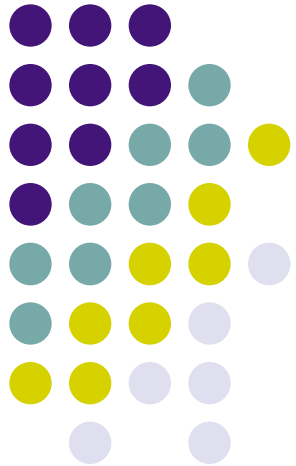
Lower Canopy Assessment & Designing Multi-resource Surveys



ESRM 304

Learning Objectives …

- Appreciate how lower canopy vegetation fits into a multipurpose resource inventory and the complex nature of planning an assessment to include all environmental components

- Know the steps involved with inventory planning

- Know what is involved with statistically sampling a well-defined population

Vegetation & LOD Surveys

- Part of multi-resource inventory
  - Need information on the entire ecosystem
  - Need to gain information on
    - ✓ Forest structure
    - ✓ Hydrology
    - ✓ Soils, microclimate
    - ✓ Wildlife
    - ✓ Human dimensions
    - ✓ Variability in conditions
    - ✓ System processes

Vegetation & LOD Surveys

- Info on structure, variability, processes …
  - Builds inventory on critical habitat conditions
  - Enables I.D. of wildlife habitat relationships
  - Aids grouping of stands into productivity classes
  - Enhances grouping of stands into risk classes
  - Allows development of management targets for
    - ✓ Biological diversity maintenance
    - ✓ Managing potential fire hazard
    - ✓ Silvicultural manipulations

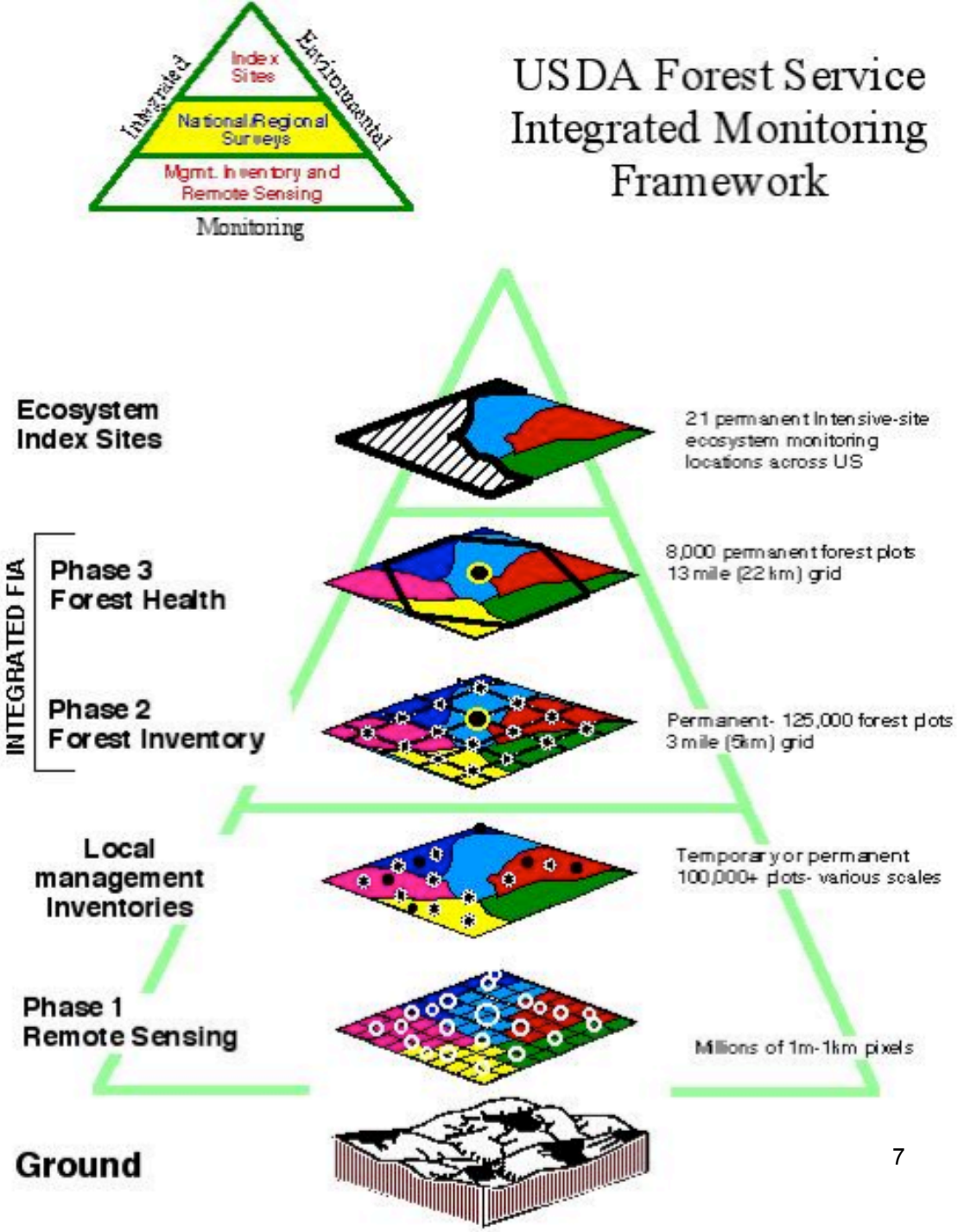
Vegetation & LOD Surveys

- Surveys are best stratified for efficiency
  - Coarse woody litter (Large Organic Detritus)
    - ✓ Use transects (line intersect) sometimes fixed-area
  - Groundstory component
    - ✓ Use fixed-area sometimes transects (point transect)
  - Understory component
    - ✓ Use transects (point transect) sometimes fixed-area
  - Overstory component
    - ✓ Use fixed-area plots sometimes variable-area

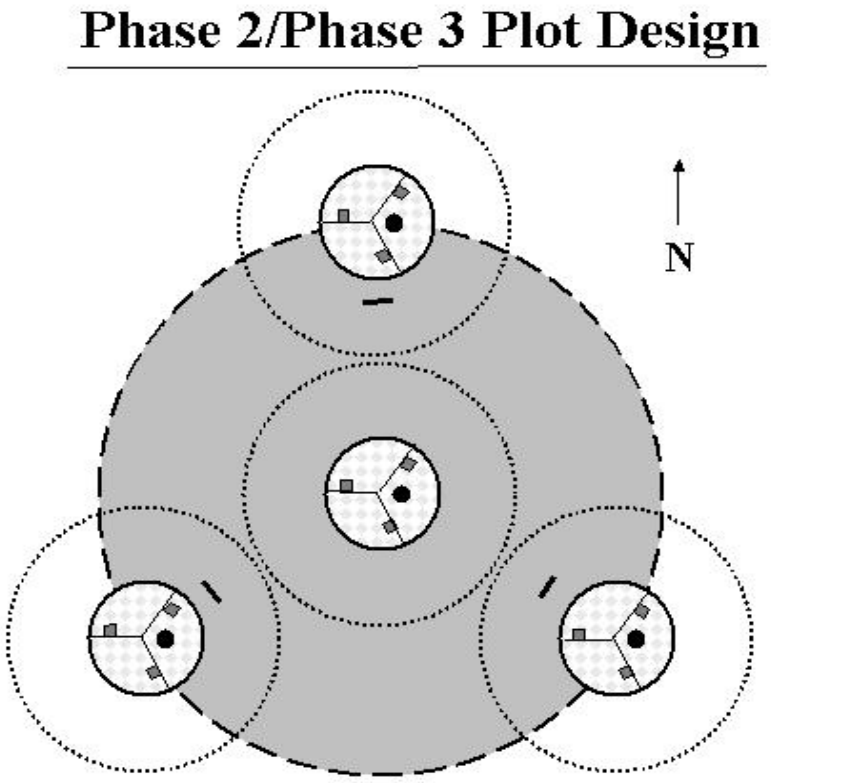
Vegetation & LOD Example Survey

- Forest Inventory & Analysis (FIA)
  - In continuous operation since 1930
  - Mission
    - "make and keep current a comprehensive inventory and analysis of the present and prospective conditions of and requirements for the renewable resources of the forest and rangelands of the US."
  - Collects, analyzes, and reports information on the status and trends of America's forests: how much forest exists, where it exists, who owns it, and how it is changing

Integrated Monitoring Framework



Integrated FIA – Sample Units



Vegetation & LOD Example Survey

- Forest Inventory & Analysis (FIA)
  - Information collected on
    - ✓ Soil quality
    - ✓ Down woody debris
    - ✓ Vegetation structure and diversity
    - ✓ Crown condition
    - ✓ Tree mortality
    - ✓ Tree growth
    - ✓ Lichen communities
    - ✓ Vegetation health

Multiresource inventories

Relative priority, either Low (L), Medium (M), or High (H), for assessing each resource depends on the inventory objectives:

Survey Objective	Area Est.	Owner Patterns	Access-ibility	Vol. Est.	Growth & Drain	Critical Habitat	Scenic Views	Other Uses
Appraisal	H	L	H	H	L	L	L	L
Recreation	M	H	H	L	L	H	H	M
Mgt. Plan	H	M	M	H	H	M	M	M

Appraisal: assessment of sale value of standing timber – sometimes called “stumpage” – depends on species, size (volume), quality of timber, accessibility, and distance to primary markets

Inventory Planning Checklist

A comprehensive plan ensures all facets of the inventory are considered

- data to be collected
- financial support needed
- logistical support required
- compilation procedures

Inventory Planning Checklist

Be sure to consider the following

1. Purpose of the inventory
2. Background information
3. Description of Area
4. Information required in final report

Inventory Planning Checklist

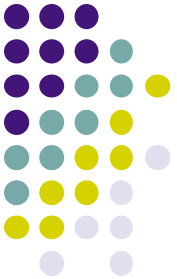
5. **Sample survey design**

- **Define target population**
- **Define sample unit**
- **Define required accuracy and precision**
  - Will need to construct confidence interval
  - *estimate ± "t-multiplier" x standard error of estimate*

$$\bar{y} \pm t \cdot s_{\bar{y}}$$

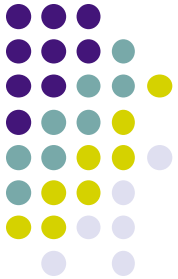
- **Decide how samples will be collected**
- **Decide how many sample units will be measured**
- **Know budgeting limitations for field work**

Inventory Planning Checklist



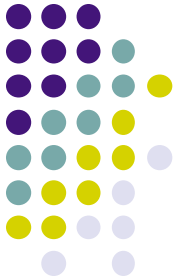
6. Photo, satellite, other remotely sensed info. interpretation procedures
7. Fieldwork procedures
8. Compilation and calculation procedures
9. Final report
10. Maintenance

5. Sample Survey Design (reprise)



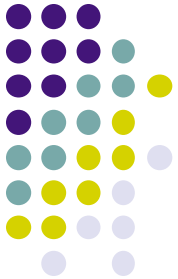
- Define target population
  - All red squirrels in a certain watershed area
  - All invasive vegetative species
  - All conifers in a certain project area with minimum DBH of 5.6”
  - Specify units of measure:
    - “…bd.ft. volume of all conifers …”,
    - “… total biomass (kg) of invasive vegetation …”

5. Sample Survey Design (reprise)



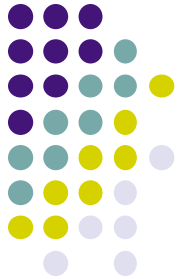
- Define sample unit
  - Fixed-area plots: 1/5, 1/10, 1/20, 1/40-acre sizes common for overstory trees; 1/200-acre, or less for seedling regeneration
  - Variable area plots (variable probability sampling)
  - Transects: lower canopy vegetation, downed woody detritus
  - Individuals: a deer, a tree, a log, a hiker on a trail
  - Groups: herd of deer, group of hikers, truckload of logs
  - Sampling window: fixed length of time to observe

5. Sample Survey Design (reprise)



- Define required accuracy and precision
  - Depends on survey objectives (and convention)
  - Management plan / multiresource surveys
    - Designed to provide info on all environmental comp's
    - Generally low intensity – info collected to make broadly-based management decisions for long range planning
    - Estimate the population mean with 10 –20% accuracy using 70 –90% confidence

5. Sample Survey Design (reprise)

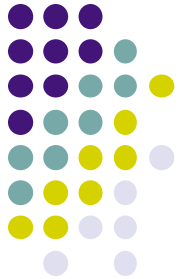


- Define required accuracy … (cont'd)
  - Timber sale / Land acquisition surveys
    - Designed to provide info on net volume or value of merchantable trees growing in "operable" areas
    - Land acquisition requires additional info on site quality, soil characteristics, proximity to markets, info on other environmental services
    - Estimate population mean with 2 –5 % accuracy using 90 – 99% C.I.

5. Sample Survey Design (reprise)

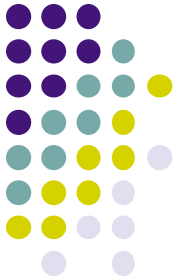
- Define required accuracy … (cont'd)
  - Special surveys
    - Varies with application –
      - Regeneration survey
      - Timber trespass survey
      - Insect / disease infestations
      - Availability of browse, mast, etc. for wildlife
      - Etc.

5. Sample Survey Design (reprise)



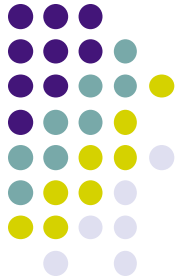
- Decide how sample units will be selected
  - Simple Random Sampling (SRS)
  - Systematic sampling
  - Double sampling (sampling for a ratio or regression)
  - Stratified random sampling
  - Two-stage, Multistage sampling
  - Cluster sampling

5. Sample Survey Design (reprise)



- Decide how many sample units will be measured
  - Know what equations will be used to compute estimates
  - Use of statistical formulas preferred

5. Sample Survey Design (reprise)



- Know budgeting limitations for fieldwork
  - Simple cost model for SRS:
    - $C_t = C_o + n\,C_1$, where
    - C_t = Total cost of survey
    - C_o = Overhead cost, e.g. planning, organization, etc.
    - C_1 = Cost per sampling unit
    - n = number of sampling units to be measured
  - Number of sample units is then limited by:
    - $n = (C_t - C_o) / C_1$

Summary Remarks

- Multiresource surveys include many important biotic and abiotic attributes
- Best to use stratified sampling schemes
  - Increases efficiency
  - Small plots for small things
  - More plots for more variable pop'ns
- Examples
  - Forest Inventory & Analysis (FIA)
  - Pack Forest Resource Inventory (PFRI)
  - Continuous Forest Inventory (CFI)

Summary Remarks

- ✓ Sound data enables sound stand, forest, and landscape management decisions
- ✓ *Multiresource* Inventories should include consideration of
  - data to be collected
  - financial support needed
  - logistical support required
  - compilation procedures

Summary Remarks

- ✓ There are 10 steps to address during inventory planning
- ✓ Statistical sampling (step 5) involves
  - Defining the target population
  - Choosing the sample unit
  - Defining required accuracy & precision
  - Deciding how samples will be selected
  - Choosing a sample size
  - Knowing budgeting and logistical constraints
- ✓ Supplemental Reading
  - Chpt. 12 (excerpts), Husch, et al.