Cover by Lifeform form in Exams shows where to record transect information and how TOV and TSA *can* add to a sum greater than TOT.



Cover by Lifeform | Cover by Species and Layer | Cover by Species

Life Form	Layer	Code	Cvr%
	Total Veg.	TV	0
Trees		TOT	45
	Hgt >= 6.1 ft	TOV	40
	Hgt < 6.1 ft	TSA	15

Note: a 50' transect can be utilized but cover estimates need to be doubled before entering into Exams.

Sup App R1-F: Protocols for Taking Plot Photos

Digital Plot Photos
If photos are taken in the field, such as in each of the cardinal directions from the plot center, then use the following protocols. These types of photos can be used by land managers to appraise fuel and vegetation conditions on the plot, such as dead and down-woody material loading, tree density, and height of understory vegetation and, if using the Inventory and Monitoring protocols, how vegetation changes over time.

F. 1. Procedure

Prior to taking digital plot photos, fill out a photo placard with the information necessary to identify what the photo displays. Include identification information such as:

- project name (optional),
- proclaimed forest
- district number (optional),
- location (compartment/subcompartment)
- stand number
- measurement number (IM),
- plot number
- cardinal direction from plot center that the photo is taken

See an example of a photo placard below (Figure 1). Placards can be printed on paper, or could be made using a small dry-erase board with the project information printed in permanent marker. The placard should be located in one of the lower corners of the photo, without blocking too much of the field of vision. The information on the placard needs to be legible when the photo is zoomed in and should not be obscured by light reflections, vegetation, or darkness. The photo field of vision should include some understory vegetation as well as the spatial arrangement of trees in the direction the photo is being taken to provide information on tree spacing, surface fuels, and ladder fuels. The following photo shows a good example of an informative plot photo (Figure 2). Figure 3 shows a poor plot photo that doesn't provide enough information on tree density and ladder fuels because the camera was pointed at the ground, limiting the field of vision.

When back in the office, plot photos should be named in a consistent fashion such as DDLLLLSSSSSPC where DD is District, LLLL is location, SSSSS is stand number, P is plot number, and C is the cardinal direction. For example 021345002105E.jpg would indicate District 2, Location 1345, Stand 210, plot 5, photo taken facing east (90 degrees azimuth). If this is IM protocols, where the plots will be remeasured over time, include the measurement number in the photo naming convention.

Note: if lynx horizontal cover measurements are taken include the cover boards in the photos.

Figure 1: Example Photo Placard

Project Name

Proc. Forest:
Dist:
Loc:
Stand #:
Plot:
N E S W

Figure 2: Informative Plot Photo

Figure 3: Unacceptable Plot Photo

Sup App R1-G: Plot Establishment (IM)

This section describes R1 protocols for establishing permanent plots that will be remeasured over time and collecting the data needed for plot relocation by future crews. Some of the data required for plot establishment is collected on a paper Setting Reference Form and some is collected electronically in the Witness Tree|Navigation Information Form. In addition, permanent plot establishment requires plot monumentation on the ground. The title line for data items collected on the paper Setting Reference Form are listed below followed by the word "Form". All other data items collected in the electronic CSE Witness Tree|Navigation Information Form.

G.A Identifying the Stand (IM)

G.A.1 Travel Description (IM)

As an aid in relocating the stand in future measurements and aiding field crews in locating the stand, it is necessary to provide descriptive travel information to the stand.

A Reference Point, may also be identified, which is a landmark, outside of any potential treatment area, that can be used to locate the Stand in the future. An RP is extremely helpful if a substantial harvest is expected to occur where many of the X and Y trees (and most large trees) are expected to be removed.

Route from easily identifiable starting point to parking location should contain (as a minimum):

- Road names and route numbers
- Major landmarks
- Mileages between roads, intersections, forks, and landmarks
- Direction or turns at intersections/forks
- Description of parking area

Hiking directions from vehicle to the stand, and optional RP, should contain (as a minimum):

- Trail name/number – if applicable
- Name of drainage/creek/ridge – if applicable
- Major landmarks
- Approximate distances between trails, creeks, landmarks, etc.

Under the Travel Description on the Setting Reference Form, record road and hiking directions from a highway intersection, or other prominent landmark to the stand, vicinity of the RP. The travel directions must be added to the electronic Exams file, but it is much easier to type them in using ExamsPC once the data has been loaded onto a computer. In Exams, enter information under **Plot Data>Witness Tree|Navigation Information (**CSE 4.20**)**.

- ❖ Tolerance (Travel Description): Both Road *and* Hiking directions must be present

G.A.2 Vehicle Coordinates (IM)

Record the following to indicate the vehicle parking location via GPS using NAD 1983 datum.

G.A.2.1 Latitude (IM) – *Required*; Form

Record the latitude for the plot as measured by a GPS. Record as a 9-digit code comprised of the following values and in the following order: a 3-digit "degree" value, a 2-digit "minute" value, a 2-digit "seconds" value, and a 2-digit "hundredths of a second" value.

G.A.2.2 Longitude (IM) – *Required;* Form

Record the longitude for the plot as measured by a GPS. Record as a 9-digit code comprised of the following values and in the following order: a 3-digit "degree" value, a 2-digit "minute" value, a 2-digit "seconds" value, and a 2-digit "hundredths of a second" value.

G.A.3 Reference Point (IM – *Optional*); Form

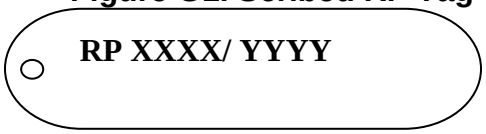
A Reference Point, is a landmark, outside of any potential treatment area, that can be used to locate the Stand in the future. An RP is extremely helpful if a substantial harvest is expected to occur where many of the X and Y trees (and most large trees) are expected to be removed. The Reference Point (RP) is a landmark that will be used to locate one of the plots in the stand in future inventories. The other plots in the stand are found by plot to plot navigation.

Choose an RP that is readily identifiable on both the ground and the aerial photograph/NAIP imagery. Select a landmark such as a prominent tree or large boulder, a sharp bend in a road, a fence corner, etc. If a tree (preferred) is designated as the RP, select a tree that is not likely to die or be removed within the next 10-15 years. If possible, choose an RP with a view of the southern sky to allow for optimum satellite reception. Do not select an RP that is in close proximity to features that will interfere with compass readings (such as metal structures/objects, barbed-wire fences, high-power transmission lines). A unique and obviously identifiable RP (on both the aerial photograph and the ground) may be critical in relocating the PC for future inventories should significant change occur over time.

The RP should be at least 75 feet from the plot that it is referencing, if possible, and outside the treatment unit boundary. It is more important for the RP to be easily identifiable so in certain circumstances, an RP can be less than 75' from the plot center but should *always* be outside the treatment unit boundary, if the stand is expected to be dramatically altered.

Monument the RP during installation. Attach aluminum racetrack tags scribed with "RP XXXX/YYYY, where XXXX = Stand # and YYYY = Plot # to the RP.

Figure G1. Scribed RP Tag



Nail aluminum tags with aluminum nails on two sides of the tree approximately 6 feet above ground level, and with at least 1 inch of nail exposed (to allow for tree growth between inventories). Nail one of the tags facing in the general route of approach to the RP when following the travel directions and nail a second tag at 6 feet on the opposite side of the tree. Nail a third tag at ground level facing towards the plot. If the RP is in a place where there is a high probability that a tag at 6 feet above the ground may be vandalized (such as highly visible

from a designated trail), only attach the tag at ground level and make a note on the paper Setting Reference Form under RP REMARKS(G.A.3.1) (Appendix A1). If no tree is available, mark rocks or other objects with a paint pen or however possible and record in the notes section. However, do not tag aspen. Avoid aspen, if possible; if an aspen tree is used, be sure it is only marked with a paint pen – no nails.

- Tolerance (RP):
  - RP Selection: at least 75' from the PC, unless extenuating circumstances apply
  - RP Selection: easily identifiable on the ground and in aerial photo

The following items are recorded on the Plot Location Reference Form.

G.A.3.1 RP Remarks (IM) – *Required (if RP is established);* Form

Record a detailed description of the RP and its location. For example, "large ponderosa pine with a fork in the southwest corner of the meadow." If the RP is not a tree, record a description clearly identifying the point such as, "northwest corner of old building at the south end of clearing."

G.A.3.2 Reference Point Species (IM) – *Required (if RP is established);* Form

If the reference point is a tree, record the Plants code

- Tolerance (RP): Species: No Errors

G.A.3.3 Reference Point Diameter (IM) – *Required (if RP is established);* Form

Record DBH to the nearest 0.1 inch

- Tolerance (RP): Diameter: ± 0.2 inch per 20 inches of diameter

G.A.3.4 Reference Point Coordinates (IM) – *Required (if RP is established)*

Record the following to indicate the location of the RP via GPS on the Universal Transverse Mercator (UTM) NAD 1983 grid system. See Appendix B for requirements and additional information in using a GPS unit.

G.A.3.4.1 Latitude (IM) – *Required;* Form

Record the latitude for the plot as measured by a GPS. Record as a 9-digit code comprised of the following values and in the following order: a 3-digit "degree" value, a 2-digit "minute" value, a 2-digit "seconds" value, and a 2-digit "hundredths of a second" value.

- Tolerance (RP): ± 10 meters (16.4 feet) of the stated plot location center

G.A.3.4.2 Longitude (IM) – *Required;* Form

Record the longitude for the plot as measured by a GPS. Record as a 9-digit code comprised of the following values and in the following order: a 3-digit "degree" value, a 2-digit "minute" value, a 2-digit "seconds" value, and a 2-digit "hundredths of a second" value.

- Tolerance (RP): ± 10 meters (16.4 feet) of the stated plot location center

G.A.4 Traversing from the RP to the PC (IM) - *Required for installation of monitoring plots*

If a Reference Point is established, then how to navigate to the first plot within the stand, needs to be recorded. Locate the plot center (PC) of the first plot, as indicated by the theoretical plot coordinates provided. Wherever possible, use the following procedures as the method for locating the first plot.

Using the GPS waypoint function, determine the distance and azimuth from the RP to the PC waypoint. Using a compass, tape and clinometer, traverse from the RP to PC along the GPS provided distance and azimuth.

*Note: GPS distances will be in horizontal distance; be sure to correct for slope when running tape and recording slope distance to PC.

If necessary, plot the location of the PC on topographic maps and/or aerial photography prior to locating the PC on the ground.

Once the PC has been located, record RP to PC traverse information (azimuth, horizontal distance, slope distance) on the paper **Setting Reference Form** during initial installation.

G.A.4.1 Azimuth (to the nearest degree; in 3 digits) (IM) – *Required*; Form

- Tolerance (RP to PC Traverse): Azimuth: ± 10 degrees

G.A.4.2 Slope Distance (record to the nearest foot) (IM) – *Required*; Form

- Tolerance (RP to PC Traverse): Distances: ± 6 feet per 100 feet of transect (30 feet maximum)

G.B (IM) Monumenting Plot Center (IM)

Use the following procedures to monument each plot center for future relocation.

G.B.1 Monumentation of Plot Center (IM) - *Installation*

Mark each plot center (PC) by installing a metal stake in the ground. If a metal stake cannot be placed in the ground because of bedrock, etc., build a rock cairn (rock pile) around the stake.

If the PC cannot be monumented at all (e.g., in a river, on a paved road), place an offset stake where possible. Record the **azimuth** (to the nearest degree) and **slope distance** (to the nearest 0.1 foot) from the offset stake to the PC on the Plot Reference Form under PC Coordinates (R1 Supplemental Appendix, R1-D). Take all measurements for inventory items from the actual PC, not from the offset stake.

G.B.1.1 Plot Location Map (IM). *Optional;* Form

Draw a simple sketch of the plot location and hiking route from the vehicle to the PC on the **Plot Reference Form**. Include any helpful landmarks that may aid crews in relocating the PC in future inventories (e.g., location of RP, old jeep roads, hiking/game trails, drainages, cliffs, openings).

G.B.1.2 Plot Narrative/Remarks (IM).

Use this section of the form to record general notes pertaining to the plot location such as the presence of hazardous conditions, description of alternative PC witness landmarks, general stand condition, etc.

Sup App R1-H: Fire Information/Weather Observation Form (IM)

This form in only enable when the exam purpose code is FF. When enabled, populating values in this form is optional, not required. If you are interested in using this section, contact the R1 Field Protocol Specialist (406-329-3443).

Sup App R1-I: Lynx Horizontal Cover Protocol

Following are horizontal cover protocols. This provides a consistent way to measure, inspect, and warehouse horizontal cover estimates collected coincident with stand exam and intensified grid data. It is recommended that prior to data collection, calibration of cover estimates are done with an experienced wildlife biologist.

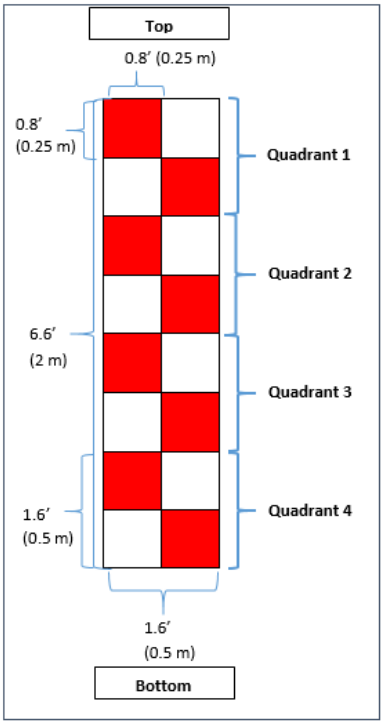
Horizontal cover of a plot is calculated by averaging four cover estimates, measured in four cardinal directions, by estimating horizontal cover based on a cover board placed 32.8 ft (10 meters) from plot center. See Figure B. These protocols are based on those developed by Nudd (1977) and updated by Bertram and Claar (2009).

Since the proper placement of the cover board is dependent upon measuring a cardinal direction. It is *imperative* to determine and record the declination that is used on the compass. Once declination is determined (either 00 or the declination for the Forest) it *must be recorded* on the Setting Form, Magnetic Declination, Item 2.37.

Cover-board Layout

The cover board consists of a cloth strip 1.6 ft (0.5 m) X 6.6 ft (2 m) that is divided into 16 blocks measuring 0.8 ft^2 (0.25 $m^{2)}$ in alternating red and white squares (Figure A). The bottom of the cover-board is placed directly along the ground surface.

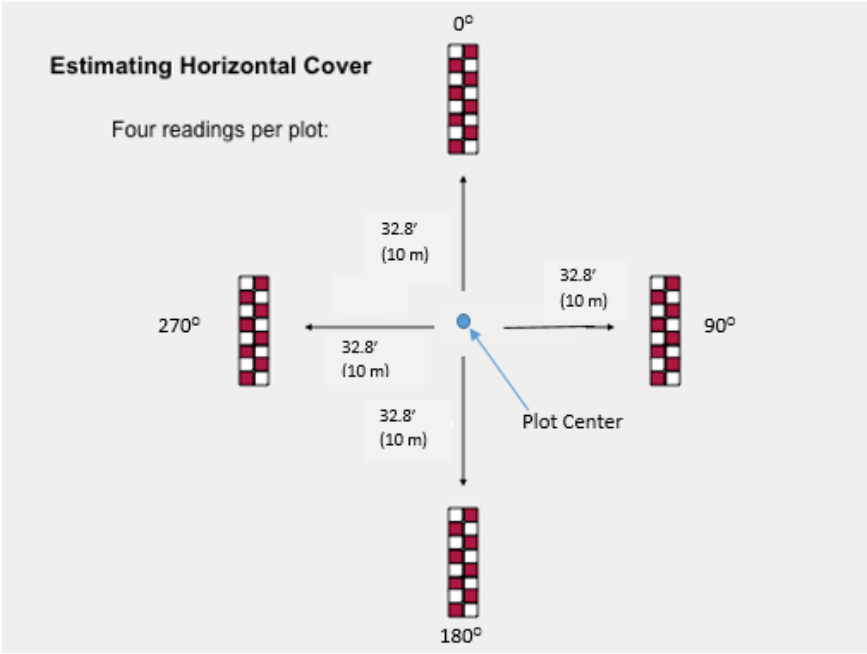
Figure A – Cover Board Layout



Placement of Cover Board

Once the cover board orientation has been determined: 0º, 90º, 180º, and 270º. The cover board is placed 32.8 ft (10 meters) from plot center. Position the cover board so that the tape bisects the center of the cover board.

Figure B – Placement of Cover Board on a plot.



Horizontal Cover Estimation

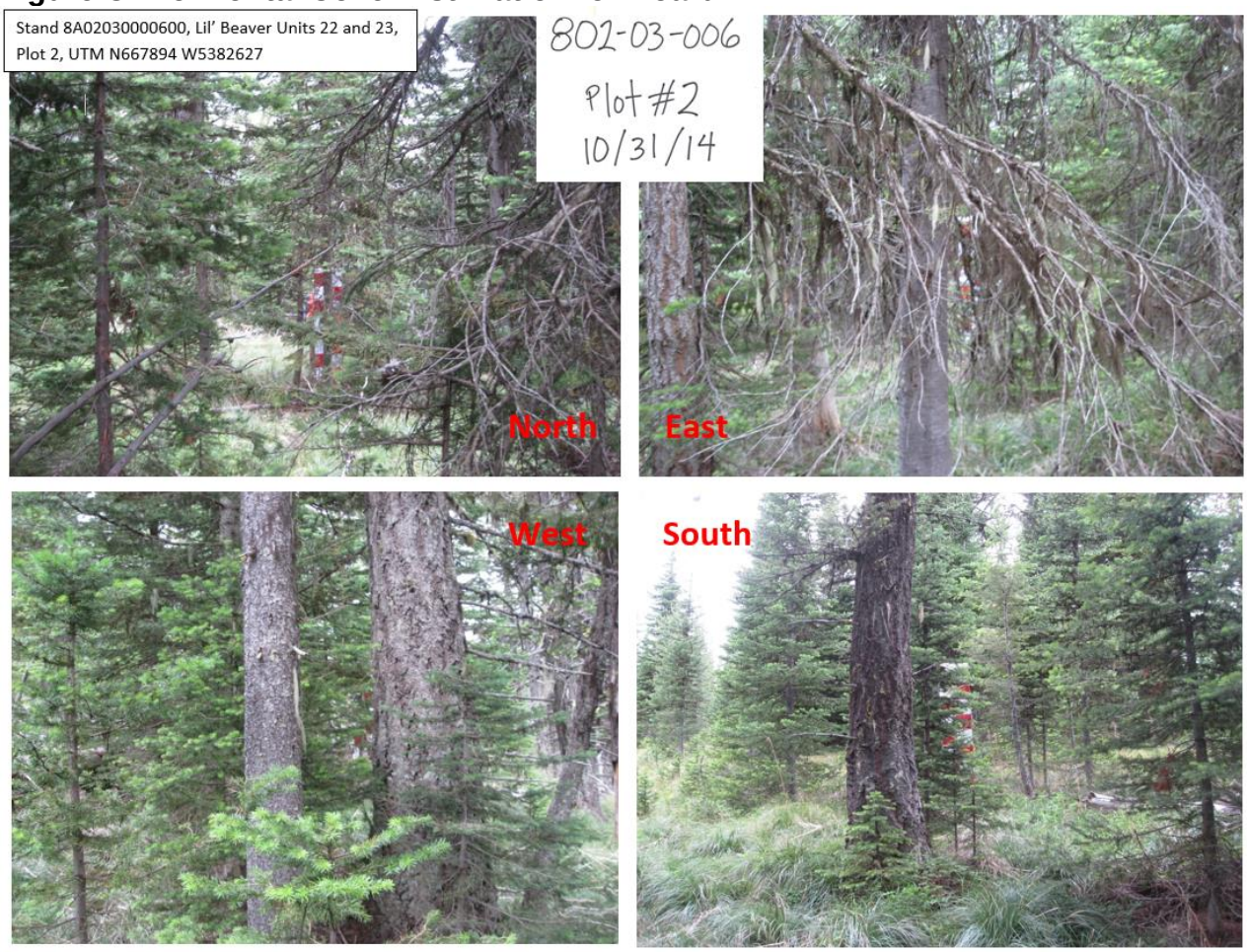
Four cover estimates are collected on each plot, one in each cardinal direction starting with north (0°) and rotating clockwise (90°, 180°, 270°), see Figure B. The estimates are taken from plot center facing the cover-board. The collector's eye should be positioned directly above the plot center, 4.5 feet above the surface of the ground.

The cover-board is visually "divided" into four quadrants, quadrant 1 is at the top of the board, quadrant 4 is at the bottom. The observer estimates how much of the board is *obscured*. Everything that obscures the cover board is included. This includes coniferous needles, deciduous leaves, boles, branches, downed logs, stumps, rocks, the land surface, beargrass clumps, trash, snow on branches, etc. Do not reposition your body to change your line of sight, regardless of vegetation conditions. Consistency is needed in the measurement, taken 4.5 feet above ground, directly over plot center, looking exactly toward the cardinal direction of the cover board.

The quadrant percentages are then averaged to determine the cover percentage for the board. See the Lynx Horizontal Cover Estimation Form (Supplemental Appendix D) for recording cover estimates. See Appendix D for an example of the data collection form.

If plot photos are being collected, include the cover board in plot photos, see R1 CSE/IM Supplemental Appendix R1-F for information on collecting plot photos. Be sure to check the focal length of the camera to ensure it is focused on the cover board.

Figure C: Horizontal Cover Estimation for Board



Example: Estimating Horizontal Cover

Azimuth 0:
(**note:** do not count white material above the red and white boxes; do not count the orange vest visible to the left of the cover board). Boles, fine branches, foliage are across all squares, some squares are not visible at all.

Top quadrant: 35%
2nd quadrant: 80%
3rd quadrant: 75%
Bottom quadrant: 75%

Azimuth:	0°
Quad 1 Cover %	35
Quad 2 Cover %	80
Quad 3 Cover %	75
Quad 4 Cover %	75

Azimuth 90:
Boles, fine branches, foliage are across all squares, some squares are not visible at all.

Top quadrant: 85%
2nd quadrant: 80%
3rd quadrant: 90%
Bottom quadrant: 85%

Azimuth:	90°
Quad 1 Cover %	85
Quad 2 Cover %	80
Quad 3 Cover %	90
Quad 4 Cover %	85

Azimuth 180:
(**note:** top left red square is obscured).

Top quadrant: 80%
2nd quadrant: 70%
3rd quadrant: 60%
Bottom quadrant: 95%

Azimuth:	180°
Quad 1 Cover %	80
Quad 2 Cover %	70
Quad 3 Cover %	60
Quad 4 Cover %	95

<table>
<tr>
<td> </td>
<td>Azimuth 270:
(note: can't be sure if top or bottom quadrant is obscured).

Top quadrant: 100%
2nd quadrant: 95%
3rd quadrant: 85%
Bottom quadrant: 60%</td>
<td>
<table>
<tr><th>Azimuth:</th><th>270°</th></tr>
<tr><td>Quad 1 Cover %</td><td>100</td></tr>
<tr><td>Quad 2 Cover %</td><td>95</td></tr>
<tr><td>Quad 3 Cover %</td><td>85</td></tr>
<tr><td>Quad 4 Cover %</td><td>60</td></tr>
</table>
</td>
</tr>
</table>

1. Sum the quadrant cover %:

Azimuth:	0°	90°	180°	270°
Quad 1 Cover %	35	85	80	100
Quad 2 Cover %	80	80	70	95
Quad 3 Cover %	75	90	60	85
Quad 4 Cover %	75	85	95	60
Sum of Quadrant Cover Q1 % + Q2 % + Q3 % + Q4 %	265	340	305	340

2. Calculate the average by dividing by 4:

Azimuth:	0°	90°	180°	270°
Quad 1 Cover %	35	85	80	100
Quad 2 Cover %	80	80	70	95
Quad 3 Cover %	75	90	60	85
Quad 4 Cover %	75	85	95	60
Sum of Quadrant Cover Q1 % + Q2 % + Q3 % + Q4 %	265	340	305	340
Board Average Cover % Sum of Quadrant Cover/4	66	85	76	85

Plot Horizontal Cover %

When horizontal cover estimates have been obtained in the four cardinal directions, average the four estimates to calculate the average horizontal cover percent for the plot.

Azimuth:	0°	90°	180°	270°
Quad 1 Cover %	35	85	80	100
Quad 2 Cover %	80	80	70	95
Quad 3 Cover %	75	90	60	85
Quad 4 Cover %	75	85	95	60
Sum of Quadrant Cover Q1 % + Q2 % + Q3 % + Q4 %	265	340	305	340
Board Average Cover % Sum of Quadrant Cover/4	66	85	76	85
Sum of Board Ave Cover (0°+90°+180°+270°)	312			
Plot Average Cover % Sum of Board Ave Cover/4	78%			

Plot Horizontal Cover % = 78

Entering Plot Horizontal Cover into Exams Software

The Plot Horizontal Cover % will be entered into the Plot User Code (CSE 4.15) in the Plot Form as LXX or LXXX, where L denotes Plot User Code is being used to collect Lynx Horizontal Cover and XX or XXX is the Plot Horizontal Cover percent entered as a 2 or 3 digit number (72% horizontal cover would be entered as L72). Appendix D shows the Plot Form in Exams with Lynx Horizontal Cover recorded in the Plot User Code field.

Figure D: Entering Horizontal Cover in Plot User Code field of Exams software Plot Form.

Plot Data for Setting: 01100223010184_06/29/2016

Plot #	Latitude	Longitude	*ASP	*Slp%	*PotVeg	UseF
1	47 23 50.90	113 40 40.40	0	0	640	L78