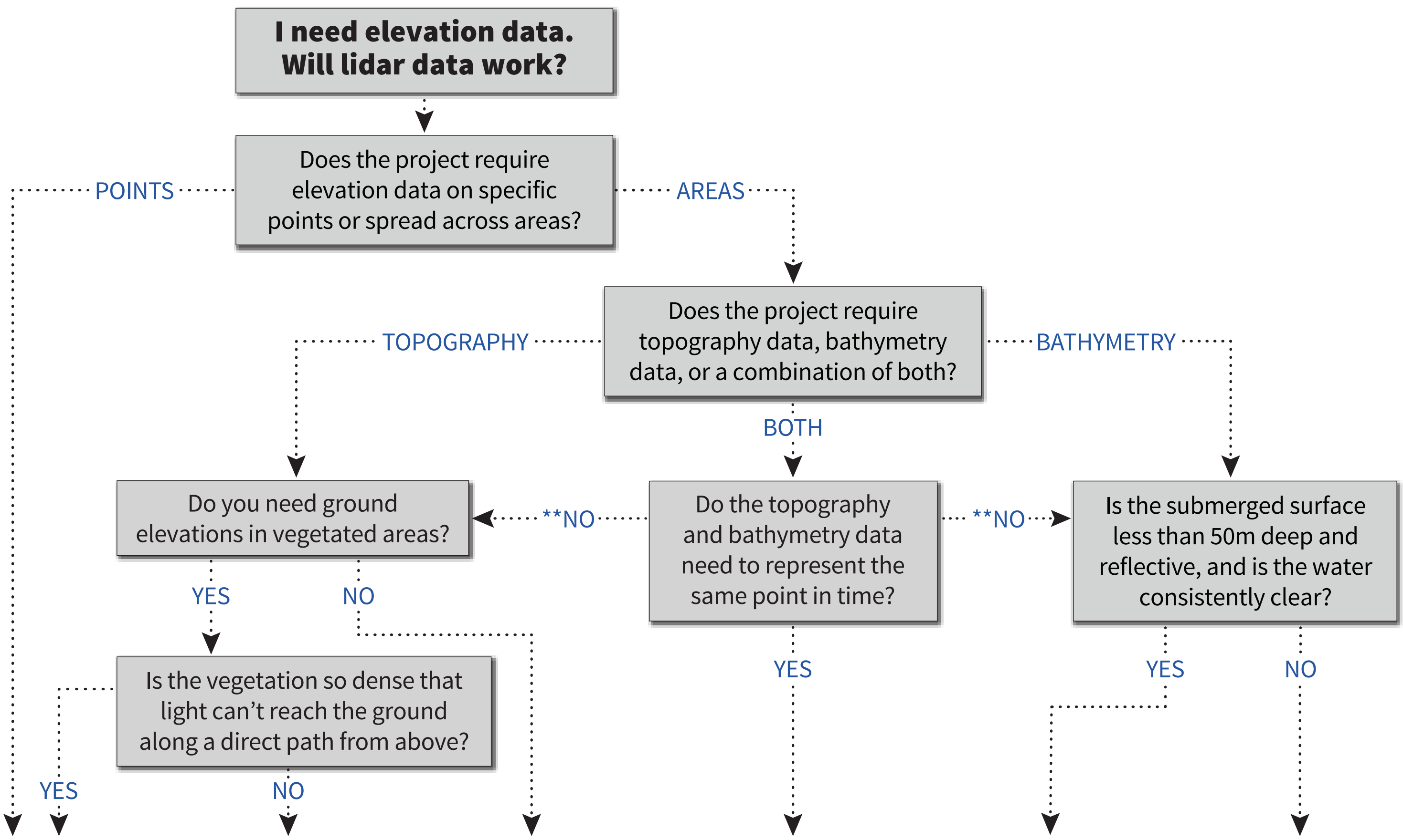
Decision Tree for Deciding If Lidar Is the Way to Go

Knowing what kinds of data are needed will determine the best mapping technologies to pursue. Use this handy decision tree to find out what your project needs. Lidar is a powerful mapping technology but is not always the best choice. Use this decision tree to answer the following question.



1

Lidar won't work. You should plan to acquire this data using traditional survey techniques.

2

Topographic lidar will provide accurate ground elevations, but errors will increase under very dense vegetation and in highly built-up areas.

3

Topographic lidar will likely include elevation data for vegetation and other above-ground features, but other technologies such as photogrammetry and radar may also provide what you need.

4

Topobathy lidar will provide a combined system to collect seamless data you seek but it will be limited to a swath along the shoreline.

5

Bathymetric lidar should work, but there might be data gaps where the water is very shallow, turbid, or turbulent.

6

Lidar won't work. You should plan to use acoustic data.

** Answering "No" here leads to 2 endpoints

Caveats and Considerations on backside

Caveats and Considerations - for each endpoint in the decision tree (front side)

1 - Lidar won't work. Obtaining absolute vertical accuracies better than 3 centimeters requires careful consideration of ground control and the use of traditional survey equipment. While traditional surveys can provide better accuracy than lidar, they can be time-consuming if a large number of points need to be measured or a large area needs to be covered. Traditional surveys can be used to generate 3D surfaces but this approach requires interpolation between points (just like lidar), so point spacing is an important consideration. This means that a traditional survey can sometimes be less accurate than a survey that uses lidar data. Lidar is not suited for measuring XYZ coordinates on specific points because each lidar pulse is expressed as a spot several inches wide and integrates all the undulations of the ground or non-ground features. It is also difficult to know where the laser hits the ground, leading to uncertainty regarding the horizontal position.

2 - Topographic Lidar. For less dense vegetation, lidar takes advantage of the open areas in the vegetation to collect accurate ground elevation data. The denser the vegetation, the lower the percentage of laser pulses that will make it to the ground. Increasing the laser pulses per unit area will help, unless none can get through.

3 - Topographic Lidar. Lidar is an excellent choice when trying to create 3D surface models of vegetation canopies, structures, and other above-ground features, but there are other options to consider as well. Data sets from photogrammetry or radar projects may also work.

4 - Topobathy Lidar. Topobathy data holdings are often limited to narrow coastal strips. Topobathy systems are designed to collect topographic and bathymetric data concurrently, but these systems fly low and are inefficient for broad-area topographic mapping. A broad area of land and water will need multiple technologies. Topobathy systems are particularly good at filling the gap between what topographic lidar and bathymetric sonar can cover.

5 - Bathymetric Lidar. Water bodies are often dynamic. Even in regions where bathymetric lidar is almost sure to work, data gaps may exist where short-term physical processes (i.e., combinations of waves, currents, and sediment transport) created sub-optimal environmental conditions.

Caveats:

If the bottom is reflective and the water is turbid, then lidar should be okay in shallow water (depends on how turbid the water is).

If the bottom is dark and the water is clear, then lidar should be okay in shallow water (depends on how dark the bottom is).

If the bottom is dark and the water is turbid, bathymetric lidar probably won't work and acoustic is recommended. You may try lidar where it's less than 4 meters deep because acoustic will be so inefficient. This is a tough one.

Very shallow water (e.g., a few inches) can cause confusion between the water surface return and the water bottom return. Lidar also won't penetrate the white water of the surf zone.

6 - Lidar won't work. Acoustic data, particularly multibeam sonar, is considered the gold standard in the water, but it is inefficient in shallow water, particularly water less than 4 meters deep. It can be dangerous to collect acoustic data in areas with uncharted hazards.