Wetland Inventory of the Yazoo Backwater Area, Mississippi

Wetland Status and Potential Changes Based on an Updated Inventory Using Remotely Sensed Imagery

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Executive Summary

An updated wetlands inventory of the Yazoo Backwater Area was conducted using high resolution 2006 aerial photography as the principle source of base information. Wetlands were mapped using an ecological classification system as described by Cowardin *et al*. (1979). Mapping produced geospatial data that provided the extent, location and type of wetlands in the study area and could be further analyzed based on various hydrologic alteration scenarios. The Delta National Forest was not re-mapped as part of this effort as digital wetlands data existed for this area derived from mid 1980s 1:58,000 scale, color infrared photography. Preliminary wetland delineations were field inspected in the spring, 2008.

The results updated mapping indicated that as 2006 there were 8,014 wetlands in the Yazoo Backwater Area totaling 278,035 acres (112,565 ha). Wetland forest and shrubs made up 94 percent of the total wetland area. Emergent wetlands made up 4 percent and open water ponds made up about 2 percent of the wetland area in this study. Five percent of the land in the study area was classified as deepwater lakes. These include reservoirs, impoundments, open water oxbow lakes and catfish ponds. Riverine wetlands made up less than one percent of the land area.

Of the remaining forested wetlands 77 percent were classified as temporarily flooded, 17 percent seasonally flooded and 6 percent semi permanently flooded. Thirty nine percent of the remaining forested wetland acreage (78,068 acres or 31,606 ha) has been partially drained, impounded or excavated. Fifty eight percent of the shrub wetlands (5,109 acres or 2,068 ha) have been partially drained, impounded or excavated.

Comparison of the circa 1970s wetland map information with the 2006 re-mapping effort indicated that wetland area declined by over 15,000 acres (6,000 ha) or 6.5 percent of the total wetland area. Forested wetlands exhibited the largest declines of any wetland type.

Introduction

The mission of the U. S. Fish and Wildlife Service (Service) is to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Service supports programs relating to migratory birds, endangered species, certain marine mammals, inland sport fisheries and wildlife refuges. The Service communicates information essential for public awareness and understanding of the importance of fish and wildlife resources and changes reflecting environmental conditions that ultimately will affect the welfare of people. To this end, the Service maintains an active role in the inventory, monitoring, and assessment of wetland habitats of the Nation and established the National Wetlands Inventory (NWI) to provide resource managers with information on the location, extent, and types of wetlands and deepwater habitats.

Service personnel regularly coordinate with the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency to consult on water-related projects that meet the critical needs of local communities and conserve fish and wildlife resources. The Service's authorities to engage in planning and coordination are provided by the Fish and Wildlife Coordination Act, National Environmental Policy Act, and the Endangered Species Act. An important planning tool provided by the Service, are geospatial wetland maps that show the extent, distribution and type of wetland habitats. The Service is in the process of modernizing its geospatial wetland data holdings and making this information available to resource managers and other users.

Original wetland mapping was conducted by the Service's NWI in 1978 with an update of the Delta National Forest conducted in the mid 1980s. No area-wide summary data or reports were produced as part of those efforts. Since the time of the original wetland inventory efforts, there have been numerous wetland changes in this part of the Mississippi Delta region (Shepard *et al*. 1998; Dahl 2000; Mississippi Museum of Natural Science 2005). In cooperation with the Service's Atlanta Regional Office, an updated wetland inventory was undertaken to provide more contemporary information for the Yazoo Backwater Area. This effort used 2006 aerial imagery as the primary source to determine wetland type and extent. The results of the inventory and limited analysis of the information are reported here.

Description of the Yazoo River Basin and Ecosystem

The Yazoo River Basin is located within the Mississippi River Alluvial Plain (Figure 1). The region is characterized by flat topography with mostly clay soils except along streams where they consist of sandy loams (Timme 1989). Bottomland hardwood forest is the dominant ecosystem, which is maintained by flood events and localized ponding on poorly drained soils (Showalter and Spigener 2008). Backwater flooding occurs when

high water stages on the Mississippi River create a damming effect and prevents tributary drainage into the main channel and at times reverses tributary flow to upstream lands.

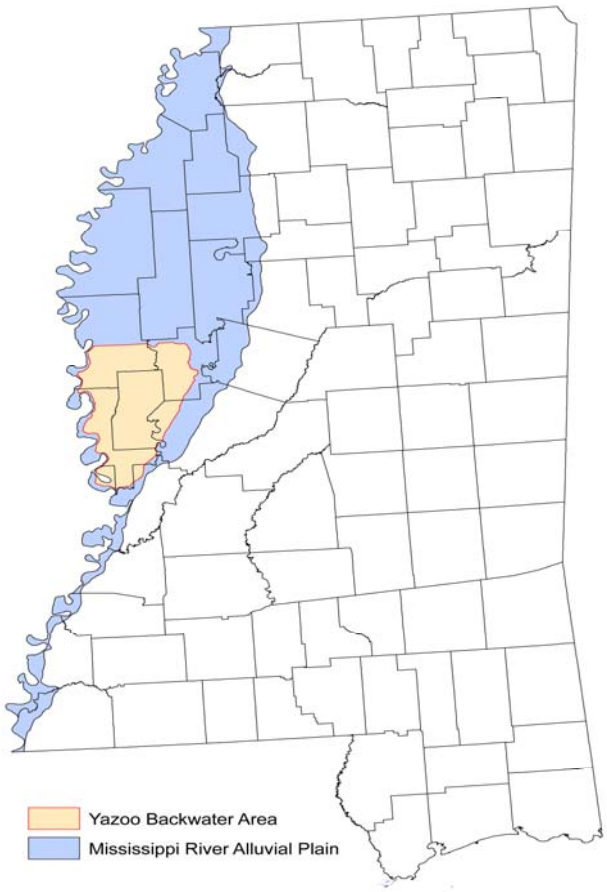


Figure 1. The Yazoo Backwater Area shown as part of the Mississippi River Alluvial Plain in MS. The largest lobe of the Mississippi Alluvial Plain extends from the Tennessee border to Vicksburg, Mississippi.

The flooding events of the Mississippi River and its tributaries have greatly influenced the landscape producing a surface geomorphology comprised of natural depressions, meander scar (oxbow) lakes, and ridge and swale topography (Figure 2). Wetlands within this region range from permanently flooded areas supporting emergent or floating aquatic vegetation to climax hardwood forests at slightly higher elevations. Bottomland terraces are irregularly flooded for durations of several days to a month or more. On these sites, the water table remains elevated during the winter and spring seasons and soils remain moist through much of the growing season (Mississippi Museum of Natural Science 2005). Slight topographic changes can result in differences in soil saturation characteristics that are reflected in the species of wetland plants that grow there. As a result, there is a range of wetland habitat types that exist within the southern alluvial plain ecosystem (Kellison *et al*. 1998; Taylor *et al*. 1990; Teskey and Hinkley 1977). Examples include, deep bald cypress/tupelo forested swamps that develop on more permanently flooded or inundated sites and; the cherrybark oak/pecan community found on the drier sites subjected to temporary flooding.

Several studies have documented the decline of bottomland hardwood forests in Mississippi (Harris and Gosselink 1990; Heitmeyer *et al*. 1989; Turner *et al*. 1981). These wetlands are primarily threatened by agricultural conversion. Additional losses have been caused by construction and operation of flood control structures and reservoirs, surface mining, and urban development. The moderately wet forest types are increasingly fragmented due to improved road access and increased agriculture usage (Mississippi Museum of Natural Science 2005).

Figure 2. The Yazoo National Wildlife Refuge shown on aerial photograph. The refuge's primary feature is a 4,000 acre oxbow lake (Swan Lake), formed when the Mississippi River abandoned a segment of riverbed. (This image has been reformatted and is not to scale.)

History of the Yazoo Backwater Area

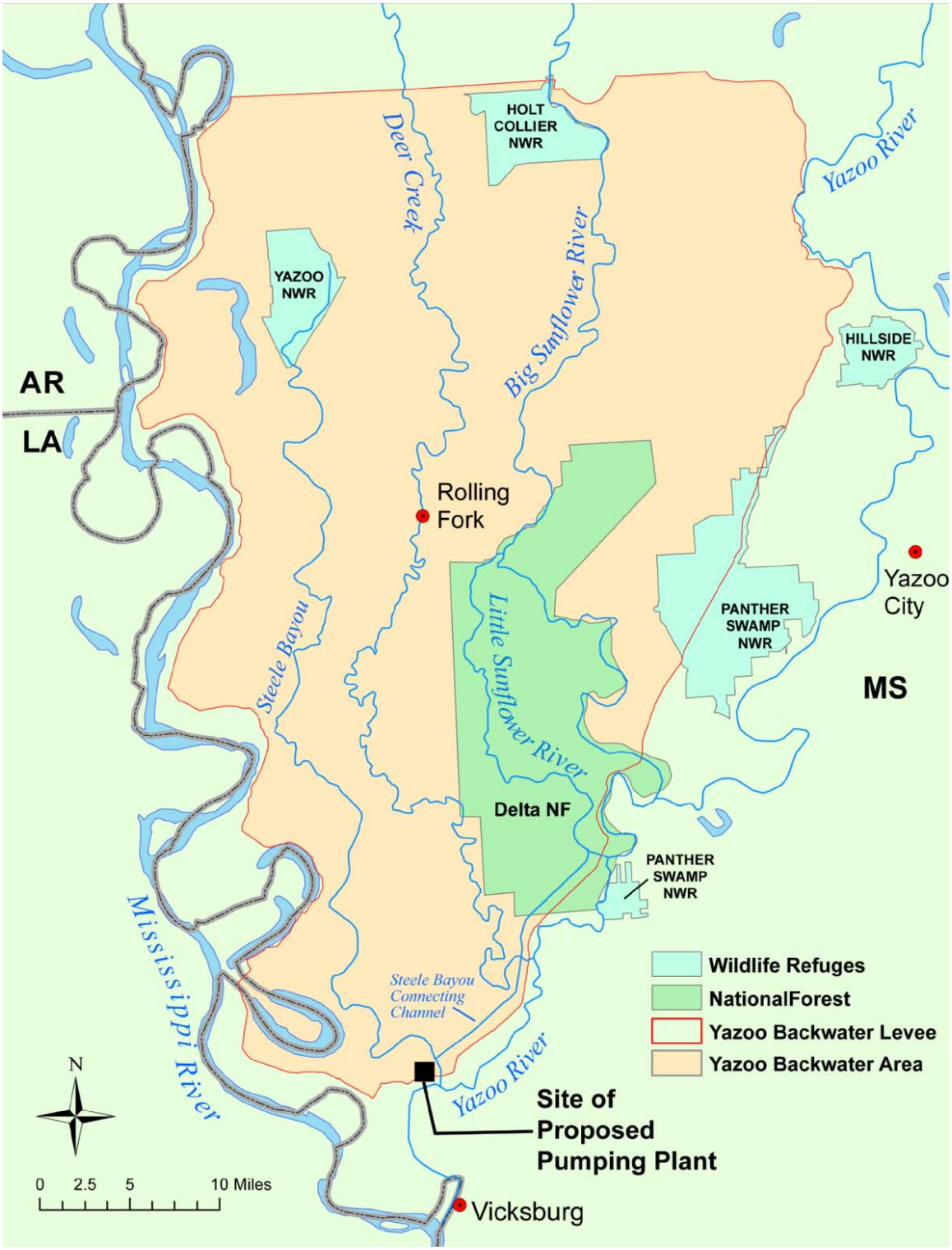
The Yazoo Backwater Area Project is a Corps Civil Works proposal designed to address flooding concerns affecting approximately 630,000 acres of land between the Mississippi and Yazoo Rivers (USEPA 2008). The Corps Civil Works projects are authorized by legislation generically referred to as Omnibus Legislation. Projects authorized through Omnibus Legislation include those under regulatory purview of various Flood Control Acts, Rivers and Harbor Acts and, since 1974, Water Resources Development Acts. This legislation provides the Corps with the authority to study water resource problems, construct projects, and make major modifications to projects.

The Yazoo Backwater Area Project was authorized by the Flood Control Act of 1941 (P.L. 77-228, August 18, 1941). The primary component of this project is a 14,000 cubic feet per second pumping station that will pump rainwater out of the Delta during high

water events on the Mississippi River. The pumps would be situated in the Mississippi-Yazoo Delta, a lowland swath that extends from Memphis, TN to Vicksburg, MS. Part of the original plan included building levees, pump stations, floodways, and associated channels (USACE 2008). The Mississippi Delta is now surrounded by levees and the completion of the Yazoo pumping station remains as the last phase to complete the project as designed by the Corps. In 2008, the Environmental Protection Agency (EPA) exerted it's authority under the Clean Water Act [33 U.S.C. §1251 et seq. (1972)] to prohibit construction of the proposed Yazoo Pumps Project in the Mississippi Delta (http://www.epa.gov/newsroom/). The agency concluded that the proposed project would result in unacceptable damage to valuable resources that are used for wildlife, economic, and recreational purposes.

Historically as waters on the Mississippi River rose, water would impede the natural gravity flow on the Yazoo River and force the river to 'back up' onto the lowlands and wetlands. Flood waters accumulated in these areas and some portions of the lower Yazoo Basin would remain above flood stage for several months. The backwaters of the Yazoo River Basin functioned as a natural floodwater storage area for this water from the Mississippi and Yazoo rivers. Over time, this area has become isolated from those rivers by a complex levee system (USFWS 2001). Construction previously completed as part of the Yazoo Backwater Project attempted to reduce backwater flooding in the Yazoo River Basin through a combination of levees, drainage structures and pumping plants. By 1978, a number of these construction projects, including flood control gates on Steele Bayou and the Little Sunflower River, the Yazoo Backwater Levee, and the Sunflower River to Steele Bayou Connecting Channel had been completed (Figure 3).

Figure 3. The Yazoo Backwater Area boundary as used in this study, location of rivers, landmarks and major Federal land ownership units.



Results of the Updated Wetland Inventory of the Yazoo Backwater Area

Original wetland mapping was conducted by the Service's NWI in 1978 and used both color infrared aerial photography (1:120,000 scale) and black and white photography (1:80,000 scale) that had been acquired in 1974. Field data collected in 1978 indicated that the minimum mapping units were limited to 3 to 5 acres (1.2 to 2.0 ha) on the 1:120,000 scale and 1 to 3 acres (0.4 to 1.2 ha) on the 1:80,000 scale black photography. The Service re-mapped the Delta National Forest portion of the region in the mid 1980s using 1:58,000 scale, color infrared photography acquired in 1983 and 1984. The Delta National Forest was the only portion of the Yazoo Backwater Area where the maps were captured in a digital format, so no wetland summary data indicating total wetland acreage or type was produced for the current study area by the NWI prior to this update. It became clear that an updated wetland inventory was needed to provide more contemporary status information in an automated geospatial format to facilitate summary and analysis of wetland habitats in the Yazoo Backwater Area.

In providing updated wetland habitat information, the Service used the Federal Geographic Data Committee Standard, Classification of Wetlands and Deepwater Habitats (Cowardin *et al.* 1979) which is the approved Federal Standard for mapping, monitoring and reporting wetlands data. This provided a standardized system of nomenclature and terms for habitat mapping. The Cowardin *et al.* system defined wetlands in a biological framework and has been adapted for mapping purposes (USFWS 2008). It is a two-part definition:

> *Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.*
>
> *For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.*

Wetlands and deepwater habitats are defined separately by Cowardin *et al.* (1979) because the term wetland does not include deep, permanent water bodies. Deepwater habitats are permanently flooded land lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium in which the dominant organisms live, whether or not they were attached to the substrate.

Mapped features are classified to the following levels: ecological system, subsystem (where applicable), class, subclass and water regime. Other special modifying terms or identifiers were added to satisfy more regional needs. In the Yazoo Backwater Area such terms included the following:

- *Partially drained or ditched*, where the water level has been changed either through drainage into or out of a basin;
- *Diked or impounded*, where a barrier or dam obstructs the inflow or outflow of water and;
- *Excavated*, where a basin or channel has been physically altered by excavating the substrate.

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 was no attempt, in either the design or products of this study, 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.

Aerial imagery from the National Agricultural Imagery Program (NAIP) acquired in August, 2006 was analyzed to identify, delineate and classify wetland habitats. These images were a combination of color infrared and natural color digital orthophoto quarter quadrangles. Other data sources used as collateral included the U.S. Geological Survey Digital Raster Graphics (topographic maps) and Natural Resource Conservation Service's digital soils data.

The Yazoo Backwater Area covered portions of 39 U.S. Geological Survey quadrangles primarily located in Sharkey, Yazoo, Washington, Issaquena, and Humphrey counties (Appendix A). Field verification of the preliminary wetland delineations was conducted in the spring, 2008.

Wetland Status - 2006

Table 1 shows the number and area of wetland and deepwater habitats found in the Yazoo Backwater Area. The total area inventoried in this study was 925,398 acres (374,655 ha). In 2006, there were 8,014 wetland and deepwater features identified in the Yazoo Backwater Area. The total area for both wetland and deepwater was 278,035 acres (112,565 ha). The remaining 647,363 upland acres (262,090 ha) in the study area were dominated by agriculture. Corn, cotton, and soybeans were the primary row crops (USACE 2008). Several small communities were also located in the study area. Rolling Fork, the county seat of Sharkey County was perhaps the largest with an estimated population of 2,343 (http://www.epodunk.com/cgi-bin/genInfo.php?locIndex=19994).

The smallest wetland inventoried was less than 0.1 acre (0.04 ha). The largest contiguous wetland was a block of forested wetland 19,247 acres (7,792 ha) located in Delta National Forest.

Forested and shrub wetlands combined made up the largest remaining acreage. Wet forest and shrubs made up 94 percent of the total wetland area in the Yazoo Backwater Area and occupy 22 percent of the land surface. Ninety six percent of the total area of forested/shrub wetland are considered dominated by wetland trees (201,938 acres or 81,756 ha).

By comparison, emergent wetlands are fairly scarce, making up about 4 percent of the remaining wetland area. Open water ponds make up about 2 percent of the wetland by area. No palustrine farmed wetlands were identified in the updated inventory.

Table 1. Number and area of wetland and deepwater habitats found in the Yazoo Backwater Area based on analysis of 2006 aerial imagery.

Habitat Type	Number of Features	Area (in acres)	Percent of Total Wetland Area	Percent of Total Project Area
Forest/shrub Wetland	4,827	210,718	94.3	22.8
Emergent Wetland	1,713	8,559	3.8	0.9
Ponds	999	4,194	1.9	0.4
All Wetlands	7,539	223,471	100	24.1
Lakes	301	46,347	---	5.0
Rivers	174	8,216	---	0.9
All Deepwater	475	54,563	---	5.9
All Wetland and Deepwater	8,014	278,035	---	30.0

Table 2 provides a summary of the most common wetland communities for characterization purposes. The use of the Cowardin *et al*. (1979) classification system provides levels of descriptive detail that may often subdivide common community associations yielding many unique wetland map codes. In this study, 144 different wetland attribute descriptors were used to identify the wetlands and deepwater habitats in the Yazoo Backwater Area (Appendix B).

Table 2. Wetland habitat descriptions, characteristic plant species and classification designation(s) as found in this study.

Habitat-Community Type and Synonyms	Description	Characteristic Plant Species	References	Designation in This Study
Forested Wetland Bald Cypress/Gum Swamps; Cypress Ponds	Cypress swamps often occur along abandoned riverine channels and in areas surrounding oxbow lakes. They can also occupy depressions, old oxbows themselves, bottomland flats, springheads and backwater areas of creeks. These swamp forests are usually seasonally to semipermanently flooded and remain inundated or saturated for long periods throughout the year.	Dominant species include: bald cypress (*Taxodium distichum*), blackgum (*Nyssa sylvatica*), water tupelo (*Nyssa aquatica*), occasional associates include silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), box elder (*Acer negundo*), sweetgum (*Liquidambar styraciflua*), willow (*Salix sp*), persimmon (*Diospyros virginiana*), green ash (*Fraxinus pennsylvanica*), ironwood (*Eusideroxylon sp*.) and water oak (*Quercus nigra*). Understory shrubs may include buttonbush (*Cephalanthus sp*.), eastern swampprivet (*Forestiera acuminate*) and Virginia sweetspire (*Itea virginica*).	Mississippi Museum of Natural Science. 2005; Gardiner and Oliver 2005 Field observations - this study	Palustrine (freshwater) forested Needle leaved, deciduous possibly mixed with broad leaved deciduous species Semipermanently flooded Attribute codes: PFO2G PFO2F PFO2/1F
Mixed Hardwood Swamp; Bottomland Hardwood Forests	Moderately wet bottomland hardwood forests are found on fertile, fine textured clay or loam soils of floodplains, stream terraces and wet	Sugarberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), sweetgum	Mississippi Museum of Natural Science. 2005; Gardiner and	Palustrine (freshwater) forested Broad leaved deciduous species

	lowland flats. The Sharkey Soil Series is the most prevalent soil type supporting this community. bottomland hardwood forests are found on landforms such as floodplain backwater depressions, swales, low terraces and wet flats that are exposed to flooding of greater frequency and duration. In addition to a supporting a highly diverse composition of overstory species, bottomland hardwood forests are characteristically rich in woody vines and shrubs, as well as species such as switchcane (*Arundinaria gigantean* and palmetto (*Sabal minor).*	(*Liquidambar styraciflua*), willow (*Salix sp*.), water oak (*Quercus nigra*), overcup, oak (*Quercus lyrata*), Nuttall oak (Quercus nuttallii), American elm (*Ulmus americana*), and pecan (*Carya illinoinensis*) are representative species of moderately wet sites. Other subcanopy species may include possumhaw (*Ilex deciduas*), stiff dogwood (*Cornus foemina*), dwarf palmetto (*Sabal minor*) and giant cane (*Arundinaria gigantean*).	Oliver 2005; Twedt *et al*. 1999 Kellison *et al*. 1998	Semipermanently flooded, seasonally flooded or temporarily flooded Attribute codes: PFO1F PFO1C PFO1A
Floodplain Swamp; Riverfront Forests	Dams, channelization, manmade levees and other modifications have restricted the extent of riverfront forests.	Black willow (*Salix sp*.), Eastern cottonwood (*Populus deltoids*), American sycamore (*Platanus occidentalis*), River birch (*Betula nigra*), Boxelder (*Acer negundo*), Sugarberry (*Celtis laevigata*), Silver maple (*Acer saccharinum*), Sycamore (*Platanus Occidentalis*), Tulip Tree (*Liriodendron tulipifera*), Water Elm (*Planera aquatica*)	Mississippi Museum of Natural Science. 2005; Tanner 1986 Field observations, circa 1978	Palustrine (freshwater) forested Broad leaved deciduous species Seasonally or temporarily flooded Attribute codes: PFO1C PFO1A
Forested wetland - partially drained	Normal hydrology has been modified by drainage and/or ditching. This wetland community exhibits drier conditions and it is reflected in the plant community.	Southern red oak *Quercus falcate,* green ash (*Fraxinus pennsylvanica*), sweetgum (*Liquidambar styraciflua*), overcup oak (*Quercus lyrata*), eastern poison ivy (*Toxicodendron radicans*), honeysuckle	Rudis 1995; Field observations - this study	Palustrine (freshwater) forested Broad leaved deciduous, temporarily flooded, partially drained Attribute codes: PFO1Ad

		(*Lonicera sp*), eastern cottonwood (*Populus deltoids*), elm (*Ulmus sp*.)		
Shrub Wetlands Young or Scrub Cypress		Bald cypress (*Taxodium distichum*)	Field observations - this study	Palustrine (freshwater) shrub Attribute codes: PSS2G PSS2F
Shrub Swamp		Buttonbush (*Cephalanthus occidentalis*), Eastern swampprivet (*Forestiera acuminate*), Virginia sweetspire (*Itea virginica*), Willow (*Salix sp.*), Dogwood (*Cornus drummondii*), Elderberry (*Sambucus canadensis*), Grape (*Vitus spp*.), Hawthorn (*Crataeus spp.*),	Connor and Buford 1998; Field observations - this study; Field observations, circa1978	Palustrine (freshwater) shrub Broad leaved deciduous, seasonally flooded or semipermanently flooded Attribute codes: PSS1F PSS1C
Freshwater Marshes		Rushes (*Juncus spp.*), *Ranunculus sp.* Bladderworts (*Utricularia spp*.), Alligatorweed (*Alternanthera philoxeroides*), Arrowhead (*Sagittaria spp*.), Builrush (*Scirpus spp.*), Cattail (*Tpha spp*.), Lizard's Tail (*Saururuscernuus spp.*), Maidencane (*Panicum hematomon*), Millet (*Echinochloa spp.*), Pickerelweed (*Pontedaria corda*), Rice cut grass (*Leersia oryzoides*), Sedges (*Cyperaceae spp.*), Smartweeds (*Polyganum spp*.) Blue Hyssop (*Bacopa caroliniana*), Buttonweed (*Diodia*	Mississippi Museum of Natural Science. 2005; Field observations, circa 1978	Palustrine (freshwater) Persistent emergent Semi permanently or seasonally flooded Attribute codes: PEM1F PEM1C

		virginiana), Cockleburs (*Xanthium spp*.), Creeping Love Grass (*Eragrostis hypnoides*), Dock (*Rumex spp*.), Horned Rush (*Rynchospora spp*.), Millet (*Echinochloa spp*.), Panic Grass (*Panicum spp*.)		Temporarily flooded Attribute codes: PEM1A
Sandbars	Sandbars are dynamic features that are formed along rivers and creeks by deposition of sediments during high water. They are important habitats for several birds and reptiles. Some bars can become sparsely vegetated by native plants and annuals or invasive weeds.	Non-vegetated	Mississippi Museum of Natural Science. 2005;	Palustrine or Riverine (freshwater) unconsolidated shore Non vegetated Temporarily flooded or seasonally flooded Attribute codes: PUSC PUSA R4SBC R2USC
Freshwater Pond	Many manmade ponds in the study area have been created for water retention or aquaculture - principally catfish farms. These open water ponds may be maintained or periodically treated to be free of vegetation. Other areas such as borrow pits or excavations have filled with water over time and may be fairly deep or lack nutrients to support aquatic vegetation . Other ponds support submerged, floating or emergent wetland vegetation. These wetlands are characteristically small (less than 20 acres or 8 ha) and hold shallow water during most years.	Non-vegetated	Mississippi Museum of Natural Science. 2005;	Palustrine (freshwater) unconsolidated bottom Attribute codes: PUBH PUBG PUBF
Lakes	Lotic or standing water habitats generally greater than 20 acres (8.1 ha) or water greater than 6.6 feet	Non-vegetated	Field observations - this study	Deepwater - Lacustrine unconsolidated bottom

	(2 m) deep including reservoirs, impoundments, oxbow lakes, and other more permanent large water bodies.			Attribute codes: L1UBH
Lacustrine oxbows	Oxbow lakes can develop naturally over extended time periods as rivers or streams abandon their old channels and leave meander scars. Natural formation involves gradual loss of connectivity with the stream as sediment fills the ends of old channels. Manmade alterations such as channelization may also convert old stream channels into oxbow lakes. These are some of the wettest habitats as oxbow lakes support a variety of fish, amphibians, reptiles, mammals, and wading and shorebirds. Frequency, duration and timing of floods are important considerations in the maintenance of these deepwater habitats.	Non-vegetated	Mississippi Museum of Natural Science. 2005	Deepwater - Lacustrine unconsolidated bottom Permanently flooded Attribute codes: L1UBH L1UBG
Rivers and streams	Lentic or flowing water habitats including the open water portion of river channels, streams or creeks.	Non-vegetated	Mississippi Museum of Natural Science. 2005	Deepwater - Riverine Attribute codes: R2UBH

Five percent of the land in the study area was classified as deepwater lakes. These included reservoirs, impoundments, open water oxbow lakes, catfish ponds or other aquaculture ponds in series. Many of these deepwater habitat features exhibited man-modified traits. The nature of these modifications often greatly influenced the character of such habitats and to the extent possible, these modifications have been included in the wetland attribute codes (e.g. indicators of excavation or impounded) . The study area contained large complexes of aquaculture, primarily catfish farms which were classified as excavated and artificially controlled lake features (Figure 4). Throughout Mississippi there have been an abundance of small impoundments built as borrow pits, flood control structures, recreational fishing ponds, farm ponds or catfish ponds. Catfish ponds often rely on wells for maintaining water levels. Farm and residential area ponds are usually created by positioning dams across small drainages or in depressions where runoff accumulates (Mississippi Museum of Natural Science 2005).

Figure 4. A color infrared aerial photograph of artificially created and maintained ponds used for catfish farming (blue rectangles) in northwestern MS, 1997.

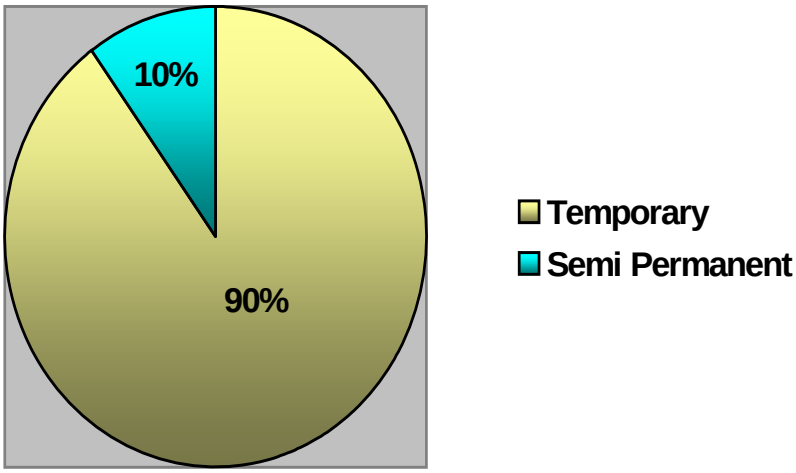
Riverine features included all wetlands and deepwater habitats within a channel, either naturally or artificially created which periodically or continuously contained moving water or connected two bodies of standing water. Major named rivers in or adjacent to the Yazoo basin are the Mississippi, Sunflower, Yazoo, Bogue and the Phalia. Wetlands classified as riverine made up less than 1.0 percent of the surface area of the Yazoo Backwater area. Most the riverine wetlands identified delineated sandbars or shorelines along river channels.

Habitat Changes circa 1970s to 2006

Field data from the initial NWI reconnaissance in July 1978 indicated flooded conditions prevented the proper application of more than three water regimes categories - permanently flooded (or intermittently exposed), semi permanently flooded and temporarily flooded areas. The permanently flooded description of inundation was applied to more permanent open water bodies. Semi permanently flooded described the deep cypress swamps, swales, treed oxbows, bayous and shrub swamps where standing water would be expected to persist throughout most of the growing season. Temporarily flooded was used as a modifying term to characterize emergent meadows, drier hardwood sites and riverine flats. Mapping conducted during the 1970s also indicated the presence of temporarily flooded wet pine woods dominated by loblolly

pine (*Pinus taeda*). There were no temporary or seasonally flooded shrub wetlands described except in cases of clear-cut bottomland forest and no seasonally flooded wetland forest (Figure 5).

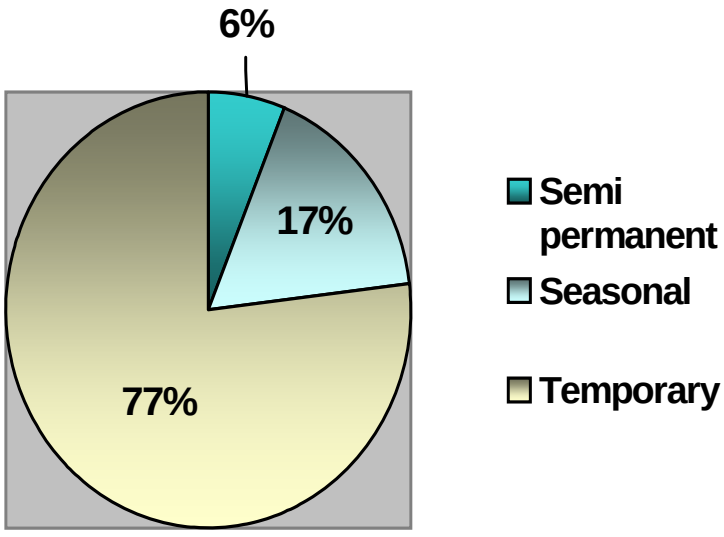
Figure 5. Frequency of flooding of forested wetlands as indicated by Cowardin *et al.* (1979) water regimes in the original wetland mapping of the Yazoo Backwater area, circa 1970s.



The updated inventory data provide a considerably different image of wetland character in the Yazoo Backwater area. The most recent inventory found that as of 2006, 77 percent of the remaining forested wetlands were classified as temporarily flooded, 17 percent seasonally flooded and 6 percent semi permanently flooded (Figure 6). Additionally, no wet pine woods were found in the updated wetland inventory.

Thirty nine percent of the remaining forested wetland acreage (78,068 acres or 31,606 ha) has been partially drained, impounded or excavated. Fifty eight percent of the shrub wetlands (5,109 acres or 2,068 ha) have been partially drained, impounded or excavated.

Figure 6. Frequency of flooding of forested wetlands as indicated by Cowardin *et al.* (1979) water regimes in the Yazoo Backwater area, 2006.



Comparison of the original wetland map information to the updated information (2006) indicates a substantial loss of forested/shrub wetland area. These wetland types, declined by over 26,000 acres (10,600 ha) or 11 percent between the 1970s and 2006. Overall, wetland area declined by 6.5 percent during the same time period. Changes between the 1970s and 2006 are shown in Table 3.

Table 3. Area of select wetland habitats found in the Yazoo Backwater Area based on analysis of mapping circa 1970s and 2006.

Habitat Type	Area (in acres) 1970s	Area (in acres) 2006	Change (in acres)	Percent Change
Forest/shrub Wetland	236,982	210,718	-26,264	-11 %
Emergent Wetland	1,668	8,559	+6,931	+19.5 %
Ponds	2,950	4,194	+1,244	+4.0 %
All Wetlands	238,925	223,471	-15,454	-6.5 %

Many bottomland hardwood tree species tend to segregate in associations that reflect specific moisture characteristics on the floodplain. This stratification results from species physiology interacting with the hydrologic conditions (Tanner 1986) and as a consequence, the abundance and distribution of any community type can be traced to the periodic flooding and drying processes of the river. This supports the notion that reduction of floodwater availability will have an affect on wetland communities as water regimes are altered reducing flood water frequency and duration in the Yazoo Basin.

Conversely, impoundment of water will ensure more permanent surface water features on the landscape. The number and type of impounded water features in the Yazoo Basin has increased over time (Figure 6). These areas provide a distinctly different suite of functions as most are being used as commercial fish ponds.

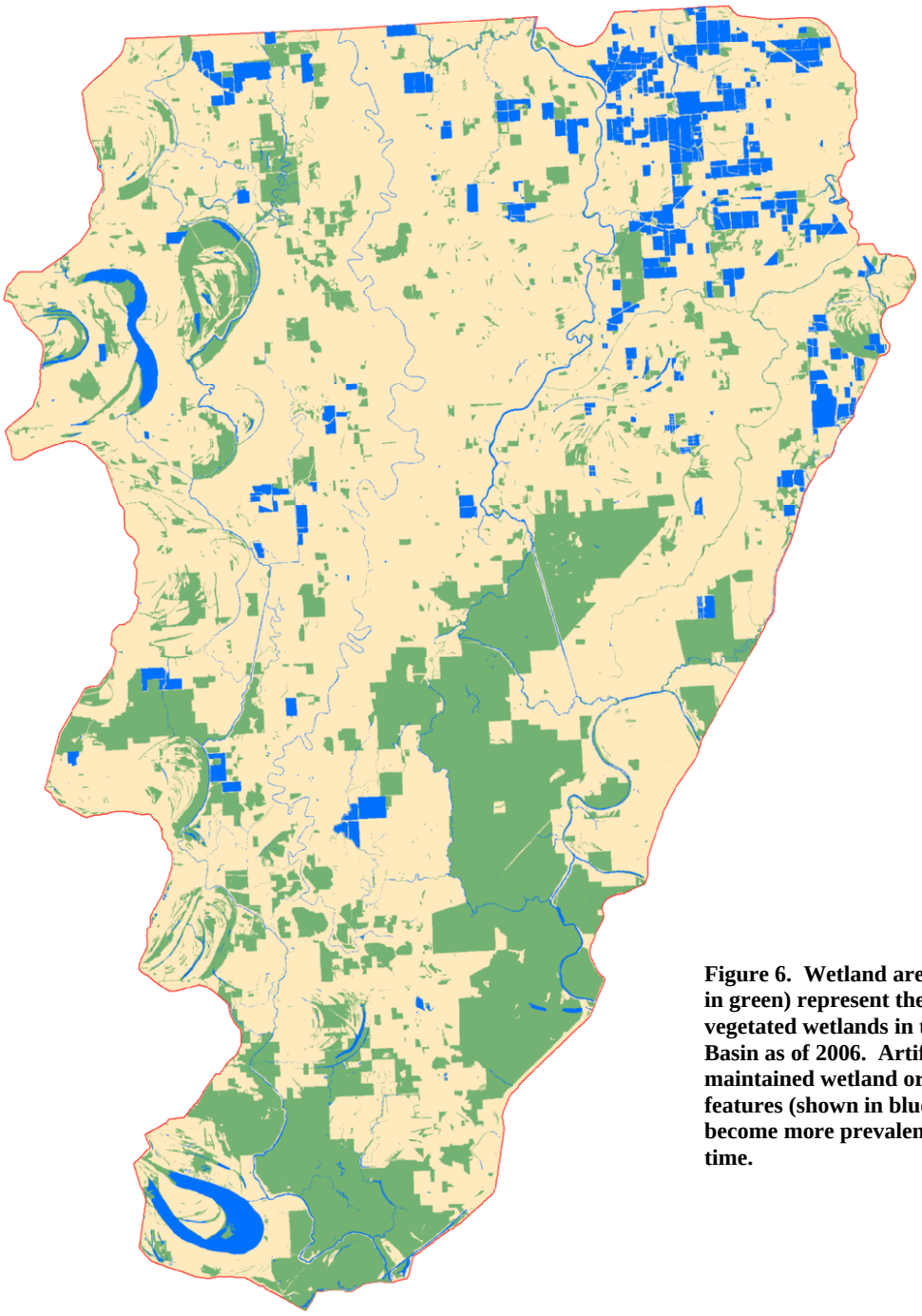


Figure 6. Wetland area (shown in green) represent the remaining vegetated wetlands in the Yazoo Basin as of 2006. Artificially maintained wetland or water features (shown in blue) have become more prevalent over time.

Summary

An updated wetland inventory of the Yazoo Backwater Area has produced a geospatial data set that provides information on wetland types, extent and location. This information can be used as a constructive tool in making resource decisions. As with any new set of data, there may be adjustments to be made based on the old paradigms or dated information.

Comparison of the circa 1970s wetland map information with the 2006 re-mapping effort indicated that forest wetland area had declined by 11 percent. Although emergent wetland and open water pond area increased over the same time period, overall wetland area declined by over 15,000 acres (6,000 ha) or 6.5 percent. Many of the existing wetlands of the Yazoo Backwater Area have been modified by controlling the hydrology through the use of levees, impoundments, pumping or ditching. Other wetlands have probably been altered by the cumulative affects of landscape level changes over a long period of time. There were slightly over 223,000 acres (90,300 ha) of wetland and another 54,000 acres (22,000 ha) of deepwater habitat remaining in 2006. Ninety four percent of the wetland area was forested habitat.

Given the importance and the extent of the wetland resources involved, consideration should be given to updating the wetland inventory data to include the Delta National Forest unit and further developing geospatial data sets for all federal land units within this area. Geospatial wetland map data combined with other biological information are important decision support tools as part of the Strategic Habitat Conservation approach. The Service's habitat conservation actions will increasing rely on geospatial habitat and trend information to help guide, prioritize, and assess species recovery, wildlife resource management, wetland threats and habitat restoration project actions.

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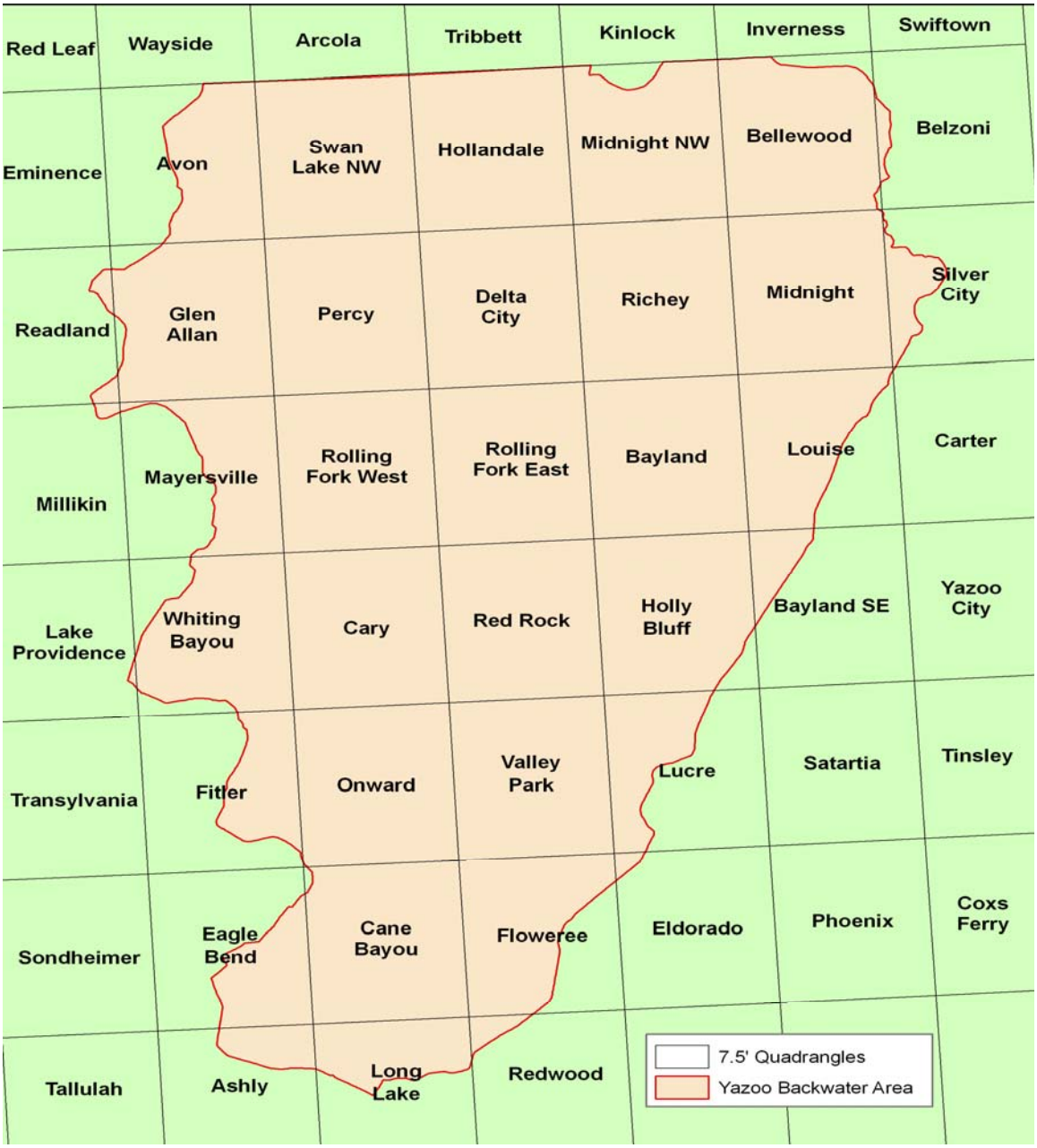
Appendix A. The Yazoo Backwater study area described by this study (outlined in red) included portions of 39 U.S. Geological Survey quadrangles in Mississippi.



Appendix B. All attribute codes, number of occurrences and acreage sum by attribute type for wetlands and deepwater habitats identified in Yazoo Backwater Project, 2006.

Habitat Type	Map Attribute	Number	Acres
Forested Wetland Class	PFO1/2C	19	687.9
	PFO1/2Cd	14	56.6
	PFO1/2Ch	2	188.1
	PFO1/2F	44	1639.5
	PFO1/2Fd	21	173.6
	PFO1/2Fh	5	845.0
	PFO1/2G	1	26.4
	PFO1/3Ad	1	7.7
	PFO1/5Fh	1	0.9
	PFO1/AB4F	1	1.3
	PFO1/AB4Fh	2	3.0
	PFO1/EM1Ad	4	19.6
	PFO1/SS1A	1	38.1
	PFO1/SS1Fd	1	48.0
	PFO1A	451	94186.8
	PFO1Ad	1088	56614.3
	PFO1Ah	28	2856.2
	PFO1Ax	6	7.0
	PFO1C	630	20552.4
	PFO1Cd	660	10023.4
	PFO1Ch	47	2689.5
	PFO1Cx	30	79.5
	PFO1F	216	3880.8
	PFO1Fd	131	963.7
	PFO1Fh	23	148.4
	PFO1Fx	5	16.0
	PFO1G	2	4.9
	PFO1Gd	1	9.4
	PFO2/1C	2	319.5
	PFO2/1Ch	1	424.6
	PFO2/1F	8	299.6
	PFO2/1Fd	2	27.9
	PFO2/1Fh	4	480.9
	PFO2/SS1F	1	19.8
	PFO2/UBFx	1	21.2
	PFO2/UBG	5	23.1
	PFO2C	2	19.4
	PFO2Cd	1	0.6
	PFO2F	40	506.0
	PFO2Fd	10	145.7
	PFO2Fh	1	0.8
	PFO2Fx	2	2.8
	PFO2G	21	952.2
	PFO2Gh	4	1783.9
	PFO2Gx	1	14.5
	PFO5/UBF	1	19.4
	PFO5Fd	1	9.9
	PFO6F	1	4.6

	PFOAd	1	32.4
Habitat Type	**Map Attribute**	**Number**	**Acres**
Shrub Wetland Class	PSS1/2Cd	8	28.0
	PSS1/2F	7	185.3
	PSS1/2Fd	6	170.5
	PSS1/2G	2	56.7
	PSS1/AB4G	2	9.7
	PSS1/EM1A	1	10.1
	PSS1/EM1Ad	4	4.7
	PSS1/EM1Cd	4	33.1
	PSS1/EM1Fd	1	6.0
	PSS1/FO2F	1	63.9
	PSS1/FO2G	1	58.2
	PSS1/USC	8	24.1
	PSS1A	135	2156.0
	PSS1Ad	257	2335.3
	PSS1Ah	14	244.8
	PSS1Ax	4	16.7
	PSS1C	141	1178.7
	PSS1CD	1	14.4
	PSS1Cd	308	1276.5
	PSS1Ch	31	93.0
	PSS1Cx	45	100.5
	PSS1F	90	788.3
	PSS1Fd	102	644.6
	PSS1Fh	25	55.9
	PSS1Fx	57	54.7
	PSS1G	6	179.3
	PSS1Gx	3	0.6
	PSS2/1F	1	6.6
	PSS2Cd	1	0.6
	PSS2F	4	18.1
	PSS2Fd	4	2.3
	PSS2Fh	4	5.1
	PSS2G	1	0.6
	PSS2Gd	2	16.9
	PSS2Gh	1	1.5
Habitat Type	**Map Attribute**	**Number**	**Acres**
Freshwater Marsh Class	PEM1/FO1Ad	2	28.4
	PEM1/FO1Cd	2	30.0
	PEM1/FO2Gh	1	37.1
	PEM1/FO5Fd	2	34.7
	PEM1/FO5Fh	2	35.3
	PEM1/SS1A	3	125.3
	PEM1/SS1Ad	1	23.1
	PEM1/SS1Cd	1	55.5
	PEM1/SS1F	1	103.0
	PEM1A	39	319.5
	PEM1Ad	763	3735.6
	PEM1Ah	21	67.7
	PEM1Ax	10	8.4
	PEM1C	83	244.2

	PEM1Cd	455	1661.1
	PEM1Ch	74	199.1
	PEM1Cx	40	87.0
	PEM1F	34	226.9
	PEM1Fd	115	539.4
	PEM1Fh	37	132.4
	PEM1Fx	16	27.8
	PEM1Gd	5	19.8
	PEM1Gh	1	1.1
	PEM1Gx	1	0.9
	PEM1Kx	3	783.0
	PEMKh	1	32.7
Habitat Type	**Map Attribute**	**Number**	**Acres**
Sandbars	R2USA	52	24.1
	R2USC	33	52.4
	R4SBC	10	59.7
	R4SBCx	21	83.8
	PUSA	10	28.0
	PUSAd	15	28.4
	PUSAh	9	82.1
	PUSAx	4	14.2
	PUSC	41	77.1
	PUSCd	25	79.7
	PUSCh	9	15.4
	PUSCx	25	15.3
Habitat Type	**Map Attribute**	**Number**	**Acres**
Freshwater Pond Class	PAB3Gd	2	3.8
	PAB4F	1	1.0
	PAB4Fd	2	6.6
	PAB4G	1	2.4
	PAB4Gd	7	3.3
	PAB4Gx	1	2.6
	PAB4H	1	0.3
	PAB4Hx	1	0.4
	PUB/ABF	2	21.8
	PUB/FO1Gh	1	5.7
	PUB/FO2G	1	21.3
	PUB/FO2Gh	2	5.1
	PUB/FO2Kx	1	32.1
	PUB/SS1F	1	13.7
	PUB/SS1G	2	7.0
	PUB/SS1Gh	2	6.1
	PUB/SS2F	1	2.7
	PUB/SS2G	1	5.0
	PUBF	34	88.4
	PUBFd	45	77.3
	PUBFh	30	91.9
	PUBFx	69	177.2
	PUBG	28	110.1
	PUBGd	58	172.7
	PUBGh	27	83.1
	PUBGx	42	55.9

	PUBH	105	555.9
	PUBHd	4	11.9
	PUBHh	71	418.3
	PUBHx	211	1038.0
	PUBKx	107	832.4
Habitat Type	**Map Attribute**	**Number**	**Acres**
Freshwater Lakes	L1UBFx	1	70.4
	L1UBG	2	57.3
	L1UBGh	5	354.5
	L1UBH	12	8094.5
	L1UBHd	1	101.7
	L1UBHh	17	1213.6
	L1UBHx	5	244.3
	L1UBKx	240	35873.9
	L2UBF	2	93.6
	L2UBFh	8	191.3
	L2UBFx	5	19.6
	L2USC	1	0.6
	L2USCd	1	27.4
	L2USCx	1	4.5
Habitat Type	**Map Attribute**	**Number**	**Acres**
Rivers and Streams	R2AB4Hx	1	2.0
	R2UBH	29	7237.5
	R2UBHx	28	756.7

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