Compensatory Mitigation Plan

For the

Angelina and Neches River Authority's

Lake Columbia Regional Water Supply Reservoir Project

DRAFT

Prepared by

Freese and Nichols, Inc.

September 4, 2009

U.S. Army Corps of Engineers Project Number 198700524

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1.0 Introduction

The purpose of this mitigation plan (the "Plan") is to identify and describe in detail the mitigation measures proposed by the Angelina and Neches River Authority (ANRA) to compensate for the impacts to aquatic resources related to the Lake Columbia project. This Plan was prepared in accordance with the guidelines established by the U.S. Army Corps of Engineers (USACE) and published in the following documents:

- Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 Code of Federal Regulations, Parts 325 and 332, as published in the Federal Register, Vol. 73, No. 70, April 10, 2008)
- Mitigation Guidelines, Regulatory Program, Fort Worth District U.S. Army Corps of Engineers, Draft – December 24, 2003

2.0 Mitigation Goals and Objectives

The goal of ANRA's proposed mitigation is to replace and/or restore aquatic functions and services in waters of the U.S. that are expected to be lost due to the development of Lake Columbia. This mitigation goal includes no net loss of wetland functions and services within the Neches River watershed. Detailed descriptions of the impacts of the proposed project to waters of the U.S. were described in the *Lake Columbia Regional Water Supply Reservoir Project Draft Environmental Impact Statement*, prepared by the USACE and published in November 2009.

ANRA proposes to mitigate the adverse effects of the Lake Columbia project on aquatic resources by identifying and implementing mitigation measures on-site, near-site, and finally off-site in the vicinity of the Big Thicket National Preserve (BTNP), a federally-protected resource recognized internationally for its unique ecological importance. In the event that additional mitigation credit is needed to offset the identified impacts to aquatic resources after implementing mitigation measures on-site, near-site, and off-site near BTNP, ANRA will also seek other off-site lands within the Neches River watershed as well as the purchase of mitigation bank credits if necessary to offset the losses of aquatic habitat. ANRA's proposed on-site, near-site, and off-site approach to achieve the no-net-loss goal affords flexibility among these mitigation locations to allow for land availability at the time the mitigation plan is implemented. However, it is ANRA's intent to mitigate as much of the impacts as practicable either at or near the reservoir site. In this context, "practicable" is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.3(q)). In addition, ANRA's primary goal is to acquire mitigation properties (fee simple or easement) by willing buyer/willing seller agreements. If necessary to fulfill its compensatory mitigation requirements, ANRA will exercise its power

of eminent domain to acquire mitigation land in the absence of readily identifiable willing sellers.

2.1 Impact Site

Lake Columbia will have a surface area of 10,121 acres and is situated in the Pineywoods vegetation area in East Texas. The area is typified by pine and mixed pine/hardwood forest and is dissected with bottomland hardwood forest associated with rivers, streams, swamps, and reservoirs. There are areas of pasture land and some areas of crop cultivation. Early timber harvesting principally involved cutting large trees. Subsequently, clear cutting practices have dominated timber harvesting and have resulted in replanting of pine stands producing even-aged monotypic communities which are generally referred to as pine plantations. Timberlands which have been converted to pasture use are dominated by coastal Bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*). Mud Creek, the stream on which the dam will be located, is a tributary of the Angelina River which is a tributary of the Neches River. Mud Creek, at the dam site, is a broad fluvial flood plain with a stream bed elevation of 265 ft. NGVD. The topography is generally rolling to hilly with broad, flat floodplains.

A total of 5,746.5 acres of waters of the U. S., including wetlands were delineated in the Permit Area (Table 2.1). The Permit Area includes the footprint of the conservation pool of the reservoir below elevation 315 NGVD and the limits of construction in the vicinity of the dam. The location and boundaries of waters of the U.S. at the site were delineated by Freese and Nichols, Inc. (FNI) as described in the Joint Public Notice of 404 permit application issued by the USACE and the Texas Commission on environmental Quality on September 4, 2003.

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Table 2.1 Waters of The US Within the Permit Area

Water of the U. S. Classification	Area (acres)
Forested Wetlands	3,689
Shrub-scrub Wetlands	144
Herbaceous Wetlands	1,518
Intermittent Streams (204,864 linear feet)	47
Perennial Streams (370,128 linear feet)	255
Open Water	63
Hillside Bog	0.5
New Channel (14,256 linear feet)	30
TOTAL	5,746.5

2.2 Mitigation Site

As noted in Table 2.1, the aquatic resources impacted by Lake Columbia consist of wetlands, streams, and open water. The ANRA proposes to mitigate the impacts of the proposed Lake Columbia on waters of the U.S. by implementing mitigation activities at the following locations, in priority order:

1. On-site, at the reservoir site
2. Near-site: Land immediately surrounding the reservoir or connected immediately downstream, including the following:
   a. Land between elevation 315 and 318 feet NGVD which will be purchased in fee simple and
   b. Land up-gradient/upstream from the reservoir within its watershed
   c. Land within the 100-year floodplain downstream from the dam and above the mouth of Mud Creek
3. Off-site: Land that is not on-site or near-site, including the following:
   a. Land adjacent to the BTNP that meets the following criteria:
      i. Is in imminent danger of disturbance or has high potential for residential, commercial, industrial, or other intensive use that would be detrimental to BTNP property.
      ii. Is undeveloped and exhibits high quality habitat or aquatic ecosystem functions based on a Habitat Evaluation Procedure (HEP) or Hydrogeomorphic (HGM) assessment.

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b. Other land suitable for wetland restoration, enhancement or preservation that is within the Mud Creek or Neches River watersheds.

c. Mitigation bank credit purchase.

ANRA has received a financial commitment from the Texas Water Development Board (TWDB) which will provide funding for the purchase of land. However, funds for land acquisition will not be released until the 404 permit is issued. ANRA will commence efforts to acquire land for mitigation in the prioritized areas upon receipt of the 404 permit.

3.0 Baseline Information

3.1 Impact Site Location

The proposed reservoir would be located on Mud Creek, a tributary to the Angelina River and would extend into Smith and Cherokee Counties (Figure 1). The proposed dam site would be located approximately three miles downstream (south) of U.S. Highway 79 in Cherokee County, approximately at Universal Transverse Mercator **(**UTM**)** coordinates 297304.242 East and 3535573.434 North (Zone 15) on the Troup West, Tecula, Griffin, Jacksonville East, and new Summerfield 7.5-minute USGS quadrangle map in the USGS Hydrologic Unit 12020004.

The location and distribution of waters of the U.S. within the Lake Columbia footprint are shown in Figures 2a through 2g. The total area of affected waters of the U.S. is 5,746.5 acres (Table 2.1).

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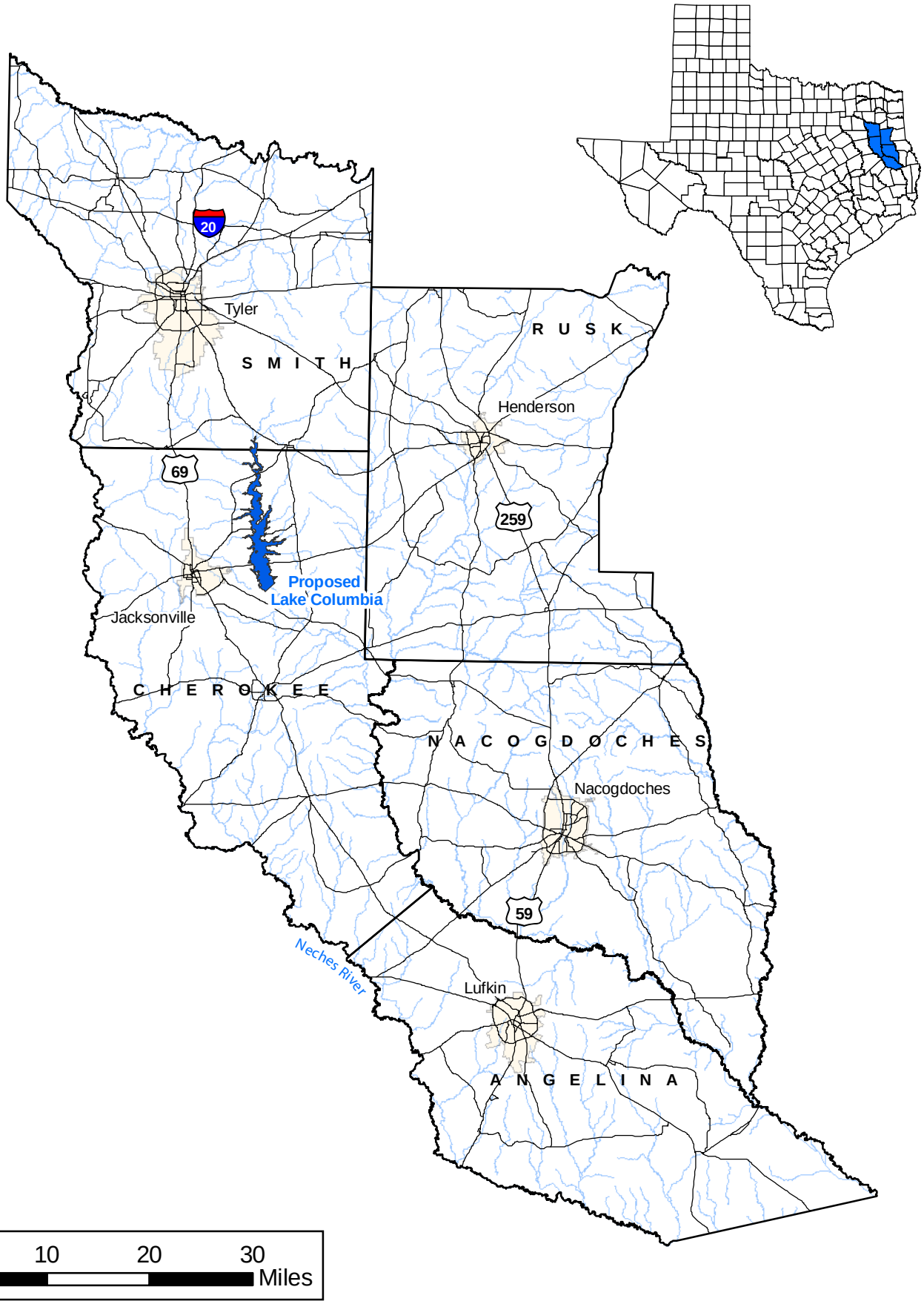

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Location Map

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1
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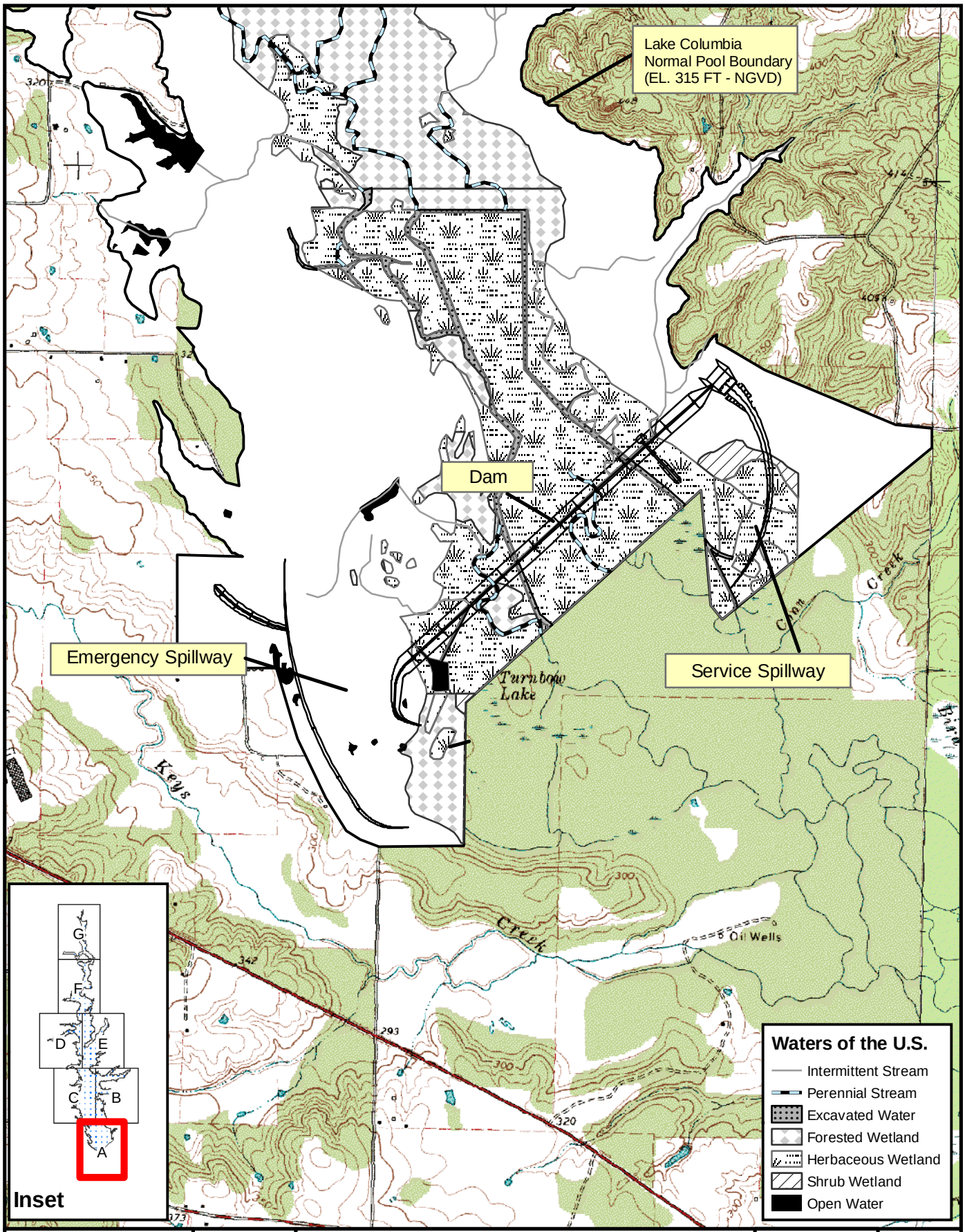

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Waters of the U.S. Within the Normal Pool

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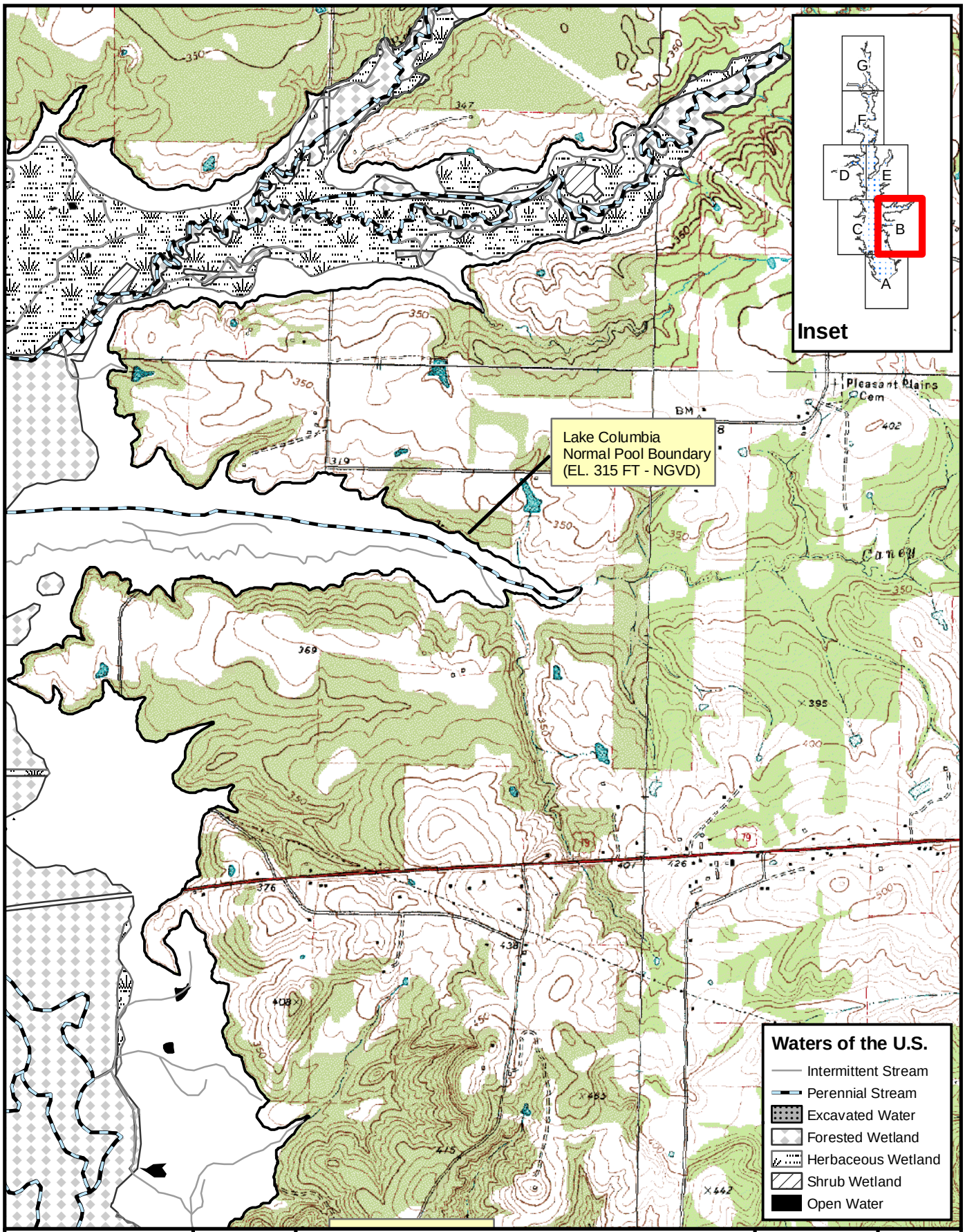
2A
FIGURE



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2B

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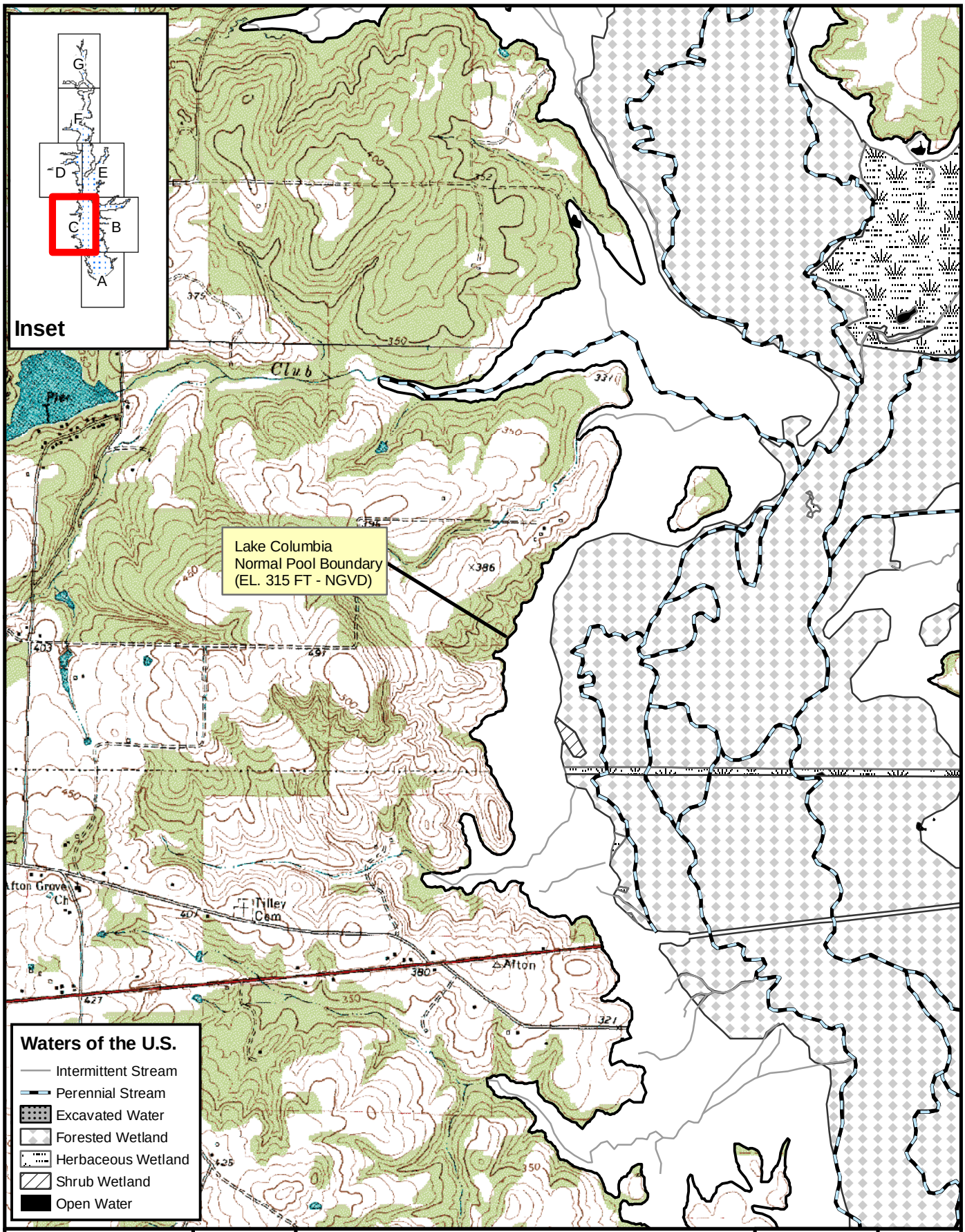

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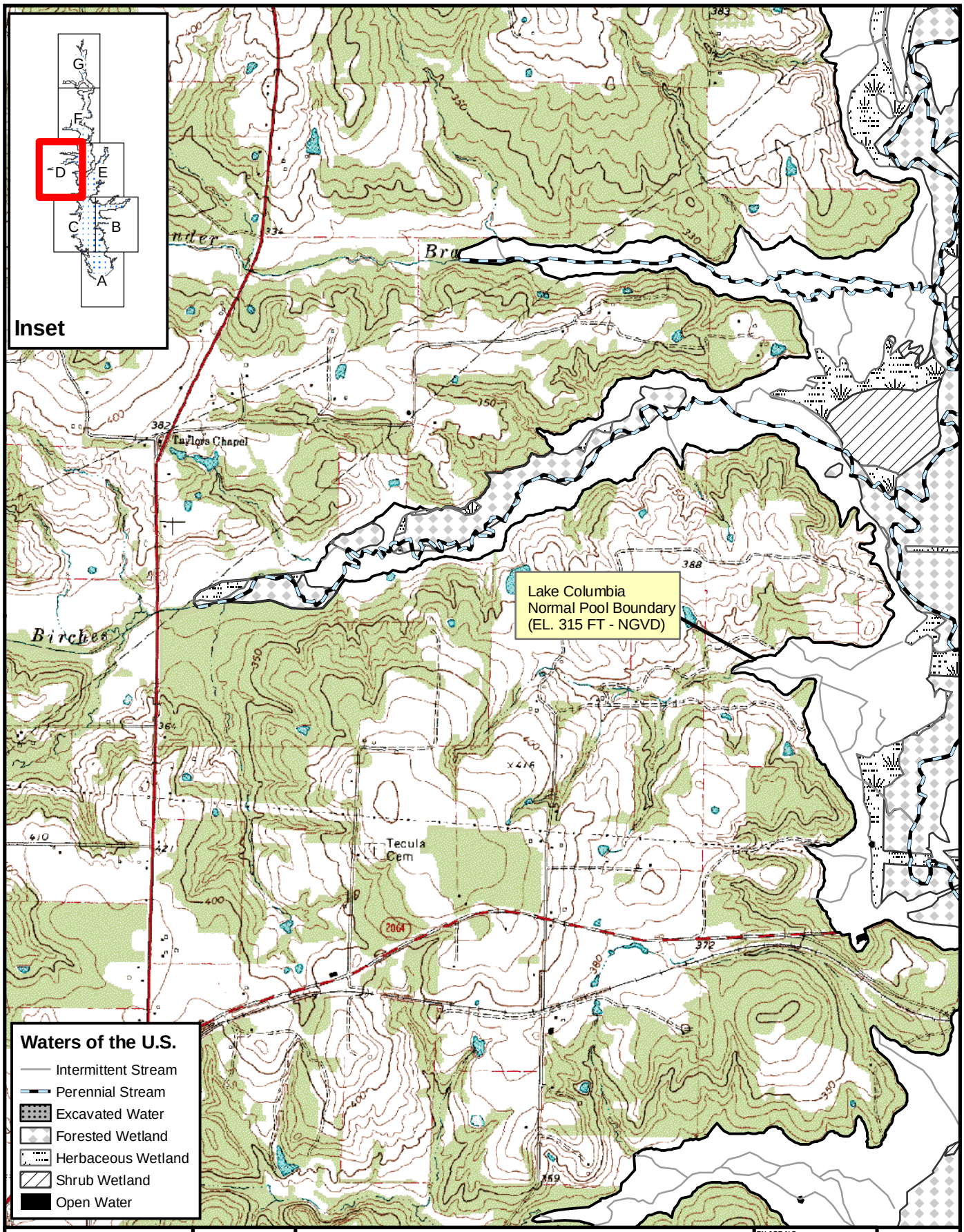
2C

FIGURE



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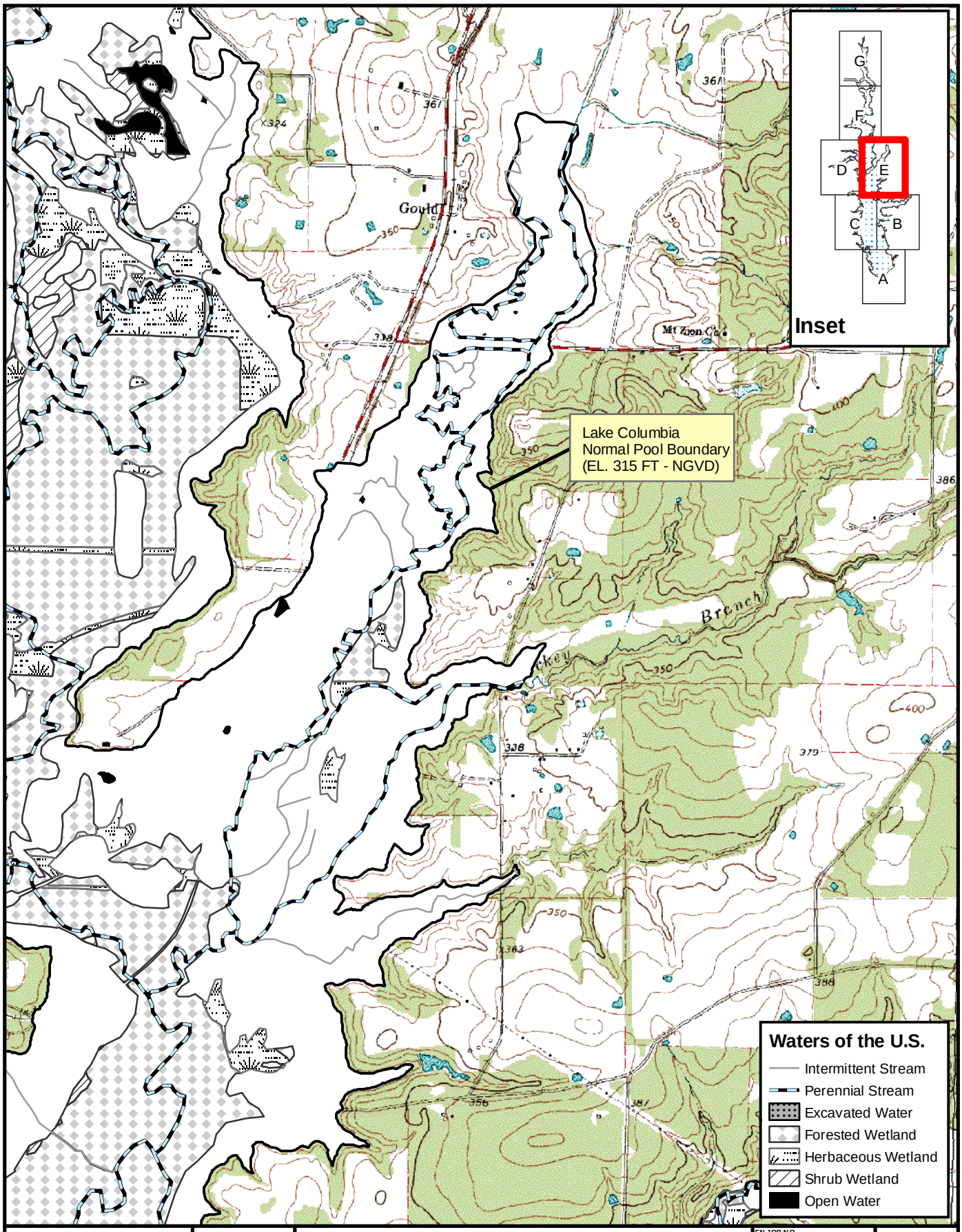

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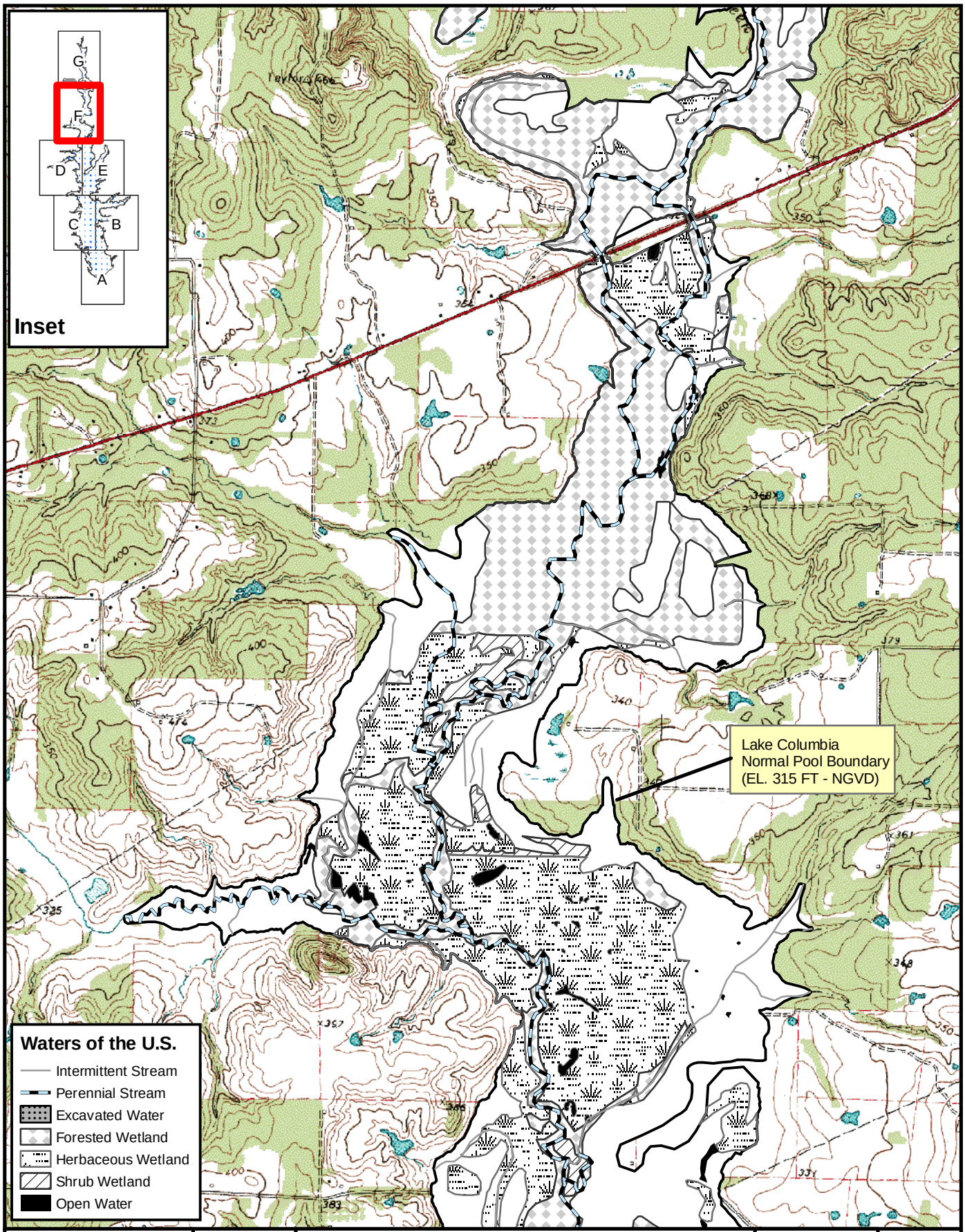

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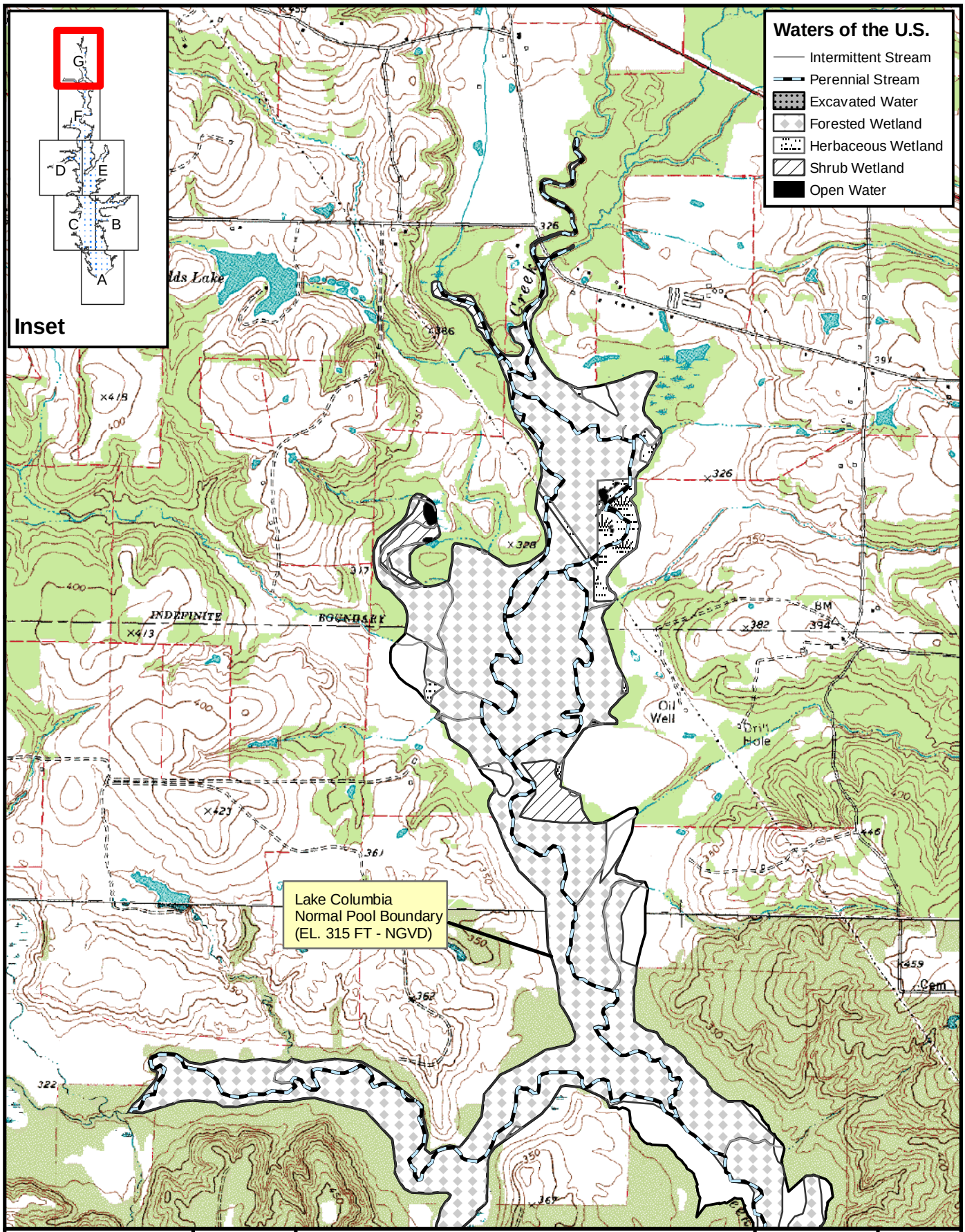

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2G
FIGURE

3.2 Assessment Methods

Wetland functions within the footprint of Lake Columbia were assessed using a modified, rapid HGM approach known as *HGM Interim*. The methodology has been employed commonly by the Fort Worth District USACE in recent years, especially to evaluate the functional uplift potential of mitigation bank sites. For the Lake Columbia site, two models were selected by the USACE: *Riverine Herbaceous/Shrub HGM Interim* and *Riverine Forested HGM Interim*. Each of these models is used to evaluate the capacity of either riverine herbaceous/shrub-scrub or riverine forested wetlands to perform three wetland functions, as follows:

- Temporary storage and detention of surface water
- Maintain Plant and animal community
- Removal and sequestration of elements and compounds

The model yields a dimensionless functional capacity index (FCI) value ranging between 0 and 1.0 for each function, with 1.0 indicating perfect functional capacity and 0 indicating no capacity or value for that wetland function. The FCI is used to calculate functional capacity units (FCU) by multiplying the FCI value by the number of acres of wetland type (i.e., forested, shrub-scrub, or herbaceous wetland). The FCU values represent the units of functional impacts at the reservoir site, and they represent the units of mitigation credit that must be achieved at the mitigation site, or that must be purchased from a mitigation bank in order to balance or compensate for project impacts. A detailed discussion of the method and the HGM analysis conducted for the Lake Columbia site is presented in the Draft EIS.

3.3 Existing Hydrology

Mud Creek, on which the proposed Lake Columbia would be located, is a tributary of the Angelina River and has a total drainage area of approximately 554 square miles. There is one streamflow gaging station on Mud Creek, USGS No. 08034500 (Mud Creek near Jacksonville). The gaging record extends from 1939 to 1979 and 2001 to present. The drainage area of Mud Creek and its tributaries above this gage covers 376 square miles. The average mean daily flow for 1940 through 1979 is 258 cubic feet per second (cfs), and the median is 74 cfs. The minimum mean daily flow is 0 cfs and the maximum is 22,700 cfs. The proposed dam site would be located immediately upstream of the Coon Creek confluence and the drainage area at this point is approximately 384 square miles.

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3.4 Existing Vegetation

The location and distribution of vegetative cover types within the Lake Columbia Reservoir site are depicted in Figures 3a through 3g. Following are descriptions of the typical species that occur within each cover type.

Herbaceous Wetland

Herbaceous wetlands within the Permit Area are dominated by wetland obligates such as rushes, sedges, smartweed, and lizard's tail (FNI, 2003). Common forbs include goldenrod and morning glory (*Ipomoea* sp.). Native grasses such as switch grass (*Panicum virgatum*) and bluestems (*Andropogon* sp.) are common.

Shrub Wetland

Shrub wetlands within the Permit Area are wetlands in successional transition between herbaceous wetlands and forested wetlands (FNI, 2003). Dominant shrubs include eastern false-willow (*Baccharis halimilifolia*), deciduous holly (*Ilex decidua*), and buttonbush (*Cephalanthus occidentalis*). Trees include overcup oak (*Quercus lyrata*), willow oak (*Q. phellos*), loblolly pine (*Pinus taeda*), and red maple (*Acer rubrum*). Vines include green briar (*Smilax* spp.), wisteria (*Wisteria* spp.), blackberry (*Rubus* spp.), and pepper vine (*Ampelopsis arborea*). Soft rush (*Juncus effusus*), American snowbell (*Styrax americana*), lizard's tail (*Saururus cernuus*), sedges (e.g., *Carex* spp., *Cyperus* spp.), and smartweed (*Polygonum* spp.) dominated the herbaceous species present.

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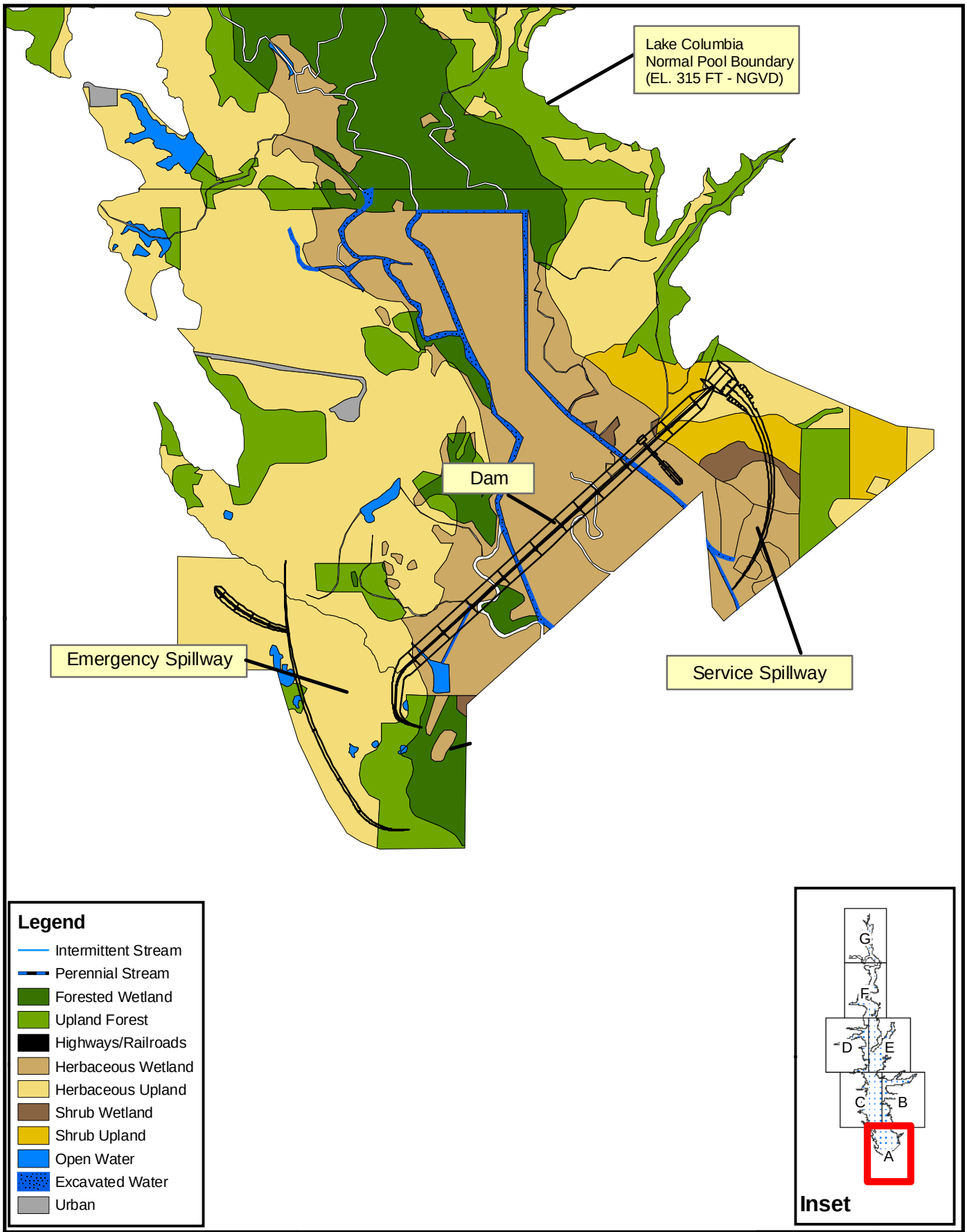

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Cover Types Within the Normal Pool

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3A
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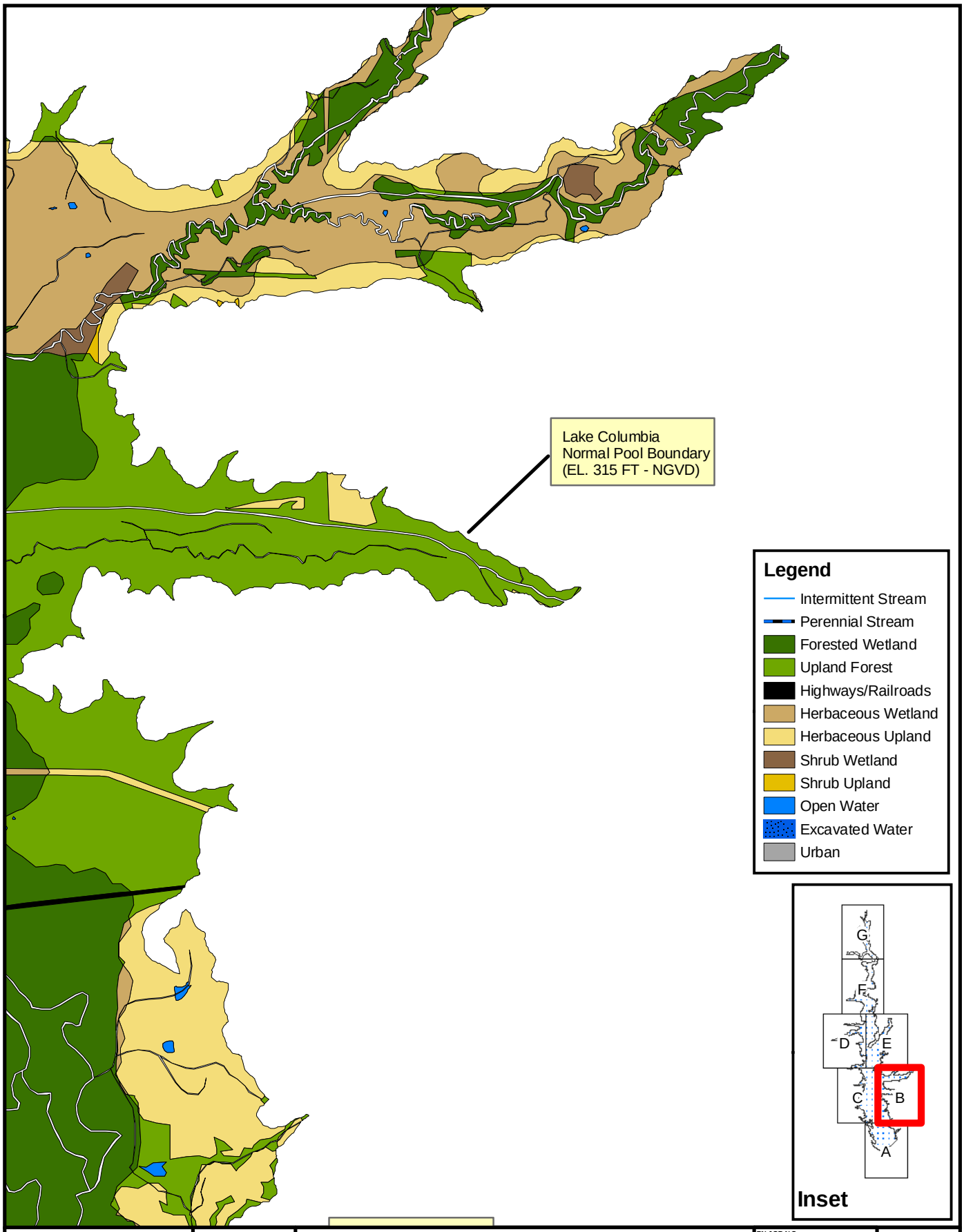

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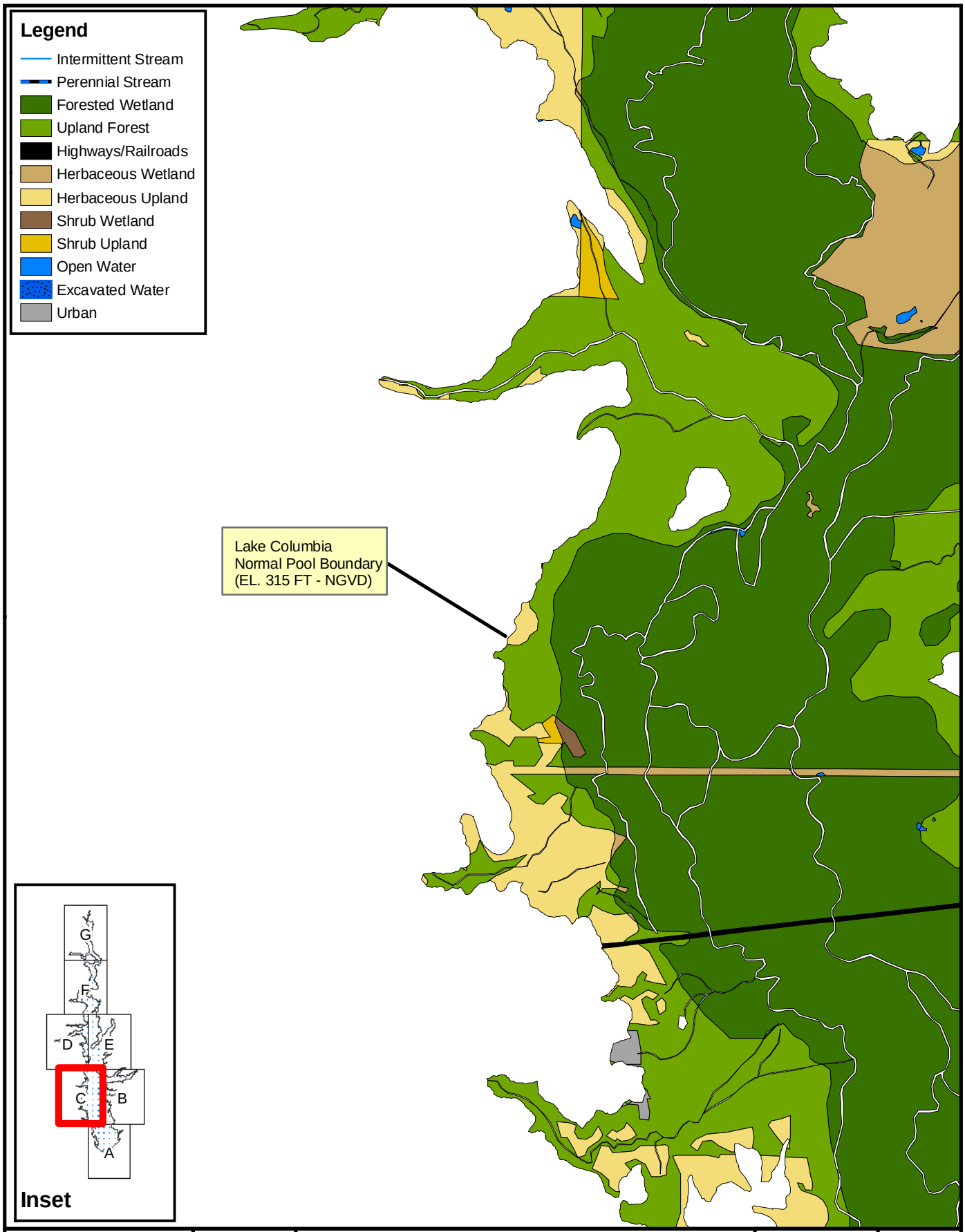
3B
FIGURE



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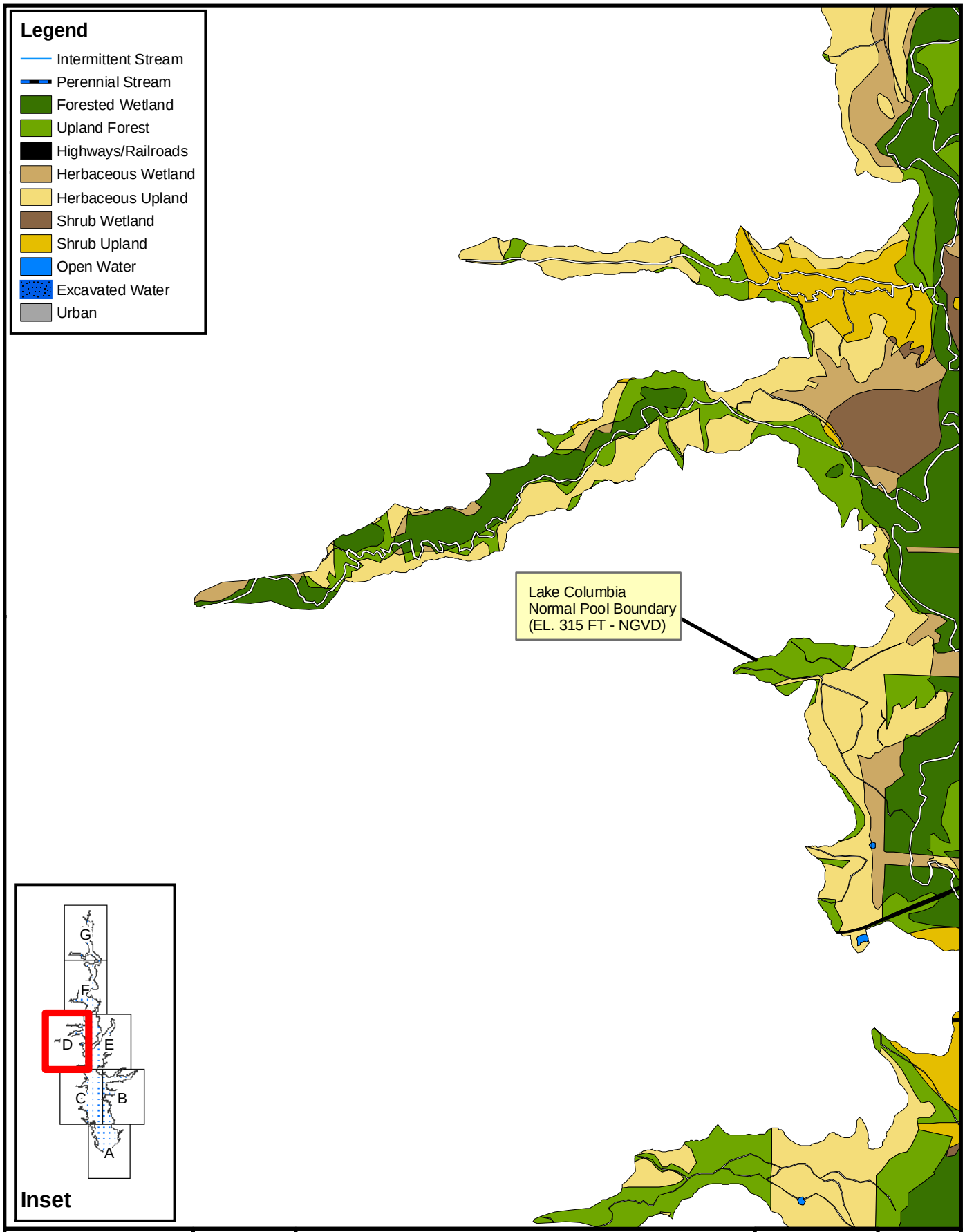
3C
FIGURE



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3D
FIGURE

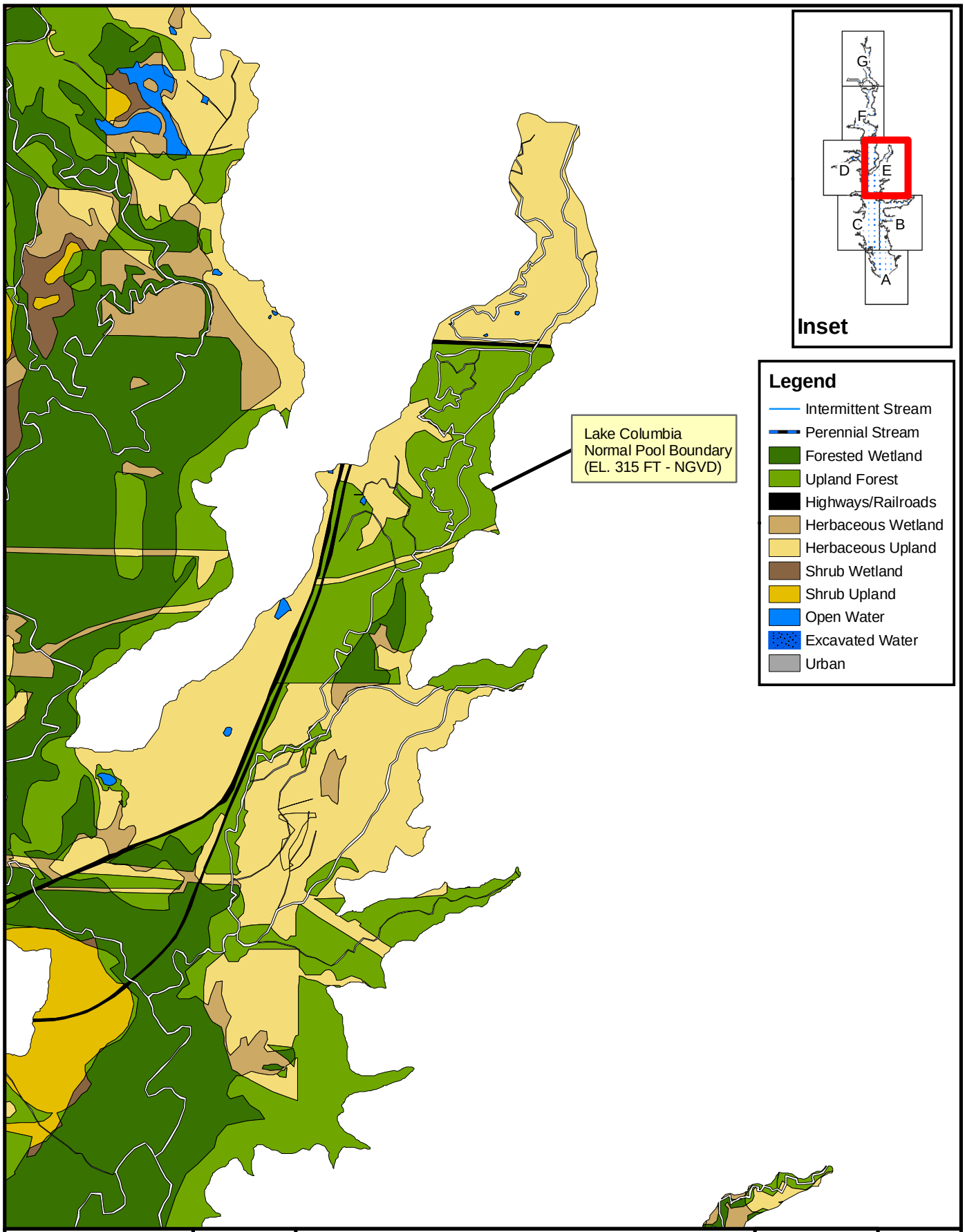

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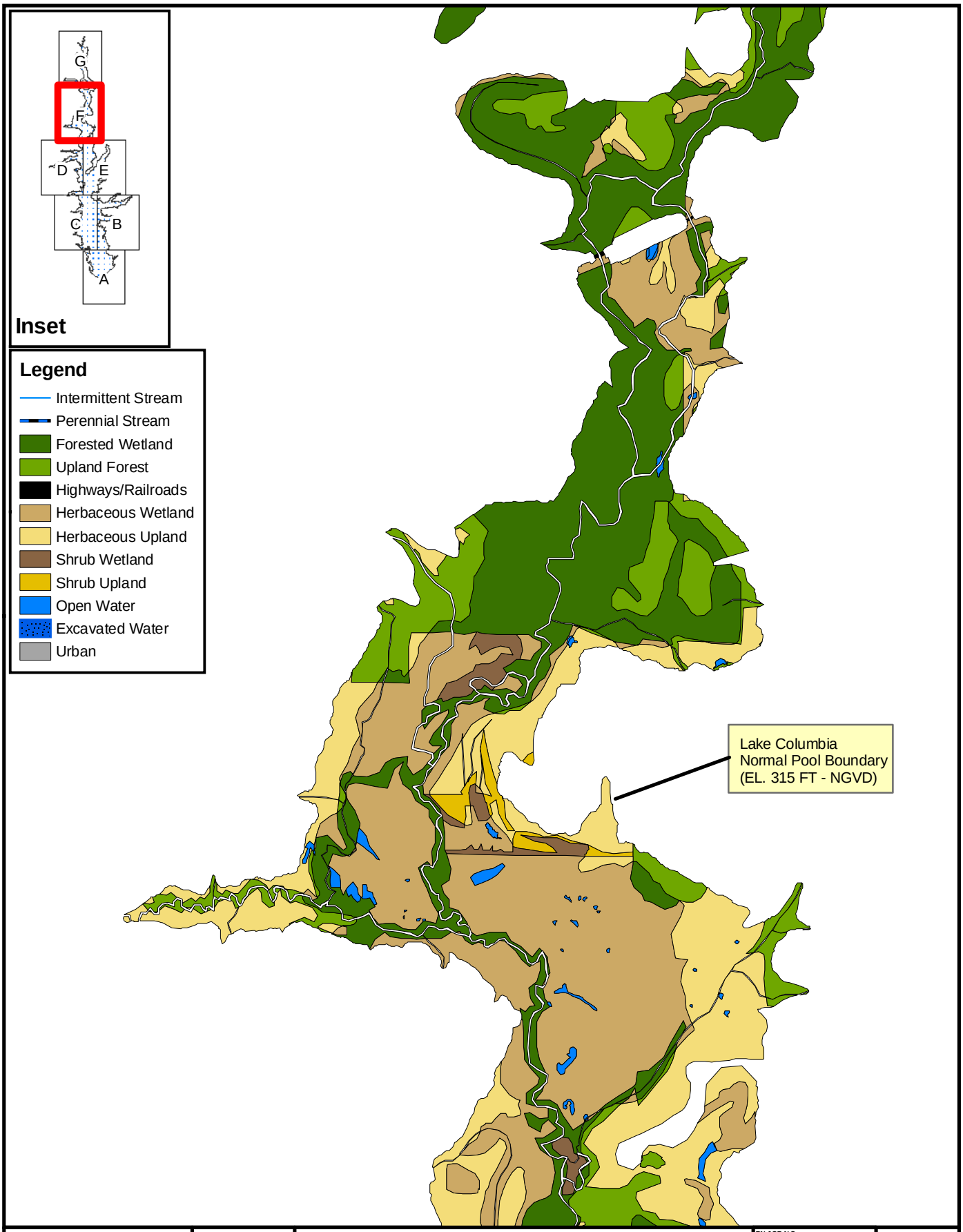
FIGURE



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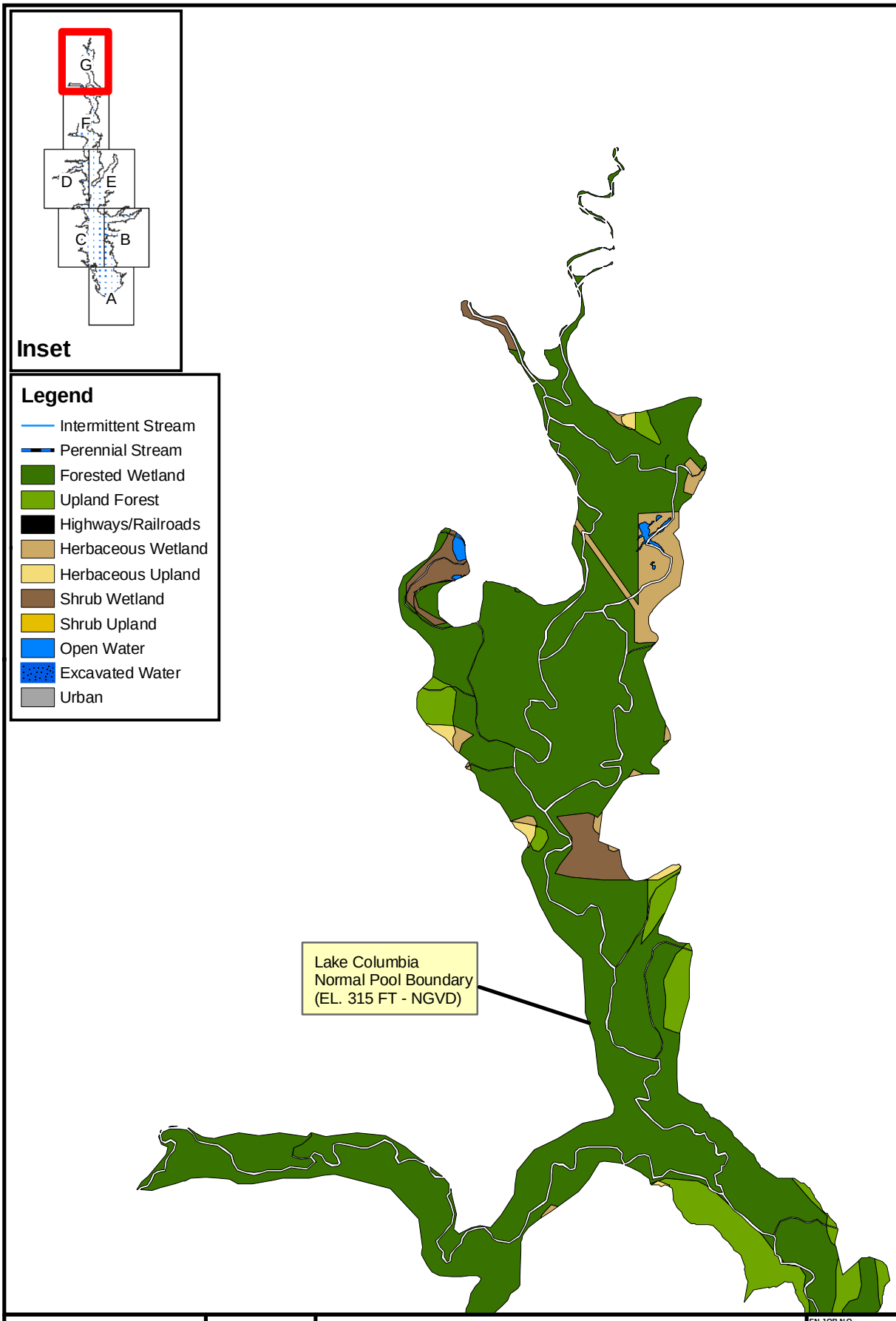
3F
FIGURE



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3G
FIGURE

Bottomland Hardwood Forest (Deciduous Forested Wetland)

Bottomland hardwood forest in the proposed Lake Columbia project area is associated with the Mud Creek floodplain (FNI, 2003). Dominant trees include willow oak, overcup oak, American elm (*Ulmus americana*), sweet gum (*Liquidambar styraciflua*), sugar hackberry (*Celtis laevigata*), and water oak (*Q. nigra).* Dominant plants in the shrub strata are often small trees, such as those listed above, and may also include swamp tupelo (*Nyssa sylvatica*), deciduous holly (*Ilex decidua*), and American beautyberry (*Callicarpa americana*). Common vines in the bottomland hardwood forest include green briar (*Smilax* spp.), poison ivy (*Toxicodendron radicans*), trumpet creeper (*Campsis radicans*), and Japanese honeysuckle (*Lonicera japonica*), while common herbaceous plants include lizard's tail, sedges, goldenrod (*Solidago* spp.), and smartweed.

Riverine

Emergent, floating, and submergent aquatic vegetation is noticeably absent from the Mud Creek channel (FNI, 2003). Vegetation overhanging the stream channel typically includes herbs and grasses such as sedges, smartweed, and Indian sea-oats (*Chasmanthium latifolia*). Common tree and shrub species include planer-tree (*Planera aquatica),* water oak, swamp privet (*Forestiera acuminata*), and water tupelo (*Nyssa aquatica*).

Upland Forest (Deciduous Upland Forest)

Upland forests in the Permit Area are typically mixed hardwood/pine stands with thick sub-canopies of young trees, shrubs, and vines (FNI, 2003). Dominant tree species include water oak, post oak (*Quercus stellata*), southern red oak (*Quercus falcata*), loblolly pine, short leaf pine (*Pinus echinata*), sweet gum, winged elm (*Ulmus alata*), and eastern red cedar (*Juniperus virginiana*). Common shrub and vine species include common persimmon (*Diospyros virginiana*), American beautyberry, blackberry, Japanese honeysuckle, and green briar. Common herbs include joe-pye weed (*Eupatorium* sp.), corn salad (*Valerianella* sp.), sweet clover (*Melilotus* spp.), and dock (*Rumex* sp.).

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Shrubland

Shrubland in the Permit Area represents a midpoint in the successional transition from pasture to forest (FNI, 2003). Most of the shrub stratum is made up of small trees (e.g., elms, oaks, sweet gum, and pines). Actual shrub species include eastern false-willow (*Baccharis halimilifolia*), sumac (*Rhus coriaria)*, Mexican plum (*Prunus mexicana*), and rusty black-haw (*Viburnum rufidulum*). Common vines include blackberry, honeysuckle, and grape (*Vitis* sp.), and common herbaceous species include sedges, corn salad, rabbit tobacco (*Evax verna*), and sweet clover.

Grassland

Grassland within the Permit Area is generally represented by upland improved Bermuda grass (*Cynodon dactylon*) pastures that have typically followed from forest clearing (FNI, 2003). Common forbs include nettles (*Solanum* sp.), yankeeweed (*Eupatorium compostifolium*), corn salad, and goldenrod.

3.5 Existing Soils

Soils within the proposed footprint of Lake Columbia are presented in Table 3.1. Descriptions of the soil series are available online from the following:

> Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions [Online WWW]. Available URL: "http://soils.usda.gov/technical/classification/osd/index.html" [Accessed 10 February 2008]. USDA-NRCS, Lincoln, NE.

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Table 3.1 Soils in the Proposed Lake Columbia Footprint

Area (ac.)	Percent of Footprint Area	Description	Geomorphology	Prime Farmland	Erodibility	Drainage
4,289	40.38	Mantachie clay loam	floodplains		Not highly erodible	Somewhat poorly drained
1,703	16.03	Iuka fine sandy loam	floodplains		Not highly erodible	Moderately well drained
1,667	15.70	Marietta clay loam	floodplains		Not highly erodible	Moderately well drained
317	2.98	Bienville loamy fine sand, nearly level	stream terraces		Not highly erodible	Somewhat excessively drained
308	2.90	Sacul fine sandy loam, strongly sloping	interfluves		Highly erodible	Moderately well drained
298	2.80	Mantachie fine sandy loam	floodplains		Not highly erodible	Somewhat poorly drained
221	2.08	Bowie fine sandy loam, sloping	interfluves		Potentially highly erodible	Well drained
220	2.08	Bienville loamy fine sand	stream terraces		Not highly erodible	Somewhat excessively drained
204	1.92	Sacul fine sandy loam, sloping	interfluves		Potentially highly erodible	Moderately well drained
196	1.84	Mantachie loam, frequently flooded	floodplains		Not highly erodible	Somewhat poorly drained
114	1.07	Ochlockonee loamy fine sand	floodplains		Not highly erodible	Well drained
102	0.96	Sacul fine sandy loam, gently sloping	interfluves		Potentially highly erodible	Moderately well drained
95	0.89	Bowie fine sandy loam, gently sloping	interfluves	X	Potentially highly erodible	Well drained
89	0.83	Bienville loamy fine sand, sloping	stream terraces		Potentially highly erodible	Somewhat excessively drained
76	0.72	Sacul fine sandy loam, sloping, eroded	interfluves		Potentially highly erodible	Moderately well drained
63	0.60	Cuthbert fine sandy loam, strongly sloping	interfluves		Highly erodible	Well drained
53	0.50	Percilla soils	depressions on interfluves		Not highly erodible	Poorly drained
53	0.50	Hannahatchee fine sandy loam	floodplains		Not highly erodible	Well drained
45	0.43	Betis loamy fine sand, sloping	interfluves		Potentially highly erodible	Somewhat excessively drained
44	0.42	Lilbert loamy fine sand, sloping	interfluves		Potentially highly erodible	Well drained
39	0.37	Darco loamy fine sand, strongly sloping	interfluves		Highly erodible	Somewhat excessively drained
38	0.36	Darco loamy fine sand, sloping	interfluves		Potentially highly erodible	Somewhat excessively drained
38	0.36	Nacogdoches fine sandy loam, sloping, eroded	interfluves		Potentially highly erodible	Well drained
38	0.36	Trawick fine sandy loam, strongly sloping, eroded	interfluves		Highly erodible	Well drained

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Area (ac.)	Percent of Footprint Area	Description	Geomorphology	Prime Farmland	Erodibility	Drainage
34	0.32	Angelina	floodplains		Not highly erodible	Very poorly drained
34	0.32	Sacul fine sandy loam, strongly sloping, eroded	interfluves		Highly erodible	Moderately well drained
32	0.30	Darco loamy fine sand, strongly sloping	interfluves		Highly erodible	Somewhat excessively drained
28	0.27	Elrose fine sandy loam, strongly sloping	interfluves		Highly erodible	Well drained
26	0.25	Elrose fine sandy loam, sloping	interfluves		Potentially highly erodible	Well drained
26	0.24	Woodtell fine sandy loam, gently sloping	interfluves		Potentially highly erodible	Well drained
26	0.24	Briley loamy fine sand, sloping	interfluves		Potentially highly erodible	Well drained
19	0.18	Alazan fine sandy loam, level	stream terraces	X	Not highly erodible	Moderately well drained
16	0.15	Tenaha loamy fine sand, strongly sloping	interfluves		Highly erodible	Well drained
15	0.14	Water				
11	0.10	Woodtell fine sandy loam, sloping	interfluves		Highly erodible	Well drained
6	0.06	Briley loamy fine sand, gently sloping	interfluves		Not highly erodible	Well drained
6	0.06	Elrose fine sandy loam, gently sloping	interfluves	X	Potentially highly erodible	Well drained
6	0.05	Ruston fine sandy loam, sloping	interfluves	X	Potentially highly erodible	Well drained
5	0.05	Bub-Trawick complex	interfluves		Highly erodible	Well drained
4	0.03	Owentown loamy fine sand, occasionally flooded	floodplains	X	Not highly erodible	Moderately well drained
2	0.02	Woodtell fine sandy loam, sloping, eroded	interfluves		Highly erodible	Well drained
2	0.02	Darco loamy fine sand, nearly level	interfluves		Not highly erodible	Somewhat excessively drained
2	0.02	Darco loamy fine sand, strongly sloping	interfluves		Highly erodible	Somewhat excessively drained
2	0.02	Lilbert loamy fine sand, gently sloping	interfluves		Not highly erodible	Well drained
2	0.02	Alazan fine sandy loam, sloping	stream terraces	X	Potentially highly erodible	Moderately well drained
2	0.02	Ruston fine sandy loam, gently sloping	interfluves	X	Potentially highly erodible	Well drained
1	0.01	Darco loamy fine sand, 1 to 6 percent slopes	interfluves		Potentially highly erodible	Somewhat excessively drained
1	0.01	LaCerda clay loam, sloping	interfluves		Potentially highly erodible	Moderately well drained
1	0.01	Gallime fine sandy loam, 1 to 5 percent slopes	stream terraces	X	Potentially highly erodible	Well drained
1	0.01	Bowie fine sandy loam, sloping, eroded	interfluves		Potentially highly erodible	Well drained

Source: NRCS, 2007

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3.6 Existing Wildlife Usage

Bottomland Hardwood Forest (Deciduous Forested Wetlands)

This habitat type is situated along slopes and lowlands bordering Mud Creek and its tributaries. Cover is young to mature hardwood forest with many mast and fruit producing species. Understory and ground cover habitat structure are usually limited due to the dense overstory. The highly variable hydrologic regime of this habitat ranging from mesic to hydric, along with it being frequently associated with aquatic habitats, provides excellent habitat diversity. Characteristic fauna of bottomland hardwoods are white-tailed deer, (*Odocoileus virginianus*), fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), swamp rabbit (*Sylvilagus aquaticus*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), three-toed box turtle (*Terrapene Carolina*), western cottonmouth (*Agkistrodon piscivorus*), ground skink (*Leiolopisma laterale*), green anole (*Anolis carolinensis*), fence lizard (*Sceloporus undulates*), green tree frog (*Hyla cinera*), gray tree frog (*Hyla chrysoscelis*), gulf coast toad (*Bufo valiceps*), barred owl (*Strix varia*), hairy woodpecker (*Dendrocopos villosus*), downy woodpecker (*Dendrocopos pubescens*), wood thrush, (*Hylocichla mustelina*), and wood duck (*Aix sponsa*). Signs of white-tailed deer, bobcats (*Lynx rufus*), and raccoons are common in the bottomlands of the Permit Area, and common avian species include pileated woodpecker (*Dryocopus pileatus*), eastern-tufted titmouse (*Parus bicolor*), wood duck, Carolina wren (*Thryothorus ludovicianus*), red shouldered hawk (*Buteo lineatus*), and yellow-crowned night heron (*Nycticroax violaceus*) (FNI, 2003).

Herbaceous Wetlands

Herbaceous wetlands (hydric habitats) typically exhibit a relatively high species diversity and habitat structure. These areas may also be associated with aquatic habitats (ponds and streams), thus increasing habitat diversity. Typical wildlife inhabiting herbaceous wetland areas include raccoon, beaver, cricket frog (*Acris crepitans*), spring peeper (*Hyla crucifer*), Strecker's chorus frog (*Pseudacris streckeri*), southern leopard frog (*Rana utricularia*), green anole, western cottonmouth, water snake (*Nerodia erythrogaster*), great blue heron (*Ardea herodias*), snowy egret (*Leucophoyx thula*), and red-winged blackbird (*Agelaius phoeniceus*). Marsh wrens (*Cistothorus palustris*), common yellow throats (*Geothlypis trichas*), and turkey (*Meleagris galopavo*), along with beaver and a variety of frogs, can be found within the herbaceous wetlands of the Permit Area (FNI, 2003).

Shrub-Scrub Wetlands

Shrub-scrub wetlands are in successional transition between herbaceous wetlands and bottomland hardwood forests. Shrub-scrub wetlands can also be associated with aquatic habitats (ponds and streams), thus increasing habitat diversity. Characteristic

wildlife included those occurring in both herbaceous wetlands and bottomland hardwood forests. A variety of songbirds, including yellow-breasted chat (*Icteria virens*), along with evidence of beaver activity have been observed in shrub-scrub wetlands within the Permit Area (FNI, 2003).

Riverine (Streams and Ponds)

Characteristic wildlife associated with streams and ponds are raccoon, opossum (*Didelphis virginiana*), beaver, cricket frog, bullfrog (*Rana catesbeana*), southern leopard frog, red-eared turtle (*Chyrsemys sp.*), snapping turtle (*Chelydra serpentina*), diamond-backed water snake (*Nerodia rhombifera*), western cottonmouth, mallard (*Anas platyrhynchos*), wood duck, great blue heron, and green heron (*Butorides virescens*).

Grassland

Characteristic wildlife of the grassland habitat are nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), hispid cotton rat (*Sigmodon hispidus*), long-tailed harvest mouse (*Reithrodontomys fulvescens*), plains pocket gopher (*Geomys bursarius*), six-lined racerunner (*Cnemidophorus sexlinatus*), racer (*Coluber constrictor*), painted bunting (*Passerina ciris*), lark sparrow (*Chondestes grammacus*), eastern meadowlark (*Sturnella ma*gna), mockingbird (*Mimus polyglottos*), scissor-tailed flycatcher (*Muscivora forfic*), mourning dove (*Zenaidura macroura)*, bobwhite quail (*Colinus virginianus*), red tailed hawk (*Buteo lineatus*), and turkey vulture (*Cathartes aura*).

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Upland Forest (Deciduous Upland Forest)

Characteristic wildlife of the upland hardwood forest habitat type are white-tailed deer, fox squirrel, raccoon, white-footed mouse (*Peromyscus leucopus*), eastern cottontail, three-toed box turtle, green anole, Texas rat snake (*Elaphe obsoleta*), downy woodpecker, red-bellied woodpecker (*Centurus carolinus*), cardinal (*Richmondena cardinalis*), Carolina chickadee (*Parus carolinensis*), Carolina wren (*Thryothorus ludovicianus*), mourning dove, black and white warbler (*Mniotilta varia*), pine warbler (*Dendroica pinus*), and blue jay (*Cyanocitta cristata*). Eastern bluebirds (*Sialia sialis*), pine warblers, tufted-titmouse (*Baeolophus bicolor*), broad-headed and five-lined skinks (*Eumeces laticeps* and *E. faciatus*, respectively), gray tree frogs (*Hyla* sp.), and armadillos (*Dasypus novemcinctus*) have been observed in upland forests within the Permit Area (FNI, 2003).

Shrub-Scrub Upland

Wildlife species inhabiting shrub-scrub uplands include white-tailed deer, raccoon, opossum, eastern cottontail, coyote (*Canis latrans*), six-lined racerunner, green anole, racer, and copperhead (*Akistrodon contortrix*). Bird species observed in this habitat type within the Permit Area included indigo bunting (*Passerina cyanea*), blue grosbeak (*Guiraca caerulea*), red-tailed hawk, cardinal, mourning dove, eastern kingbird (*Tyrannus tyrannus*), and common crow (*Corvus brachyrhynchos*).

4.0 Mitigation Site Selection and Credit Determination

ANRA proposes to mitigate the impacts of the proposed Lake Columbia on waters of the U.S. by implementing mitigation activities on-site, near-site, and off-site, in priority order. ANRA proposes to purchase mitigation lands in fee simple or acquire conservations easements for near-site and off-site mitigation. Proposed mitigation activities and restrictions on uses of these lands include:

1. Limiting timber harvesting and clearing to wetland enhancements
2. Eliminating livestock grazing
3. Limitations on public access and non-consumptive uses
4. Restoration and enhancement of degraded forested wetlands
5. Preservation of intermittent streams and riparian buffers
6. Preservation of perennial streams and riparian buffers

The first three actions will minimize future disturbances to the wetland and any adjacent habitats and will allow natural succession processes to occur. This will improve the quality of the habitat and should enhance or improve the existing wetland functions.

As the trees in forested wetlands grow and mature herbaceous cover will likely decrease as result of increased canopy cover and shading. Tree density usually decreases in mature forests as the size (dbh) of the trees increase. This will result in higher basal area and density of tree stems. As large trees mature and die there will be an increase in the number of snags and coarse woody debris. These predictions can be measured during monitoring activities to show the results of these compensatory mitigation actions.

Some areas downstream have been clearcut or heavily harvested for timber. Any such areas acquired will be restored by minor topographic enhancements and vegetation plantings. Wetland hydrology would be improved or restored by removing restrictive culverts, roads, and levees, and filling drainage ditches or swales. These actions will increase wetland functions by increasing the number and types of topographic features and frequency and duration of flooding.

The most important restoration feature will be revegetating the area with appropriate herbaceous, shrub, and tree species. Particular attention will be paid to providing functional riparian buffers along streams and channel sloughs.

The estimated project impacts, expressed in units of linear feet for streams, functional capacity units (FCU) for wetlands, and acres for open water and hillside bogs, are compared to proposed mitigation measures and presented in Table 4.1. Hence, Table 4.1 is a balance sheet comparing the impacts of waters of the U.S. with the mitigation measures that are proposed to compensate for those impacts. Values within the net gain/loss column that are equal to or greater than zero indicate that the impacts for the indicated water resource would be mitigated by the proposed mitigation measures in columns to the right. Following are descriptions of ANRA's proposed mitigation measures.

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Lake Columbia Mitigation Balance Sheet

9-Sep-09

Impact Type and Amount					Net Gain/Loss			Mitigation Totals			Mitigation Measure																	
											Onsite					Near-site								Offsite				
											Lake Columbia	Lake Columbia	Fringe Wetlands Created	Fringe Wetlands Created**	Standing Timber in Reservoir (3500 ac.)*	Upstream Conservation Easement	Stream Buffer Preservation (perimeter of Lake)	Stream Buffer Preservation Downstream	Downstream Conservation Easement (preservation) ***	Downstream Conservation Easement (preservation) ***	Downstream Restoration (wetlands uplift per 500 acres)	Downstream Restoration (wetlands uplift per 2500 acres)	Downstream Restoration (Streams) Fee Simple	Purchase Mitigation Bank Credits	Within Watershed Restoration	Big Thicket Restoration (2500 acres)	Big Thicket Preservation (3500 acres)	Big Thicket Preservation/ Restoration Streams
Resource Impacted		Linear Feet	Acres	FCUs	Linear Feet	Acres	FCUs	Linear Feet	Acres	FCUs	Acres	FCUs	Acres	FCUs	FCUs	Acres	Feet	Feet	FCUs	Acres	FCUs	FCUs	Linear Feet	If needed	If needed	FCUs	FCUs	Feet
New Channel (Unpermitted Activity by Others)		14,256																										
Intermittent Stream		204,864			217,882			422,746									182,746	10,000					110,000					120,000
Perennial Streams		370,128			126,466			496,594									52,594	18,500					203,500					222,000
Open Water			63			10,058			10,121		10,121																	
Shrub-Scrub Wetlands			144																									
	Functions																											
	1. Storage/Detention****			135			180			315		135									180							
	2. Maintenance			108			72			180											180							
	3. Removal/Sequestration			107			180			287		107									180							
Hillside Bog			0.5			0.5			1															1				
Herbaceous Wetlands			1,518										1,195															
	Functions																											
	1. Storage/Detention****			1423			270			1,693		1,423									270							
	2. Maintenance			1054			17			1,071				801							270							
	3. Removal/Sequestration			1060			270			1,330		1,060									270							
Forested Wetlands			3,689													250				500								
	Functions																											
	1. Storage/Detention			3532			3,379			6,911		3,532							45			879				879	1,575	
	2. Maintenance			3612			2,194			5,806					686				45			1,750				1,750	1,575	
	3. Removal/Sequestration			3062			3,053			6,115		3,062							45			717				717	1,575	
		589,248	5,415	14,093	344,348	10,059	9,615								FCUs =0.2*.98*acres standing timber			Ft.=5ft/acre* acres forested wetland	FCUs=0.1* acreage*.9; assume 0.9 FCI		Assumed uplift of 0.9 uplift for herbaceous and for shrub	Uplift based on assumptions of Mud Creek MB	intermittent Ft.=20ft/acre*a cres restored				=.5*0.9 FCI*acreas	

Intermittent Feet/acre 20

perenniel feet/acre 37

135 500 Conversion of cropland/pasture 2500 3500

Preennial ft =37*acres restored

1. Onsite: Proposed onsite mitigation consists of actions that take place within the reservoir footprint. These are described as follows:
    a. Wetland fringe development in shallow areas on the margin of the lake. It is estimated that 1,195 acres of fringe wetlands will develop in certain shallow, gently sloping portions of the reservoir (USACE, 2009). The expected location and distribution of these wetlands are depicted in Figure 4.
    b. The lake will have a surface area of 10,121 acres. Subtracting 1,195 acres of expected fringe wetlands, the total area of open water to be created in the lake is 8,926 acres of open water. It is expected that this area will compensate fully for the inundation of 63 acres of open water within the reservoir footprint.
    c. On a watershed basis, the reservoir is expected to compensate for the lost wetland function of "temporary storage and detention of surface water." For example, this function in the existing wetlands is limited to the total area of 5,351 acres of wetlands (herbaceous, shrub-scrub, forested). Lake Columbia's surface area will be nearly twice that of the existing wetlands and is expected to provide this function in an amount that is proportional to the surface area of the lake. Water will be released from the dam to provide supply to downstream users thereby making water storage temporary. Thus, the value of this function in the lake in terms of FCUs is expected to be at least equal to the value of FCUs present in the existing wetlands (i.e., 5,090 FCUs) as noted in Table 4.1.
    d. Again, on a watershed basis, the reservoir is expected to compensate for the lost wetland function of "removal and sequestration of elements and compounds." Reservoirs are documented to be efficient settling basins or sinks for suspended solids and nutrients and compounds that are attached to colloidal clays and other settleable materials. Therefore, Lake Columbia is expected to be at least as effective as the existing wetlands at removing and sequestering elements and compounds, and ANRA proposes to take credit for 4,229 FCUs in the lake for this function (Table 4.1).

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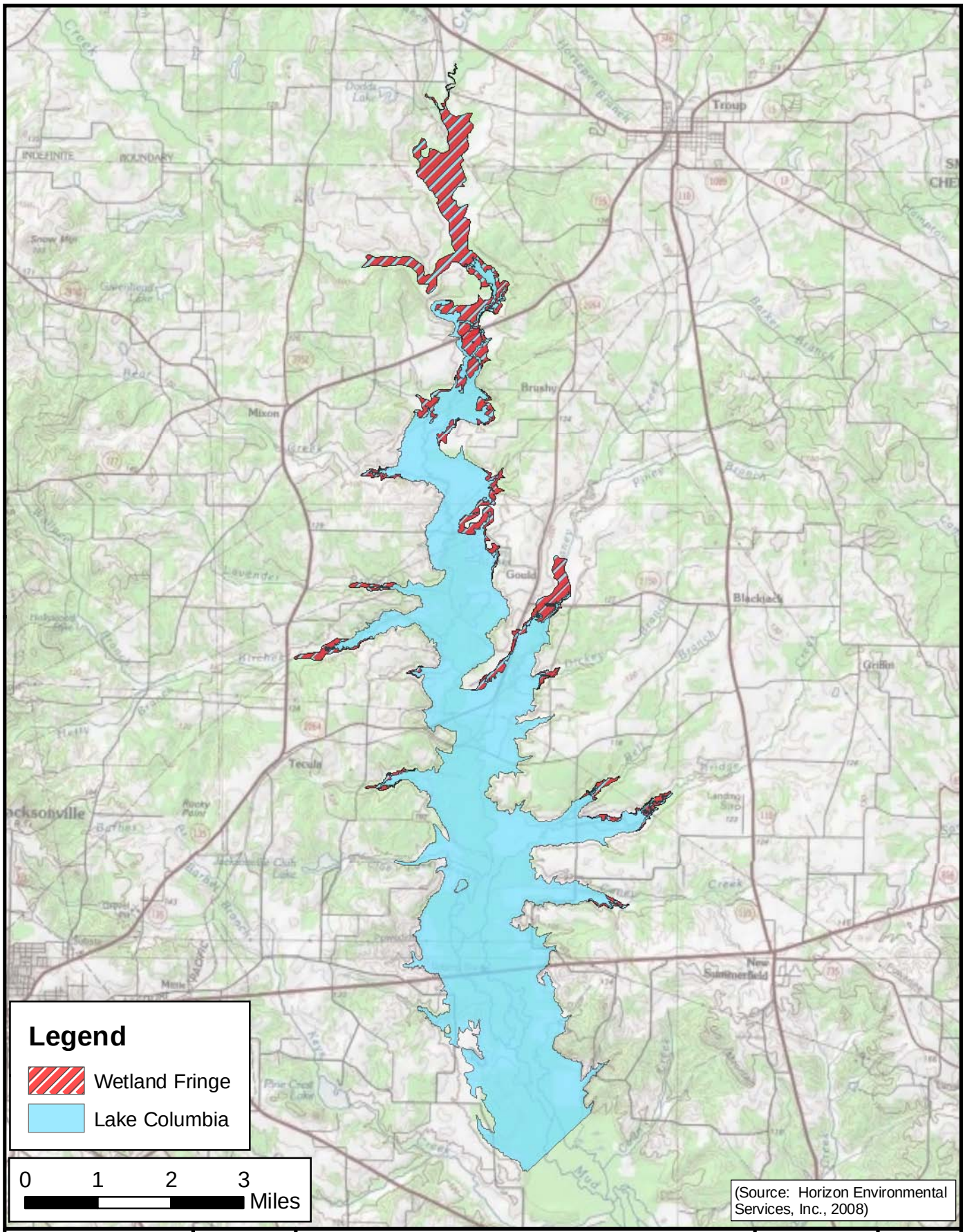

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Angelina and Neches River Authority
Lake Columbia Mitigation Plan

Wetland Fringe Areas

FN JOB NO	ANR00164
FILE	Figure4.mxd
DATE	August 2009
SCALE	1:115,000
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4
FIGURE

e. As part of the proposed action, ANRA proposes to acquire 3,500 acres of land within the reservoir footprint with standing mature forest that would not be cleared (Table 4.1). Such standing timber would provide cover for fish in the lake, and it would provide nesting, roosting and perching habitat for birds where the snags are exposed above the water level. Thus, leaving standing timber within the reservoir relates to the wetland function, "maintenance of plant and animal communities," as it would benefit fish and avian species. ANRA proposes to take credit for 686 FCUs based on the assumptions that 1) they will be able to keep 3,500 acres of timber standing in the reservoir prior to inundation and that 2) it will be worth 20 percent of the value of forested wetlands having an FCI value of 0.98.

2. Near-site: Proposed near-site mitigation includes actions on lands immediately surrounding the reservoir; in the upstream watershed including Mud Creek and its tributaries; and the 100-year floodplain downstream from the dam.

   a. **Land and Flowage Easement Acquisitions.** ANRA will purchase land around Lake Columbia up to elevation 318 feet NGVD and prohibit unpermitted development within this area. This would avoid indirect impacts to 1,029 acres of land contiguous with the conservation pool. In addition, flowage easements would be purchased for land from 318 ft NGVD up to elevation 326 ft NGVD. Approximately 3,350 acres would be included. Development restrictions would minimize the secondary impacts of development in the vicinity of the reservoir and avoid flood damage to habitable structures.

   b. **Water Quality Regulations.** ANRA adopted Lake Columbia Water Quality Regulations on August 7, 2007 (Appendix A). These regulations apply to the lake itself and to an area immediately surrounding the lake shore known as the "No Discharge Zone" (NDZ). The NDZ is defined by the regulation as "the land located horizontally 2,000 feet from the 315 feet [NGVD] elevation. The NDZ as well as the 318 foot and 326 foot NGVD contours are depicted in Figure 5.

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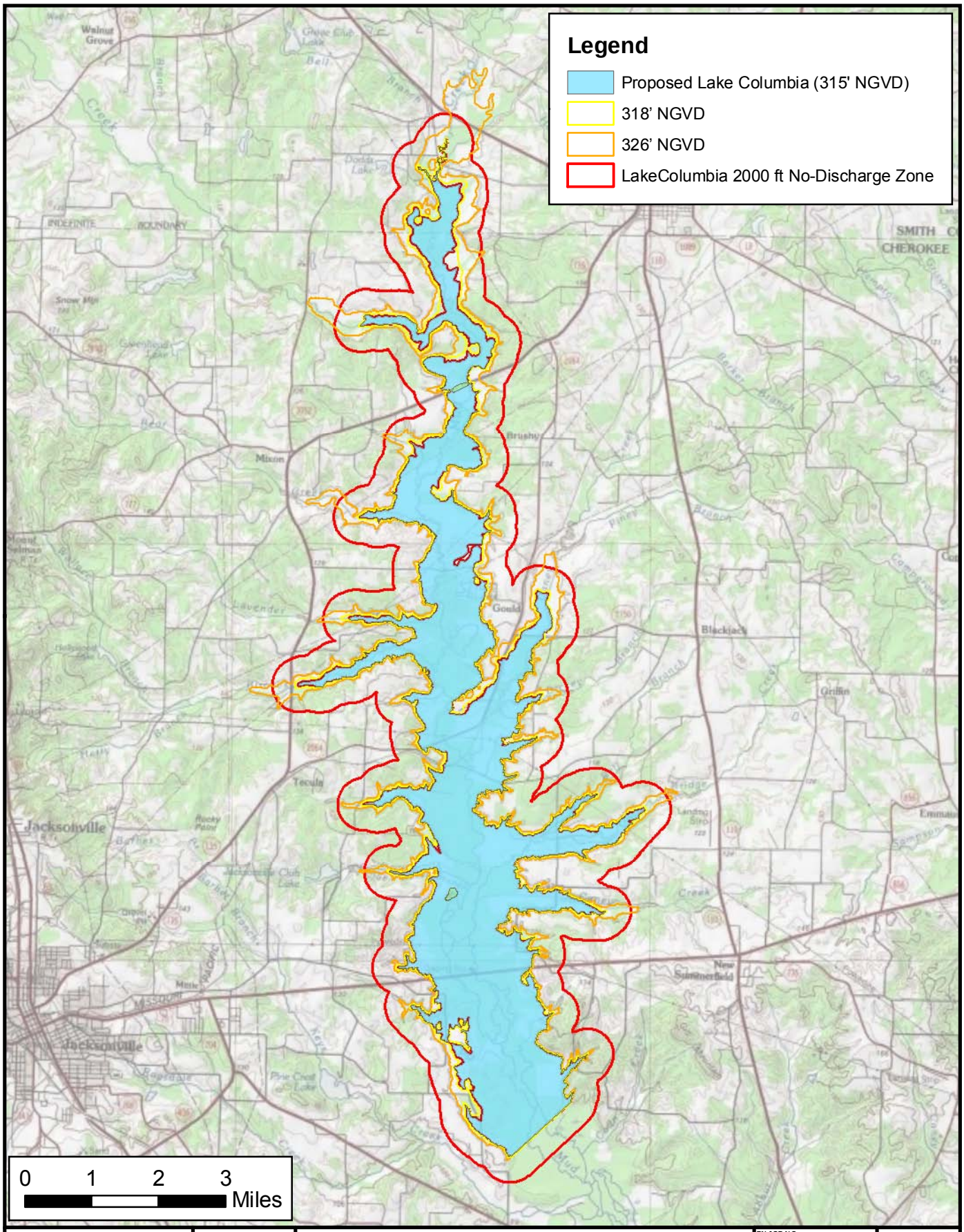

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No Discharge Zone

FN JOB NO	ANR00164
FILE	Figure5.mxd
DATE	August 2009
SCALE	1:125,000
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5
FIGURE

The NDZ encompasses approximately 15,500 acres, and it includes approximately 35 miles of intermittent stream channels and 10 miles of perennial stream channels. ANRA's Water Quality Regulations specifically prohibit the following:

1) Construction and installation of pipelines and utility lines within the lake.
2) Construction or enlargement of existing hazardous or municipal solid waste facilities within the Lake Columbia watershed (except for such facilities owned, operated, or within the incorporated limits of Tyler, Jacksonville, New Summerfield, Troup, Whitehouse, and Bullard).
3) Petroleum storage tanks greater than 100 gallons within the NDZ.
4) Onsite sewerage facilities (OSSF) in the NDZ on lots: less than 0.75 acre if connected to a public water supply; less than 1.25 acres if not connected to public water supply; which can be served practicably by a sewage collection system. (NOTE: All OSSFs in the NDZ must be permitted by ANRA.)
5) Human-induced erosion.
6) Construction of any structure that would decrease the storage capacity of the lake, be a source of contamination, or significantly impact aquatic or terrestrial habitat.
7) Modification of the shoreline (up to the 100-year flood elevation, 322.59 feet NGVD) without prior written consent of ANRA.

In addition, ANRA's regulations require the following measures to protect water quality in Lake Columbia:

1) Forestry best management practices (BMPs) for all forestry activities within the NDZ.
2) OSSFs must be designed by a P.E. or registered professional sanitarian.
3) OSSF plan approval by ANRA prior to construction.

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4) ANRA approval of plans to construction piers, docks and other water front facilities.

c. **Stream Buffer Preservation in NDZ.** ANRA proposes to partially mitigate impacts to intermittent and perennial streams based on the protection afforded the stream channels in the NDZ by the Lake Columbia Water Quality Regulations. As indicated in Table 4.1, there are 182,746 linear feet of intermittent streams and 52,594 linear feet of perennial streams that would benefit from such protection.

d. **Upstream Conservation Easement.** ANRA expects to obtain conservation easements on up to 250 acres of land upstream of Lake Columbia in the Mud Creek corridor downstream of Lake Tyler. As these lands are identified and the habitat characterized in terms of existing functional capacity, ANRA proposes to update the mitigation balance sheet (Table 4.1) to reflect the appropriate mitigation credit due to these lands.

e. **Downstream Restoration**. ANRA proposes to secure land in fee simple and in conservation easements within the 100-year floodplain downstream of the dam to mitigate a portion of the losses of waters of the U.S. due to the project (Figure 6). As noted in Table 4.1, ANRA's goal is to purchase 2,500 acres in the floodplain downstream of the dam for forested wetlands restoration and enhancement.

   Assuming that functional capacities indices (FCI) for the wetland functions including temporary water storage, maintenance of plant and animal communities, and removal and sequestration of elements and compounds can be improved by factors of 0.35, 0.7, and 0.29, respectively, ANRA proposes to compensate for impacts to these three functions by providing 879 FCUs for temporary storage; 1,750 FCUs for plant and animal community maintenance; and 717 FCUs for removal and sequestration (Table 4.1, Downstream Restoration Wetlands Uplift per 2,500 acres column).

   Further, ANRA's goal for downstream mitigation is to acquire 500 acres of bottomland pasture or cropland and convert it to 200 acres of shrub-scrub wetland and 300 acres of herbaceous wetlands. Assuming a functional uplift of 0.9 for these conversions, ANRA proposes to compensate for impacts to the three functions by providing 180 FCUs each for shrub-scrub wetlands mitigation and 270 FCUs each for herbaceous wetlands (Table 4.1, Downstream Restoration Wetlands Uplift per 500 acres column.).

   In addition to the fee simple land, ANRA proposes to secure an additional 500 acres of high quality (FCI=0.90) forested wetlands in the downstream floodplain to protect by conservation easement (preservation credit). Protection of such land will yield a small number of FCUs for forested and

herbaceous wetlands mitigation (Table 4.1, Downstream Conservation Easement (preservation) column).

The acquisition of both the fee simple and easement land downstream will provide additional stream mitigation by buffering stream channels on those properties and protecting them through deed restrictions or conservation easements. As noted in Table 4.1 (Stream Buffer Preservaton Downstream column), the downstream fee simple and easement properties are expected to compensate for impacts to 10,000 linear feet of intermittent streams and 18,500 linear feet of perennial streams.

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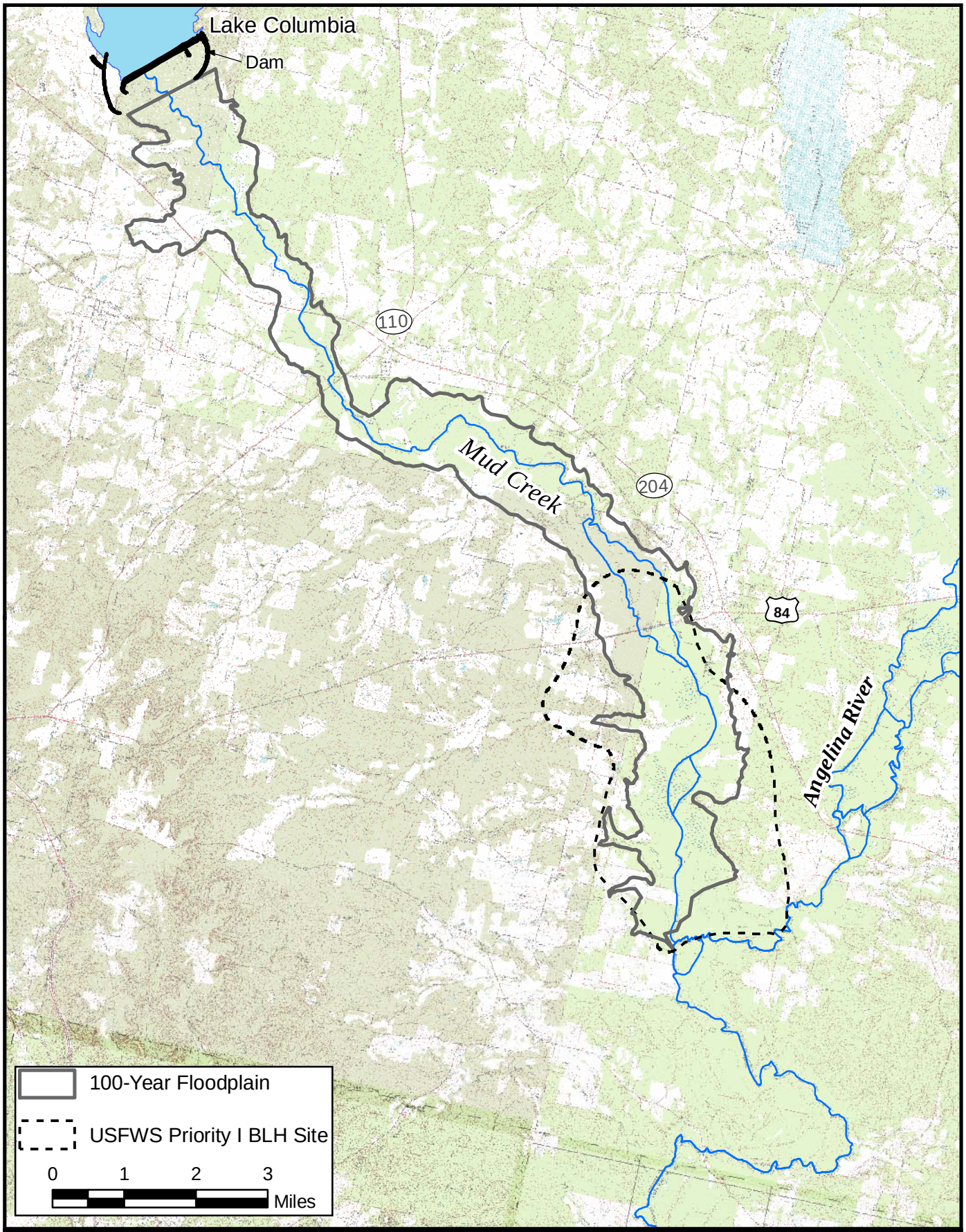

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100-Year Floodplain Downstream from Dam Site

FN JOB NO	ANR00164
FILE	Figure6.mxd
DATE	August 2009
SCALE	1:117,000
DESIGNED	BME
DRAFTED	BME

6

FIGURE

3. Off-site: Proposed off-site mitigation consists of actions involving land acquisition adjacent to the Big Thicket National Preserve (BTNP), mitigation bank credit purchases from USACE approved wetland mitigation banks, and restoration/enhancement/ creation of wetlands on other off-site lands besides the BTNP.

    a. **BTNP.** ANRA proposes to conduct a portion of its mitigation in the vicinity of the BTNP based on the fact that the Lake Columbia impacts would occur in the BTNP watershed (Figures 7 and 8); the project site is hydrologically connected to the BTNP by way of Mud Creek, the Angelina River, Sam Rayburn Reservoir, the Neches River, B.A. Steinhagen Lake, and the Neches River; the BTNP is recognized as a resource of national and international importance for its unique ecological attributes; and portions of the BTNP face threats from the sale of adjacent lands by timber companies and others that could be developed for purposes that are incompatible with the preservation goals of the BTNP. Congress has authorized the National Park Service to purchase lands within the BTNP proclamation areas, but no funding has been allocated to accomplish additional land acquisition. Land acquired for the BTNP augmentation would have to meet the following criteria in order to be considered eligible for purchase:

    - It must be contiguous with the BTNP.
    - Restoration lands must be in a degraded state (e.g., clearcut or cropland) or otherwise managed to preclude development of wetlands (e.g., pine plantation, bermed, dewatered by ditching, etc.).
    - Preservation lands must have an potential threat of disturbance (e.g., logging) or have a high potential for residential, commercial, industrial, or other intensive use that would be detrimental to adjacent BTNP property.
    - Preservation land must be undeveloped and exhibit high quality aquatic ecosystem functions (FCI=0.90 or greater) based on a Hydrogeomorphic (HGM Interim) assessment.

    ANRA proposes to acquire 2,500 acres of land adjacent to the BTNP on which to restore wetlands functions. Such restoration efforts are estimated to provide 879 FCUs for temporary storage; 1,750 FCUs for plant and animal community maintenance; and 717 FCUs for removal and sequestration (Table 4.1, Big Thicket Restoration (2,500 acres) column). These lands would be donated to the National Park Service for perpetual management and protection

upon concurrence from the USACE that the restored areas are functioning as intended. ANRA's responsibility for protection of the mitigation lands would be conveyed to the National Park Service along with the land ownership.

ANRA also proposes to purchase up to 3,500 acres of high quality (FCI-0.9) forested wetland adjacent to the existing BTNP and donate it to the National Park Service for incorporation into the preserve for perpetual management and protection (Table 4.1, Big Thicket Preservaation column). Based on the importance of the BTNP in terms of the services it provides to society and the ecological functions that exist, ANRA proposes that donating 3,500 acres of high quality forested wetlands that are contiguous with existing BTNP lands warrants a 1:2 mitigation credit ratio (as compared to a 1:10 ratio for lands not associated with the BTNP) which would result in the preservation of 1,575 FCUs for each of the three wetland functions.

It is estimated that the acquisition of 2,500 acres of restoration lands and 3,500 acres of preservation lands would provide compensation for 120,000 linear feet of intermittent streams and 222,000 linear feet of perennial streams that would fall within the mitigation lands (Table 4.1, Big Thicket Preservation/Restoration Streams column).

b. ANRA proposes to purchase one mitigation credit from an approved mitigation bank to compensate for the loss of 0.5 acre of hillside bog (Table 4.1, Puchase Mitigation Bank Credits column).

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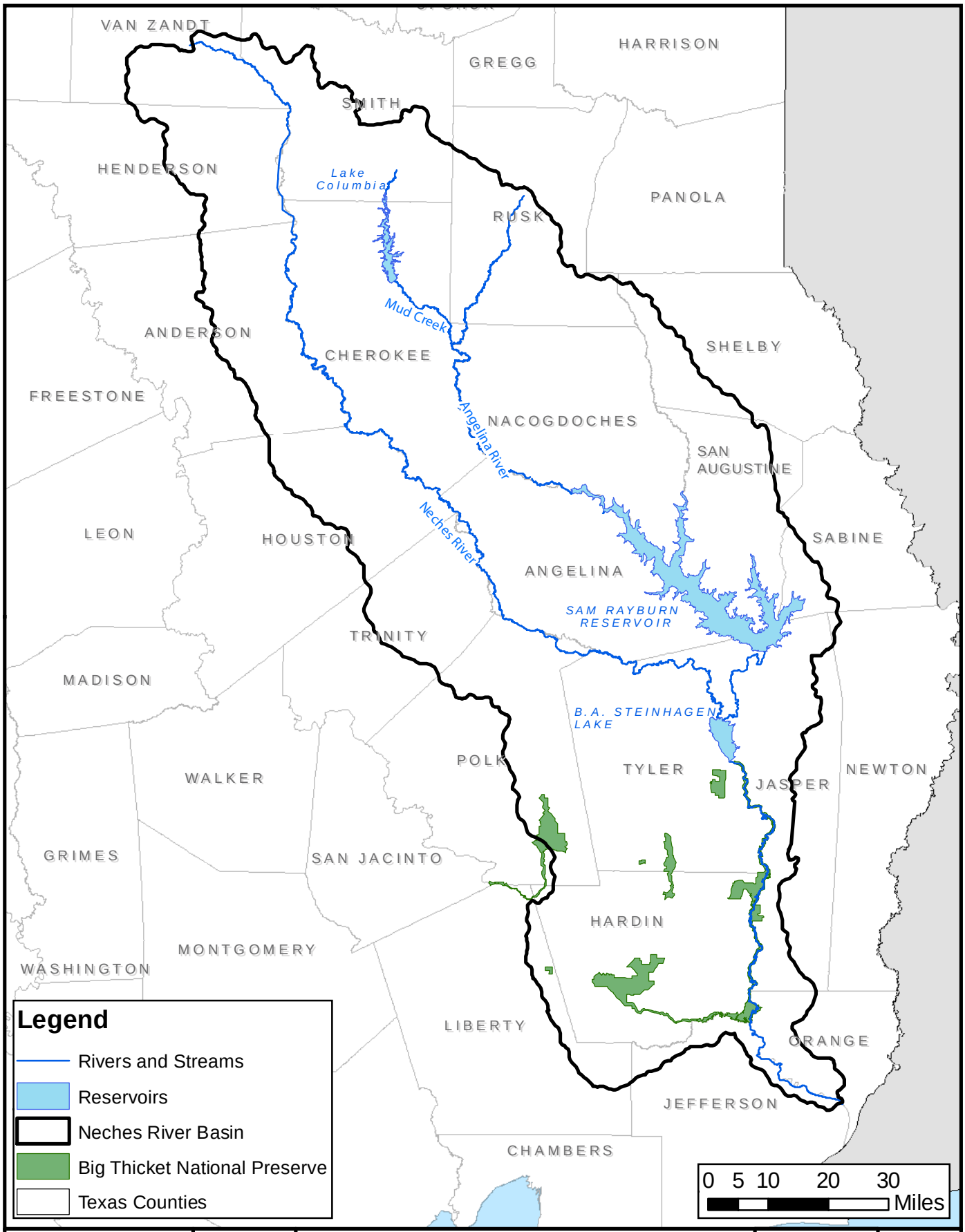


Freese and Nichols
4055 International Plaza, Suite 200
Fort Worth, TX 76109 - 4895
Phone - (817) 735 - 7300

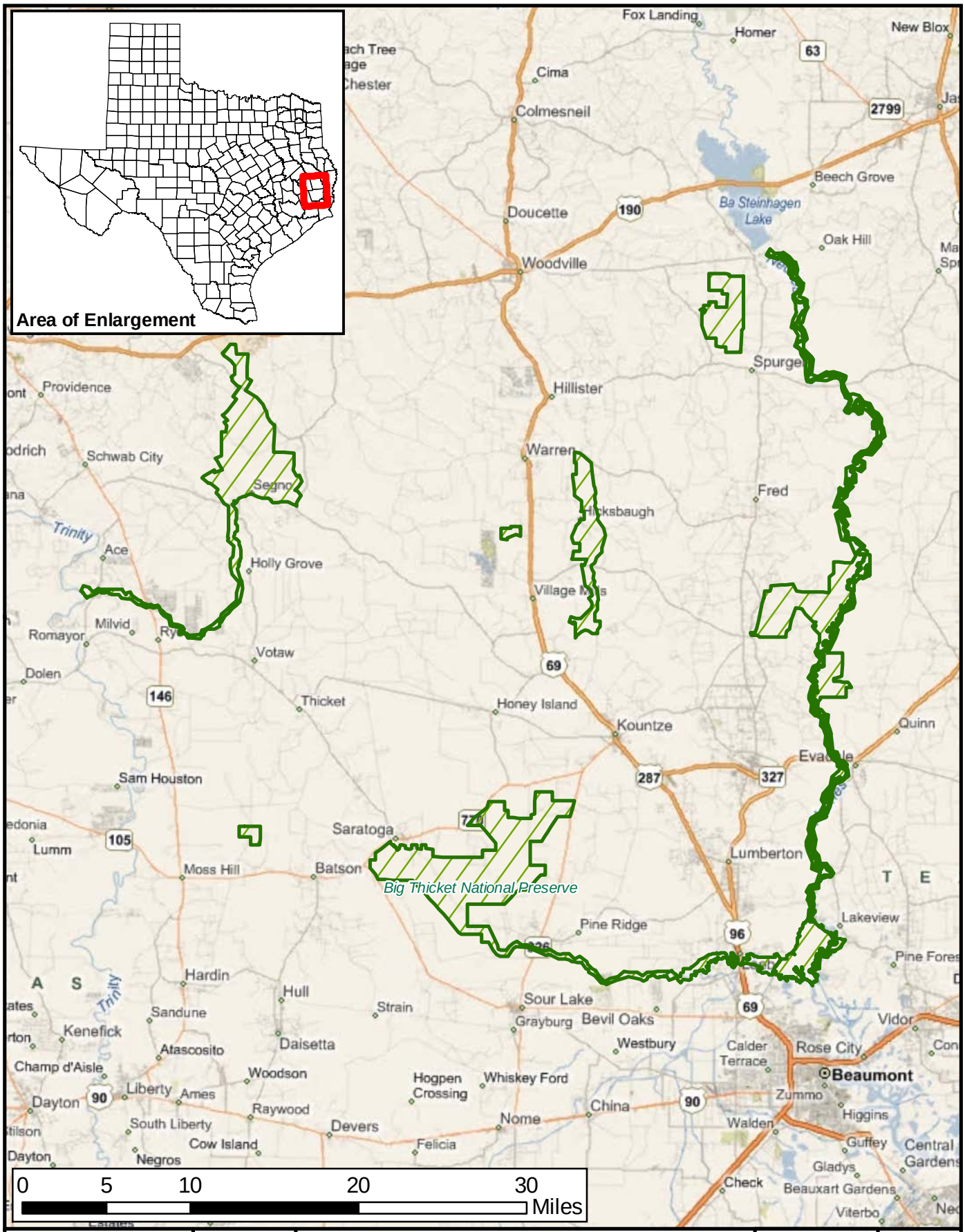
N W E S

Angelina and Neches River Authority
Lake Columbia Mitigation Plan

Location of Big Thicket National Preserve

FN JOB NO	ANR00164
FILE	NechesBasin.mxd
DATE	August 2009
SCALE	1:500,000
DESIGNED	SPW
DRAFTED	BME

7
FIGURE



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N W E S

Angelina and Neches River Authority
Lake Columbia Mitigation Plan

Big Thicket National Preserve

FN JOB NO	ANR00164
FILE	BigThicket.mxd
DATE	August 2009
SCALE	1:500,000
DESIGNED	SPW
DRAFTED	BME

8
FIGURE

c. The ANRA proposes to acquire additional off-site mitigation properties within the Neches River watershed to supplement on-site, near-site, and other off-site mitigation measures as necessary to compensate for the impacts summarized in Table 4.1.

ANRA has received a financial commitment from the TWDB which will allow the purchase of land, but the funds for land purchase will not be released until the 404 permit is issued. ANRA will commence efforts to acquire land for mitigation in the prioritized areas upon receipt of the 404 permit. As prospective wetland mitigation lands are identified, they will be assessed using the HGM Interim method, and Table 4.1 will be adjusted with the actual compensation values in terms of acres of wetlands, FCUs, and linear feet of streams. As the net gain/loss for each resource type reaches or exceeds zero, compensation for that aquatic resource will be complete. ANRA proposes to acquire mitigation lands and conduct the work necessary to balance the impacts within ten years of receiving the 404 permit for Lake Columbia.

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5.0 Mitigation Work Plan

ANRA will provide enhancement, restoration, protection, and maintenance of a bottomland forested wetland ecosystem by developing a native, self-sustaining mosaic of forest type indigenous to the Angelina-Neches River Basin. The dominant forest type would be a closed-to-partially-open canopy layer dominated by desirable tree species including water hickory, blackgum, water elm, white oak, laurel oak, overcup oak, swamp chestnut oak, water oak, cherrybark oak, willow oak, and bald cypress. Associated midstory species include American hornbeam, *Crataegus* spp., common persimmon, deciduous holly, American holly, Eastern hop-hornbeam, coral berry, *Vaccinium* spp., and possum-haw viburnum. This forest type will be supplemented by scrub/shrub wetlands, emergent wetlands, and open water areas, indigenous to the Basin. These are species anticipated to occur naturally or will be planted to achieve the desired vegetation alliance. The purpose of this mitigation work plan is to restore or enhance the existing vegetative communities, restore the desired native, bottomland hardwood wetland forest, continue to provide flood storage and sediment/element/compound retention, and increase the wetland functions from their present levels.

5.1 Tree and Shrub Plantings

A variety of tree species will be planted at varying densities and age classes with the goal of establishing the base conditions for establishment of a deciduous forested wetland on the mitigation site(s). Species selections will include fast growing species such as sycamore and cottonwood; soft mast species such as elm, red mulberry, and green ash; and hard mast such as oaks, pecan, and hickories. Species will be selected based on actual site conditions of topography, hydrology and soils.

Fast growing species will accelerate the production of canopy cover, nesting habitat for some bird species and snag habitats as the trees age and die. These species will also provide biodiversity function for the mitigation site.

Soft mast and hard mast species will be important for providing food sources for a variety of wetland species and species that utilize wetlands, including gray squirrels, white-tailed deer, cottontail and swamp rabbits, and waterfowl (wood duck, mallard, etc.). As these trees age, they will provide snags and large woody debris for nesting and refuge habitat.

A representative planting and site preparation plan for a floodplain site located along Mud Creek is presented in Table 5.1. When specific mitigation sites are selected details plans and specifications describing locations, seasons, and species to plant will be prepared for contractors to follow and comply with.

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Table 5.1 Typical tree and shrub planting plan for selected habitats at a Mud Creek floodplain mitigation site.

Riparian Corridor	Shrubs	Species	No./acre	Plantings	Comment *
		Swamp Privet	50	Shrubs shall be planted within 25' of channel	S
		Redbud	35		H
		Buttonbush	75		S
		False Indigo	50		H
	Trees	**Species**	**No./acre**	**Plantings**	**Comment ***
		Green Ash	35		S
		Sycamore	30	Live stakes	F,S
		Pecan	25	3" B/B	H
		Bur Oak	10	3" B/B	H
		Chinquapin Oak	15	3" B/B	H
		Water Oak	30		H
		Hickory	10		H
		Mulberry	10		S
			165		
Floodplain	**Shrubs**	**Species**	**No./acre**	**Plantings**	**Comment ***
		Possum Haw	15		S
		Swamp privet	25		S
		Buttonbush	20		S
		Dogwood	25		S
		Redbud	10		H
	Trees	**Species**	**No./acre**	**Plantings**	**Comment ***
		Green Ash	25		S
		Willow Oak	40		H
		Bur Oak	30	3" B/B	H
		Sugarberry	25		F,S
		Sycamore	30	Live stakes	F,S
		Cottonwood	15	Live stakes	F,S
		Swamp Oak	10		H
		Sweetgum	5		F,S
			180		
Pond/slough	**Shrubs**	**Species**	**No./acre**	**Plantings**	**Comment ***
		American Beautyberry	10	Shrubs clumped around pond/slough edges	S
		Dogwood	25		S
		Swamp Privet	20		S

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		Cherry Laurel	15		S
	Trees	**Species**	**No./acre**	**Plantings**	**Comment ***
		Green Ash	20		S
		Cottonwood	15	Live stakes	F,S
		Bur Oak	12		H
		Water Oak	25		H
Hummock	**Shrub**s	**Species**	**No./acre**	**Plantings**	**Comment ***
		Redbud	15		H
		Cherry Laurel	20		S
		Dogwood	15		H
	Trees	**Species**	**No./acre**	**Plantings**	**Comment ***
		Bur Oak	15		H
		Overcup Oak	20		H
		American Elm	10		S
		Pecan	15		H
		Hickory	10		H
		Sweetgum	5		F,S

* S=soft mast; H=hard mast; F=fast growing

6.0 MAINTENANCE PLAN

Once initial construction is completed, the Mitigation Land will be monitored as provided in the *Monitoring Requirements* and *Performance Standards* sections of this plan. In addition to corrective action as may be required, maintenance of the property will include:

- Protection from encroachment by neighboring landowners;
- Protection from timber thefts;
- Maintaining boundary markings;
- Providing for usages which do not interfere with the achieving and maintaining wetland functions;
- Replacing vegetation planted as needed to achieve survival goals;
- Controlling invasive species; and
- Taking such other action as may be necessary under the Adaptive Management Plan set out below.

The cost of the maintenance will be included in the cost for operating and maintaining Lake Columbia Reservoir which the Participants will be obligated to pay.

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7.0 Performance Standards

7.1 Target Values

The following vegetation characteristics are indices of the highest function (FCI) values for "Maintenance of plant and animal communities" in the HGM Interim model. These will be used as indicators of the effectiveness of mitigation site success..

- >90% of area is covered by woody vegetation
- At least 60% of stand is oak, hickory, or elm (black willow, cottonwood, tallow, and sycamore = < 5% of stand)
- 5 or more tree species present
- The basal area (DBH) of site averages > 100 sq ft/acre
- The site averages a tree density of 100 to 250 trees/acre
- Midstory cover averages > 50%

7.2 Herbaceous cover Survival Goals

Goals for tree and shrub planting survival will be monitored annually in September and October for years 1 through 5 after the site restoration is completed and then at years 7 and 10. The overall goal will be to have a functioning early-successional stage forested wetland established at the end of 10 years. The 10-year goal is based on growth and yield models for southern hardwoods (McTague et al.). For a moderate quality site (site index =50 based on 25 years base age) a mixed southern hardwood site should have trees with a mean height of approximately 25 feet at the end of 10 years. Part of the monitoring would be to document tree height, stem density, basal area, shrub and tree canopy cover.

The survival goals will be used as indicators of the relative success of planting and any discrepancies will be addressed as part of the Adaptive Management Plan.

7.3 Functions Goals

In addition to the survival goals, the primary goal of the overall compensatory mitigation plan is to restore and/or create a functioning forested wetland that will ***replace the lost functions and services*** of those lost by the proposed Lake Columbia Project.

At years 5 and 10, the HGM Interim model variables used for the Lake Columbia HGM Interim baseline would be sampled, calculated and compared to the mitigation sites baseline to document success. If after 10 years the mitigation site(s) have achieved net gain/loss of zero or greater as described in Table 4.1, the plan will be considered a success and mitigation implementation will be deemed complete.

Wildlife use of the mitigation site will be documented (quantitatively if practicable) during monitoring events.

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8.0 Site Protection

Mitigation land that is acquired by ANRA which is adjacent or proximate to the BTNP will be conveyed to the United States of America to be made part of the Preserve. Todd Brindle, Park Superintendent, has advised ANRA that the National Park Service has the legal authority to accept donated land. The conveyance will be made after it has been determined by ANRA that the restoration, establishment, enhancement or action to benefit lands has been successful.

On-Site Mitigation Lands acquired by ANRA in the vicinity of the reservoir will have restrictive covenants imposed upon them in the form and substance found in Appendix B. These restrictions are intended to continue the land in its desired condition in perpetuity.

9.0 Monitoring Requirements

The ANRA will be responsible for retaining a qualified staff or entity to conduct monitoring at the mitigation site at years 1 through 5 and years 7 and 10 following implementation of planting. Monitoring will be conducted by evaluating plant survival rates based 5-percent surveys of mitigation tracts using 0.1-acre plots. The HGM Interim model as employed to quantify impacts at the Lake Columbia site will be used to assess the improvement of the three wetland functions on mitigation tracts. Monitoring reports shall be prepared in letter format and will include maps, data, and photographs necessary to allow the USACE to evaluate the performance and success of mitigation efforts.

10.0 LONG-TERM MANAGEMENT PLAN

Mitigation land owned by ANRA will be monitored on a periodic basis by making visual observations after year 10 to insure that the land has continued to develop in accordance with the applicable Desired Mitigation Condition.

The East Texas area is subject to a number of events which could be detrimental to the Mitigation Land including hurricanes, floods, wildfires, tornados, and other similar types of occurrences. The impacts from these events may require corrective actions in order to maintain or obtain the appropriate functions. Any corrective action taken will be consistent with this Mitigation Plan. Any proposed action which will result in a modification of a mitigation site will be submitted to the Corps for its prior approval. Corrective actions consistent with the Texas Forest Service BMPs will not require prior approval.

The cost of the maintenance shall be included in the cost for operating and maintaining Lake Columbia Reservoir. In the contracts between ANRA and the Participants, the Participants will be obligated to pay the annual operating and maintenance expenses.

Long term management may also require prescribed burns of forest lands, control of invasive species, and maintenance of topographic features to control hydrology. Likewise, cost of insuring compliance with conservation restrictions will be a part of the operation and maintenance expense payable by the Participants.

Upon a determination that a Big Thicket preservation tract meets the compensatory mitigation requirements, the tract of Big Thicket mitigation land will be conveyed to the United States of America to become part of the BTNP. Once Big Thicket mitigation land has been transferred to the United States of America, the BTNP will provide for the long term management. For other Mitigation Land, the long term costs will be included in the operation and management costs of Lake Columbia which will be an obligation of the Lake Participants.

ANRA will give the District Engineer sixty (60) days written advanced notification before any action is taken to void or modify Conservation Restrictions, this Mitigation Plan, or to transfer the legal title to the Mitigation Lands other than to the United States of America. Upon the transfer of title to the United States of America, ANRA shall give the District Engineer a copy of the recorded conveyance.

11.0 Adaptive Management Plan

The following elements will be monitored and evaluated during monitoring events to determine whether any corrective action needs to be implemented.

11.1 Hydrology

If baseline hydrological conditions or modified conditions created as part of the mitigation plan are not supporting the conditions need for a functioning forested wetland, then the problem will be assessed using hydrological/hydraulic modeling, on the ground surveys, etc. to provide solutions.

The creation of beaver dams or other natural events modifying hydrology will not be considered a problem unless the event is detrimental to the overall functioning of the site.

11.2 Topography

Any topographical modifications made as part of the mitigation plan will be monitored for effectiveness. If there is evidence that features created (ponds, swales berm/hummocks, etc.) are not “working” attempts to modify them will be made to the extent practicable without damaging the other features of the site.

11.3 Biology – Plant and Animal Communities

The functioning of the site will be monitored using HGM Interim as described above. If a site is not performing as expected, then the results of the HGM Interim

sampling can be used to identify variables that need to be improved. This will be the basis of any additional habitat enhancements such as additional planting, selectively cutting trees, modifying topography, etc.

11.4 Invasive Species

The presence of invasive species is unwanted and to the extent that other desirable species would not be harmed, plans will be developed and implemented to control invasives.

12.0 Financial Assurances

The funds to carry out this Mitigation Plan will come from the proceeds of bonds which will be issued only after ANRA has entered into contracts with the State of Texas, cities, water supply corporations, industries, and other entities for the sale and purchase of water from Lake Columbia. The money to purchase mitigation land and/or easements will be borrowed as part of the funding for reservoir site acquisition. ANRA and the TWDB have previously entered into a Master Agreement for the Lake Columbia Project, to provide the terms and conditions for the TWDB involvement. The TWDB has committed over $64,000,000 for the next phase of the project costs. ANRA has also included in its development budget, funds ("Mitigation Fund") to be used for restoring, enhancing, establishing, and/or preserving tracts to produce the required mitigation.

13.0 References

U.S. Army Corps of Engineers. 2009. Lake Columbia Regional Water Supply Project Draft Environmental Impact Statement.

Freese and Nichols. 2003. Lake Eastex [Columbia] Planning Studies Final Report. Prepared for Angelina and Neches River Authority and Texas Water Development Board. May 2003. Fort Worth, Texas

McTague, John Paul, Daniel J. Robison, David O'Loughlin, Joseph Roise, and Robert Kellison. 2006. Development of Growth and Yield Models for Southern Hardwoods: Site Index Determinations. In, Connor, Kristina F., ed. 2006. Proceedings of the 13th Biennial Southern Silvicultural Research CConference.

Gen. Tech. Rep. SRS–92. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 640 p.

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Appendix A

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LAKE COLUMBIA

WATER QUALITY REGULATIONS

The State of Texas has conferred on the Angelina and Neches River Authority ("ANRA") the authority and responsibility to develop and maintain Lake Columbia so that the quality of water flowing into, stored, and diverted from it will be of the highest quality. This authority and responsibility is derived from Senate Bill 1362 (78th Leg. Ch. 1230), Texas Water Code Chapter 26, Texas Special Local Districts Code Chapter 8501, Texas Constitution Article 16, Section 59, and other laws. After public notice and hearing, ANRA has adopted the regulations set out below, which it may amend from time to time, in order to protect water quality while at the same time provide for the use and enjoyment of Lake Columbia..

SECTION 1

Definitions. The following definitions are used in these Regulations unless another meaning is specifically stated. All locations are in relation to the shores of Lake Columbia.

1.01 "MSL" means an elevation with reference to mean sea level.

1.02 "Construction Regulated Zone" means land located at or above 315 feet MSL and below 330 MSL and in the locations shown on the attachments labeled "Construction Limits."

1.03 "No Discharge Zone" means the land located horizontally 2000 feet from the 315 feet MSL elevation.

1.04 "100 Year Flood Level" means 323.4 feet MSL.

1.05 "On-site Sewage Facility" ("OSSF") means a system defined in Texas Health and Safety Code Sec 366.

1.06 "Effective Date or Effective Dates" means the day or days established in an Order adopted by ANRA after which compliance with these Regulations will be

required. The Order, as may be amended, will be recorded in the Real Property Records of both Smith and Cherokee Counties.

1.07 "Forestry BMPs" mean the Best Management Practices established, from time to time, by the Texas Forest Service

1.08 "Lake Columbia Watershed" means all land draining into Lake Columbia.

1.09 "Lake Columbia" means the reservoir project authorized by Permit to Appropriate State Water Number 4228 (Application No. 4537) held by ANRA.

1.10 "Large or Significant Development" means a development that ANRA believes may have a direct water quality impact on Lake Columbia.

1.11 "Nonpoint Source Pollution" ("NPS") means pollution that is caused by or attributable to diffused sources such as land runoff, precipitation, or percolation.

1.12 "Best Management Practices" ("BMPs") mean those practices, including but not limited to Forestry BMPs, that prevent or control nonpoint source pollution.

1.13 "Pollution" has the same meaning as given in Texas Water Code Chapter 26, as amended.

1.14 "Lake Columbia Water Quality Regulations" mean these regulations adopted and as may be amended, by ANRA for the protection and preservation of the water in Lake Columbia.

1.15 "Shoreline Habitat Plan" means a plan that addresses the Shoreline and/or the Streamside Management Zone in the Forestry BMPs.

1.16 "Shoreline Habitat Zone" means the area along the Shoreline.

1.17 "Subdivided" means the division of land into two or more tracts which is not exempt under Texas Local Government Code Chapter 232.

1.18 "Subdivision" means land which has been subdivided.

1.19 "Shoreline" means the extended point where the plane of the surface of water stored in Lake Columbia touches land up to the 100 year Flood Level.

1.20 "Commission" means the Texas Commission on Environmental Quality or its successor or agency.

1.21 "Agricultural Activities" means all activities associated with the production of livestock or use of land for planting, growing, cultivation and harvesting crops, or participation in a wildlife management plan.

1.22 "Utility Line" means any wire, cable, pipe or any other type of conveyance for the transmission of gas, liquid, electronic signal, electricity, telephone service, cable television service or any other type of service whether public or private.

1.22 "Development" means all land modification activity, including the construction of buildings, roads, paved storage areas and parking lots. Development also includes, but is not limited to, any land disturbing construction activities or human-caused change of the land surface including clearing of vegetative cover, excavating, leveling, grading, contouring, mining and the deposit of refuse, waste, or fill. Care and maintenance of lawns, gardens and landscape vegetation, agricultural activities and activities subject to "Forestry BMPs" are not included within this definition.

SECTION 2

Pipelines and Utilities

The construction and installation of pipelines and utility lines in Lake Columbia is prohibited.

APPROVED 8/7/07

SECTION 3

Solid or Hazardous Waste Facilities

3.01 Construction of or enlargement of existing Hazardous or Municipal Solid Waste facilities including receiving and transfer facilities are prohibited within the Lake Columbia Watershed except for Municipal Solid Waste within the incorporated limits of the Cities of Tyler, Jacksonville, New Summerfield, Troup, Whitehouse, and Bullard or owned by or operated by one of said cities.

3.02 Petroleum storage tanks ("PST") with a capacity greater than 100 gallons are prohibited in the No Discharge Zone without the approval of ANRA.

SECTION 4

Forestry Activities:

Forestry BMPs are mandatory for all forestry activities in the No Discharge Zone.

SECTION 5

No Discharge Zone.

5.01 After the Effective Date, OSSF are not allowed in the No Discharge Zone on: (1) a lot less than 0.75 acres in size if the improvements are connected to a public water supply; (2) a lot less than 1.25 acres that is not connected to a public water supply; or (3) on any lot which can practicably be served by a sewage collection and treatment system permitted by the Texas Commission on Environmental Quality (the"Commission") .

5.02 OSSF may be allowed in the No Discharge Zone, except as provided in 5.01 above, provided the OSSF has received a permit as provided below and it does not discharge pollution.

APPROVED 8/7/07

5.03 All On-Site Sewage Facilities must be designed by either a registered professional engineer or a registered professional sanitarian. Plans for an OSSF, along with all applicable fees and other information which may be required by ANRA, must be submitted to ANRA for its review and approval prior to beginning construction. Upon its review and approval, ANRA shall issue a permit to the property owner for the system. ANRA shall make available to the public the forms and design criteria for OSSF.

5.04 All OSSF permits shall remain subject to the continued jurisdiction of ANRA and shall be cancelable upon reasonable notice for failure to comply with applicable laws, regulations and requirements.

5.05 ANRA shall adopt application forms, design criteria, maintenance requirements, fee schedules, and other requirements from time to time which shall be incorporated by reference into these Regulations. The requirements may be more stringent and restrictive than those established by the Commission, Cherokee County or Smith County for OSSF.

5.06 Erosion is prohibited in the No Discharge Zone. Property owners are required to take action to prevent erosion from occurring on their property and to immediately abate any erosion on it. Property owners may be relieved of the duty to abate erosion occurring on their property if they can show to ANRA's satisfaction that the erosion is caused by natural forces.

SECTION 6

Construction Regulated Zone.

6.01 Owners of property adjacent to the Construction Regulated Zone ("Adjacent Owners") may be granted permission to use this Zone but are limited in what can be constructed on it. The general rules are that nothing can be constructed in this Zone which will decrease the storage capacity of the Lake, be a source of contamination, or significantly impact aquatic or terrestrial habitat.

6.02 Adjacent Owners may construct piers, docks, and other water front facilities in the Construction Regulated Zone after applying to and receiving from ANRA a license to do so. Each application will be evaluated on a case by case basis consistent with applicable construction regulations.

SECTION 7

Land Development

7.01. Any person who proposes to subdivide land within the Construction Regulated Zone, except for land within the municipal limits or extraterritorial jurisdiction of the Cities of Tyler, Whitehouse, and Troup, must submit to ANRA the plat or plats required under the Subdivision Regulations of Smith County or Cherokee County.

7.02 In addition to the County Requirements, the Subdivider must provide a Non-point Source Pollution control plan for both the construction of any roads, utilities, parking lots, or other improvements associated with the development and any impervious cover that will remain on the property.

7.03 Any Shoreline property that is to be Subdivided must contain a Shoreline Habitat Plan that states how the Shoreline habitat will be maintain, restored and protected as well as means and methods of stabilizing the Shoreline to prevent erosion. At

least sixty percent (60%) of all Shoreline within 50 feet of the 315 MSL Level must be maintained in a natural condition. No modification within the Shoreline as defined in these Regulations is permitted without prior written consent from ANRA. The purpose of the Shoreline Habitat Plan is to prevent sedimentation within the lake, prevent erosion along the shoreline, to filter and remove nutrients from runoff into the lake and to provide a productive wildlife habitat. Shoreline Habitat Plans shall be reviewed on a case by case basis as necessary, consistent with the purpose stated herein, and any such review shall be based upon the following considerations:

a. Slope, soil type and other characteristics within the area to be covered by the Shoreline Habitat Plan.

b. Exotic invasive species as identified by the Texas Parks and Wildlife Department or Commission, United States Fish and Wildlife, the Texas Department of Agriculture, the Texas Commission on Environmental Quality, any branch or part of the United States Department of Agriculture or the United States Environmental Protection Agency are prohibited.

c. Use of native species over non-native species.

d. Use of non-natural shoreline materials such as sea walls, bulkheads, rip rap and other hard shoreline materials will be considered on a case by case basis.

e. Any other factors peculiar to the site being considered and determined, by ANRA, to be relevant.

7.04 In determining whether Development is a "large or significant development" as defined by Rule 1.10 ANRA shall consider the following:

a. the size of the development;

b. the character of the development (residential, commercial, industrial, etc.);

c. the amount of impervious cover;

d. proximity to Lake Columbia and/or streams, rivers or creeks draining into Lake Columbia; and

e. other factors the ANRA considers relevant.

7.05 All Development within the No Discharge Zone equal to or greater than one (1) acre, must comply with TCEQ TPDES General Permit No. TXR150000. Development of less than one (1) acre must control run-off and sedimentation from the Development so as to prevent discharges that would cause or contribute to a violation of water quality standards or that would fail to protect and maintain all existing designated uses of Lake Columbia.

ADOPTED this ___ day of _____, 2007.

_____
President

ATTEST:

_____
Secretary

APPROVED 8/7/07

Appendix B

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CONSERVATION RESTRICTIONS

This declaration of Conservation Restrictions is made on _____, 200__, by the Angelina and Neches River Authority, a Texas conservation and reclamation district.

RECITALS

1. ANRA is a conservation and reclamation district organized under Texas Constitution Article 16, Section 59, and Texas Local Special Districts Code Chapter 8501, and is the sponsor of the Lake Columbia Regional Water Supply Reservoir Project ("Lake Columbia") to be located on Mud Creek a tributary of the Angelina and Neches Rivers, in Cherokee and Smith Counties, Texas.

2. ANRA has applied to the U.S. Army Corps of Engineers (USACE) for a permit to be issued under Clean Water Act Section 404. As a requirement of the 404 Permit, ANRA has submitted, and the USACE has approved, a Mitigation, Conservation, and Protection Plan ("Mitigation Plan") to mitigate for the impacts that Lake Columbia is expected to have upon the Waters of the United States.

3. ANRA has acquired the property described below in furtherance of the Mitigation Plan and has and will be taking action to restore, establish, enhance, and/or preserve wetlands

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and other habitat on it. The property ("Property") subject to the Conservation Restrictions is described as follows:

4. In accordance with both the doctrines of restrictive covenants, easements, and implied equitable servitudes, ANRA desires to restrict the property in accordance with the covenants, conditions, and restrictions set forth below.

NOW, THEREFORE, IT IS DECLARED that all of the Property shall be held in and on subject to the following easements, restrictions, covenants, and conditions.

1. **PROHIBITED PROPERTY USES.** Any activity on or use of the Property inconsistent with the purposes of this Conservation Restriction and the Mitigation Plan is prohibited. Without limiting the foregoing, the following is a listing of activities and uses which are expressly prohibited.

1.1 Subdivision. The Property may not be divided, subdivided or partitioned.

1.2 Plants. No invasive or noxious plant species with known potential for escaping control such as

ligustrum, Chinese tallow, Kudzu, and others as listed by the U. S. Department of

Agriculture as noxious weeds and plants, may be knowingly introduced.

1.3 Construction. There shall not be any further construction of roads, buildings, structures, or other improvements on the Property.

1.4 Mineral Extraction. The extraction, mining, or removal of soil, sand, gravel, rock, peat, sod, or other surface minerals by any surface mining method is prohibited. Surface mining is not allowed.

1.5 Excavation. Except as necessary to accommodate activities expressly permitted under these Restrictions, there shall be no ditching, draining, filling, excavating, dredging, removal of topsoil, sand, gravel, rock, minerals or other materials, mining, or removal of surface minerals, nor any building of roads or change in the topography of the Property or disturbance in the soil in any manner.

1.6 Destruction of Plants, Disturbance of Natural Habitat. Invasive and exotic plants shall be controlled as needed. Plants on the prohibited list

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referenced in Paragraph 2.2 shall not be knowingly introduced anywhere on the Property.

1.7 Hydrology. Except as necessary to accommodate the Mitigation Plan, there shall be no permanent alteration or depletion of surface or subsurface water, including natural

watercourses, lakes, ponds, marshes, groundwater resources, or any other water bodies on the Property.

1.8 Signage. No signs or billboards or other advertising displays are allowed on the Property.

1.9 Dumping. There shall be no permanent storage or dumping of garbage or other unsightly or offensive material, hazardous substance, or toxic waste, nor any placement of underground storage tanks in, on, or under the Property; there shall be no changing of the topography through the placing of soil or other substance or material such as land fill or dredging spoils, except as required in the Mitigation Plan.

1.10 Pollution. There shall be no pollution of surface water, natural watercourses, lakes, ponds, marshes, subsurface water or any other water bodies, nor shall activities be conducted on the Property that would be

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detrimental to water purity or that could alter the natural water level or flow in or over the Property.

1.11 Commercial Development. Any industrial use of, or activity on, the Property is prohibited. Uses of the Property that do not negatively affect wildlife and natural habitats on the Property may be conducted, provided such uses do not undermine the Mitigation Plan. Examples are hunting, fishing, birding or other recreational activities.

1.12 No animals, livestock, or poultry of any kind shall be raised, bred, or kept on the property.

1.13 Any action that may interfere with achieving the Desired Mitigation Conditions as set out in the Mitigation Plan. 2. **COVENANTS RUNNING WITH THE LAND**. These easements, restrictions, covenants, and conditions are for the purposes of protecting the property and achieving the requirements of the Mitigation Plan. Consequently, they shall run with the real property and shall be binding on all parties having any right, title, or interest in the property in whole or in part, their successors and assigns.

3. **DURATION AND AMENDMENT.** This Conservation Restriction shall be effective from the date it is filed for record and shall be effective in perpetuity or, until

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the property is transferred and conveyed to the United States Government to be included in the Big Thicket National Preserve, or some other park or preserve established by the United States of America at which time they will be subject to the rules, conditions, regulations, and laws applicable to such park or preserve.

4. The invalidity of any one of these covenants or restrictions by judgment or court order shall in no way effect any other provision, and all other provisions shall remain in full force and effect.

5. This Conservation Declaration shall be liberally construed to effectuate the purposes of the Mitigation Plan.

SIGNED this ___ day of _____, 200__.

ANGELINA AND NECHES RIVER AUTHORITY

By:_____

President

STATE OF TEXAS §
§
COUNTY OF ANGELINA §

This instrument was acknowledged before me on the ____ day of _____, 200__, by _____, President of Angelina and Neches River Authority.

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_____
_____
Notary Public in and for
the State of Texas

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