Oregon Bathymetry Project

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Project Goals and Outline

- Compile existing bathymetric data and metadata
- Develop bathymetric data standards based on diverse types of bathymetric data
- Provide data and metadata for distribution
- Display data on the Oregon Lakes Atlas

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- Looking for feedback – use the Zoom chat or QA features!

Bathymetric data background

- Topography below full pool elevation
- Based on diverse data collection and processing methods:
  - LiDAR and structure-from-motion (SFM) surveys
  - Multibeam hydroacoustic surveys + LiDAR
  - Single-beam surveys + LiDAR (*raw data often not avail.*)
  - Lead-line soundings + LiDAR (*raw data not available*)
- Accuracy and precision varies by data type
- *A single waterbody is often composed of several types of bathymetric data*

Fall Creek Reservoir drawdown during 2015
https://www.nwp.usace.army.mil/willamette/fall-creek/drawdown/

LiDAR & SFM during drawdown

- High resolution and accuracy point data
- Existing elevation data standards apply with addition of full pool elevation
- Fall Creek Lake is the only waterbody available with full LIDAR/SFM coverage

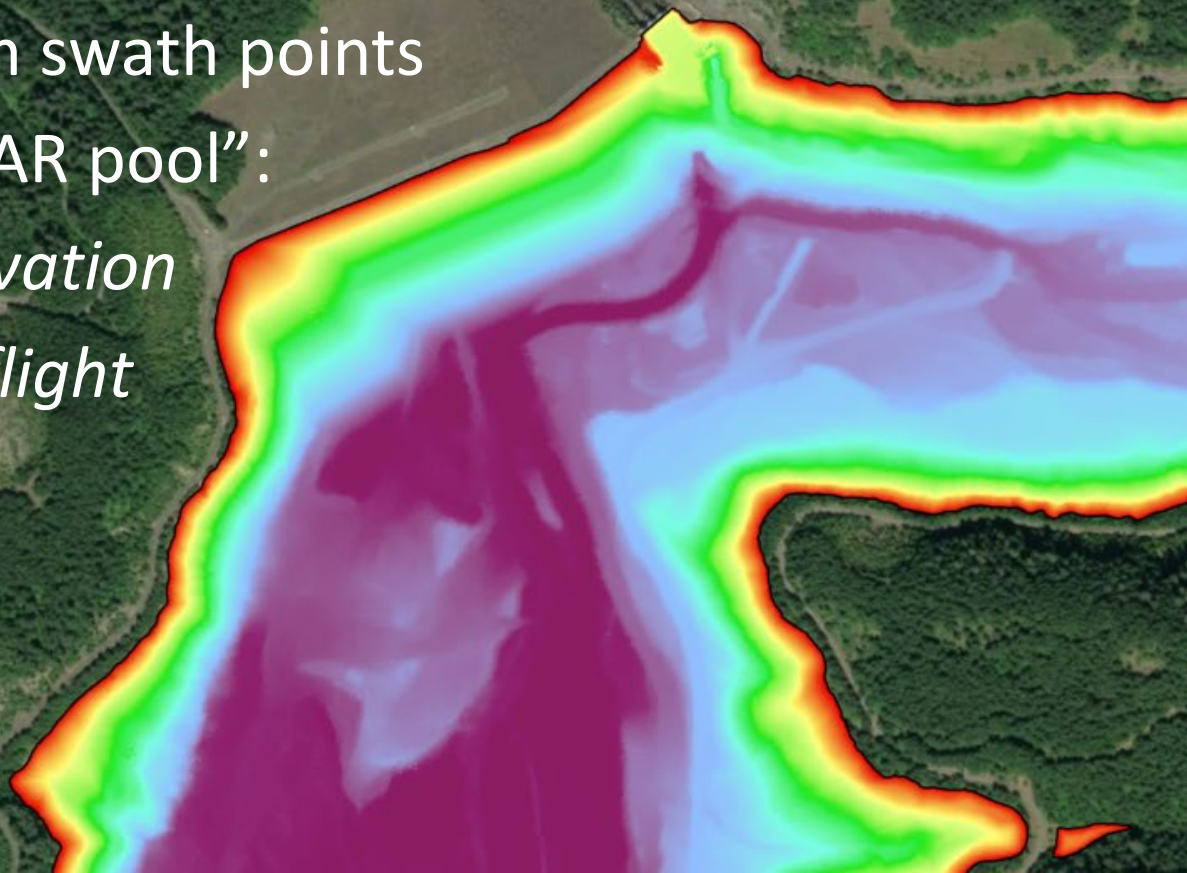
USACE, 2012 and Keith, M.K., and Mangano, J.F., 2020, Structure-from-motion datasets of Fall Creek Lake, Oregon, acquired during annual drawdown to streambed November 2016: U.S. Geological Survey data release, https://doi.org/10.5066/P9AYWU8Z.

Multibeam hydroacoustic data

- High accuracy, high resolution point swath data collected during boat-based surveys
- DEM created from swath points
- LiDAR above "LiDAR pool":

  water surface elevation

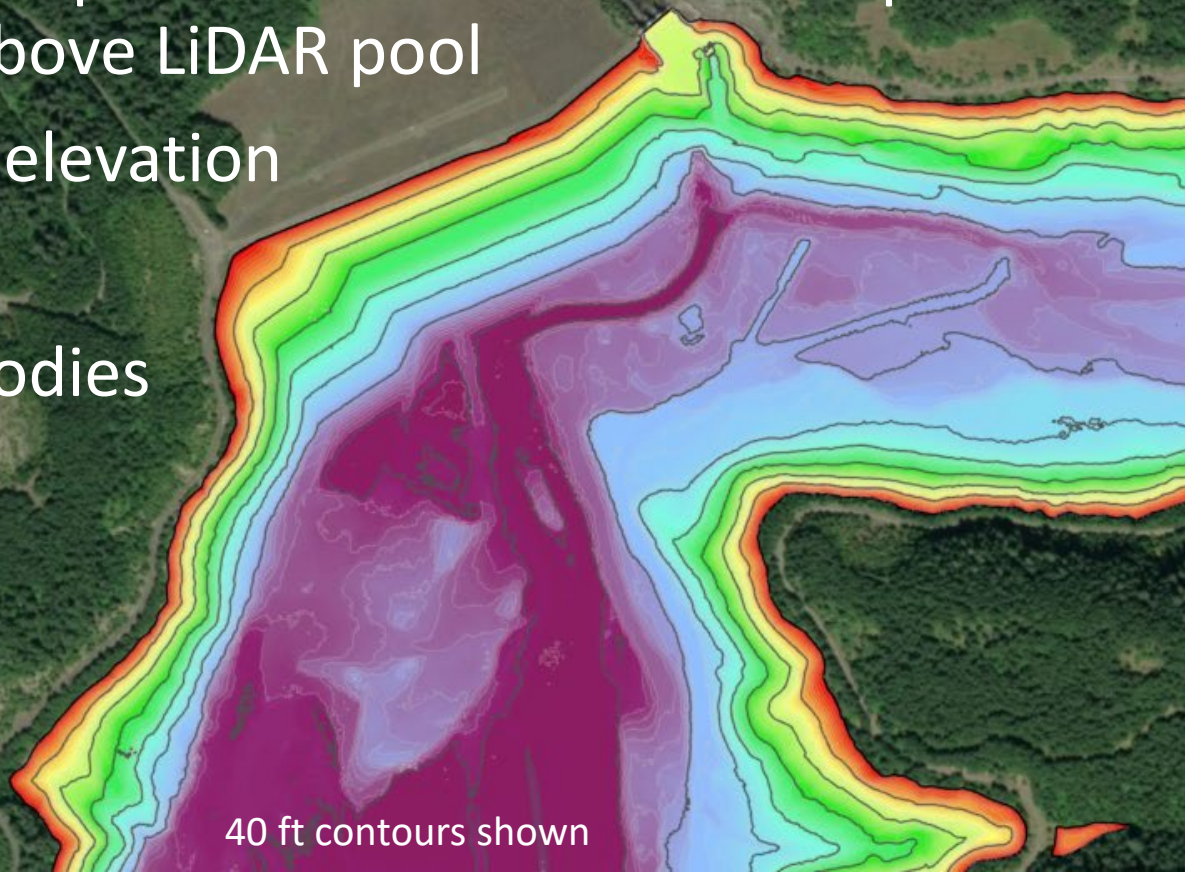
  at time of LiDAR flight



Hills Creek Reservoir multibeam hydroacoustic survey data (USACE 2015)

Multibeam hydroacoustic data

- Full pool elevation from reservoir specifications
- Contours below full pool elevation from swath point DEM and LiDAR above LiDAR pool
- New bathymetric elevation data standards
- 14 USACE waterbodies

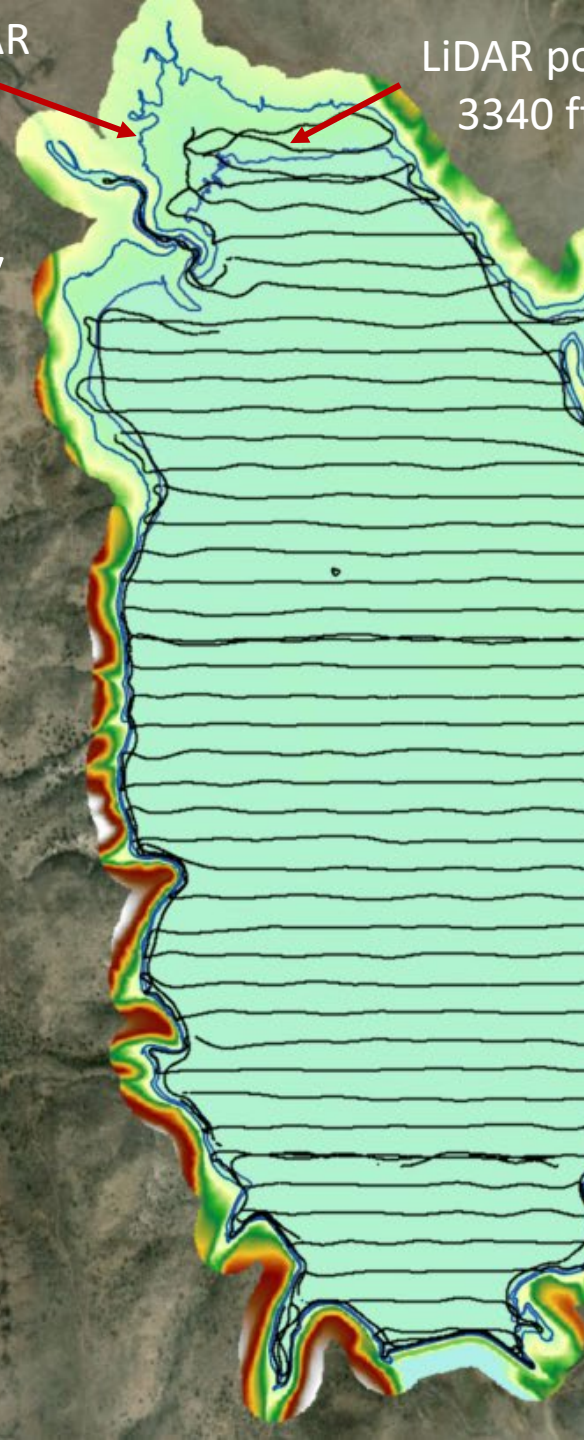


Hills Creek Reservoir multibeam hydroacoustic survey data (USACE 2015)

40 ft contours shown

Single-beam survey + LiDAR + photogrammetry

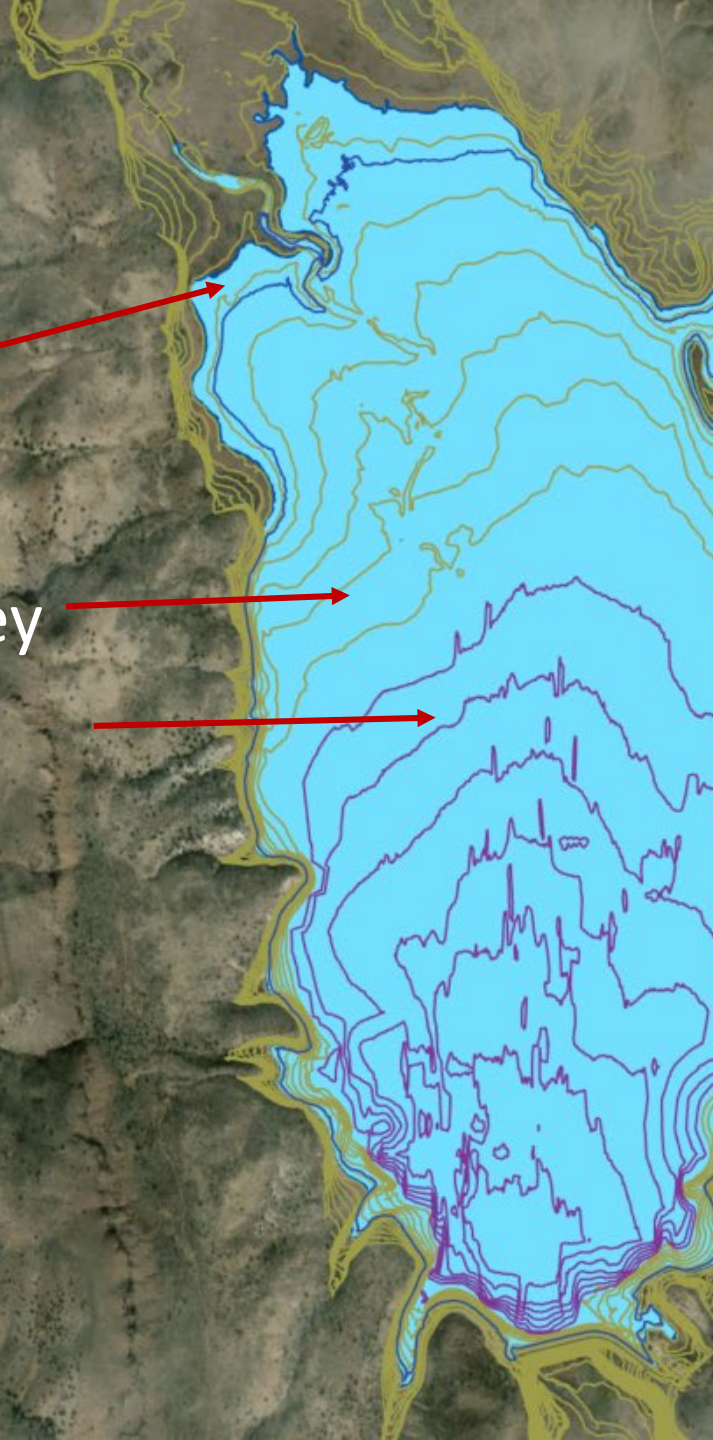
- Point data available along transects
- LiDAR data between full pool and LiDAR pool elevations
- Terrestrial photogrammetry during low water



Beulah Reservoir Survey
R. Ferrari Bureau of Reclamation, 2000
www.usbr.gov/tsc/techreferences/reservoir/

Single-beam survey + LiDAR + aerial imagery

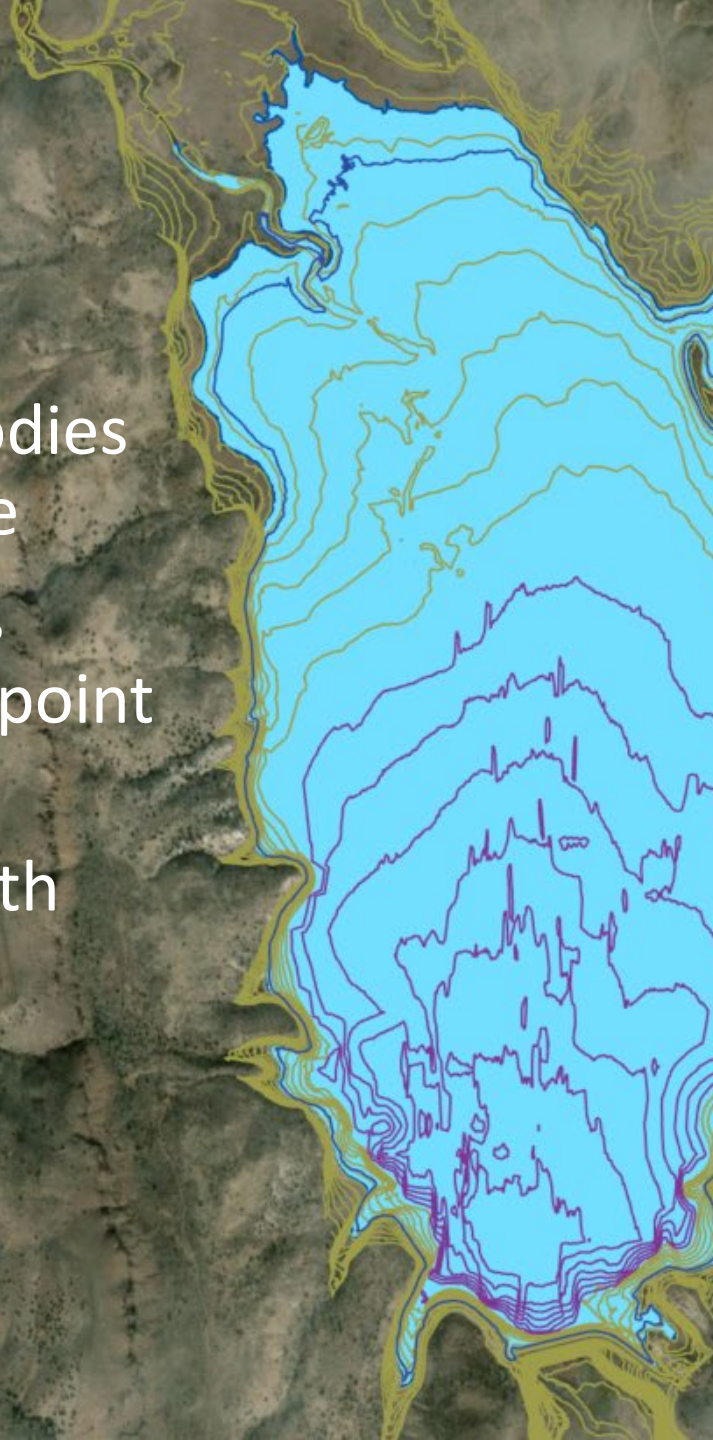
- Contours from LiDAR
- Contours from 2000 terrestrial photogrammetry low water survey
- Contours interpolated from 2000 hydro survey transect points



Beulah Reservoir Survey
R. Ferrari Bureau of Reclamation, 2000
www.usbr.gov/tsc/techreferences/reservoir/

Single-beam survey + LiDAR + aerial imagery

- 4 Bureau of Reclamation waterbodies with original survey data available
- 4 BOR waterbodies with contours generated in similar manner, but point data not available
- 18 Portland State waterbodies with original survey data available



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Pamelia Lake - LiDAR + AOL

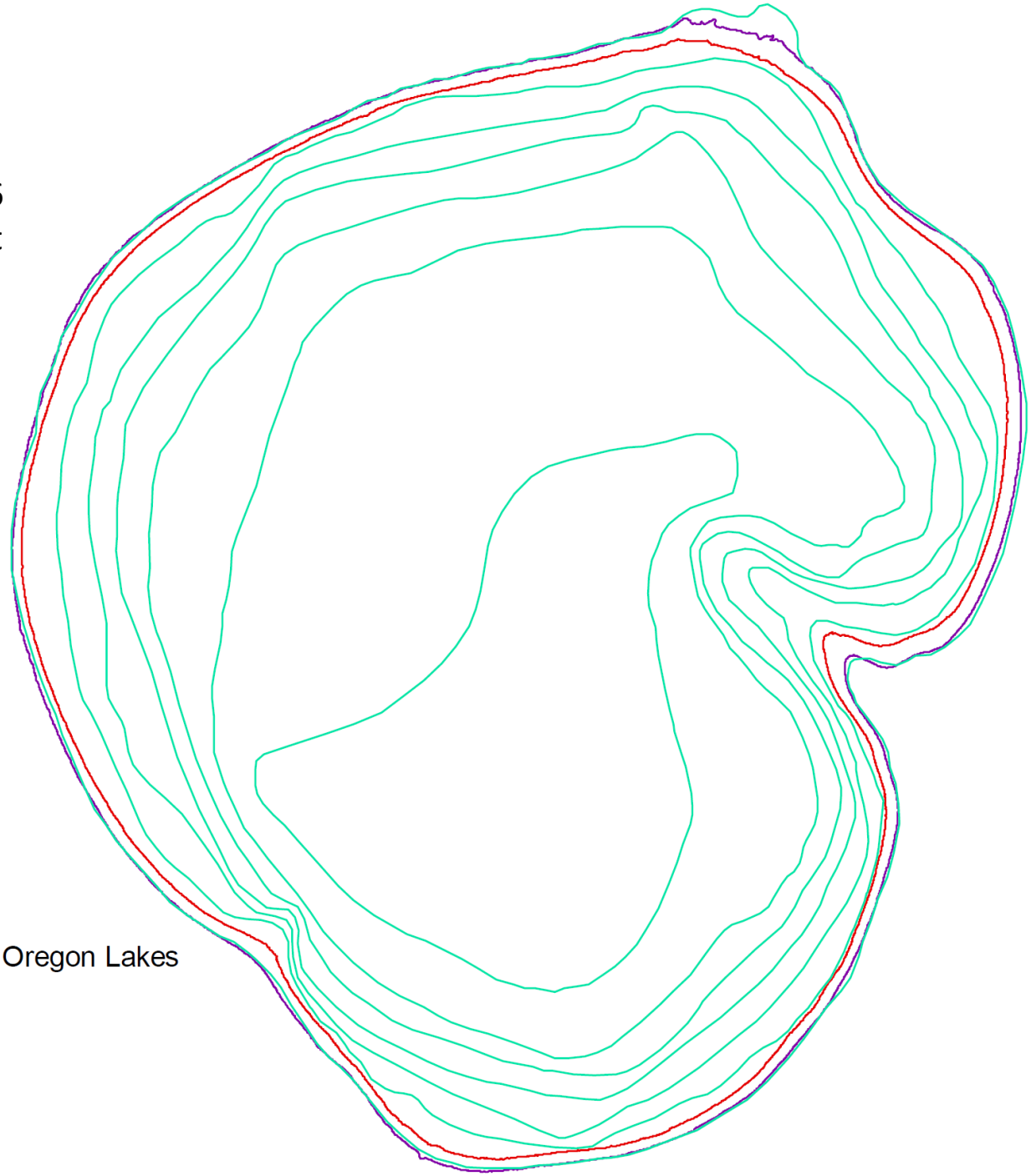
- Example of poor quality legacy data
  (PSU survey 7/11/1982)
- Full pool elevation from LiDAR based topographic spill
- 3 ft of LiDAR coverage
- LiDAR based full pool is a poor match with NHD waterbody shape

LiDAR+Atlas

- Used LiDAR data supplemented by NAIP imagery to determine shoreline using ArcGIS 3-D Analyst
  - Used published full pool for reservoirs if available
  - Created LiDAR bathymetry contours if possible
- Used Atlas of Oregon Lakes contours for any bathymetry that could not be created from LiDAR data.
  - Original survey data is generally not available
  - Maps of contours were georeferenced and digitized
  - Accuracy is unknown
- Without LiDAR, the elevation of lake could not be established for lakes with only Atlas contours

North Twin Lake

ODFW survey, 1/1/1966
Original survey data not available

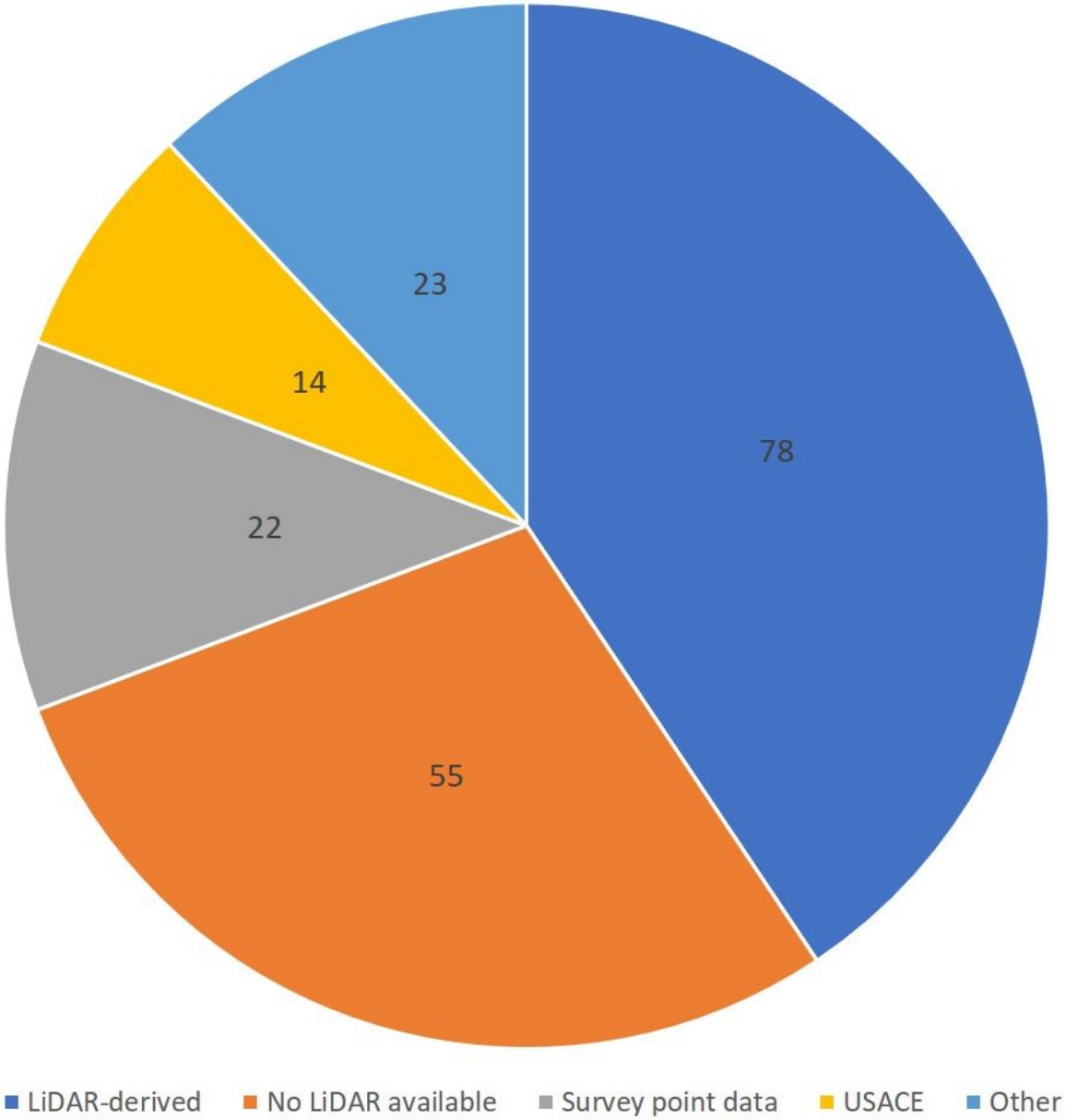


Contours from Atlas of Oregon Lakes

Shoreline from LiDAR

Contour from LiDAR

Bathymetry Types



Metadata issues – LiDAR-derived bathymetry

- Each lake has two or more datasets for the complete bathymetry
  - Full pool shoreline
  - Contours from LiDAR
  - Contours from photogrammetry
  - Contours from Atlas of Oregon Lakes
- Each dataset was created with a different methodology and may have different source data
- What is the best way to communicate this information?

Metadata issues – LiDAR derived bathymetry

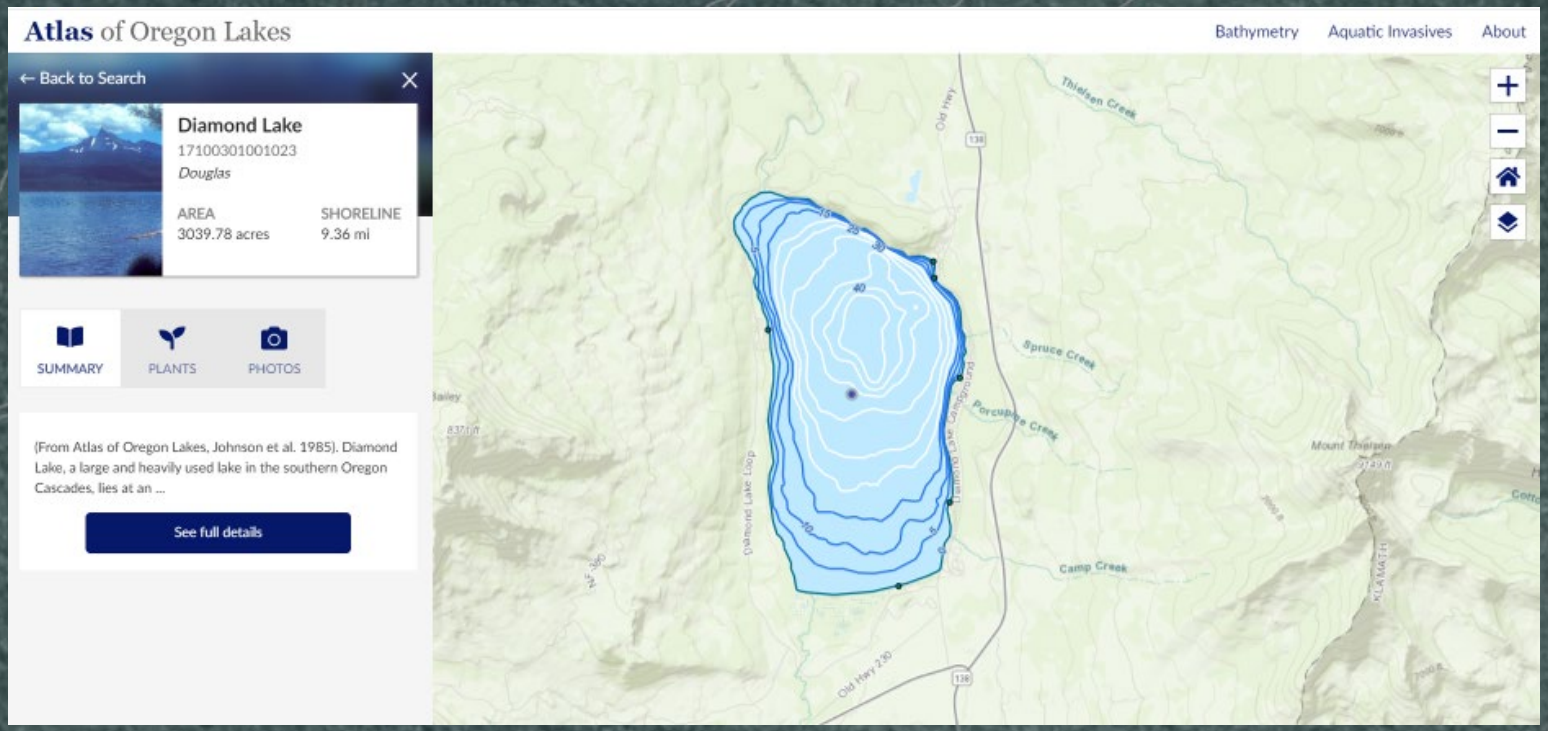
- OPTION 1 – Metadata for each individual file for each lake
- OPTION 2 – A metadata document for each lake
- OPTION 3 – A metadata document that covers all 78 lakes
- OPTION 4 – A metadata document that covers all lake bathymetry from all methods

Data delivery

- A geodatabase for each lake that includes all relevant datasets
- What is the best way to package this diverse set of data?

Data delivery

- A collection of bathymetry data for all lakes available for download from the Oregon Lakes Atlas



https://oregonlakesatlas.org/map

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Questions and discussion

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