



Wetlands Delineation for Environmental Assessment

Introduction

The Environmental Photographic Interpretation Center (EPIC) provides wetland analyses using current and historical imagery to locate, characterize, and document current status and change in wetlands due to natural or man-made processes.

Aerial photographs offer a synoptic view of wetlands and their surrounding environments and form a permanent record of present and past conditions. Precise quantitative measurements can be derived from aerial photos that aid field work by displaying relationships not readily apparent on the ground. Uses for this extracted data range from general regional planning to legally defensible presentation of data.

EPIC analysts have years of experience in photo interpretation of varied wetlands habitats. Collateral information on soils, local hydrology, and vegetation is always utilized to ensure the accuracy of the delineations. Field verification may be used to enhance the accuracy of the delineations. Areal measurements of data can determine loss of wetland habitat, length of constructed drainage channels, or other pertinent information.

Various levels and formats of wetlands delineations are available as dictated by the needs of the requester. Overlays to either aerial photos or topographic maps may be produced, or the data can be converted to digital form for use within a Geographic Information System (GIS).

Scope

Wetland/Upland Boundary Analysis

Determination of a wetland/upland boundary is the simplest analysis. This level of analysis is used to locate wetlands and off-site drainage patterns. It is typically requested for a specific area surrounding sites and usually involves the most current year of photography, but multiple years can be analyzed if change detection is needed.

Detailed Analysis

A detailed wetlands analysis is requested when information is needed on vegetation types in the wetlands and deepwater habitats. A classification system developed by Cowardin et al. (1989) for the U.S. Fish and Wildlife Service is used for this purpose. Analyses of single or multiple years of coverage are performed.



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Section 404 Support

Section 404 of the Clean Water Act protects wetlands from unpermitted dredge and fill activities. Analyses involve field work using jurisdictional delineation procedures. Wetlands are classified using the full Cowardin et al. (1979) classification system. Two types of analyses are used in support of this program; they are enforcement and advance identification.

Enforcement

Court support can be provided for enforcement cases where wetlands have been dredged or filled or otherwise altered and no permit had been issued. Using historical photographs and field verification, reference wetlands having the same photographic signature, soils, and hydrology as the altered wetlands are used to confirm the former type of the altered wetlands. Current overflights of the site are generally acquired to ascertain current conditions. To detect change, at least two years of photography are analyzed. Area measurements of



Figure 1. Both natural color and false color infrared (CIR) aerial photographs when used together provide different information about wetlands and surrounding water bodies. This false color image, for example, identifies different vegetation species as various shades of red and pink, adjacent water bodies as deep blue to black (which helps to define the land/water interface), and exposed tidal flats and beaches as light blue to almost white. A natural color aerial photograph of the same site taken concurrently with the CIR provides better information on water turbidity and underwater features not as easily seen on the CIR because of CIR's limited water penetration capability, and better shadow penetration for delineating an upper wetland boundary separating upland from wetland.

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wetlands loss and change by type are calculated using Geographic Information Systems software. Should legal proceedings be required, graphic displays and expert witness testimony are provided.

Advance Identification

In support of the Advance Identification process of section 404, wetland delineations on overlays of current photographs or base maps are available. These studies are a cost-effective way to identify wetland habitat in advance of permit application and evaluation.

Advantages and Limitations

Historical aerial photographs are often the only means of establishing the prior existence of wetlands for sites that have been changed through natural or man-made processes. Progress in computer technology has enhanced the accuracy of both presentation and measurement of wetland change and subsequent transfer of this information onto maps.

Advantages

- More cost effective than intense field sampling
- Legally defensible
- Verifies existence of current or historical wetlands
- Detection of change
- Potential for photo coverage of critical years

Limitations

- Visibility obscured by snow, cloud cover, and leaf-on conditions
- Available photography may exhibit extremes in hydrology (drought and flood)
- Lack of photo coverage for critical years

Future Plans

Remote sensing for wetlands delineation and mapping is an expanding field. Improvements in analog to digital image conversion and associated automated image processing may expedite the delineation process. With the introduction of photogrammetric instruments into this mapping discipline, precise planimetric and volumetric measurements can be performed in support of EPA needs. By converting photo interpreted data into digital format, they can be combined with data from diverse sources resulting in spatial information useful for environmental decision making.

Reference

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. Classification of Wetlands and Deepwater Habitats of the United States, U.S. Department of the Interior, Fish, and Wildlife Service, FWS/OBS-79/31, 1979.