Wetlands Are Vital

Wetlands are areas where "the water table is usually at or near the surface, or the land is covered by shallow water\textsuperscript{1}\), and are split into two major categories – tidal wetlands and non-tidal wetlands. Tidal wetlands lie on coasts and are often part of estuaries where freshwater from rivers meets saline sea water. Non-tidal wetlands are exclusively freshwater and often exist in floodplains, swamps, and isolated depressions. Even though some do not see the ecological beauty of wetlands, but view them as big water puddles that need to be drained, the advantages of wetlands far outweigh the disadvantages. Wetlands are vital because they:

- Are necessary for migration and life cycles for over a third of bird species in the United States\textsuperscript{2}.
- Provide habitat for a wide variety of plants and animals, some of which, like the whooping crane, fatmucket mussel, and red wolf, are endangered\textsuperscript{2}.
- Absorb major amounts of flood water, which slows erosion and reduces the impact of floods.
- Recharge aquifers\textsuperscript{3}.
- Absorb nutrients from agricultural and suburban runoff that degrade water quality as a result of a variety of microorganisms and flora that live there\textsuperscript{4}.
- Can reduce mosquito populations, depending on the biodiversity of wetland, by providing a habitat for frogs, fish, birds, bats and other mosquito predators.

Need for Data About Wetlands

Data about wetlands is mainly needed by scientists for research, wildlife managers for conservation, and policy makers for decisions. There is also a significant need for up-to-date information because many processes in wetlands are not well understood and wetlands can change rapidly as they are affected by: inflows and outflows that vary depending on many different hydrology factors\textsuperscript{5}, Evaporation of water from wetlands; Temperature of the surrounding area. People onsite collecting data is essential due to the dynamic nature of wetlands. Typical data collected includes flow measurements, water samples, soil samples, depth measurements, amount of vegetation per unit area, aquatic life, photos and more. Equipment can also be set up to automatically record data and transmit it remotely. Satellite images and aerial photos are also important sources of information.

Steps for Collecting Data Using Quadrats

Basic equipment needed to collect vegetation, aquatic life, and other types of data about wetlands includes a GPS, Quadrat, measuring pole, and safety measures. The general steps for data collection are:

1. Have a plan that defines objectives, what data needs to be collected, how and why.
2. Carefully paddle or wade into the wetland with needed safety equipment and a team member.
3. Place the end of meter pole gently on the bottom of the wetland and record the depth within the data sheet in the GPS
4. Mark the location with the GPS.
5. Center the quadrat over the meter stick so the quadrat sits on the water surface.
6. Only looking within the quadrat, observe carefully to correctly identify the data that needs to be collected then record the designated information with the GPS.
7. Double check your data and measurements then move the designated distance and repeat the procedure.
8. Upload GPS Data and incorporate into a GIS software.
9. Analyze data.
10. Make decisions, evaluate results and improve the procedure.

Importance of Accurate Data

Research can have major impacts on society by influencing policy, management practices, and public opinion. For example, because of research, wetlands are now being restored on a larger scale to improve water quality especially in agricultural areas. Wetlands need to be effectively monitored in order to evaluate their performance.

It is vital that data be as accurate as possible because of the consequences of bad information. There are many sources for the introduction of error into data collection and analysis, especially in wetlands, because of their ephemeral characteristics.

Common sources of error while gathering data about wetlands include:

- Measurement error. For example, tools being unable to accurately measure minute, but important, changes in concentrations of pollutants.
- Limited number of wetlands studied and number of trials. Because of limited resources, some wetlands are studied and others are not but the variability between wetlands can be significant. What is effective at one wetland may not work at another.
- Data aggregation from sources with different standards. When data from multiple sources is combined, errors can be introduced and compounded.

For example, as wetlands are constructed contractors typically are required to provide an "As-Built" survey that includes specific depths of the wetland in relation to the full pool of water. However, sometimes the data in these surveys does not align with data taken by researchers.

Using GIS to Make Decisions

GIS can significantly increase results and reduce costs by providing a means for the collection, visualization, analysis and manipulation of geospatial data to create powerful maps. GIS is a powerful tool for educating decision makers and the public. Visualizing information about water depth, soil type, amount of sunlight, distance from inflows or outflows, position in relation to other bodies of water, boundaries, city zoning regulations, underground pipes and more helps:

- Identify where wetlands could be beneficial for specific purposes such as reducing nitrates.
- Estimate the cost of establishing and maintaining wetlands.
- Choose what to plant and where within wetlands including grasses, shrubs, and trees.
- Decide where wetlands could best help with wildlife restoration projects.

Evaluate the health and effectiveness of wetlands.

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