A SURVEY AND EVALUATION OF WETLANDS LOCATED IN THE LITTLE CEDAR MOUNTAIN PROPERTY MARION COUNTY, TENNESSEE

For

Natural Resources Branch
Tennessee Valley Authority

September 5, 1996

Thomas H. Roberts
Associate Professor
Tennessee Technological University
Cookeville, TN 38505

Sixteen jurisdictional wetlands were located during a survey of the Little Cedar Mountain Property in Marion County, Tennessee. All wetlands are considered to be in either the depressional or slope classes and perform a variety of functions. Depressional wetlands typically perform all of the three major groups of functions considered in HGM, including hydrology, biogeochemistry, and habitat. Slope wetlands perform functions in these categories also, but typically do not recharge groundwater or store precipitation and overland flow for a significant period.

Vegetated shallows exist along the shoreline of Nickajack Lake. Although these areas are not jurisdictional wetlands, they are unique and provide several important functions including fish habitat and shoreline stabilization. To protect the functions of the wetlands and vegetated shallows in the Little Cedar Mountain area, buffers of between 75 and 100 m wide are recommended.

Wetlands perform a variety of functions, many of which are valued highly by society. Five identified in Tennessee's Wetland Conservation Strategy (Tennessee State Planning Office 1994) include 1) water quality enhancement, 2) flood impact mitigation, 3) biological productivity, 4) ground water influence, and 5) direct human benefits. Direct human benefits include such activities as recreation, education, and timber production and is more correctly considered a value rather than a function.

The hydrogeomorphic approach (HGM) to classifying wetlands (Brinson 1993) has led to the development of new tools for assessing wetland function (Smith et al. 1995). One of the primary advantages of using HGM to classify wetlands is that wetlands in the same HGM class and subclass probably perform similar functions in a similar manner. This has greatly simplified the development of models for assessing wetland function. The three primary categories of functions considered in HGM incorporate most of the concepts of the State's five categories and will be used in this report. The HGM categories include 1) hydrology, 2) biogeochemistry, 3) habitat for fish and wildlife. Depending on hydrologic regime and geomorphic setting, an individual wetland may perform some or all of these functions to varying degrees. A summary of the HGM classification system, a description of the various classes, and of the functions they perform can be found in Smith et al. (1995). The rationale for the functions attributed to certain wetlands can be found in Adamus et al. (1991), Brinson (1993), and Smith et al. (1995).

WETLAND SURVEY

During the month of June, 1996, Little Cedar Mountain Tracts 1, 3, and 4 adjoining Nickajack Reservoir were searched systematically for the existence of wetlands. National Wetland Inventory (NWI) maps of the area (Sequatchie, TN and South Pittsburg, TN) were used to locate potential wetlands. Transects spaced approximately 100 m apart were run from East to West in Tract 1. The powerline, which runs the entire length of Tract 1 and in a North/South direction, was designated as a baseline. The transect baseline in Tract 3 was Shellmound Road; transects were run from North to South. Tract 4 was completely searched by walking the entire property. Wetland delineation criteria followed the 1987 Wetlands Delineation Manual (U.S. Army Corps of Engineers (USACE) 1987).

RESULTS

TRACT 1

NWI maps indicated the presence of five wetlands in Tract 1, an area 258 ha (638 acres) in size. All five wetlands were located and found to meet jurisdictional status. Nine wetlands which were not on the NWI maps also were located in Tract 1.

Of particular significance in this tract was the presence of two bald eagles (*Haliaeetus leucocephalus*). They were observed flying over the agricultural field on the northern border of the tract. Personnel from the U.S. Fish and Wildlife Service and TVA subsequently confirmed that they were nesting near the area.

TRACT 3

NWI maps indicated the presence of four wetlands in Tract 3, an area 201 ha (701 acres) in size. Two of the wetlands were located and found to meet all wetland criteria; both appeared to be old farm ponds. The other two wetlands were determined not to be jurisdictional areas.

TRACT 4

NWI maps indicated the presence of one wetland in Tract 4, an area only 16 ha (39 acres) in size. Upon examination, the site was found not to meet the criteria for classification as a wetland.

FUNCTIONS OF DEPRESSIONAL AND SLOPE WETLANDS

The wetlands located in the Little Cedar Mountain area (Figures 1-3) are considered to be in either the depressional or slope HGM classes. The shallow fringes identified on the NWI maps as lacustrine fringe wetlands do not meet the technical criteria for being considered wetlands because they lack emergent vegetation. They are instead classified as "vegetated shallows" (USACE 1987). Regardless of this technical distinction, these fringe areas are unique and provide several important functions similar to that of wetlands in the HGM lacustrine fringe class. Following is an overview of the primary functions provided by the two HGM classes of wetlands and the vegetated shallows in the project area.

Depressional Wetlands

Depressional wetlands are located in low positions on the landscape and often are in closed contours, although some have discernable inlets or outlets. The dominant sources of water are precipitation, groundwater discharge, and interflow from adjacent uplands. The hydrodynamic regime normally associated with depressions is that of vertical fluctuation. Depressions sometimes are linear in shape and meander much as low order riverine wetlands do, except the linear depressions lack a defined channel. Several of the wetlands in the study area fit this meandering description.

Depressional wetlands typically perform all of the three major groups of functions considered in HGM. Most serve to retain surface water runoff which helps to reduce flood peaks in adjacent streams or rivers. If water remains on site for a period, the maintenance of physical and biogeochemical processes is facilitated. Some depressional wetlands serve to recharge groundwater whereas other with impermeable layers such as fragipans do not.

Biogeochemical cycling occurs in most depressional wetlands because of the close proximity of oxic and anoxic conditions, typically near the sediment/water interface. Because of the closed or semi-closed nature of these systems, they also retain sediments that enter them. If the wetlands are located near an agricultural field or other source area, they trap and sequester nutrients and toxicants. Toxicants are adsorbed onto reactive silt and clay particles in wetland soils and eventually will become buried, thus removing them from the environment. All of these processes are significant in improving water quality in adjacent water bodies. Organic carbon is produced in all wetlands as dead plant and animal material is broken down by bacteria or fungi. The organic carbon either will remain on site in closed depressions or be exported into streams or rivers in open depressions.

The provision of wildlife habitat is a function that virtually all wetlands, including depressions, perform to varying degrees. All major vertebrate groups utilize depressions with factors such as vertical and horizonal structure, plant species composition, plant density, litter depth, snag and log abundance, and hydrologic regime determining actual usage. Fish habitat is dependent on many of these same factors as well as connectivity to a source stream or river.

Slope Wetlands

Slope wetlands normally are found where there is a discharge of groundwater to the land surface. Other sources of water include precipitation and interflow from surrounding uplands. The hydrodynamic regime is one of downslope unidirectional flow. Some slope wetlands have well developed channels that convey water away from the wetland.

Slope wetlands perform several functions, but typically do not perform two commonly associated with depressions. They lack the capacity to store precipitation or overland flow for a significant period, and because they are created by discharge, serve no function in groundwater recharge. They do perform the biogeochemical and habitat functions in a manner similar to that of depressions.

Vegetated Shallows

Vegetated shallows occur near the fringes of lakes, streams, and other water bodies. The water elevation in the lake maintains the hydrology of the system, although precipitation and groundwater discharge may contribute. Water flow may be bidirectional (lakes) or unidirectional (rivers).

Vegetated shallows are similar in many ways to lacustrine fringe wetlands. Because of their location, they help to stabilize shorelines as sediments are anchored by the rooted vegetation. Energy dissipation may occur, but is not as significant as in fringe wetlands in which emergent vegetation serves to intercept and lessen erosive forces. Biogeochemical cycling and the production and export of organic carbon occur as described previously.

The habitat provided by the vegetated shallows is extremely important to several species of fish and wildlife. Many species of fish use these areas as nursery habitat because of the abundant food and cover they provide. The shallows also provide excellent foraging habitat for several picivorous birds. Wading birds, such as herons, routinely forage in the vegetated shallows along the shoreline to take advantage of the abundant fish populations.

FUNCTIONS OF WETLANDS IN THE PROJECT AREA

The depressional wetlands in the project area provide considerable temporary storage potential for precipitation and runoff. Capacity for storage is related directly to size so some of the wetlands such as 1-1 and 1-8 have substantial capacity, whereas others such as 1-10 and 1-12 have relatively little. The slope wetland has little storage potential and the vegetated shallows do not provide this function.

Most depressional wetlands in the study area probably do not serve as significant groundwater recharge areas. The soils in these wetlands are in either the Melvin or Linside series (Soil Conservation Service 1958), both of which have relatively restrictive horizons within the upper 1.5 meters. These horizons are composed of silty clays or silty clay loams and while they do not restrict water movement completely, they do retard it significantly. Both soils also have high water tables during the wettest portion of the year so the capacity for recharge is limited. Water entering the wetland will be removed through evaporation or transpiration. The slope wetland is a groundwater discharge site; therefore it does not serve as a recharge area.

All of the wetlands and the vegetated shallows present perform biogeochemical functions such as cycling nutrients and elements, and producing organic carbon. Some of the wetlands including 1-2, 1-3, 1-4, and 1-7 are adjacent to croplands and function to improve water quality by collecting runoff containing sediments, nutrients, and toxicants.

All of the wetlands in the project area provide valuable habitat for wildlife. The majority of the depressions are forested and provide habitat for birds and other arboreal species as well as those that utilize aquatic, ground, or shrub level strata. Several mammals are associated with wetlands and they or their sign were observed during field visits. One species, the beaver (*Castor canadensis*), is responsible for creating two of the largest and most diverse wetlands in the project area (Sites 6 and 8). A large number of avian species including permanent residents, winter residents, and long-and short-distance migrants all utilize these wetlands. Some of the most common ones include common yellowthroat (*Geothlypis trichas*), Carolina wren (*Thryothorus ludovicianus*), downy woodpecker (*Picoides pubescens*), northern cardinal (*Cardinalis cardinalis*), and tufted titmouse (*Parus bicolor*). Of special significance is the presence of a great blue heron (*Ardea herodias*) rookery adjacent to the beaver pond. The wetlands in the area doubtless are extremely important to this species which is listed by the Tennessee Heritage Program as threatened (Eager and Hatcher 1980).

One group of vertebrates that has received considerable attention in recent years is the amphibians. For reasons that are poorly understood, amphibian populations have declined worldwide. Part of the reason probably has been the loss of wetland habitats which are essential for their reproduction. Tennessee has lost approximately 60 percent of its wetland acreage (Dahl 1991), thus the remaining wetlands assume even more importance as breeding sites. Several species of amphibians almost certainly occur in the area although only a few actually were detected during field surveys. Most of the depressional wetlands which pond water seasonally should provide significant habitat for several species including the spotted salamander (*Ambystoma maculatum*), mole salamander (*Ambystoma talpoideum*), chorus frog (*Pseudacris triseriata feriarum*), and spring peeper (*Pseudacris crucifer*). A few of the larger wetlands such as 1-6 and 1-8 hold water year round and probably contain fish populations. They provide habitat for species such as bullfrog (*Rana catesbeiana)*, green frog (*Rana clamitans melanota)*, and leopard frog (*Rana utricularia)*. Salamander eggs were observed in two sites, 1-6 and 1-8.

The slope wetland is forested and provides habitat for the same groups of wildlife mentioned above. Because the site is saturated for most if not all the year, it likely provides excellent habitat for salamanders such as the eastern zigzag salamander (*Plethodon* dorsalis dorsalis) and slimy salamander (*Plethodon glutinosus*). Conditions are ideal for the American woodcock (*Scolopax minor*) an avian species associated with moist forests. Larger mammals such as white-tailed deer (*Odocoileus virginianus*) and raccoon (*Procyon lotor*) would be expected to use this area extensively.

The vegetated shallows that occur along the lake fringe provide extremely valuable habitat for both fish and wildlife.

The aquatic vegetation is composed largely of pondweeds (*Potamogeton* spp.) and coontail (*Ceratophyllum* spp.); although not seen during field visits, water-milfoil (*Myriophyllum brasiliense*) likely is present. The dense underwater vegetation produces a rich invertebrate fauna including amphipods, cladocerans, and other forms of zooplankton. In areas in which this vegetated habitat does not occur, the invertebrate fauna would be much less diverse and consist mostly of midges.

Many species of fish routinely use these types of areas because of the abundance of invertebrates and for the cover they provide. Some, especially Centrarchids such as largemouth bass (*Micropterus salmoides*) and several of the sunfish, all valuable sporting species, use the aquatic beds as nursery areas. Adult largemouths frequently forage there as well. Wading birds that forage in these areas include the great blue heron and green-backed heron (*Butorides striatus*). The pair of bald eagles nesting in the area benefit from the presence of the vegetated shallows indirectly because they feed on fish produced there.

Selected vertebrate wildlife species that were not seen during field visits but would be expected to be present are listed in Table 1. In some instances an animal's presence was confirmed through identification of tracks, droppings, or other sign.

Recommendations for Preserving Functions

In the absence of significant hydrologic alterations, these wetlands will continue to provide the functions discussed above for very long periods. Some will eventually fill in as a result of sediment deposition. This is particularly true of the wetlands adjacent to agricultural areas which have highly erodible soils. However, in the absence of accelerated sediment inputs, depressional and slope wetlands are relatively stable except for the natural successional processes that occur in the plant community. Given this stability, the primary means of conserving wetland function simply is to protect the wetlands themselves.

Regulation of wetlands under Section 404 of the Clean Water Act currently prevents their direct filling and destruction, so the wetlands are protected theoretically in perpetuity. What occurs in the vicinity of the wetland however, is not regulated in most instances and certain activities can seriously impair or eliminate some functions. For example, cultivating to the edge of a wetland sometimes results in substantial amounts of sediments being deposited into the wetland, reducing its functional capacity to store rainfall or overland flow. Wildlife may be affected adversely by activities adjacent to the wetland. Some species are sensitive to disturbance (the great blue heron is a good example) and activities directly adjacent to or within the wetland may drastically reduce the habitat value of the site for this species. In both of these examples, the action needed to maintain a high level of function is the establishment of a buffer zone around the wetland.

Buffer zones have been recognized widely as a means of protecting wetland systems (Hunter 1990). Buffer zones may restrict certain land use practices such as farming or tree harvesting or even human access in the case of sensitive nesting areas. Buffer zones along streams or rivers have ranged in width from 8-400 m (Brinson et al. 1981) and typically vary with the sensitivity of the area to disturbance and the erosive potential of the land adjacent to the wetland. Ideally the buffer will be wide enough to satisfy the goal of protecting all wetland functions.

The Tennessee Division of Forestry (1993) published guidelines for the establishment of buffer zones to protect aquatic and wetland habitat in areas subject to timber harvest. The recommendations are based largely on slope with a minimum of nearly 9 m recommended for areas with little to no relief. As slopes become greater, the recommended width of the buffer increases. For example, with a 20 percent slope, the recommended width increases to 20 m. These widths are believed to be sufficient to prevent degradation of aquatic habitats due to increased sediment loading.

In practice, the minimum buffer necessary to protect a stream or wetland from sediment deposition probably is not sufficient to ensure that the habitat value of the site is maintained. Narrow fringes of vegetation around wetlands and streams have been shown to be of less than optimum value to wildlife. For example, fox and gray squirrels (*Sciurus niger* and

S. carolinensis) were not common in buffer zones less than 73 m wide (Dickson and Huntly 1985). Similarly, Stauffer and Best (1980) found that certain avian species did not use narrow riparian strips. Nine of the 40 species they surveyed occurred only in riparian strips wider than 90 m. Studies to measure the use of various width buffers have never been conducted in this area; however, it is reasonable to expect that results would be similar to those found these two studies.

To protect the functions of the wetlands and the vegetated shallows in the Little Cedar Mountain area, buffers of between 75 and 100 m are recommended. This width should be sufficient to protect the areas from degradation from sediments or pollutants while providing sufficient cover for most vertebrate wildlife. A larger buffer might be considered in the area adjacent to the great blue heron rookery, especially during the nesting season.

Table 1. Additional species that were not seen but probably occur in wetlands in the Little Cedar Mountain Property.

Common name	Scientific name
Blue Jay	*Cyanocitta cristata*
Carolina Chickadee	*Parus carolinensis*
Eastern Wild Turkey	*Meleagris gallopavo*
Fox Sparrow	*Passerella iliaca*
Indigo Bunting	*Passerina cyanea*
Prairie Warbler	*Dendroica discolor*
Red-eyed Vireo	*Vireo olivaeus*
Ruby-crowned Kinglet	*Regulus calendula*
Song Sparrow	*Melospiza melodia*
Swamp sparrow	*Melospiza georgiana*
White-breasted Nuthatch	*Sitta carolinensis*
Wood Thrush	*Hylocichla mustelina*
Yellow Warbler	*Dendroica petechia*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-breasted Chat	*Icteria virens*
Yellow-rumped Warbler	*Dendrocia coronata*
Red-spotted Newt	*Notophthalmus viridescens viridescens*
Wood Frog	*Rana sylvatica*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethica*

Figure 1.

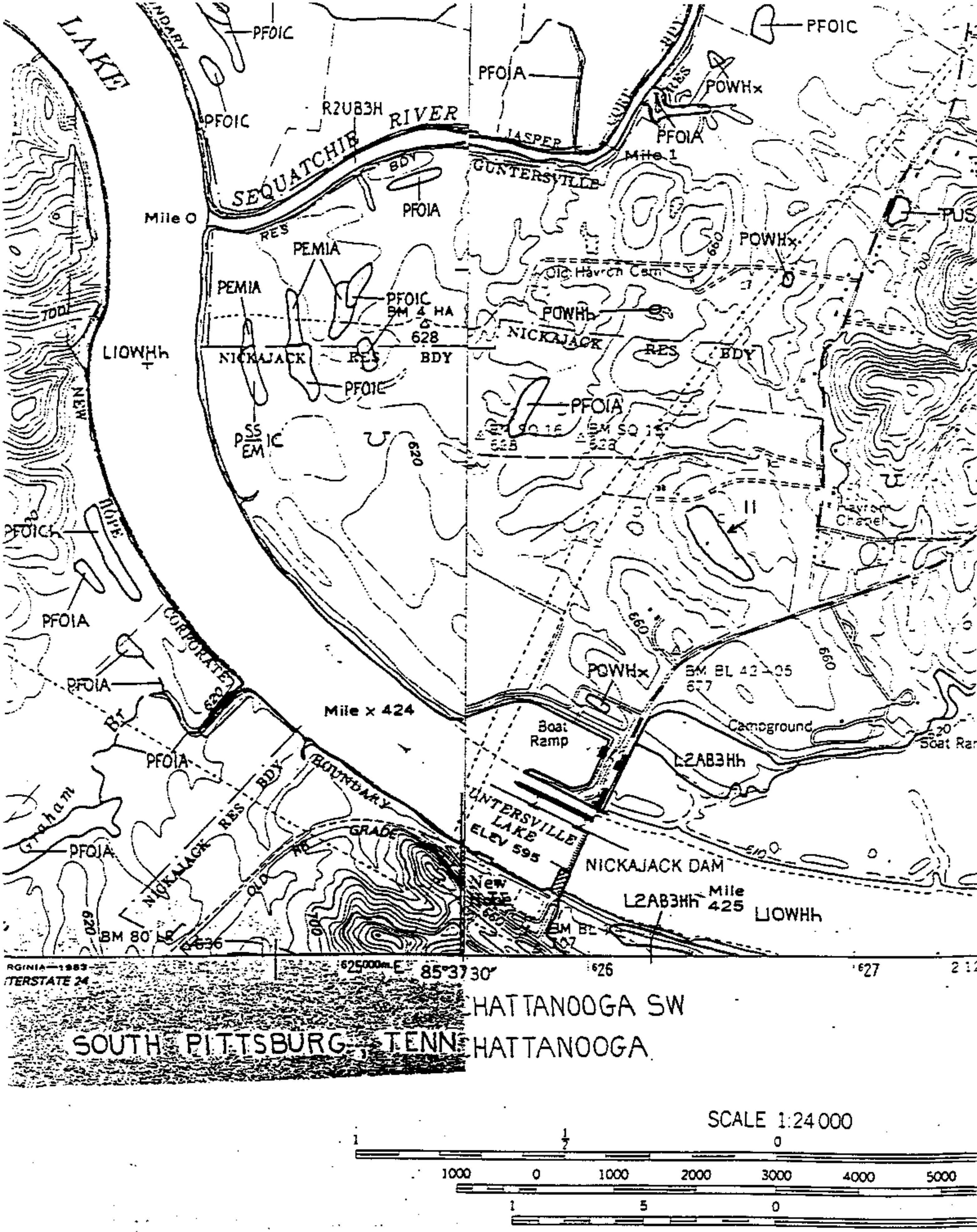
LAKE
PFOIC
R2UB3H
SEQUATCHIE RIVER
PFOIA
Mile 0
RES
BDY
GUNTERSVILLE
JASPER
Mile 1
POWHx
TUSA
PEMIA
Old Havron Cem
BM 4 HA 628
POWHb
NICKAJACK RES BDY
LIOWHh
NEW HOPE
PSS/EM IC
620
660
700
BM SQ 16 628
BM SQ 15 628
11
Havron Chapel
PFOICh
PFOIA
CORPORATE
Mile x 424
BM BL 42-05 677
Campground
Boat Ramp
L2AB3Hh
Graham Br
BOUNDARY
GRADE
OLD RD
GUNTERSVILLE LAKE ELEV 595
NICKAJACK DAM
New
L2AB3Hh Mile 425
LIOWHh
BM 80 LR
636
INTERSTATE 24
625000m.E.
85°37'30"
626
627
CHATTANOOGA SW
SOUTH PITTSBURG, TENN.
CHATTANOOGA
SCALE 1:24 000
1
½
0
1000
0
1000
2000
3000
4000
5000
1
5
0

Figure 2.

Figure 3.

Literature Cited

Adamus, R. P. 1991. Wetland evaluation technique (WET). Volume 1, Technical Report WRP-DE-01, U.S. Army Waterways Experiment Station, Vicksburg, MS.

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. USACE. Tech. Rep. WRP-DE-4. 79 pp.

Brinson, M.M., B.L. Swift, R. C. Plantico, and J.C. Barclay. 1981. Riparian ecosystems: their ecology and status. Eastern Energy and Land Use Team, U.S. Fish and Wildlife Service. FWS/OBS-81/17, Kearnysville, WV. 155 pp.

Dickson, J.G., and J.C. Huntley. 1985. Streamside management zones and wildlife in the southern coastal plain. Pages 263-264 *in* Johnson et al. Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service. Gen. Tech Rep. RM-120. 523 pp.

Eagar, D.C., and R.M. Hatcher. 1980. Tennessee's rare wildlife volume 1: the vertebrates. Tennessee Wildl. Res. Agen. and Tennesseee Conser. Dept. 366 pp.

Hunter, M.L. 1990. Wildlife forests, and forestry. Prentice Hall. Englewood Cliffs, NJ. 370 pp.

Mitsch, W.J., and J.G. Gosselink. 1993. Wetlands. Van Nostrand Reinhold. New York, NY. 721 pp.

Stauffer, D.F., and L. D. Best. 1980. Habitat selection by birds in riparian communities evaluating effects of habitat alteration. J. Wildl. Manage. 44:1-15.

Tennessee Department of Agriculture Division of Forestry. 1993. Guide to forestry best management practices. 41 pp.

United States Army Corps of Engineers. Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Tech. Rep. Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS. 100 pp.

United States Army Corps of Engineers. P.R. Adams, L.T. Stockwell, E.J. Clairain, Jr., M.E. Morrow, L.P. Rozas, and R.D. Smith. 1991. Wetland evaluation technique (WET); Volume I: Literature review and evaluation rationale. Tech. Rep. WPR-DE-2. US Army Engineer Waterways Experiment Station, Vicksburg, MS. 287 pp.

United States Department of Agriculture. 1958. Soil Survey, Marion County Tennessee. USDA Soil Conserv. Service 89 pp + maps.