1. Advanced Forest Inventory
   • The Need for Forest Sampling
   • Brief Intro to Remote Sensing and GIS

Readings:

Related Courses!
• FOR 274: Forest Measurements
• REM 410: Range Measurements
• NR 402: GIS in Natural Resources
• Stats 422: Sample Survey Methods
• FOR 472: Remote Sensing
• FOR 570: Grad Remote Sensing

Why do we Care About Forest Sampling?
Forest managers are required to make important decisions relating to numerous (sometimes competing) resources. Ideally such decisions would be based off an inventory of all the organisms, but cost, feasibility, and timing make this rare. As such, we must make decisions based off only a small portion, or sample, of the data.
Why do we Care About Forest Sampling?

Questions that this course will help answer:
- How can we use LiDAR in forest inventory assessment?
- What are the limitations of LiDAR?
- What do we do when data is missing?
- How can we make management decisions?

Why Are Forest Inventories not Tree-Based?

Example: Assume in this forest we want to quantify the board feet of all PIPO >15” DBH

Problems:
- Many many trees will meet this requirement
- These trees will likely be widely and irregularly dispersed

It will not be practical to develop a sampling protocol where each PIPO was a sampling unit.

Timber estimation is rarely done with the individual tree as the sampling unit.
This is why Plots & Stands are used.
Message of the Day: Analysis of aerial photography can enable us to assess a whole stand with no field measurements.

What is Not Remote Sensing?

Definition of a Geographic Information System (GIS):
A system for capturing, storing, checking, integrating, manipulating, analyzing, and displaying data which are spatially referenced to the Earth. - http://maps.google.com/
Remote Sensing: Overview

Campbell, 1996:

‘Remote sensing is the science of obtaining information about an object from measurements made at a distance from the object (i.e. without touching the object).’

Remote Sensing of the Earth frequently measures electromagnetic radiation in one or more regions of the electromagnetic spectrum. This radiation can be reflected or emitted from the earth’s surface.

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Remote Sensing: Overview

Wildlife Management
Hazard Assessment

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Remote Sensing: Overview

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Water, Ice, and Snow

ASTER: Glaciers Retreating

Baffin Bay, Greenland

The Forest: Let's Start With Aerial Photographs!

Aerial Photographs: Overview

Airphoto acquisition

Airphoto interpretation

Cartographic/GIS Analysis

Data to Users
Aerial Photographs: Overview

Radial Displacement

Stereoscopy – The science of perceiving depth (and thus height) with two eyes/vantage points
Visual Association: we can identify trees and rivers and thus use expert knowledge to infer what species are likely to occur near the river.

Aerial Photographs: Assessments

Pattern and Shape: we can identify trees by their branches

Pattern and Shape: we can also identify natural forests from human generated environments
Color and Tone: we can easily separate conifers (dark) from hardwoods in winter or early spring.

Color and Tone in Infrared Film: we can easily separate conifers from hardwoods as hardwoods reflect more infrared radiation and so appear brighter.

Texture: can easily separate conifers (rough) from hardwoods (smooth).
Color and Tone in Infrared Film: we can easily separate healthy trees as they appear red and diseased trees appear green.

LiDAR for Operational Forest Management

Next Week …