

READERSHIP RESPONSE

Readers of the *Wetland Journal* have the opportunity to express their ideas, concerns, inquiries, and suggestions, as well as their knowledge and experiences, for the benefit of all involved in wetland issues, including restoration, education, and research. Letters, as well as articles, responding to previously published material in the *Wetland Journal* are welcome for publication. Your contributions are appreciated.

Response to Michael Rolband's Article, "A Comparison of Wetland Areas in Northern Virginia..." (Wetland Journal Volume 7 No.1)

--Ralph Tiner

The article by Mr. Rolband described a comparison between National Wetlands Inventory (NWI) maps and field delineations in northern Virginia. Some of the specific findings (e.g., acres mapped on the ground vs. mapped by NWI and as hydric soils by the Soil Conservation Service) were interesting. Some of the "findings", however, should be obvious to anyone familiar with wetland photointerpretation, resource mapping, and wetland delineation:

- 1) NWI maps underestimate the extent of wetlands in a given region;
- 2) wetland delineations performed on the ground following established methods, designate more wetlands, and more accurately delineate wetland boundaries, than NWI maps.

I would not disagree with these conclusions, as we have been aware of this since our project's inception. Several of our published references mention limitations of NWI maps due to remote sensing techniques and the level of NWI field review, including: "NWI Maps Made Easy" (Smith 1991), "Use of High Altitude Aerial Photography for Inventorying Forested Wetlands in the United States" (Tiner 1990), and State reports for New Jersey, Delaware, Rhode Island, and Connecticut. The latter reports are prepared upon completion of the NWI. Among other things, these reports document the more significant problems encountered during wetland photointerpretation (see "Wetlands of Delaware" Tiner 1985, for example).

In light of certain statements made and the conclusions drawn in the article, I do, however, feel the need to emphasize a few points for those readers not well acquainted with NWI maps.

1. All NWI maps contain the following **Special Note** (to the user) in the map legend:

"This document was prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with **Classification of Wetlands and Deepwater Habitats of the United States**, (FWS/OBS-79/31 December 1979).

The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of the aerial photographs. Thus, a detailed on the ground and historical analysis of a single site may result in a revision of the wetland boundaries established through photographic interpretation. In addition, some small wetlands and those obscured by dense forest cover may not be included on this document.

Federal, State, and Local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different

manner than that used in this inventory. **There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, State, or Local government or to establish the geographical scope of the regulatory programs of government agencies.** (Emphasis added) Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State, or Local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities."

This note should provide map-users (land-developer, land-use regulator, environmental consultant, and others) with sufficient cautions about the wetlands designated, and those not shown, to clearly understand that the maps do not identify the limits of jurisdictional wetlands. Whoever claimed that "no jurisdictional wetlands exist" based solely on a review of NWI maps, was clearly misrepresenting the situation. I find it hard to believe that any responsible, ethical environmental consultant would use NWI maps in this manner. Financial institutions accepting this type of "verification" need to re-examine their eligibility requirements for land development loans. In no way has the FWS or any Federal regulatory agency



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stated or implied that existing NWI maps form the basis of a regulatory program. Regulatory maps have been produced by several States, but this was done at an effort and cost orders-of-magnitude beyond that required to produce existing NWI maps.

2. NWI maps do represent a useful starting point for localities to create maps of resource protection areas. The NWI maps should, by design, err more due to omissions rather than commissions. This means that if the NWI map identifies an area as wetland, it is most likely to actually be a wetland. By so doing, more difficult to photointerpret wetlands will be missed, rather than include many acres of nonwetlands in wetland polygons. With NWI maps as the base wetland data, localities can begin to build a wetland resource database and conduct ground surveys or intensify the wetlands inventory in other ways to produce a more complete assessment of their wetlands.

3. The regulatory definition of wetland for the Clean Water Act is generally consistent with the definition of a vegetated wetland according to the U.S. Fish and Wildlife Service's official wetland classification system. Yet, this does not mean that NWI maps show all jurisdictional wetlands (see Comment #1 above). It does mean that for a given site, if NWI field personnel were to collect data on the vegetation, soils, and hydrology of a wetland identified by the FWS system, it should be the same as one identified by the 1989 "Federal Manual for Identifying and Delineating Jurisdictional Wetlands", which was developed as a technical standard for identifying jurisdictional wetlands ("vegetated wetlands") (Federal Interagency Committee for Wetland Delineation 1989). Such areas, when located in the field by NWI personnel, should be added to the NWI map. In contrast to the 1989 manual, the "Corps of Engineers Wetland Delineation Manual", was based on both technical and policy considerations, and by design, does not include all wetlands (Environmental Laboratory 1987). For example, many wetlands mapped by NWI on the Eastern Shore of Maryland fail to satisfy the Corps' three-parameter method because they fail to show certain signs of wetland hydrology

during the growing season or fail to be wet for a significant period during the growing season (Dennison and Berry 1993). Most of these sites are the "Winter wet woods" or "wet flatwoods" that are wet for extended periods from Fall to Spring. Older NWI maps have missed many of these wetlands, but the latest maps based on 1:40,000 color infrared photography probably capture the majority of them.

4. The article does not clearly state the type, or types, of wetlands being missed. This is most pertinent information. There is a statement that "understated areas of wetlands seem to be located primarily in small forested watersheds that do not have USGS mapped streams", yet one cannot determine whether or not these areas are below the NWI mapping threshold (e.g., 3-5 acres for 1:80K photos, 1-3 acres for 1:58K, and 1 acre for 1:40K). Generally, linear (narrow) wetlands along streams or in drainage divides are typically not mapped by NWI, especially the older versions. This could, in fact, encompass considerable acreage in some landscapes.

5. I agree with Mr. Rolband that map to map comparisons (NWI map to NWI map or State map to NWI map) for determining wetland losses are inappropriate. There are significant differences in mapping methods (especially source imagery) that make such comparisons unproductive and meaningless. For example, one could show a gain in wetlands, simply because wetlands were more accurately mapped on the latest map. Analysis of aerial photographs (recognizing limitations) provides meaningful statistics on wetland trends, although the documented losses are probably underestimated.

6. Despite the undermapping of certain wetland types, NWI maps do provide useful information for wetland resource planning and for increasing our knowledge of U.S. wetlands. The NWI is a national program with the national perspective - it is not, by design, an all-inclusive inventory of wetlands in the United States. Such a goal would require far more funding than the current effort. Many types of wetlands, however, are accurately mapped considering the minimum mapping unit established by NWI. The overwhelming majority of NWI mapped wetlands do possess characteristics that provide significant public ben-

efits and/or pose serious limitations for certain land-uses. For these reasons and others, data produced by the NWI in a map, digital, or report form are invaluable to decision-makers, natural resource and land-use planners, real estate agencies, land-developers, bankers, the average citizen, and a host of other individuals. NWI maps are not the "give-all and end-all" to mapping wetlands, nor are they the "Rolls Royce" of wetland maps, but they are still a tremendous resource for those seeking to know more about the location, extent, distribution, and characteristics of our nation's wetlands. The NWI Project has provided the United States with a far better assessment of the national wetland resources than any previous project. Due to the efforts of the NWI Project, we know a lot more about U.S. wetlands than ever before. Much progress has been made; NWI mapping techniques and products have greatly improved; the information is readily available to everyone. Can you name a single land or water resource where we have more accurate maps and statistics nationwide?

7. The NWI Project has always welcomed constructive input on the map products. We produce and distribute draft maps for interagency review and also make them available to the public (1-800-USA-MAPS). Unfortunately, we (in the Northeast) do not get much outside help; seems like folks are too busy to put their comments on paper. Even when the maps are "final" (note: mapping is an iterative process), we encourage wetland delineators to take a few moments to generally sketch any needed revisions on an NWI map and send it to us at **U.S. Fish & Wildlife Service, Ecological Services-NWI, Region 5, 300 Westgate Center Drive, Hadley, MA 01035**. Such contributions can help improve the NWI maps and make additional use of the hard work being done in the field to delineate wetlands. So, if you want your efforts to become part of the historical record through the NWI maps, simply send us your comments and your work will be used to help revise the maps. If a map has been found to have significant omissions, we will probably initiate revisions well before we originally planned.



Finally, we must all keep things in perspective and avoid the tendency to exaggerate. Any map is simply a representation of how the world is perceived by its maker. When using any map, one must be aware of the objective of the mapping and its limitations. If you don't know this, you should contact the map maker. All NWI maps have the address of the applicable Regional Office of the U.S. Fish and Wildlife Service for more information. The FWS has numerous papers/reports available to provide additional information on wetlands to anyone interested in learning more.

We look forward to your help in making better maps! ☺

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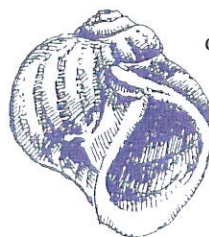
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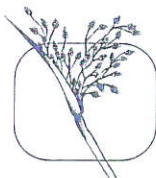


Common Moon Shell
Lunatia heros

Paleoecology and Wetland Creation and Restoration

--Richard A. Orson

Paleoecology is the study of the history of the environment with emphasis on the past ecology of a habitat. The field includes fossil studies, pollen and diatom identifications, and historic seed bank studies, among others. Although the prefix means "old" and has often been used to denote fossil remains, it is used in this context to include historic and prehistoric analysis of past environments and the factors which control their ecology. It can include time periods ranging from thousands of years to tens of years.



The compensation and restoration of wetlands to mitigate the unavoidable impacts of development on sensitive habitats has become an important issue. Although the natural development of wetlands relies on a complex set of ecological variables, all too often wetland creation and restoration projects are designed based solely on present hydrology, soils, and choice of plantings. Although these factors are important, there are many areas of science, such as paleoecology, which may also prove to be vital to the success of any individual plan. Subsequently, many projects can show short-term success in compliance with monitoring programs, but few actually achieve the long-term goal of replacing the function and value of the natural habitat.

Our ability to design a successful wetland compensation project relies on our understanding of processes controlling wetland development. One of the most powerful tools available to the wetland scientist for interpreting processes of development is **paleoecology**. Paleoecological research (i.e., palynology, seed bank studies, macrofossil identification) has provided important theoretical and technical information on such topics as accretion,

rates of development, and factors which influence the structure and development of wetland plant communities through time. Indeed, some of our most basic understanding of wetland ecology has come from paleoecological investigations (i.e., coastal submergence, climatic fluctuations).

Paleoecology has the potential to benefit many wetland creation/restoration projects. For instance, seed bank studies in annual dominated marshes have shown that the structure of the plant community through time is based on the ability of a species to germinate at the onset of the growing season, rather than the assemblage of seeds in the sediment (Van der Valk and Davis 1978, Leck 1989, Haukos and Smith 1994). In systems dominated by perennials, the plant community is structured by factors controlling vegetative reproduction, such as hydrology (Orson and Howes 1992) and inter- and intraspecific competition (Leon 1978). Various marsh types may also differ in their ability to perform a particular function, such as the ability to assimilate heavy metals and other pollutants from the environment. Orson *et al.* (1992) noted that heavy metals are incorporated into annual dominated tidal freshwater marshes through the accumulation of, and decom-



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