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AIRBORNE LiDAR Easily Defines Underwater River Channel Geometry

New method of collecting river bathymetry data saves time and money

What Is The Problem?

Collecting underwater river bed elevations (bathymetry), especially for reaches longer than about five miles, has long been a challenge for those who model rivers for hydraulics, sediment transport, and water quality and habitat. Surveying a river channel and processing the data using alternative methods that include performing surveys from a boat using SONAR (acoustic depth soundings) linked with Real Time Kinematic global positioning system (RTK GPS) equipment are labor intensive and time consuming and can be dangerous.

What Is The Solution?

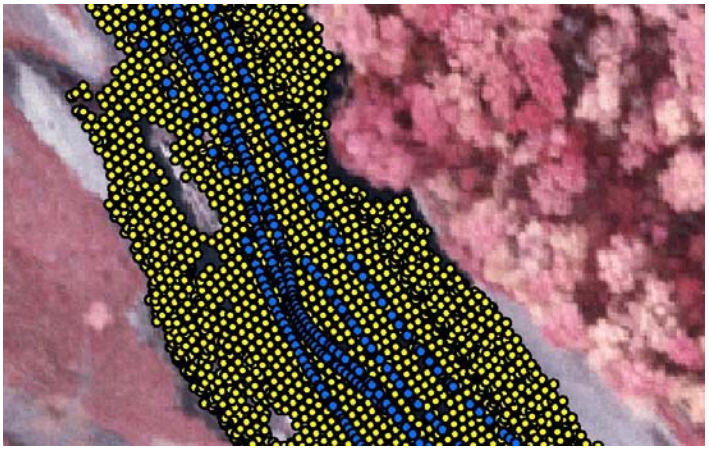
Airborne LiDAR (light detection and ranging) bathymetry is a new technology that has been available to survey coastal regions for about 20 years and can now be used to survey rivers in relatively clear water. It uses two colored laser beams (red and blue-green) to perform surveys of main and side channel bathymetry from an airplane or helicopter. This type of data collection reduces the need for field crews surveying potentially dangerous river channels either by wading or from a boat.

Airborne LiDAR used to collect bathymetry data not only saves time and money as compared to traditional methods especially for long reaches, but the data are much denser producing point densities as low as 2 x 1 m. Traditional methods used to collect river bathymetry data require personnel to wade a river with surveying equipment, probe the bed with a survey rod from a boat, or use SONAR linked with GPS surveying equipment. Airborne LiDAR improves accuracy for collecting river channel bathymetry data and enhances the ability to represent underwater terrain for users of hydraulic, sediment transport, water quality, and habitat models.

Airborne LiDAR can collect bathymetry data faster than traditional methods resulting in cost savings associated with reducing the number of people and decreasing the number of days needed to collect and process the bathymetry data.

Where Have We Applied This Solution?

Airborne LiDAR has been used to collect bathymetry data in seven reaches of the Yakima River covering 92 river miles and on the Trinity River covering 42 river miles. Ground surveys using RTK GPS were used to compare bathymetry data collected from these rivers. The comparison revealed that airborne LiDAR produced precise bathymetry data with standard deviations of about +/- 25 cm vertical. The airborne LiDAR data obtained from the Yakima River has been successfully used in conjunction with a two-dimensional hydraulic model to evaluate aquatic habitat for fish species.



The density of Airborne LiDAR data points (shown in yellow) is much greater than for data points surveyed with boat-mounted SONAR and RTK GPS (shown in blue).

More Information

Using airborne LiDAR to conduct surveys of river channels is a new development and the majority of current literature is limited to applications in coastal areas. Information regarding SHOALS airborne laser bathymetry is provided on the manufacturer's web site, http://www.optech.ca. More information about airborne LiDAR is provided at http://shoals.sam.usace.army.mil. The manuscript for studies conducted at the Yakima and Trinity Rivers has been accepted for publication in *Earth Surface Processes and Landforms*. A preprint of the article can be found at www.usbr.gov/pmts/sediment.

Contact Information

Robert Hilldale, Technical Service Center
Sedimentation and River Hydraulics Group
(303)445-3135, rhilldale@do.usbr.gov

Collaborators

Reclamation Science and Technology Program, Upper Columbia Area Office, and Trinity River Restoration Program