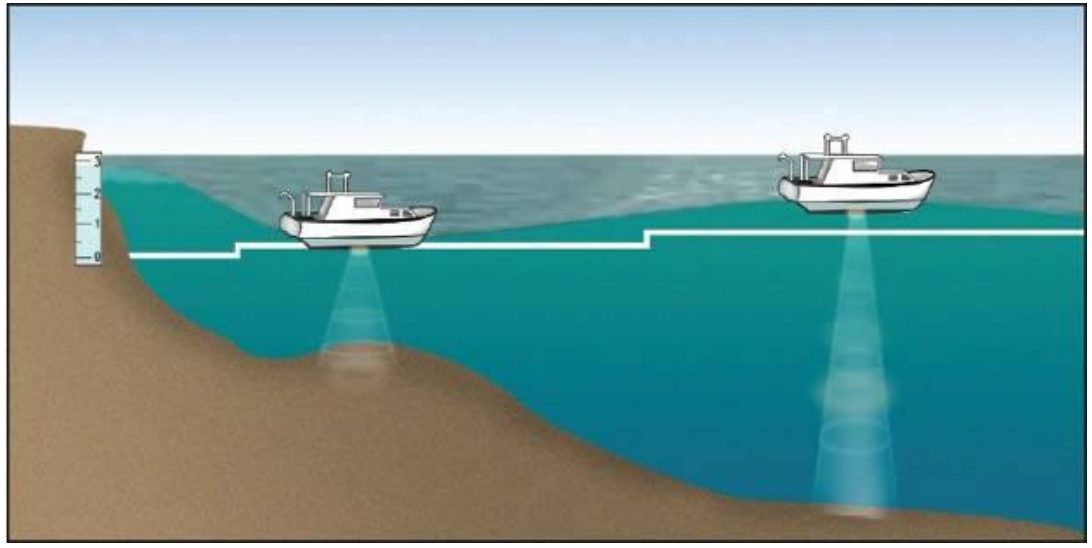
The Hydrolevel Buoy system for accurate tide/water-level measurements anywhere in the ocean

February 2020

Depth Reduction to Chart Datum

- Knowing exact sea depths in the Littoral Zone is critical to the safety of navigation for commercial and military vessels.
- Traditional depth reduction depends on the availability of land based tide gauges.
- In denied areas or areas of conflict, the deployment of tide gauges is an operational and security challenge.



Problem # 1: 40 - 60% Error

- Where tide gauges are not available, the Hydrographer relies on a combination of techniques such as tidal constituents databases, tidal zoning and hydrodynamic modeling to produce estimates of chart datums and tide corrections.
- This modeling is based on best available information and estimates which not always produce the desired results.
- Due to this uncertainty in model input, the current water level error can be 40 to 60% of the total depth solution

Problem # 2 Land Permissions

- Shore-based tide gauges may require permissions from national and local authorities, Institutions, Companies as well as landowners.
- Sometimes harsh terrain or armed resistance could make it impossible for the Navy to gather the necessary data.
- Installation costs increase exponentially when armed forces are required.

Problem # 3: Tide = Water Levels

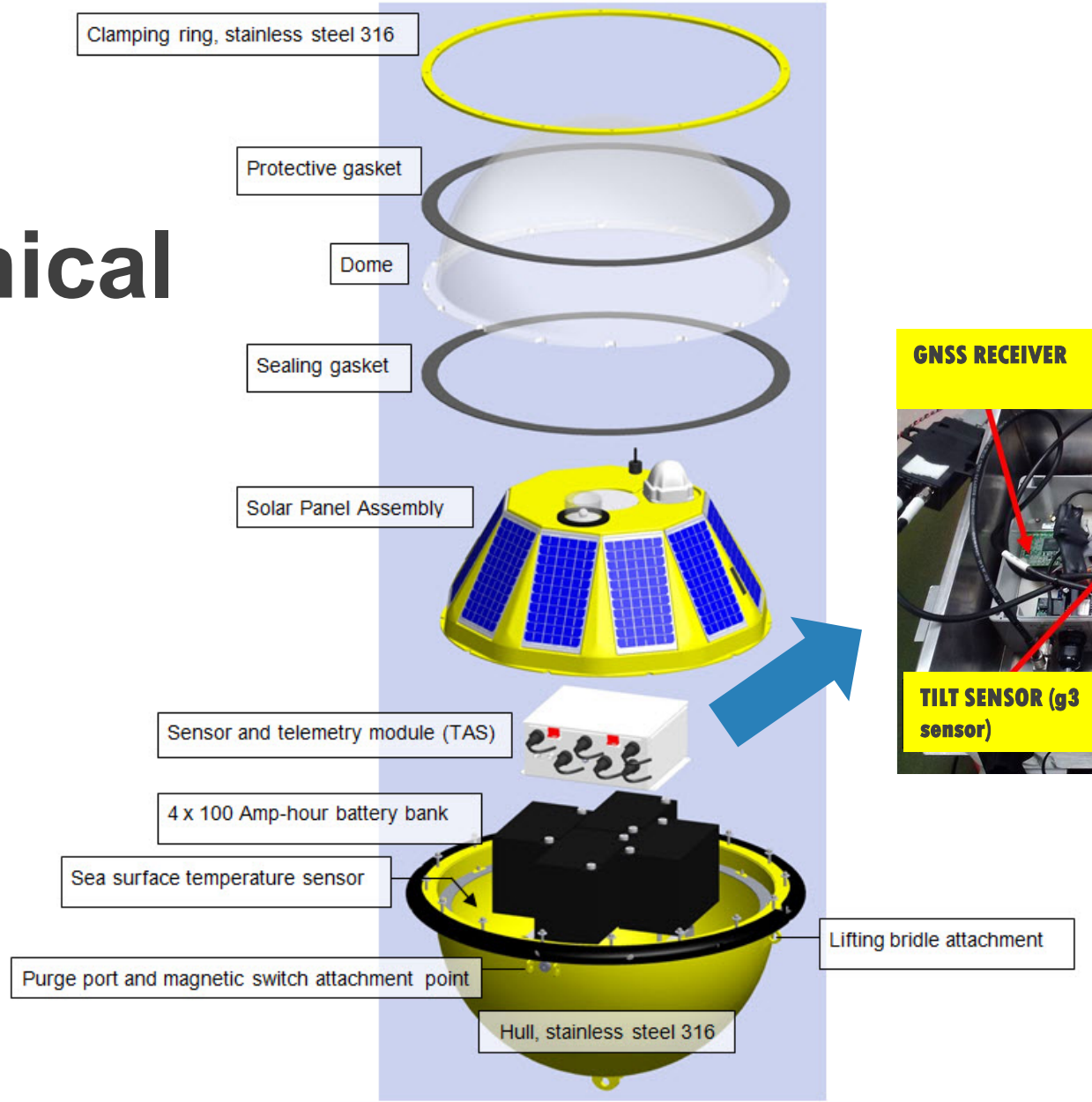
- One of the key concerns of a navigator regarding nautical charts is the depth of the seabed relative to a mean low water level of the tide cycle.
- Water Levels in the Costal Zone are affected by a number of factors; i.e. Tide, Seabed Topography, Coastlines.

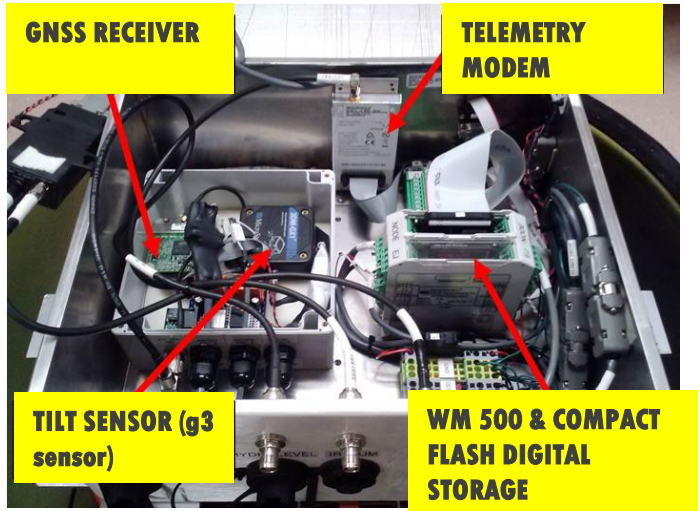
AXYS Technical Solution: HydroLevel Buoy

- The Hydrolevel system is based upon the successful wave-following spherical buoy design (TRIAXYS Buoy), incorporating a rubber shock absorber to maintain water level
- Equipped with a dual-frequency GNSS receiver, tilt sensor (g3 sensor), Data Processor (AXYS WM500) and other ancillary hardware.
- The buoy acquires 1 Hz data that is processed to provide the elevation of in situ water level in a geodetic, ellipsoidal reference frame.

AXYS manufactured this buoy originally to Naval Oceanographic Office (NAVOCEANO) Operational Requirements to Measure Water Levels and to Determine Chart Datum

AXYS Technical Solution: HydroLevel Buoy



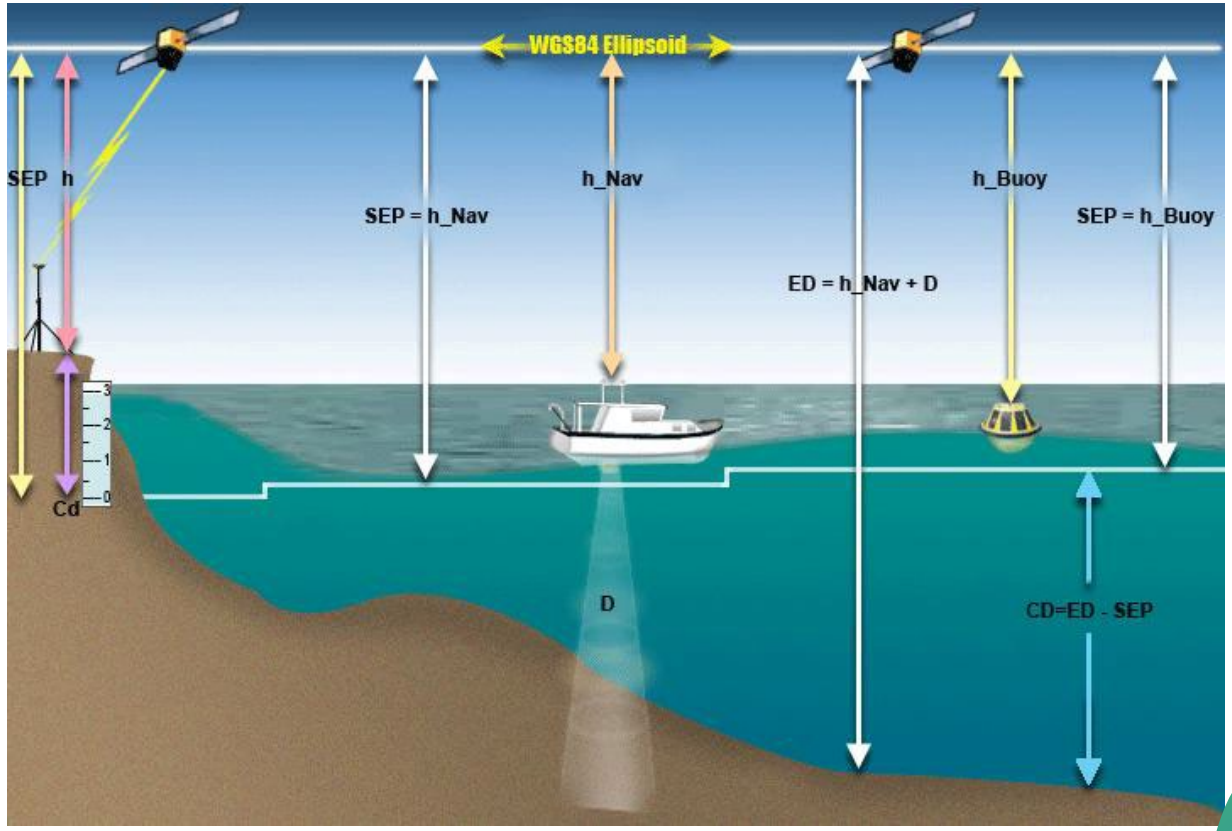


AXYS Technical Solution: HydroLevel Buoy

- This buoy system is able to Operate in any location in the world withstand impact, shock, and extreme temperatures.
- The system is serviceable without the requirement of any special tools or equipment, and can be maintained by technically trained staff.

AXYS Technical Solution: HydroLevel Buoy

- Generates a real-time accurate three dimensional positions using a Global Differential GNSS solution.
- GNSS Solution Methods:
  - Real Time Kinematic (RTK)
  - Post Processed Kinematic (PPK)
  - Precise Point Position (PPP)
- Accuracy of the order of 5 – 10 cm



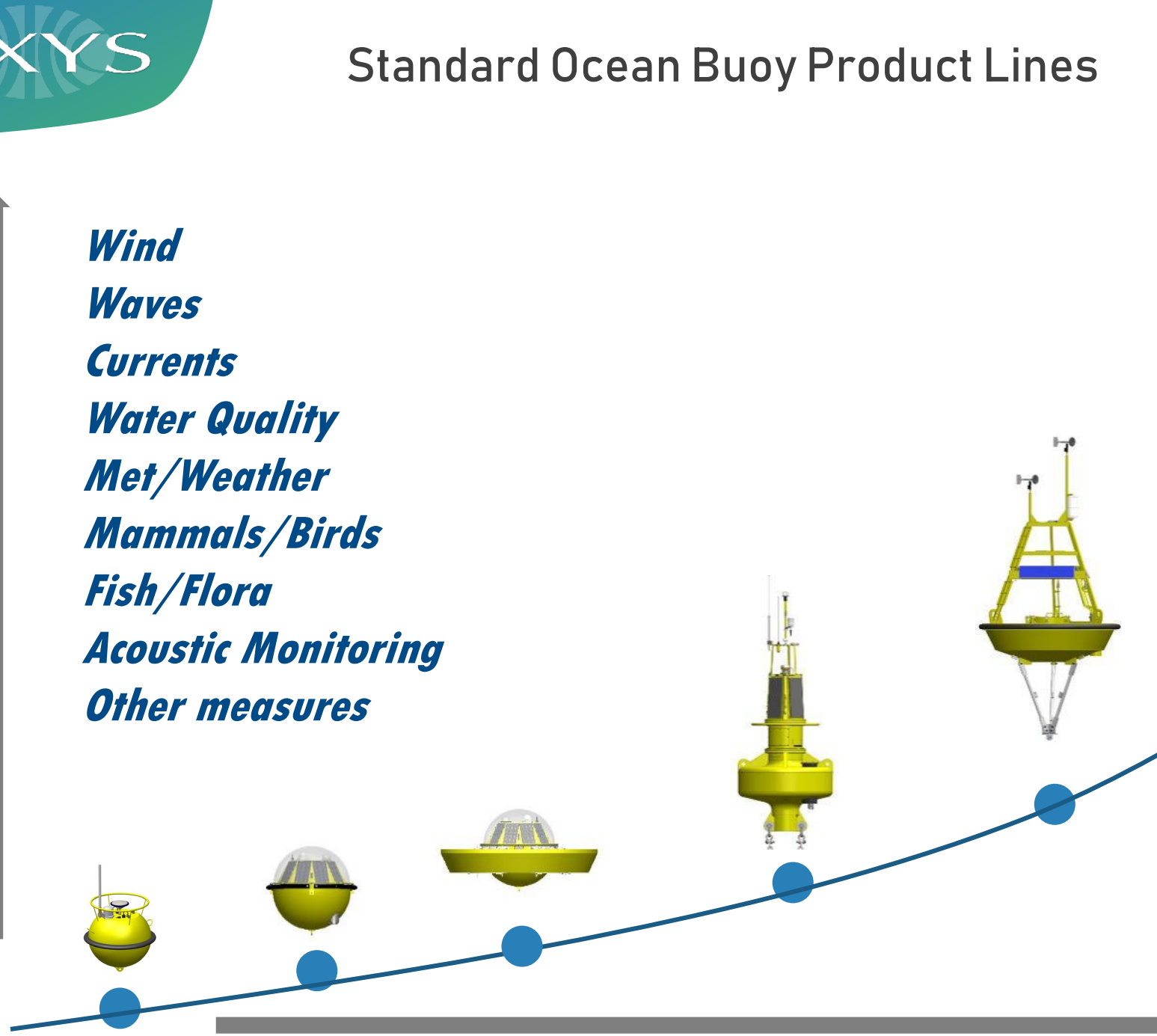
Benefits

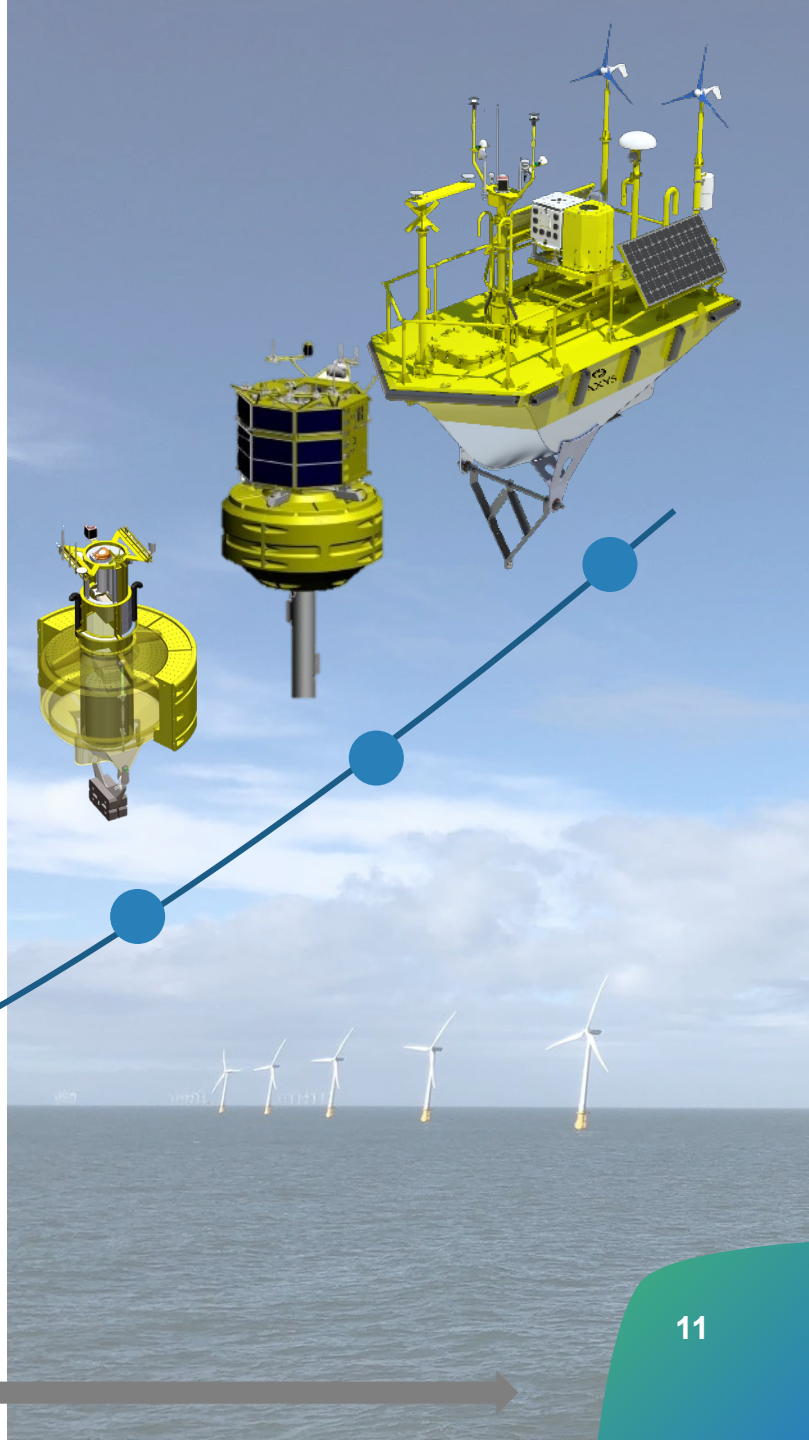
- Increases Flexibility and Operational Range
- Enables depth positions to be measured on the absolute three dimensions and eliminates the “guessing” of water level estimates.
- Deployed for less than 30 days may be used to refine tertiary gauge requirements for hydrographic survey projects.
- In denied areas, areas of conflict or areas with NO tide gauges, buoy occupations of 30+ days may be used to derive tidal datums at needed basin interior points and offshore boundary points.
- Can measure water levels anywhere in the world without the need for permissions or the costly deployment of personnel to land based infrastructure

Standard Ocean Buoy Product Lines

Power & Sensor Capacity

- *Wind*
- *Waves*
- *Currents*
- *Water Quality*
- *Met/Weather*
- *Mammals/Birds*
- *Fish/Flora*
- *Acoustic Monitoring*
- *Other measures*



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