

Ectomycorrhizal Mantles as Indicators of Historic Hydric Soils

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Wetlands are protected by Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers developed a Wetland Delineation Manual to provide technical guidelines and methods for the identification and delineation of wetlands. The manual endorses a three criteria approach for wetland determinations: the presence of a hydrophytic plant community, hydric soil and wetland hydrology. For the majority of fresh water wetlands on the DelMarVa Coastal Plain, wetland hydrology is only evident for a part of the growing season. Therefore, many wetlands have been destroyed because of inaccurate characterizations. Typical indicators of wetland hydrology such as drift lines and blackened leaves require inundation which does not occur in many wetlands. One potential hydrology indicator is the presence of ectomycorrhizae, a symbiosis between fungi and plant roots, in which fungal hyphae surround a root tip forming a visible 'mantle'. Ectomycorrhizae start forming early in the growing season, when the water table is close to or at the soil surface, and remain there for most of the growing season. The vertical distribution of the visible 'mantle' within the soil profile should provide valuable information regarding previous heights of the water table. Anna Palermo, a senior majoring in Environmental Soil Science, worked with a team of scientists, including her advisor, Dr. Bruce Vasilas, Jeff Thompson from the Maryland Department of the Environment and Lenore Vasilas from the Natural Resources Conservation Service, to evaluate the potential of ectomycorrhizae as a hydrology indicator. She received training in plant identification, plant community assessment, soil morphology descriptions and the interpretation of hydrologic conditions based on soil morphology. There were three objectives of the research project. The first objective was to

determine if a correlation could be made between the presence of ectomycorrhizal fungal mantles (ECM mantles) and other wetland indicators, such as water table depths and hydric soil indicators. If so, the next objective was to determine whether or not the presence or absence of these ECM mantles could aid in wetland delineation (by being consistently present or absent along the edge of a wetland). Finally, the third objective was aimed at determining the feasibility of using the ECM mantles as indicators of hydrology to aid in the identification of historic hydric soils. Historic hydric soils occur when artificial drainage changes the hydrology of a site, so that it is no longer an official functioning wetland. Four locations representative of seasonally saturated naturally forested systems were selected. At each location, three sites were delineated to include an upland with non-hydric soil, a wetland with undrained hydric soil and a site with drained hydric soil. Monitoring well data was collected to show water table fluctuation throughout the year. Results to date show that ECM mantles were found less than 5 cm deep at all sites, but only found greater than 5 cm deep at the upland site and the drained site (never greater than 5 cm depth at the wetland site). Although the research is still ongoing, the data collected so far indicates that new hydrology indicators are needed if accurate delineations are to be completed. Since in most cases wetland delineators will not have the time to set up monitoring wells and wait for hydrology data, a reliable method is needed to distinguish wetlands from drained wetlands. More sensitive than plants to hydrology conditions, ectomycorrhizae have the potential to be a living hydrology indicator whose presence or absence within certain ranges could be used to help make a decision about a wetland. At the conclusion of the project, a protocol will be developed so wetland scientists can test this indicator for themselves.