

# Introduction to 3P Photo

Check Cruiser Workshop

Medford, Oregon

October 18, 2006

# 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.

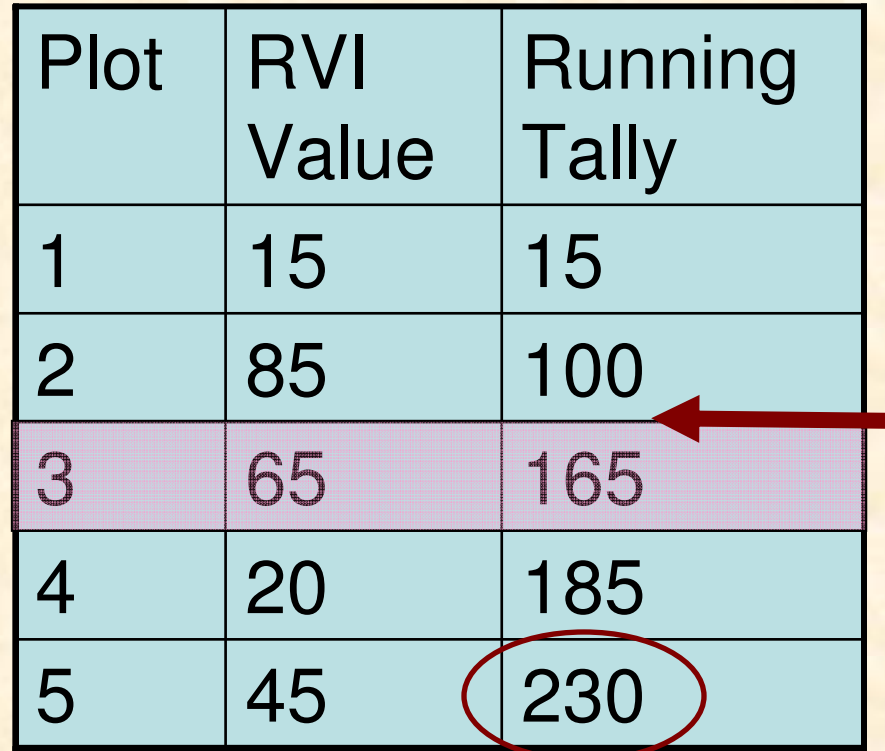
# List Sampling Procedures

- 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
  - $51.0 \times 16.542 = 843.6$  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	
<u>10</u>	<u>5</u>	<u>613.4</u>	<u>50</u>	<u>12.268</u>
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?