Sediment Measurement

RSM-U Reservoir Sediment Management Workshop
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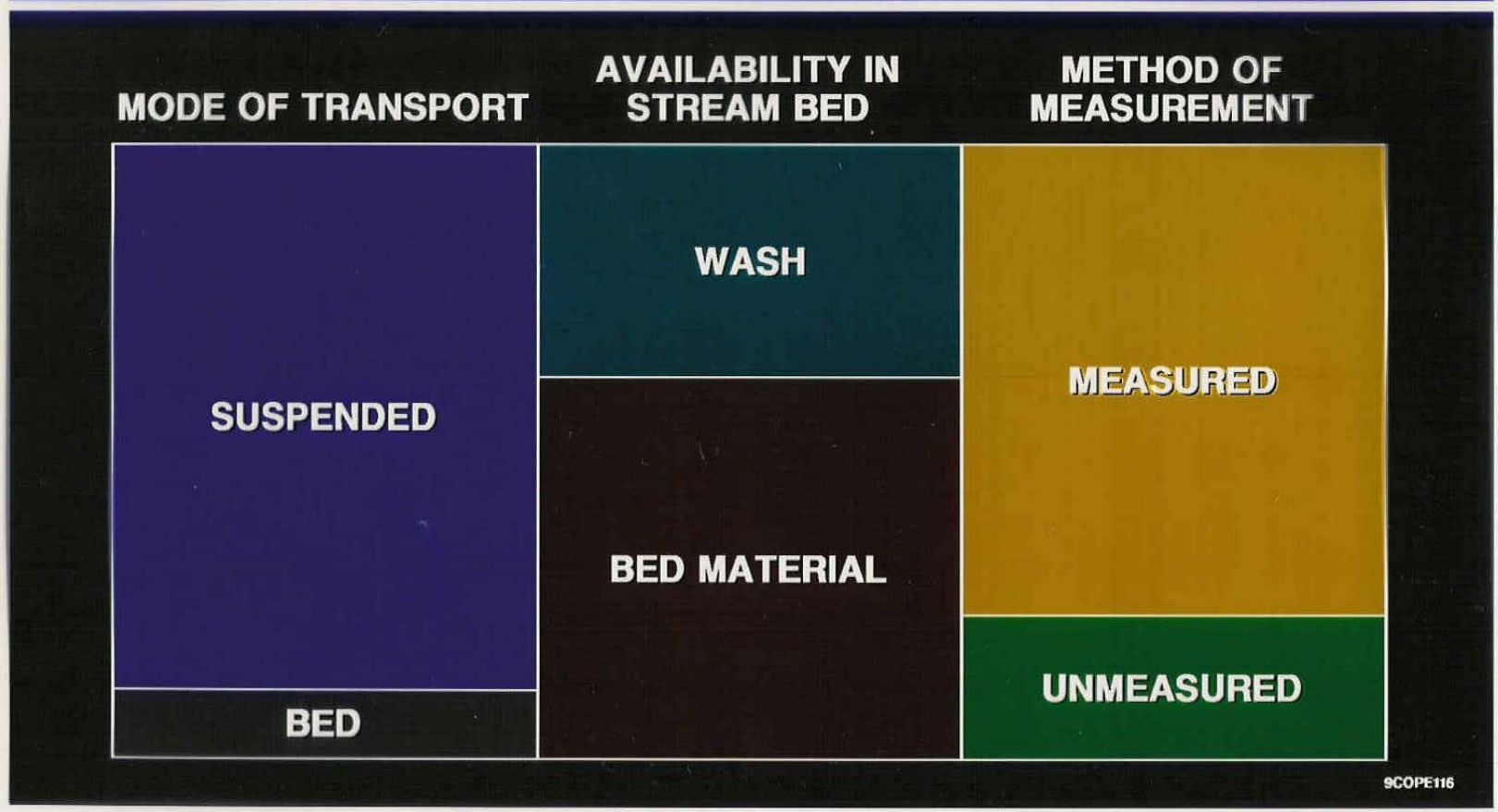
DEFINITIONS OF TOTAL SEDIMENT LOAD



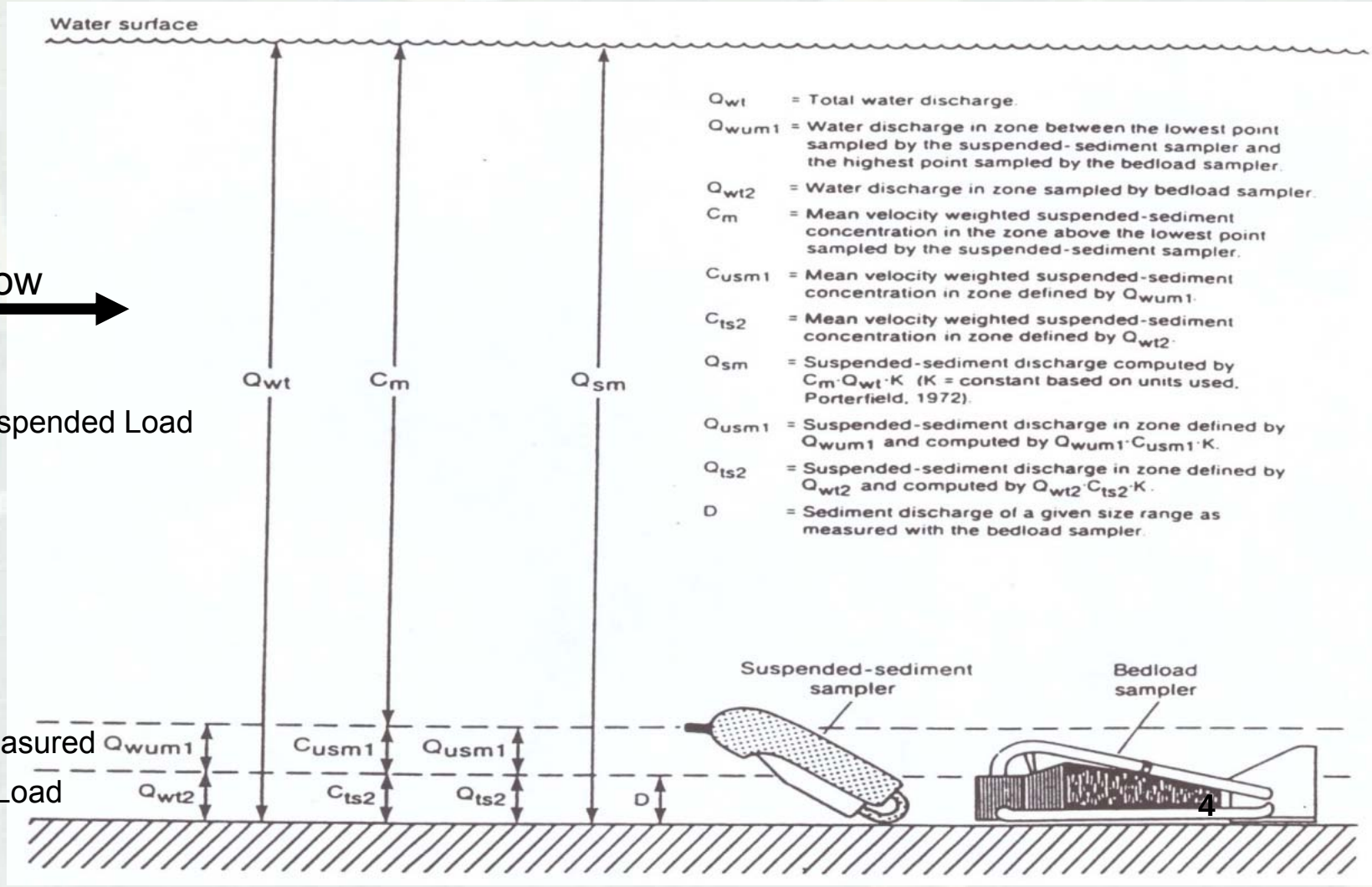
TYPES OF SAMPLERS

- Suspended Sediment

- Bed Load

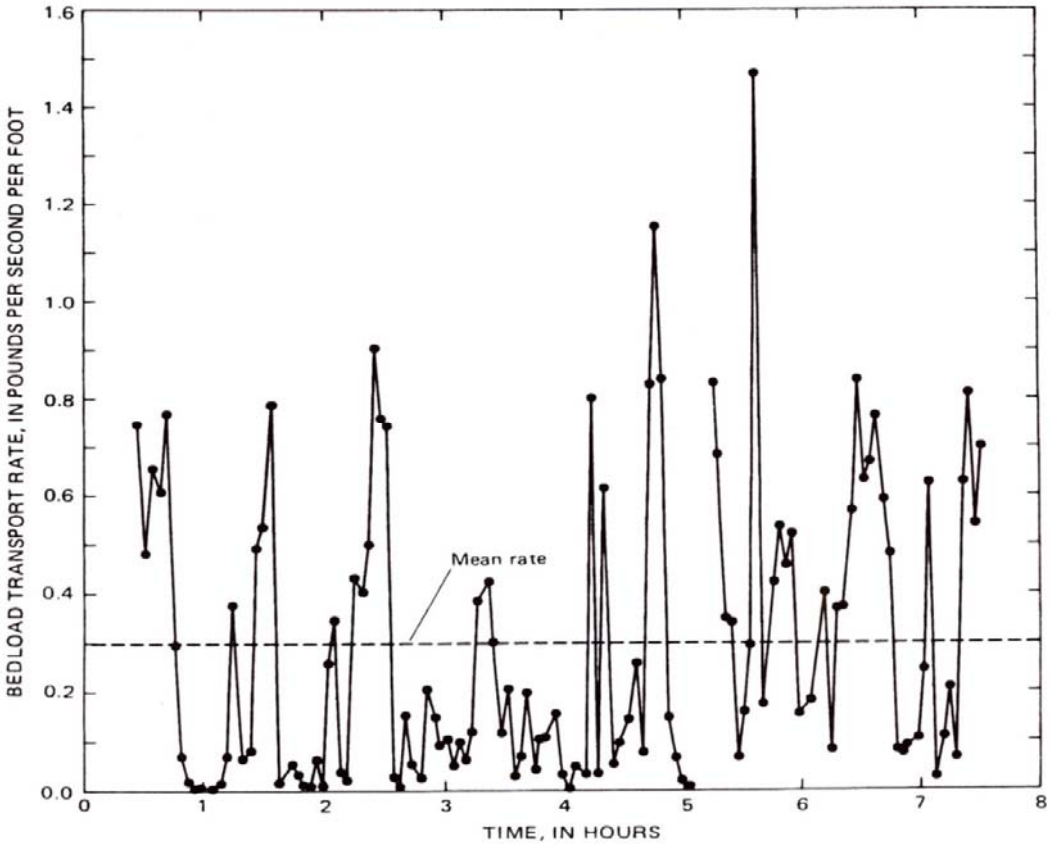
- Bed Material

Unmeasured Load – Unmeasured Zone

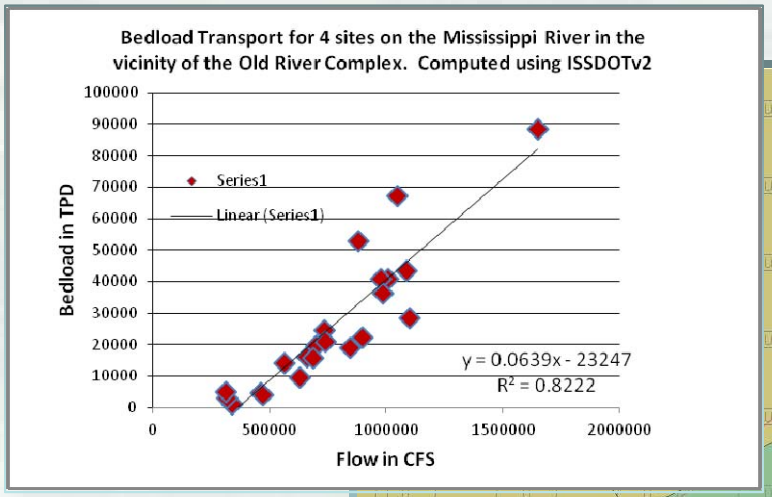


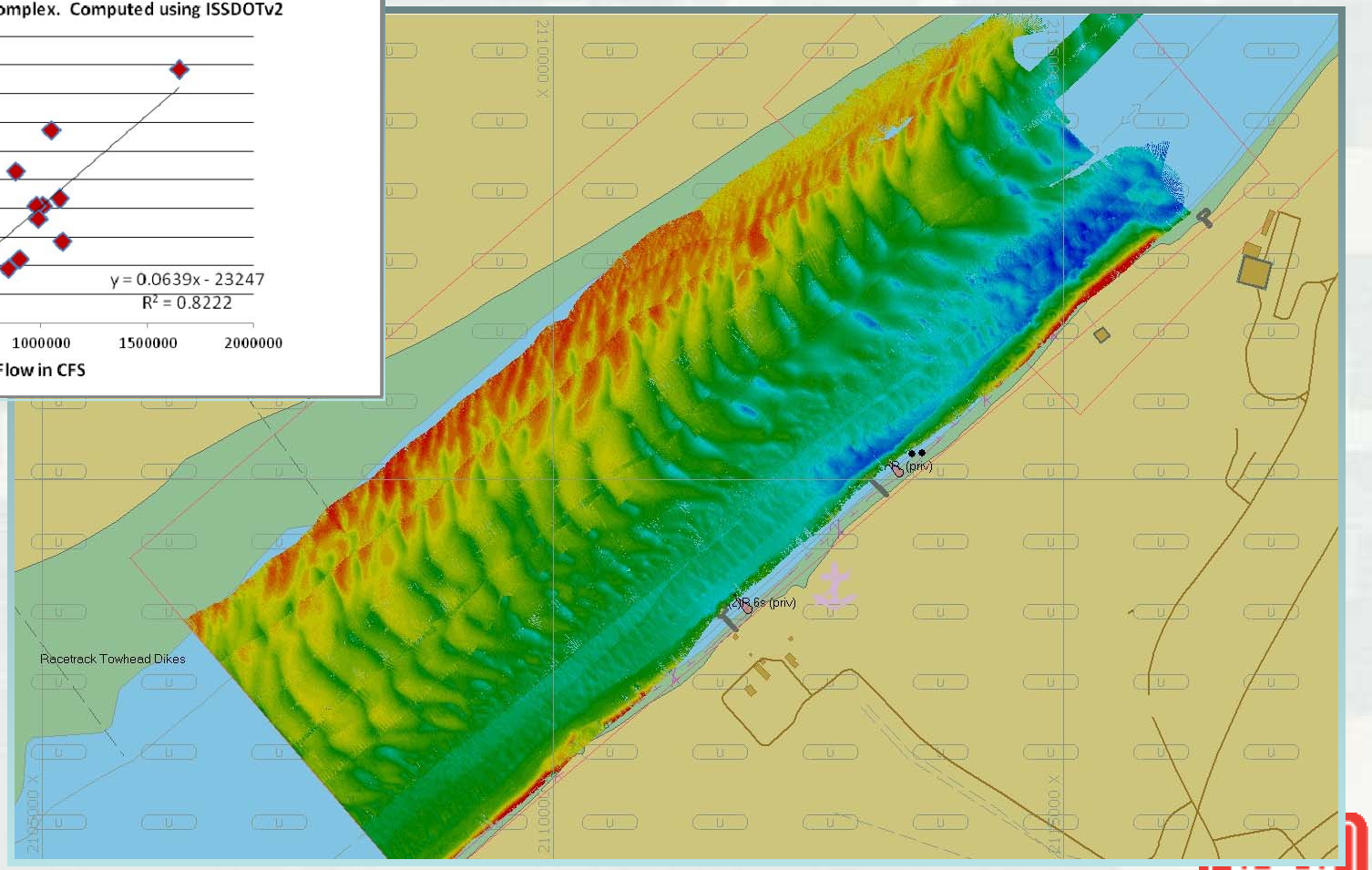
Bed Load Variation

- Bed load movement is extremely even when the streamflow is constant
  - ▶ Spatially
  - ▶ Temporally



ISSDOTv2 Bedload Measurement





Sediment Load Summary

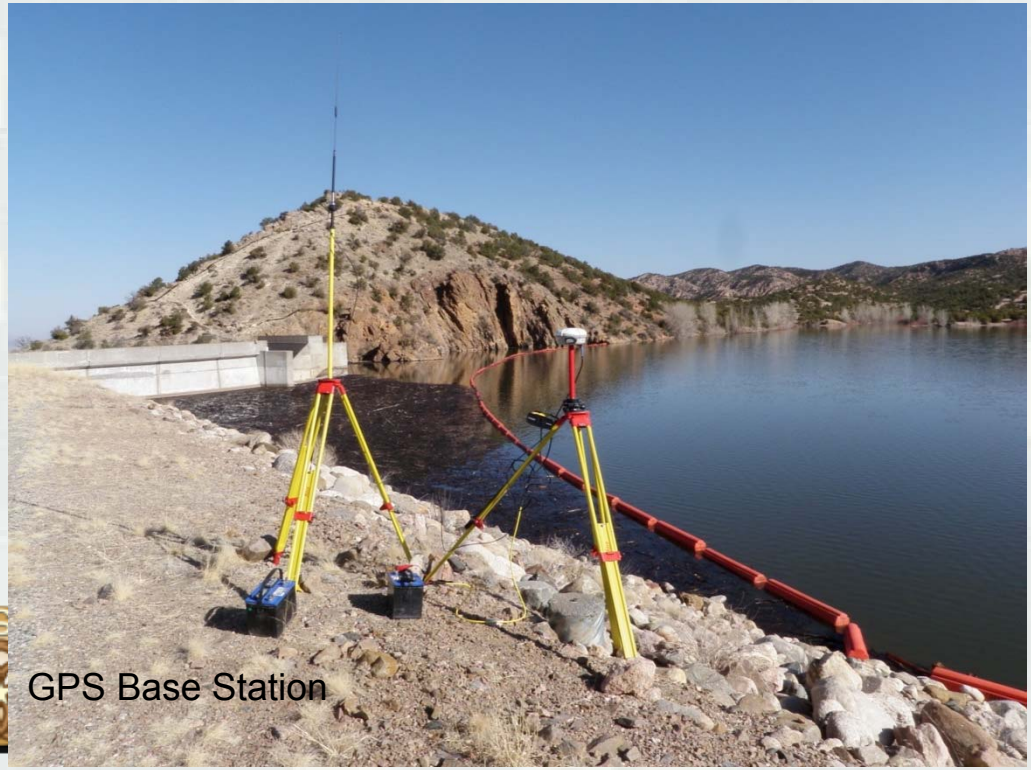
- Bed load rates vary greatly over space and time
- Unmeasured zone between suspended load and bed load zones
- Most sediment data collected is suspended load

Reservoir Sedimentation Data

- Hydrographic survey – a reservoir survey involving both above water and underwater surveys
  - Topographic survey – Above water
  - Bathymetric survey – Underwater
- Type of data and coverage determined by:
  - Study purpose
  - Site conditions
  - Schedule
  - Budget

Land Survey Techniques

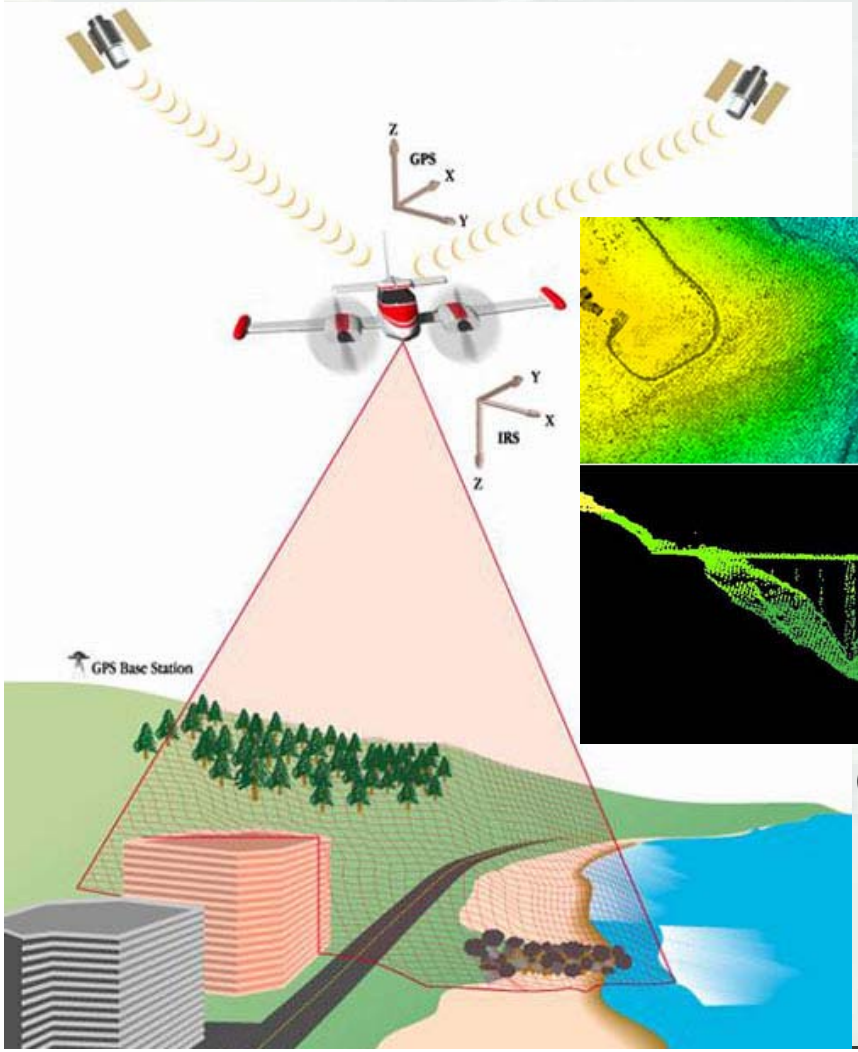
- Tag Line and Level
- Transit
- Total Station
- Global Positioning System (GPS)

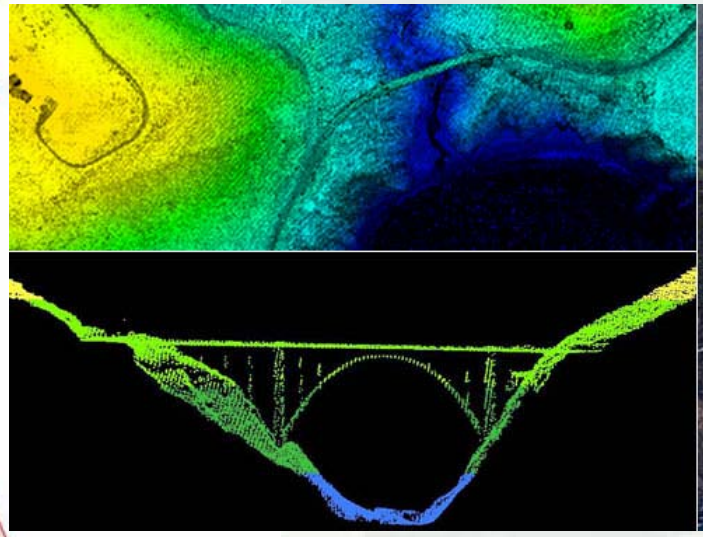


GPS Base Station

GPS Rover

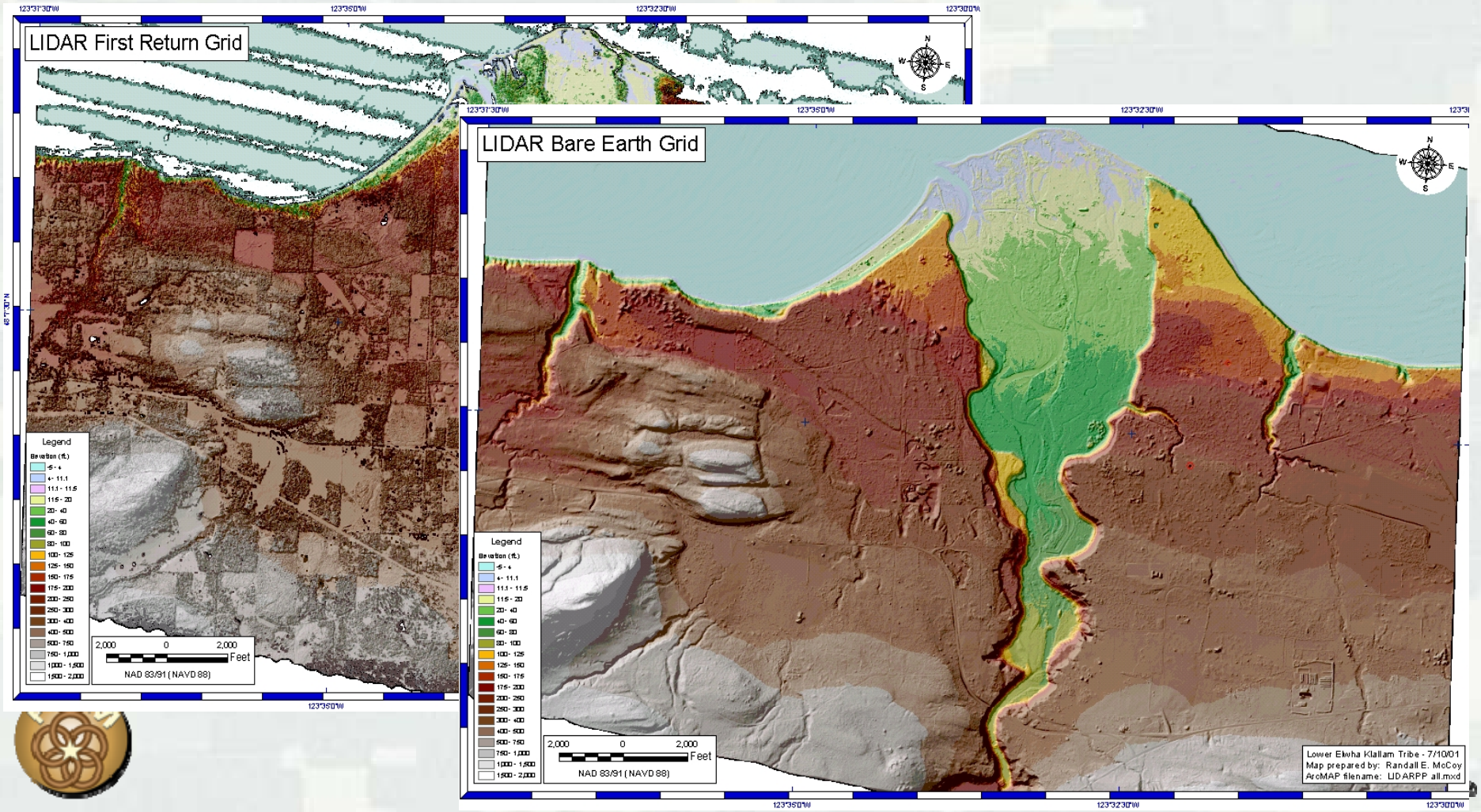
Terrestrial LiDAR – Aerial Collection





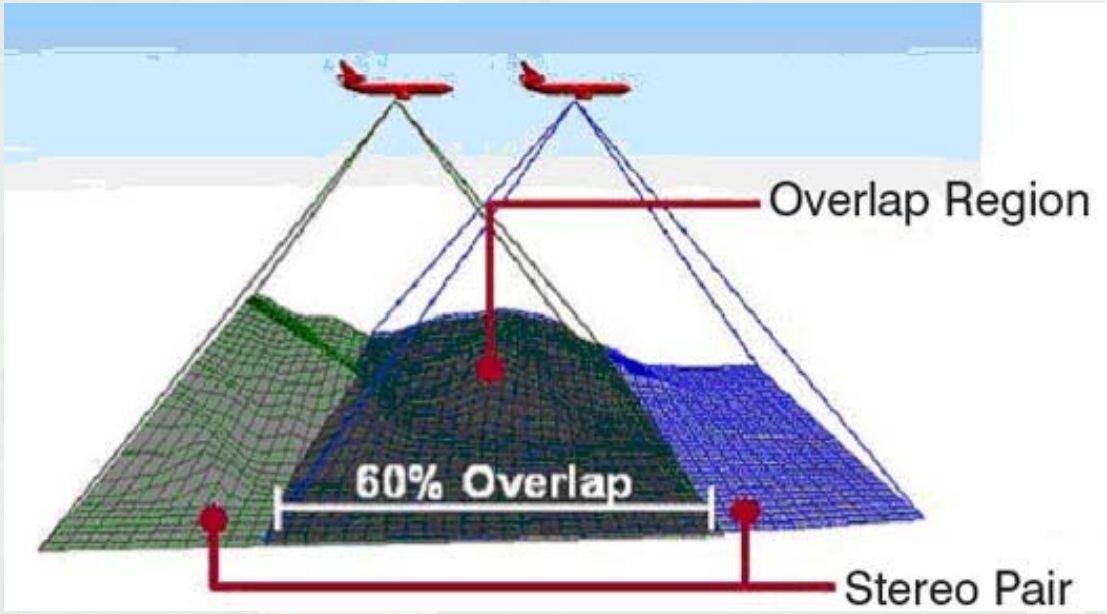
Capture vertical and horizontal features

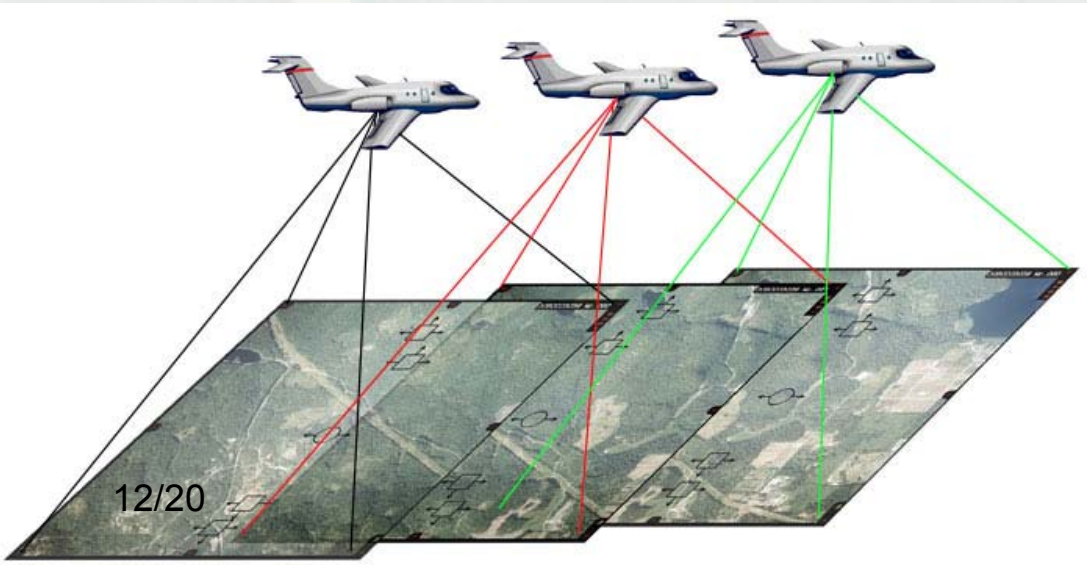
LiDAR Coverage – First Return vs Bare Earth



Photogrammetry

- Multiple sets of overlapping aerial photos
- Ground control points or targets are matched up in overlapping photos
- Less expensive than aerial LiDAR



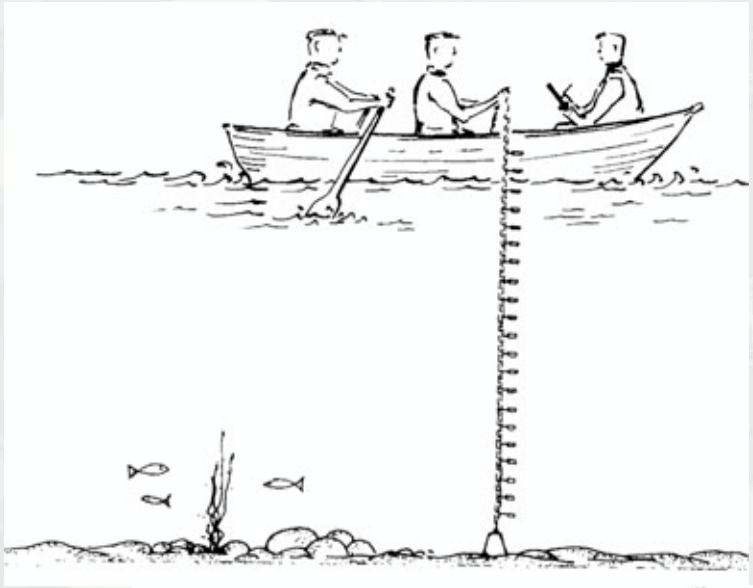


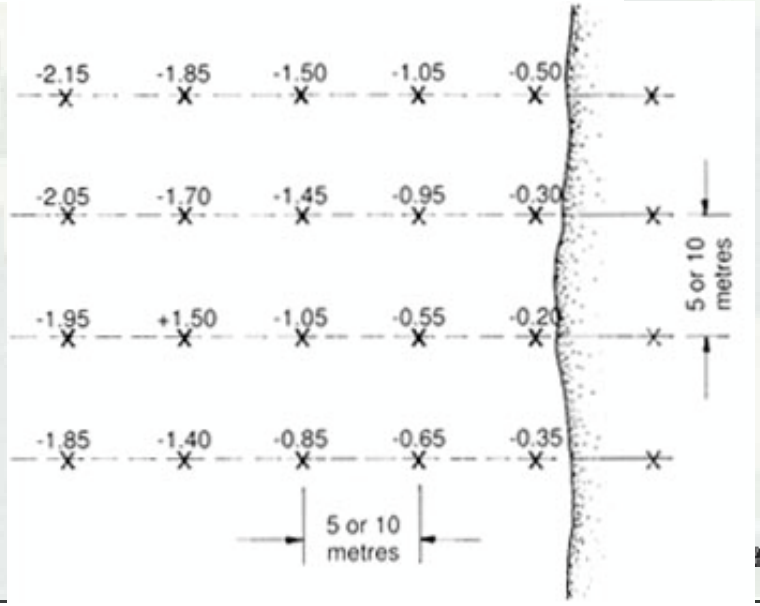
Types of Bathymetric Surveys

- Lead Line
- Single Beam
- Multibeam – Swath System
- Bathymetric LiDAR

Lead Line

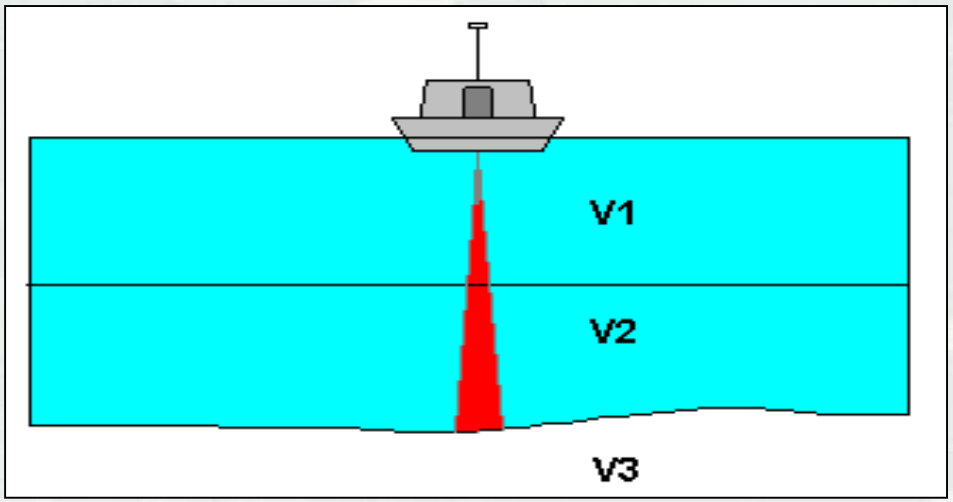
- Old Technology
- Single depth measurement at each location
- Minimal data processing
- Time consuming
- Sparse data
- Good for depth calibration or survey of small shallow areas

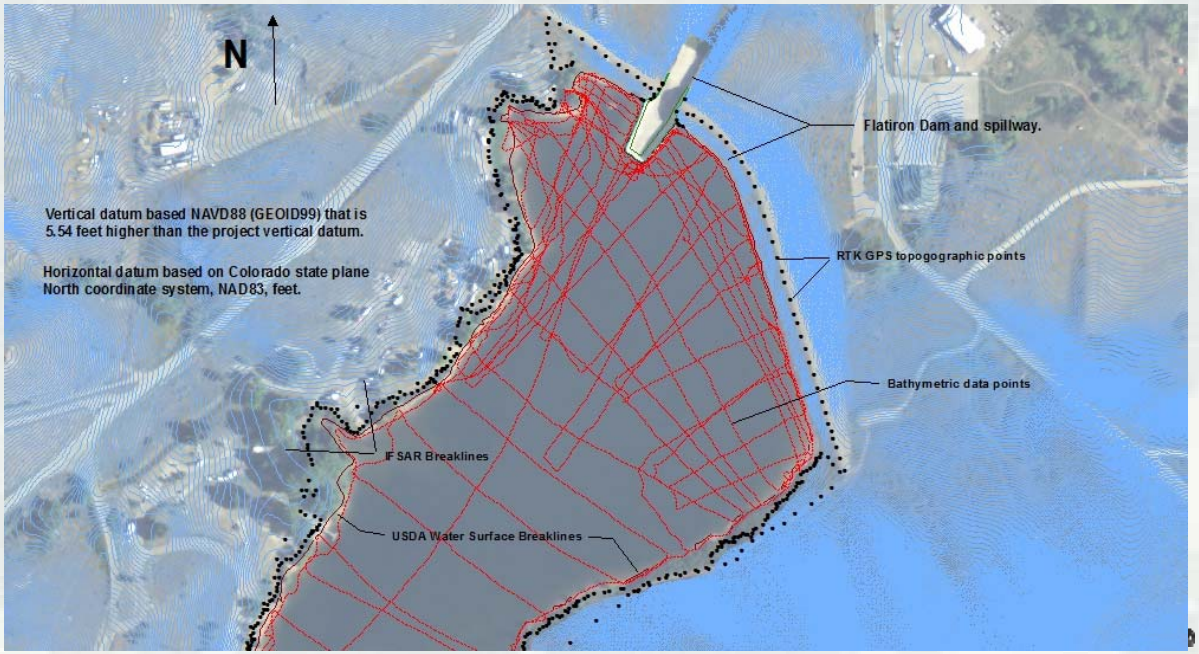




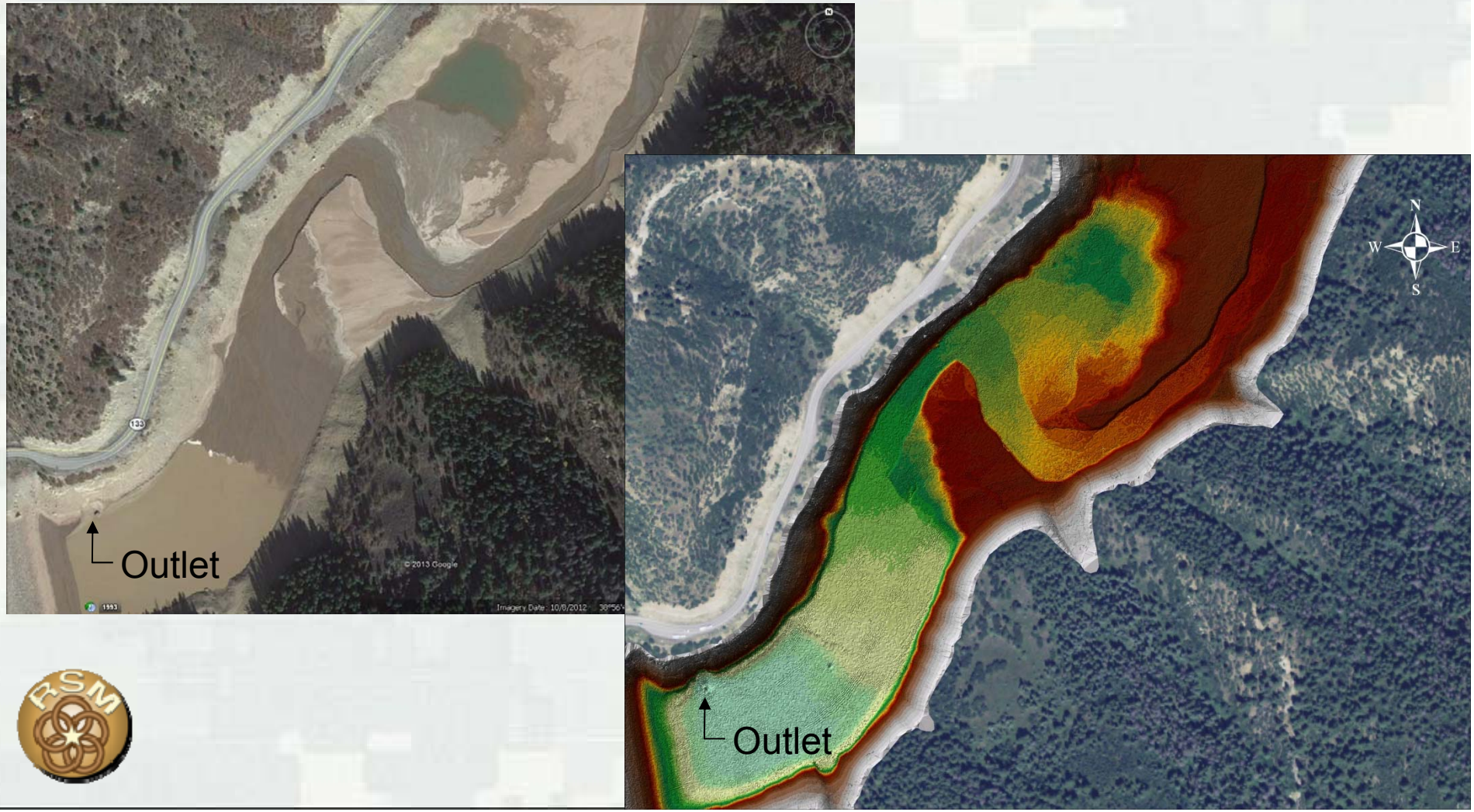
Single Beam

- Simple
- Cost Effective
- Survey at higher speeds
- Less equipment required than other SONAR
- Less data processing than other SONAR



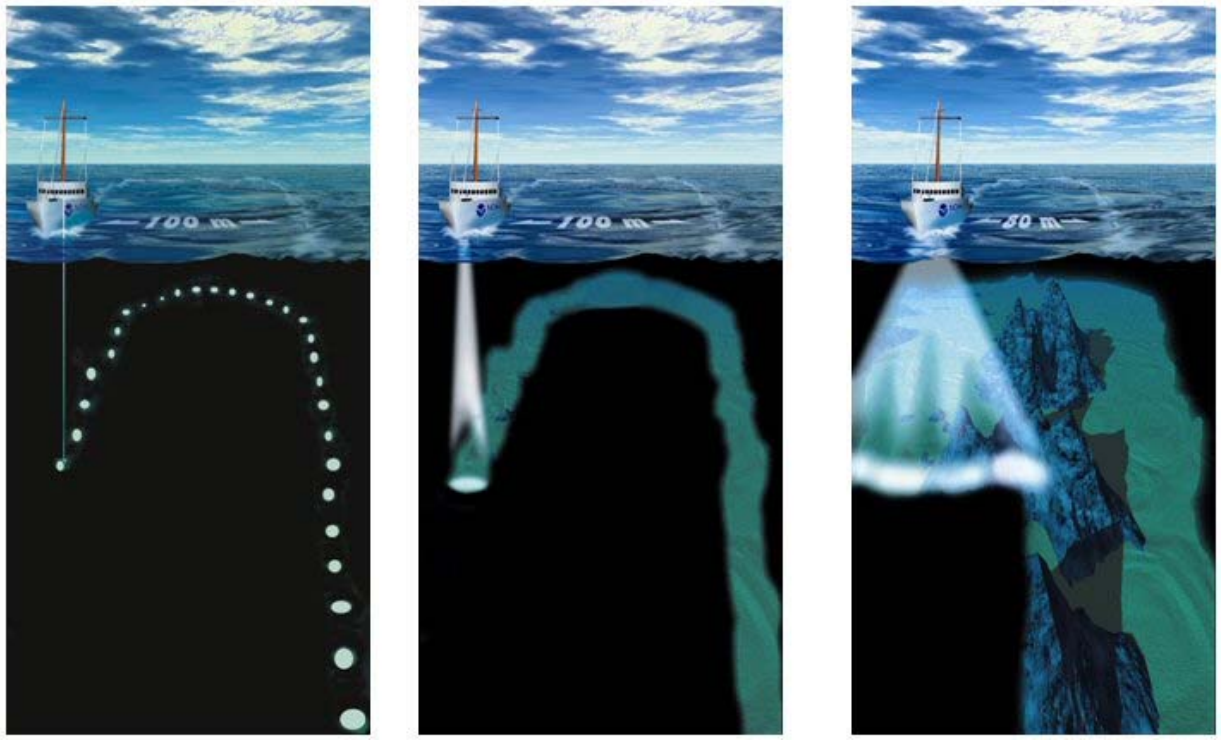


Multibeam – Swath System



Lead Line vs Single Beam vs Multibeam Coverage

- May be missing significant detail with single beam



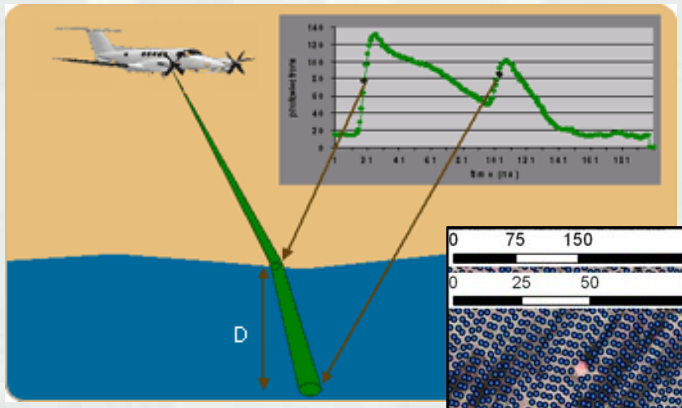
Lead Line Survey

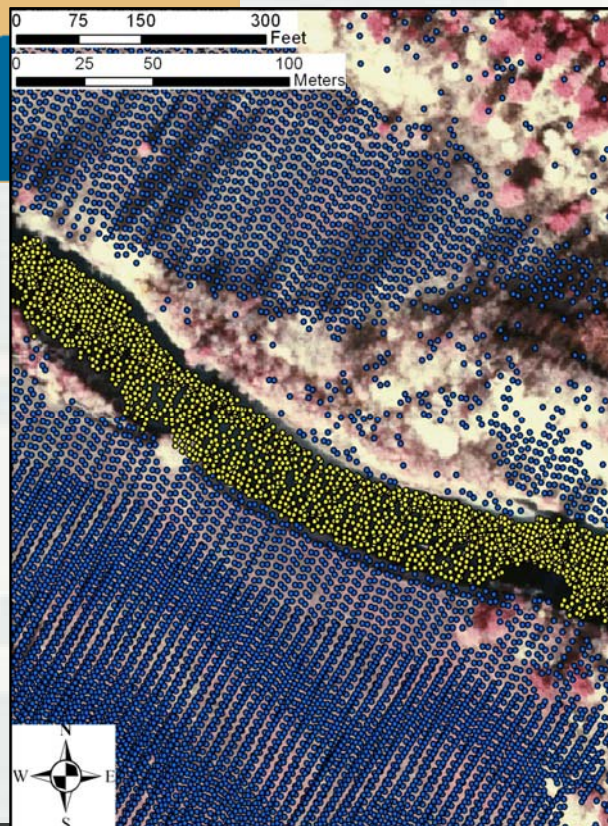
Single Beam Survey

Multibeam Survey Full Coverage

Bathymetric LiDAR – Green LiDAR

- Best results in shallow clear water
- Accuracy affected by
  - ► Turbidity
  - ► Aeration
- Can be collected with terrestrial LiDAR simultaneously
  - ► Different instruments mounted to same aircraft





Reservoir Sedimentation Data Summary

- Used for monitoring sediment levels and updating area-capacity relationships
- Measurement over entire reservoir often requires a combination of above water and underwater data collection
- Many data collection methods are available depending on
  - ► Study Purpose
  - ► Site Conditions
  - ► Schedule
  - ► Budget

Questions?