

Implementing an AIM Sample Design

AIM Field Training
2016

Goal of sampling design

- To select a **statistically representative** sample from a **population** in order to **estimate** attributes of the population in an **unbiased** and **cost-effective** manner.



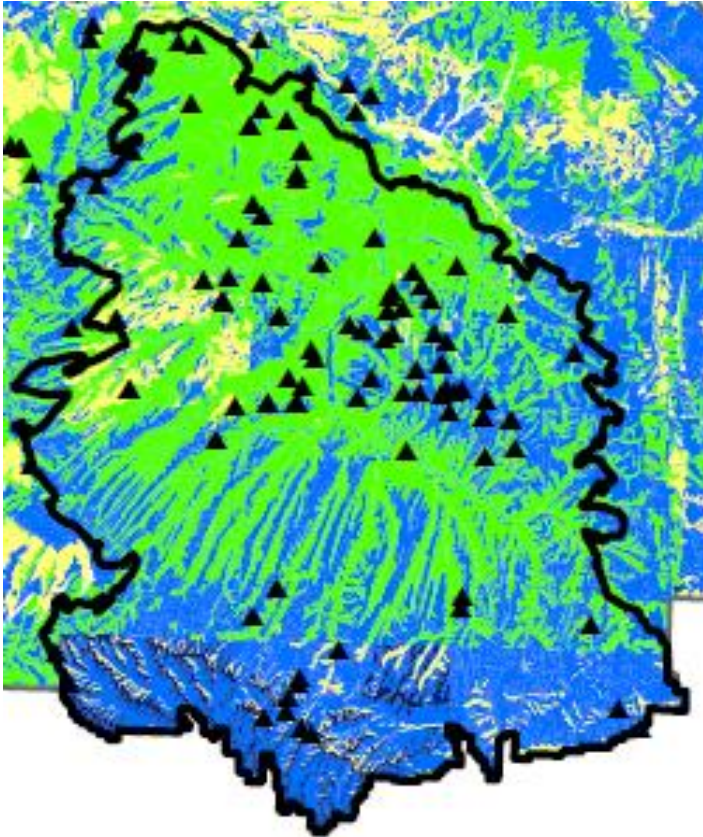
Sampling 101

- Most of the time we can't measure everything everywhere.
- **Sampling** – using selected members to estimate attributes of a larger population.
- If sampling is “statistically valid”
 - Gives unbiased estimates of the population



Concepts – Population

- The entire “universe” to which the results of sampling apply



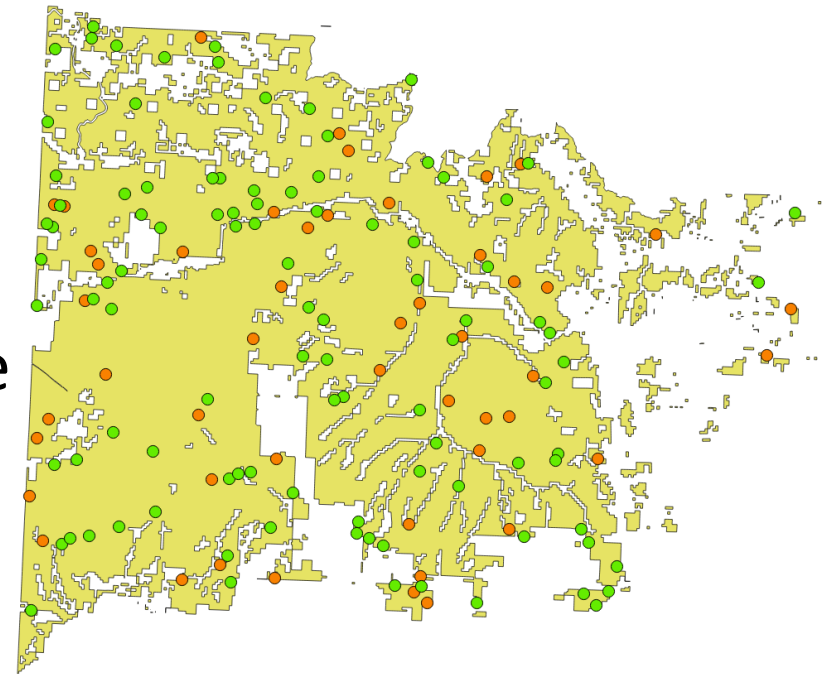
- Defined by many factors
 - Area you’re interested in
 - Objectives
 - Constraints
- Every **sample unit** in population must have some chance of being selected for sampling
- Care should be taken to “preserve” preserve the population
 - Avoid inadvertent restrictions

Defining the population

- Figuring out the area/population you want to monitor isn't always a trivial task
 - If you need to make conclusions about an area, it should be in your population
- **Target population**
 - The population that you intend to draw conclusions about
- **Sampled population**
 - That portion of the target population that you could actually sample
- Be careful not to unnecessarily restrict the population
 - Reductions of target population related to land use can bias results!

Sample Sites – Base & Overdraw

- Sampling points are selected using a spatially-balanced design algorithm
- Points are “balanced” by stratum and by year
- ***Base*** sample consists of *intended* sample sites
- Oversample – alternative points
 - can be used if a base sample point must be rejected



So you have some points...

- Step 1: Office Rejection
- Step 2: Hitch planning
- Step 3: Sampling, Field Rejection, and Plot Tracking
- Step 4: Review Hitch planning

Office Rejection

First things first:

Sample points should be reviewed against rejection criteria in the office using ancillary data sources (e.g., ownership maps, topographic maps, and aerial or satellite imagery).

Office Rejection

Rejection Criteria	Rejection Description
Office - Unsafe to sample	Office Rejection Criteria: Sample point is unsafe to sample.
Office - > 3 miles walking distance	Office Rejection Criteria: Sample point is >3 miles walking distance from the closest point accessible by a vehicle.
Office - Non-BLM land	Office Rejection Criteria: Sample point falls on non-BLM land.
Office - Slope > 50%	Office Rejection Criteria: Slope of sample point exceeds 50%
Office - Access Denied	<p>Office Rejection Criteria: Access to the point was denied: (Information below should be put in Rejection Criteria Comments field)</p> <ul style="list-style-type: none"> ▪ Access route unsafe ▪ Access required passage through non-BLM land, access was denied <ul style="list-style-type: none"> ○ Owner contacted on _____. ▪ Locked gate ▪ Access denied but visit rescheduled for _____.
Office - Transect crosses boundary	Office Rejection Criteria: (Optional, determined by the monitoring objectives) The sample point transect crosses a boundary between different management units (e.g., in an allotment-scale monitoring project, the sample point intersects two allotments). ONLY USE THIS REJECTION CRITERIA IF INSTRUCTED BY YOUR PROJECT LEAD.

This information should be stored in the ***Plot Tracking*** excel file (more information to come in Data Management talk).

Hitch Planning

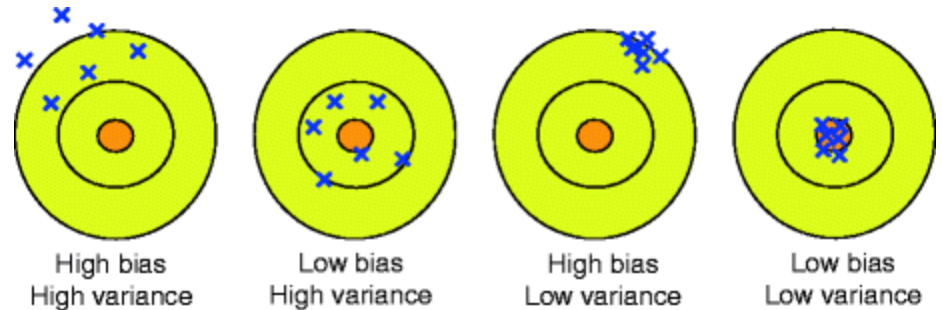
Maintaining Statistic Validity:

- Within each stratum, you should visit the plots in order.
 - For example: Plots SH-001, SH-002, and SH-003 should be visited in that order, but you can add in a plot from another stratum between the plots (SH-001, BA-024, SH-002).
- Optimizing each hitch and attempting to limit travel time between plots each day is also important.
 - You shouldn't travel 100 miles across your project area to ensure that you sample SH-002 directly after sampling SH-001 if you are **certain** that you will sample SH-002 during the field season.

*The goal is to find a balance between going in strict plot order and being efficient, with the emphasis being on maintaining plot order. Going out of order can introduce BIAS** in a number of ways.*

Bias Defined

- The difference between the reported indicator and the true value of the indicator
 - Sampling error
 - Non-sampling error
 - Systematic errors



- Sampling goal: reduce systematic and non-sampling errors wherever possible

**BIAS examples

- Visiting plots most easily accessible first could mean that your crew never gets to the least accessible plots.
- Not spreading out your hitches geographically, going to the various sides of your project area, could mean that the plots sampled are aggregated in one spatial area.
- Going out of order within a stratum can compromise the statistically valid nature of your design – you could be introducing bias and not even know it!

Field Rejection and Plot Tracking

Rejection Criteria	Rejection Description
Field - Unsafe to sample	Field Rejection Criteria: Sample point is unsafe to sample (e.g., unstable soil surface, cliffs, hazardous wildlife, law enforcement concerns).
Field - >3 miles walking distance	Field Rejection Criteria: Sample point is >3 miles walking distance from the closest point accessible by a vehicle.
Field - Slope > 50%	Field Rejection Criteria: Slope of sample point exceeds 50%.
Field - Access Denied	<p>Field Rejection Criteria: Access to the point was denied: (Information below should be put in Rejection Criteria Comments field)</p> <ul style="list-style-type: none"> ▪ Access route unsafe ▪ Access required passage through non-BLM land, access was denied <ul style="list-style-type: none"> ▪ Owner contacted on _____ ▪ Locked gate ▪ Access denied but visit rescheduled for _____
Field - Intersects wetland, riparian, or aquatic feature	Field Rejection Criteria: (Optional, determined by the monitoring objectives) Sample point transect intersects wetland, riparian or aquatic feature.
Field - Intersects Road	Field Rejection Criteria: Sample point transect intersects a road or primitive road.

This information should be stored in the **Plot Tracking** excel file (more information to come in Data Management talk).

Moving a plot!

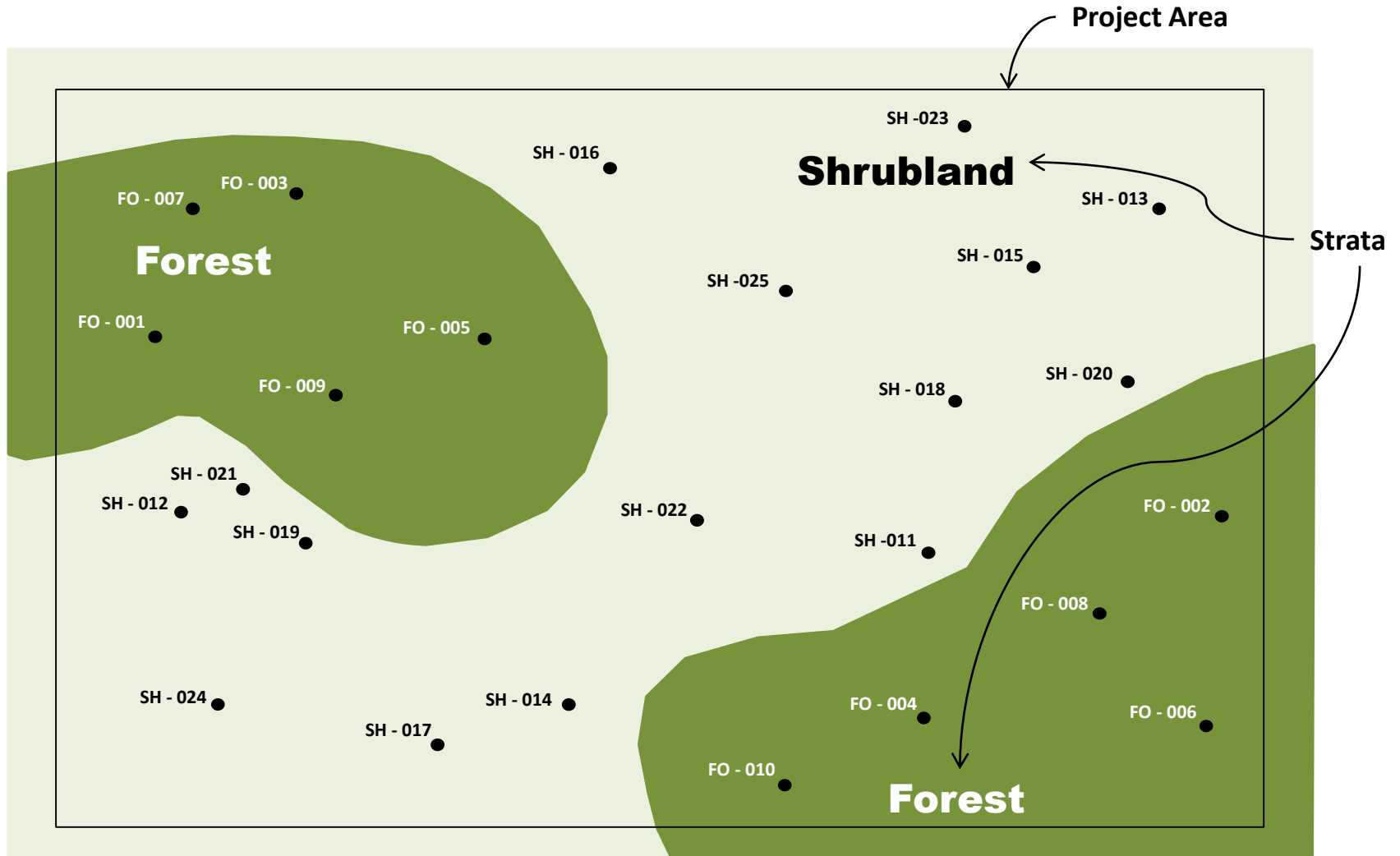
- Plots can be moved up to 50m if doing so would prevent the site from being rejected.
- From the original plot center point
 - Move 50 m north, evaluate the rejection criteria. If not rejected, sample that plot.
 - If rejected, move 50m East/South/West and evaluate
- If rejected in all 4 cardinal directions, reject the plot and activate an oversample.
 - Record the reason for the original rejection, this procedure and the outcome in your plot notes and then in the ***Plot Tracking excel***.

Review Hitch Planning

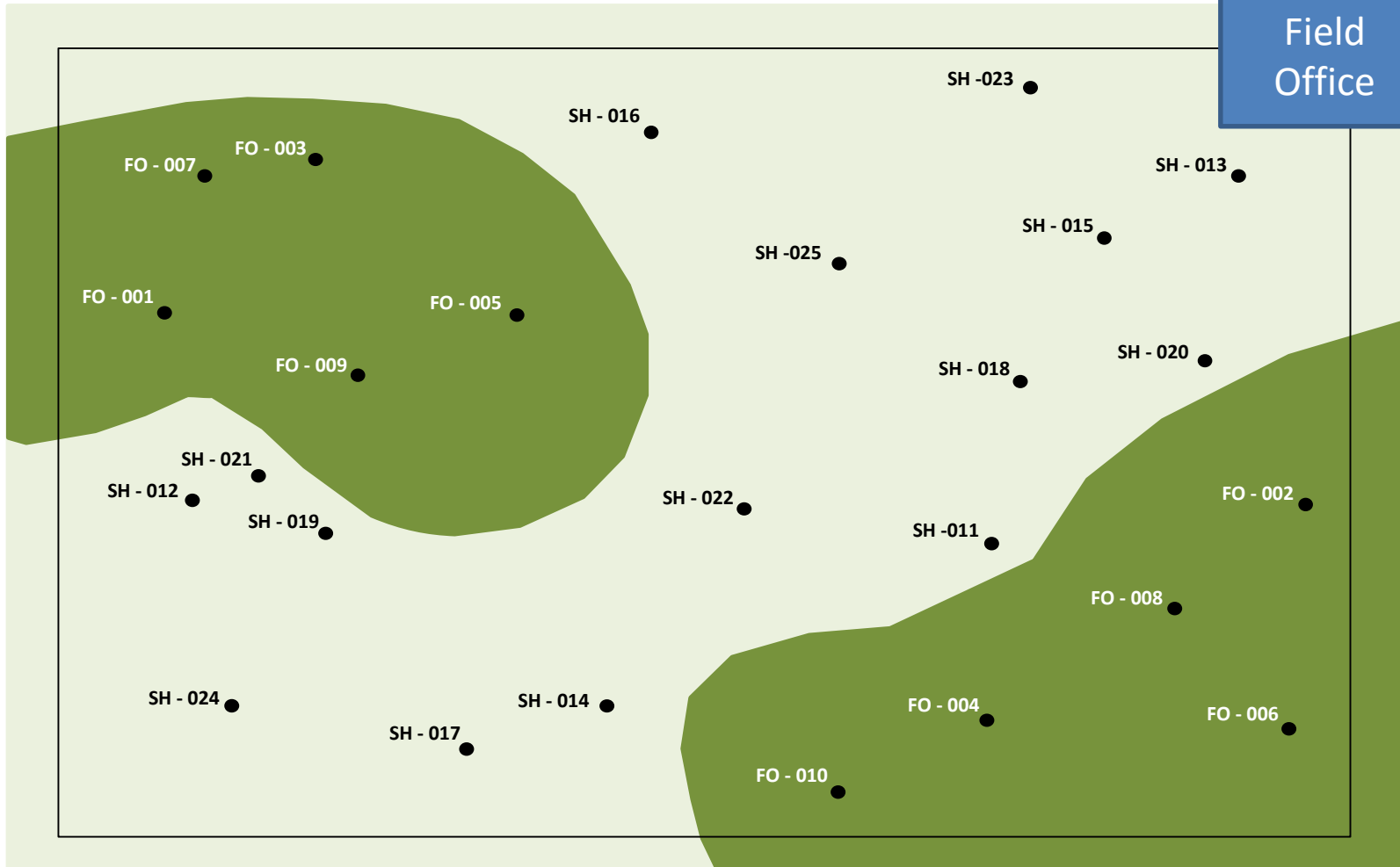
Keep in mind:

- Hitch planning should change as your Sample Design Implementation changes (CONSTANTLY)!
- At the end of the season you should have the same proportion of plots per strata that you started with.
 - Started with 25% in FOREST; 50% in SHRUBLAND; and 25% in GRASSLAND – even if you don't collect all the plots assigned, what you do collect should match these percentages
- For each plot that you reject, you will add in an oversample plot in that strata (at the end of the order).
 - Original order SH-001, SH-002, SH-003; reject plot SH-002 add in Oversample A; *new order is SH-001; SH-003, Oversample A.*

Example of poorly run sample frame



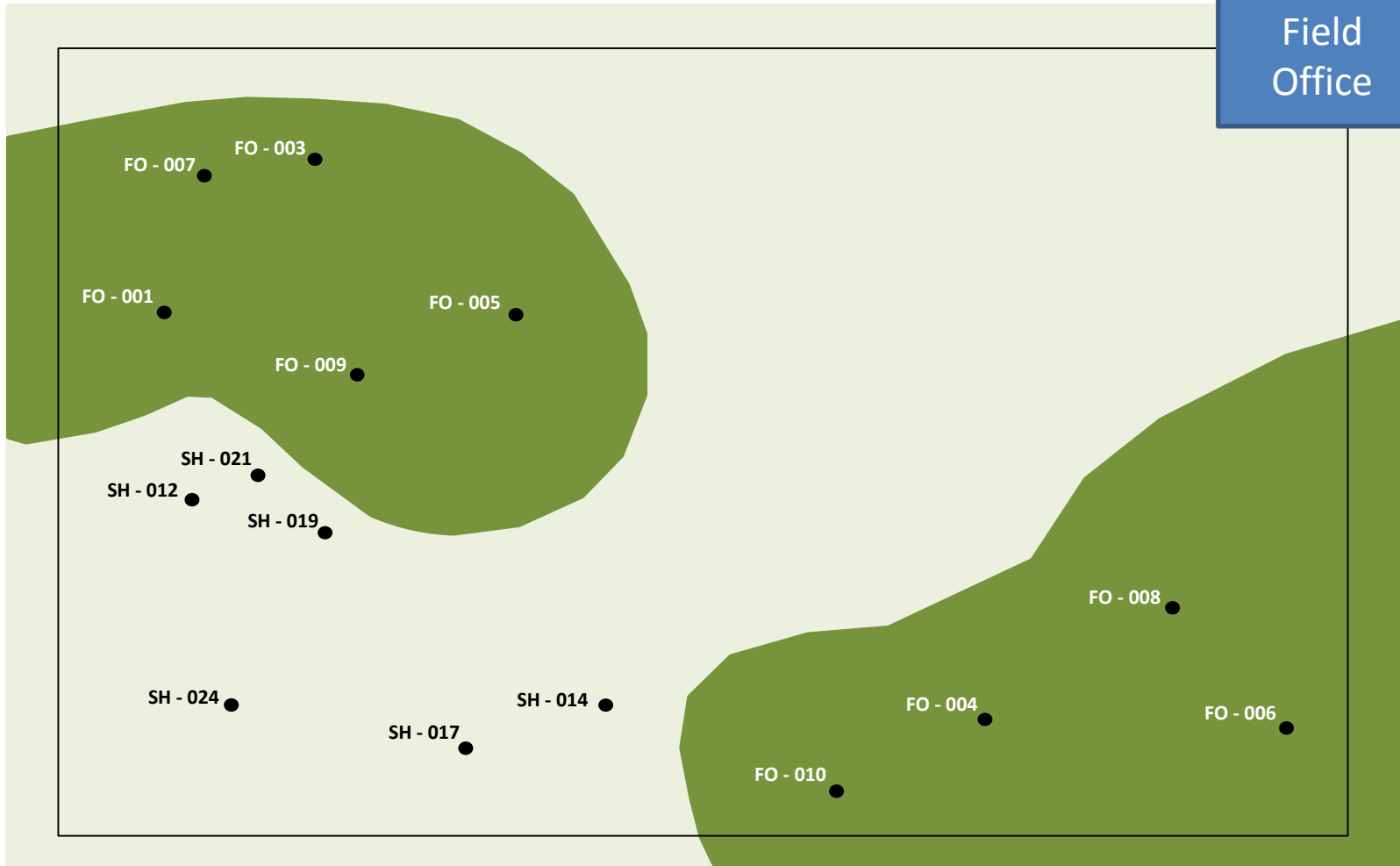
Field
Office



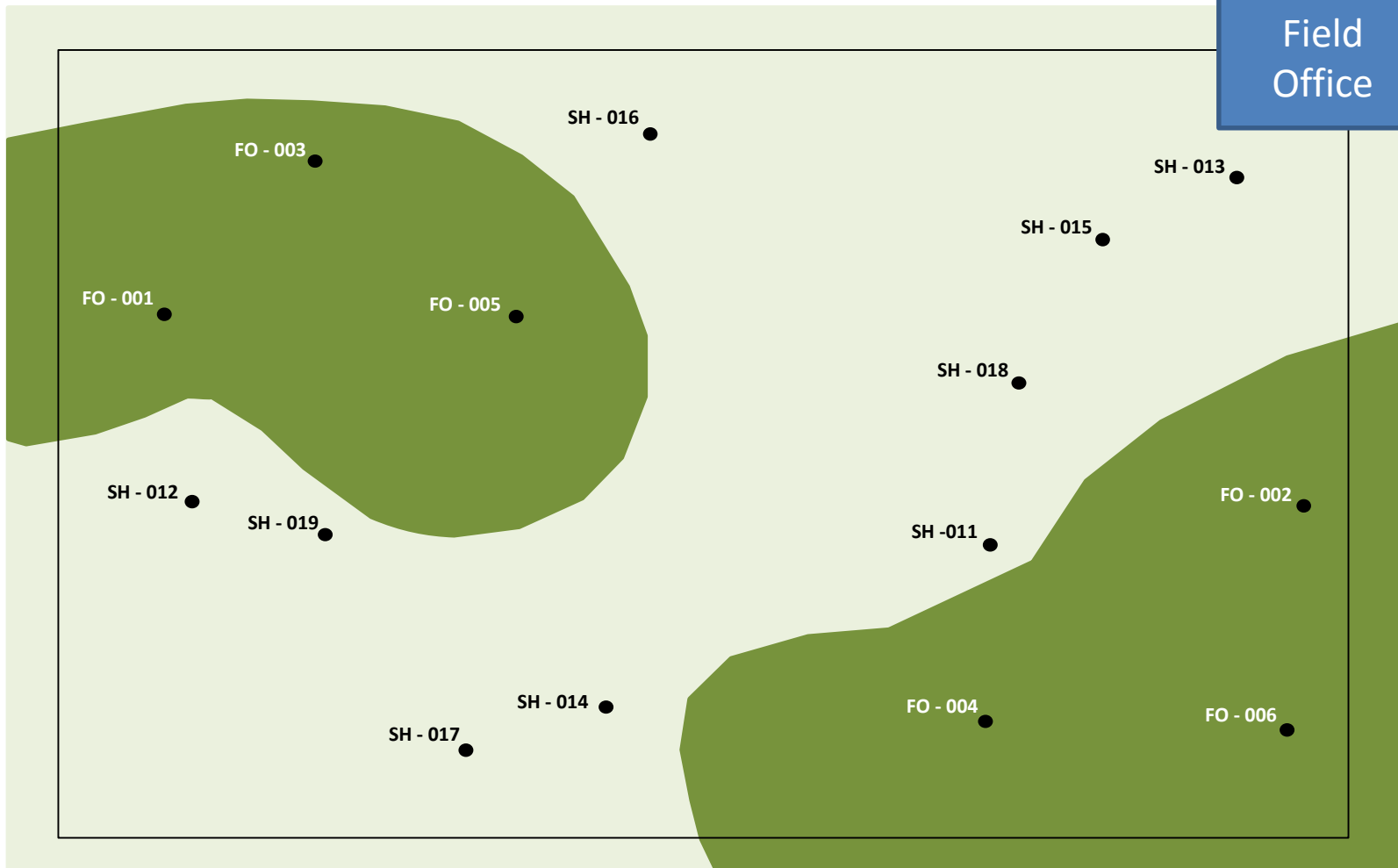
The crew decided to start furthest from the Field office and work their way closer to the office.

- Sampled 15 out of the 25 plots
- Original Proportion of plots was 10 Plots in FOREST and 15 plots in SHRUBLAND

Field
Office



- New Proportion of plots is 9 plots in FOREST and 6 plots in SHRUBLAND
- Because plots are aggregated in one area of the Field Office, even if they are able to sample the other section of the field office next season, varying rainfall may bias the results in one geographic region over another (i.e. this field season was very rainy and next year was dry – results will imply the northwest section of the FO is in worse shape than the south east!)



If the crew went in order (i.e. HOW YOU SHOULD SAMPLE!):

- Sampled 15 out of the 25 plots
- Balanced plot sampling between strata and went in order within strata.
- Originally 10 in FOREST and 15 in SHRUBLAND; after field season the spread is 6 plots in FOREST and 9 plots in SHRUBLAND (same proportion of total plots sampled - 40% and 60%).

Implementation Resources

- <http://aim.landscapetoolbox.org>
 - Sample point evaluations
 - Rejection criteria
 - Hitch planning
 - **Plot Tracking Form**