# Introduction to 3P Photo

Check Cruiser Workshop

Medford, Oregon

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# Description

- Two Stage Sampling Method
- First Stage:
  - Plots Located on Aerial Photos
  - Estimate Plot Volumes From Photos
- Second Stage:
  - Measure a Subset of Plots
  - Calculate the Measured to Prediction Ratio
- Ratio ‘Corrects’ the Initial Estimates

# Tools Needed

- Recent Aerial Photo Stereo Pairs
- Geo-Referenced Orthophoto
- Software Tools Capable of Overlaying Geo-Referenced Sample Points onto the Orthophoto (GIS)
- Approved GPS Receiver
- Stereoscope

# Sampling Procedure

- Area Based, Need to Traverse the Area
- Overlay Traverse on Geo-Referenced Orthophotos
- Establish First Stage Sample Points on Orthophoto.  Fixed Plot boundaries should be displayed.
- Locate Fixed Plots on Aerial Photo Stereo Pairs.

# Sampling Procedure

- Estimate Volume per Acre (KPI) on the First Stage sample plots.
  - Use visual clues from photos
  - Recommend using Relative Volume Index (RVI)
- Select desired number of Second Stage samples using List Sampling.
- Locate second stage plots on the ground and measure all trees in the plots.
- Calculate the Measured to Predicted Ratio.

# Relative Volume Index (RVI)

- Consistent estimate
- Can be correlated to Volume per Acre for each plot
- Uses a sliding scale between 0 and 100
- Areas where plots would give the highest volume per acre estimates are given a 100 RVI
  - All plots are compared to 100 RVI areas.
  - The plot RVI is the percent volume per acre compared to the 100 RVI areas.
    - Low volume per Acre for the plot – Low RVI value.
    - High Volume per Acre for the plot – High RVI value.

# List Sampling

- Selects samples using probability proportional to prediction.
- 3P sampling is a subset of List Sampling
  - With 3P, the KZ is unknown.
  - With List Sampling, the KZ is known.
- Samples are chosen after all estimates (KPI) are made.
- Insures the desired number of samples.

# List Sampling Procedures

- Estimate and record KPI values
- Create a running tally of the estimates
- The final tally is the KZ value
- Draw a random number between 1 and the KZ value
- Use the running tally to select sample plot

# Example of List Sampling

- Estimate RVI Values
- Create a Running Tally
- Final Tally is KZ Value
- Draw a Random Number Between 1 and KZ
  - Random Number = 116
- Find the Sample Plot Using the Running Tally.
  - Plot 3 is a Sample
- Repeat for additional samples

| Plot | RVI Value | Running Tally |
|---|---|---|
| 1 | 15 | 15 |
| 2 | 85 | 100 |
| 3 | 65 | 165 |
| 4 | 20 | 185 |
| 5 | 45 | 230 |

# Expanding Volumes

- Average Volume per Acre
  - Avg KPI x Avg Measure/Predicted Ratio
- Total Volume
  - Average Volume per Acre x Total Acres

# Example Expansion

- Measured Plot Volume is Expanded to Volume per Acre.
- Measured to Predicted Ratio is computed.
- Total Volume/Acre is computed by:
  - Average KPI multiplied by Average Ratio
  - 51.0 x 16.542 = 843.6 cft/acre

| Plot | Numb Trees | Total Plot Vol/Acre | RVI (kpi) | Ratio |
|---|---|---|---|---|
| 1 | 7 | 1110.0 | 65 | 17.077 |
| 2 | | | 40 | |
| 3 | | | 35 | |
| 4 | 3 | 353.0 | 25 | 14.120 |
| 5 | | | 80 | |
| 6 | 18 | 1543.33 | 75 | 20.578 |
| 7 | | | 15 | |
| 8 | 9 | 1120.1 | 60 | 18.668 |
| 9 | | | 65 | |
| 10 | 5 | 613.4 | 50 | 12.268 |
| Sum | | | 510 | 82.711 |
| AVG | | | 51.0 | 16.542 |

# Sampling Error

- Two Sources of Variability
  - Estimated Volume per Acre (KPI)
  - Measured to Predicted Ratio
- Sampling Errors for both sources of variation are combined

Questions?