ERDC/EL TR-12-28

Environmental Laboratory

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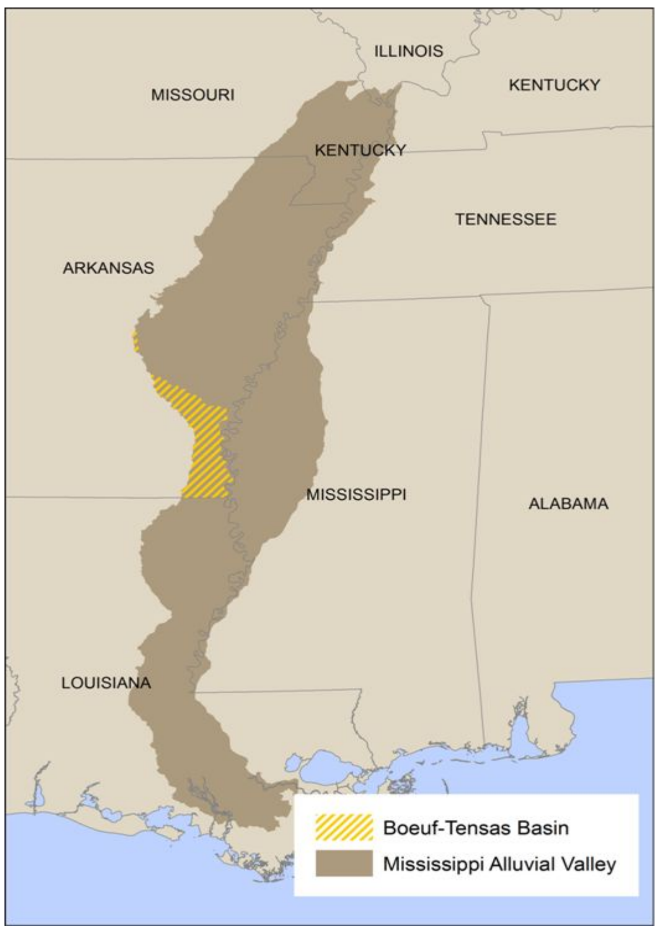
Ecosystem Management and Restoration Research Program

Potential Natural Vegetation of the Mississippi Alluvial Valley: Boeuf-Tensas Basin, Arkansas, Field Atlas

Charles Klimas, Thomas Foti, Jody Pagan, Malcolm Williamson, and R. Daniel Smith

September 2012



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Final report

Abstract

Over the past three decades, extensive field studies of wetland plant communities have been conducted in the Mississippi Alluvial Valley. These field studies have been carried out for various purposes under the auspices of federal and state research programs or in conjunction with Corps of Engineers project planning efforts. In the process, a wetland site classification approach has evolved based on hydrology, soils, and geomorphic setting. The research data and classification system have been recently used for a new purpose: to create a set of Potential Natural Vegetation (PNV) maps covering more than 26,000 square miles within the region. The purpose of PNV maps is to serve as blueprints for restoration planning and prioritization. Due to the fact that the hydrology of the landscape has been permanently changed by major flood control projects, the PNV maps do not represent the distribution of the original, pre-settlement vegetation. Rather, they identify the natural communities that are appropriate to the modern altered site conditions. By using these maps, persons interested in restoring particular tracts of land can identify the plant communities appropriate to the conditions present. Conversely, individuals interested in restoring particular plant communities can identify parts of the landscape that can support each respective type. The PNV maps are available for use in a Geographic Information System, where a range of complex restoration scenarios (such as the development of wildlife travel corridors or refuge areas) can be explored efficiently and alternative approaches can be compared to one another in terms of relative costs and ecological effectiveness. This report is one of six Field Atlases that present the same data in a downloadable, printable format at a scale of 1 inch = 1 mile.

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Preface

The Mississippi Alluvial Valley (MAV) once contained the most extensive and diverse lowland forest in North America. The complexity and productivity of the ecosystem were the result of the dynamic behavior of the large rivers that have repeatedly migrated across the landscape, eroding and depositing sediments and periodically flooding millions of acres. Since the arrival of the first European settlers in the 19th century, the rivers have been stabilized and prevented from inundating most of the former floodplain, and agriculture has largely replaced the native vegetation. The deforestation of the MAV has been recognized for more than half a century as contributing to a variety of problems such as the extinction of wildlife species and pollution of receiving waters, including the Gulf of Mexico. Various government policies and private initiatives have been implemented to reverse this damage through restoration of native plant communities.

Ecologists working to restore natural systems in the MAV have sought to understand the fundamental changes that have occurred — particularly with regard to hydrology — and evaluate the effects of these changes on ecosystem function and restorability. The state of Arkansas, with funding from the Environmental Protection Agency (EPA), initiated much of the research in this area as part of a program to develop guidebooks for hydrogeomorphic (HGM) classification and assessment of wetlands. Various Corps of Engineers offices also participated in HGM-related studies as part of impact and alternatives analyses conducted for proposed federal flood control and water development projects in the MAV. The field data and spatial information developed for some of the projects in Arkansas provided the basis for the initial Potential Natural Vegetation (PNV) maps that were intended to be used to guide restoration planning over large areas. Since then, PNV maps have been developed for all of the MAV in eastern Arkansas, northwestern Mississippi, and northeastern Louisiana, with funding from diverse sources, including Corps of Engineers District offices, EPA, the state of Arkansas, and the U.S. Fish and Wildlife Service.

PNV maps were originally intended to be used in a geographic information system (GIS), where numerous possible options for restoration design can be explored and evaluated. However, as part of their PNV efforts, the Fish and Wildlife Service also produced the first two Field Atlases–for Louisiana and Mississippi–and made the PNV maps available as downloadable products intended to be printed and bound for field use (http://www.lmvjv.org/bookshelf.htm). This format proved popular, so a set of four additional atlases covering the Arkansas portion of the MAV has been developed, the current atlas being one of them. All four of these documents are available for download at: (http://el.erdc.usace.army.mil/emrrp/analyt.html*)*.

Charles Klimas, U.S. Army Engineer Research and Development Center (ERDC), Thomas Foti (Arkansas Natural Heritage Commission and Oakleaf Institute, Little Rock AR) and Jody Pagan (5-Oaks Wildlife Services, LLC, Stuttgart AR) developed the PNV concept and approach and have been the core mapping team across all of the basins. The original PNV maps upon which this atlas is based were developed for the Vicksburg District, Corps of Engineers, as part of the Southeast Arkansas Project, with the assistance of the State of Arkansas' Multiagency Wetland Planning Team. R. Daniel Smith (ERDC) participated in the field effort and assembled and processed the original project GIS data. Malcolm Williamson (Center for Advanced Spatial Technologies, University of Arkansas, Fayetteville) updated and normalized that GIS data and prepared the maps that are included in this atlas.

While various sponsors participated in the development of the original maps, as described above, this series of Arkansas PNV Atlases was prepared and published under the Ecosystem Management and Restoration Research Program (EMRRP), within the Environmental Laboratory, ERDC, Vicksburg Mississippi. Glenn Rhett is EMRRP Program Manager. Dr. Al Cofrancesco is the ERDC Technical Director for the EMRRP.

COL Kevin J. Wilson is the Commander of ERDC, and Dr. Jeffery P. Holland is the Director.

1 Introduction

Studies of wetland plant communities in the Mississippi Alluvial Valley (MAV) over the past decade have produced a site classification approach based on hydrology and geomorphic setting. The approach is consistent with the "hydrogeomorphic" or HGM wetland classification system, but it has been adapted and refined specifically to support the development of detailed maps of the Potential Natural Vegetation (PNV) of the region. The purpose of PNV maps is to serve as a template for restoration planning and prioritization in a landscape that has been highly modified. Most of the bottomland hardwood forests and other native plant communities of the MAV were converted to agriculture during the 20th century. The remnants are largely those forest types that are adapted to the wettest sites where row cropping was infeasible. At the same time, tremendous local and federal effort has been expended on drainage, flood control, and navigation projects that have permanently altered the hydrology of the floodplain and alluvial terraces in the region. Consequently, the PNV maps are not designed to represent the distribution of the original, pre-settlement vegetation; rather, they identify the natural communities that are appropriate to the altered site conditions, hence the "potential" designation. This means that persons interested in restoring particular tracts of land can identify the plant communities appropriate to the various site conditions present. Conversely, individuals interested in restoring particular plant communities can identify parts of the landscape that could support each respective type. This information is available in GIS format, so various restoration scenarios can be explored and compared in terms of relative costs and ecological effectiveness.

This atlas covers the Boeuf-Tensas Basin, in southeast Arkansas. It has been created as a field reference for professionals who plan and conduct restoration projects in that area. The maps in this atlas (Appendix A) are produced at a scale of approximately 1:63,360 (1 inch = 1 mile). As an aid to orientation in the field, each PNV map is accompanied by the corresponding aerial image on the facing page, and both pages display major roads and towns. The pages immediately preceding the maps include master indexes to the map pages, using two different basemaps to provide an overview of the mapped PNV types as well as roads and towns for orientation. Also included in front of the map section is a map key that lists all of the PNV vegetation community types present in the basin as well as the community classification code, typical site conditions, and common dominant species for each type. Appendix B follows with details on the characteristics of each comm.-unity type; these details provide guidance regarding natural topographic features and plant species appropriate for restoration. The PNV approach, mapping criteria, and typical applications are described in more detail in a separate publication (Klimas et al. 2009).

2 The Boeuf-Tensas Basin

The mapped area is located in southeastern Arkansas (Figure 1), where it is bounded on the north and east by the mainstem levee systems along the Arkansas and Mississippi Rivers, and on the west by uplands. The basin continues into Louisiana to the south, but the coverage of this atlas extends only to the state line, incorporating approximately 1.24 million acres. A separate atlas covers the Louisiana portion of the basin as well as the adjacent Macon Ridge upland and Ouachita River lowland (Klimas et al. 2011a).

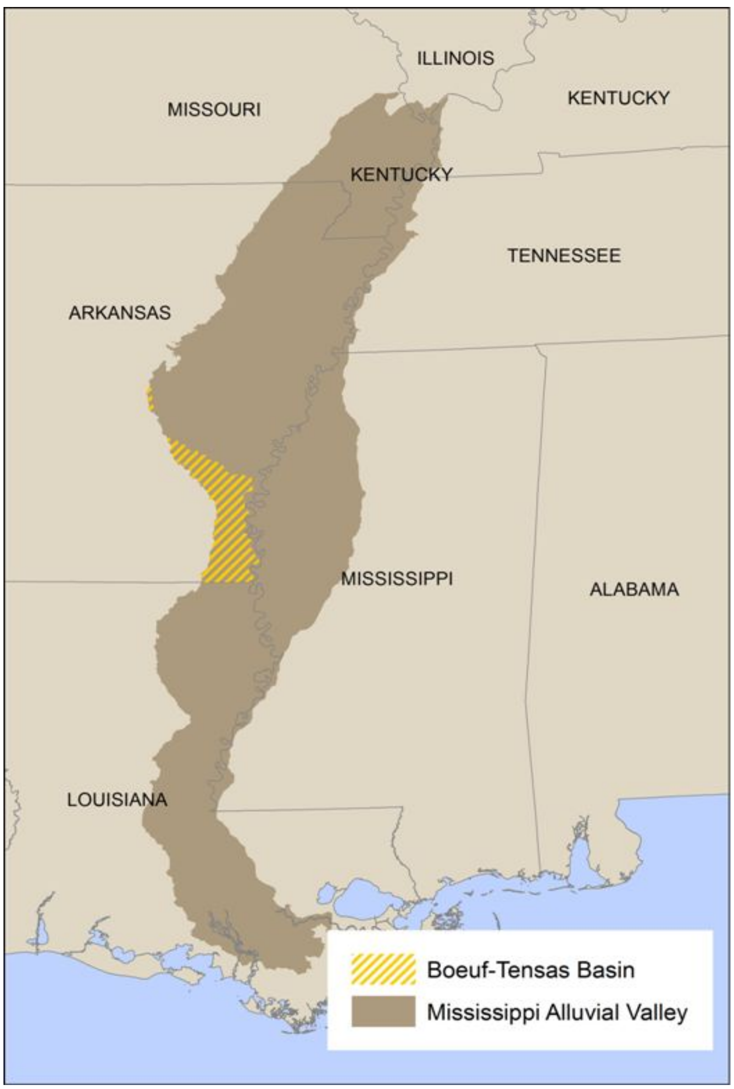

Figure 1. Location of the Boeuf-Tensas Basin in Arkansas.

There are two separate lowland areas partly separated by the northern end of Macon Ridge that are collectively referred to as the Boeuf-Tensas Basin. The Boeuf Basin is a narrow lowland on the west of Macon Ridge that consists of sediments deposited in past meander belts of the Arkansas River. It is named after the Boeuf River, but in Arkansas that stream flows entirely within the Macon Ridge uplands to the east before entering the lowlands in Louisiana. In Arkansas, the principal stream is Bayou Bartholomew, which flows within an abandoned course of the Arkansas River. To the east of Macon Ridge is the Tensas Basin, which is a very narrow area extending from the mouth of the Arkansas River into Louisiana, where it widens considerably. In Arkansas it consists primarily of backswamp deposits of the Mississippi River. Macon Ridge itself is a remnant of the glacial outwash that was deeply deposited throughout the MAV during periods of waning continental glaciation. For the purposes of this Atlas, the Boeuf-Tensas Basin is considered to include both of the two major lowland areas as well as the intervening portion of Macon Ridge and some parts of the adjacent modern meander belt of the Mississippi River where those areas lie west of the mainstem levee system.

Surface water entering the Boeuf-Tensas Basin arrives as precipitation or as runoff from the hills along the western flank of the basin. All drainage is to the south, leaving the Arkansas portion of the basin via Bayou Bartholomew, Bayou Macon, or the Boeuf River. Prior to construction of modern levees, major Mississippi and Arkansas River floods would have inundated most or all of the area, and poor internal drainage produced wet conditions over large areas even without flooding. Much of the natural drainage system has been deepened and straightened and ditches have been added to further improve drainage.

3 Using the PNV map as a model for restoration

The PNV mapping process was conceived as a way to provide the best available representation of restoration potential for the native plant communities of the MAV. One key aspect of these maps is that they reflect current, rather than historic, hydrologic patterns. This fundamental feature of the classification system — basing community designations on site conditions rather than species composition — also prevents misclassification of sites based on past management practices or other historic influences. The map legend (Appendix A) includes several ways of classifying the community types: by HGM subclass, for use with the corresponding HGM functional assessment guidebook (Klimas et al. 2011b); by site characteristics, which can be used to help guide site preparation; and by species dominance type, which lists species that frequently dominate on similar sites throughout the MAV. Note that these dominant species are not the only ones that should be included in a restoration plan for a site, and that sometimes one or more of the listed species are not common on a site type within a specific basin. Restoration planning should be based on the detailed and basin-specific community type descriptions in Appendix B. These descriptions reflect the probable long-term dominance patterns under current conditions. Forested sites sometimes will include species other than those that presently dominate. As a consequence of these characteristics, there are many possible uses for the PNV maps, including the following:

Replacement of critical habitat

The PNV mapping effort in Louisiana was initiated specifically to support restoration of potential habitat for the Ivory-Billed Woodpecker, which was prompted by its recent reported rediscovery in Arkansas. Foti et al. (2011) present a discussion of how PNV mapping can be used to help guide a restoration program of that type in the modern MAV landscape. Where critical habitat for other species is dependent on the composition, structure, and distribution of plant communities, the PNV maps can be used in similar ways to target the most effective sites for habitat restoration and population management.

Site-specific restoration design

Because the PNV maps often recognize mapping units of a fraction of an acre, they can normally inform restoration design even on relatively small or diverse sites. The site characteristics and geomorphic settings described in Appendix B indicate the extent to which a particular community tends to be affiliated with the ridges or swales of point bars; the almost-imperceptible vernal pools in backswamps; and similar subtle variations in topography that may have been moderated or eliminated by agricultural practices. Users should evaluate a particular site in light of these descriptions, and restore the appropriate topography prior to planting the area. If filling a ditch or breaking a levee is part of the restoration plan, the expected change in flood frequency will indicate establishment of a different plant community than the mapped unit, and that new "target" condition can be identified by consulting Appendix B. While all of these features will help guide restoration design, users are encouraged to adjust their site preparation and planting plans as needed based on their local knowledge, experience, and observations of actual conditions in the field. In particular, it is important to recognize that the accuracy of the community boundaries on the PNV map are limited by the precision and resolution of the underlying geomorphic, soils, and hydrology mapping, and that transitions between vegetation communities are normally more gradual than the distinct polygons on such maps imply. Similarly, where the modern hydrology is affected by structures such as roads and aquaculture impoundments, community boundaries may appear as straight lines. The authors have attempted to estimate the approximate true boundary if the structure is one that can be easily removed as part of a restoration project (e.g., a low catfish pond levee) but did not modify linear boundaries where the structure is unlikely to be removed (roads and flood-control levees) or where the topography, geomorphology, and soil data did not indicate a probable community transition location. In such cases the mapped feature appears as a rectangle and users should evaluate such modified sites individually prior to developing restoration specifications.

Landscape-level restoration planning

PNV maps can be useful for identifying restoration needs and opportunities where resource objectives involve the distribution of particular habitats over large regions. For example, in a GIS environment, it is relatively simple to identify sites appropriate for the restoration of extremely rare communities (e.g., prairies); sites that would support the maximum habitat diversity within a single large block of restored forest; or the forest communities appropriate for restoration within various sections of a lengthy riparian corridor. PNV maps directly reflect flood frequency; therefore, restoration projects can be designed to assure that flood refuge areas are included in projects intended to provide habitat for terrestrial wildlife. Because the PNV maps use the HGM classification system, they reflect other wetland characteristics of potential interest. For example, the PNV map distinguishes between sites suitable for establishing Connected Depressions and Unconnected Depressions. Though these sites support the same forest communities, the latter is far more suitable for restoring amphibian populations due to the lack of predatory fish. There are numerous similar types of applications that can add flexibility and insight to the restoration planning process.

Mitigation design

The PNV maps have several obvious regulatory and planning applications. They can be used to find suitable locations for in-kind mitigation of project impacts, or to plan mitigation in a watershed context, as is currently encouraged in various federal programs. However, because the PNV maps use the HGM classification system, they can also be used in conjunction with HGM Regional Guidebooks to help calculate the appropriate amount of compensatory mitigation for particular wetland subclasses under various impact scenarios. The HGM guidebook for the Arkansas Delta Region (Klimas et al. 2011b) includes assessment models and recovery trajectories that can be used to estimate the degree to which restored wetlands perform certain functions over time. This means that restoration priorities can be adjusted to offset the loss of particular functions, or to favor restoration scenarios that will most quickly meet particular functional needs.

This atlas and other files and documents related to Potential Natural Vegetation mapping in the Mississippi Alluvial Valley can be downloaded from http://el.erdc.usace.army.mil/emrrp/analyt.html

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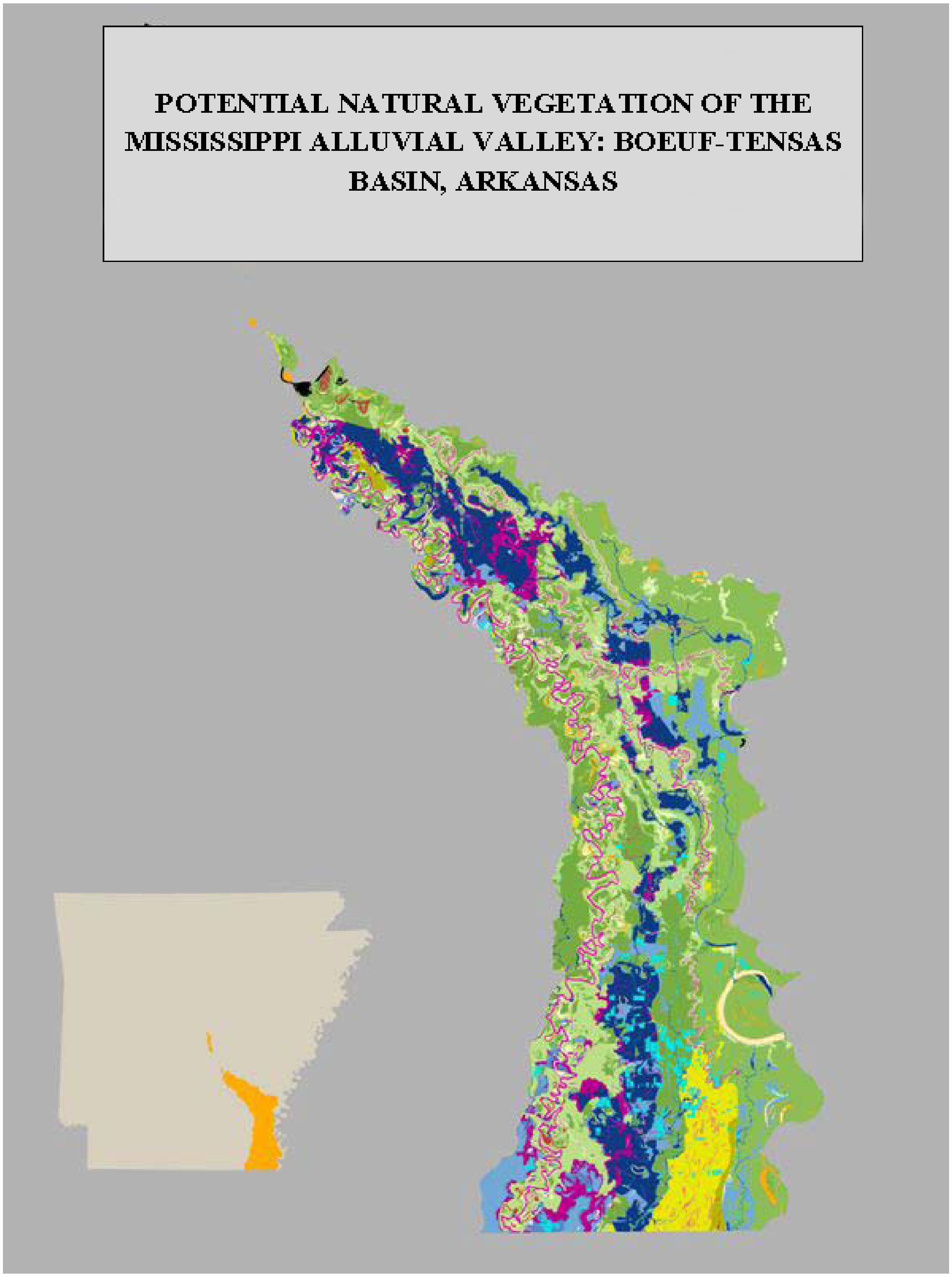
Appendix A: Field Atlas



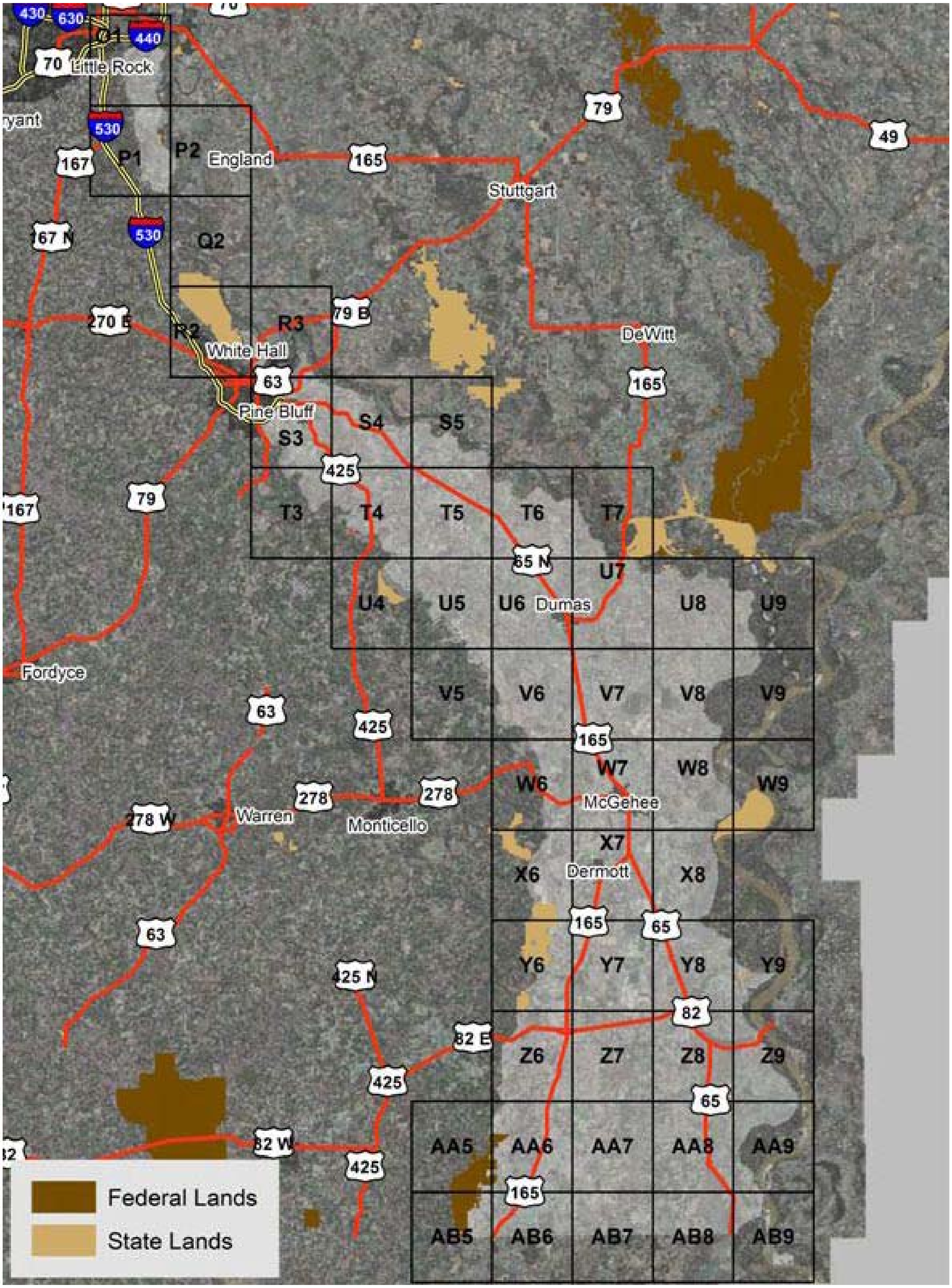


Figure A1. Boeuf-Tensas Basin Map Index: Cities, Roads, and Public Lands.

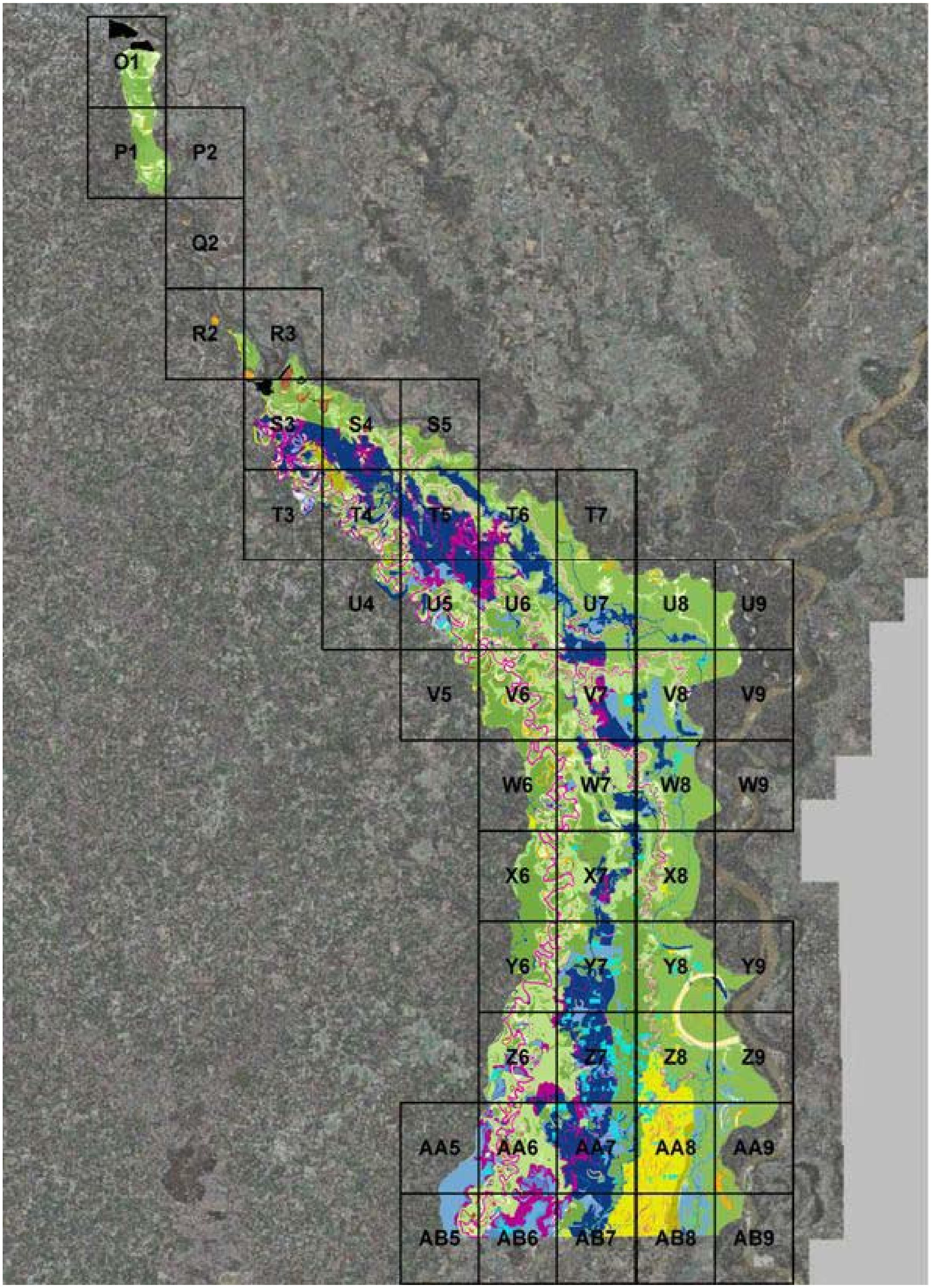
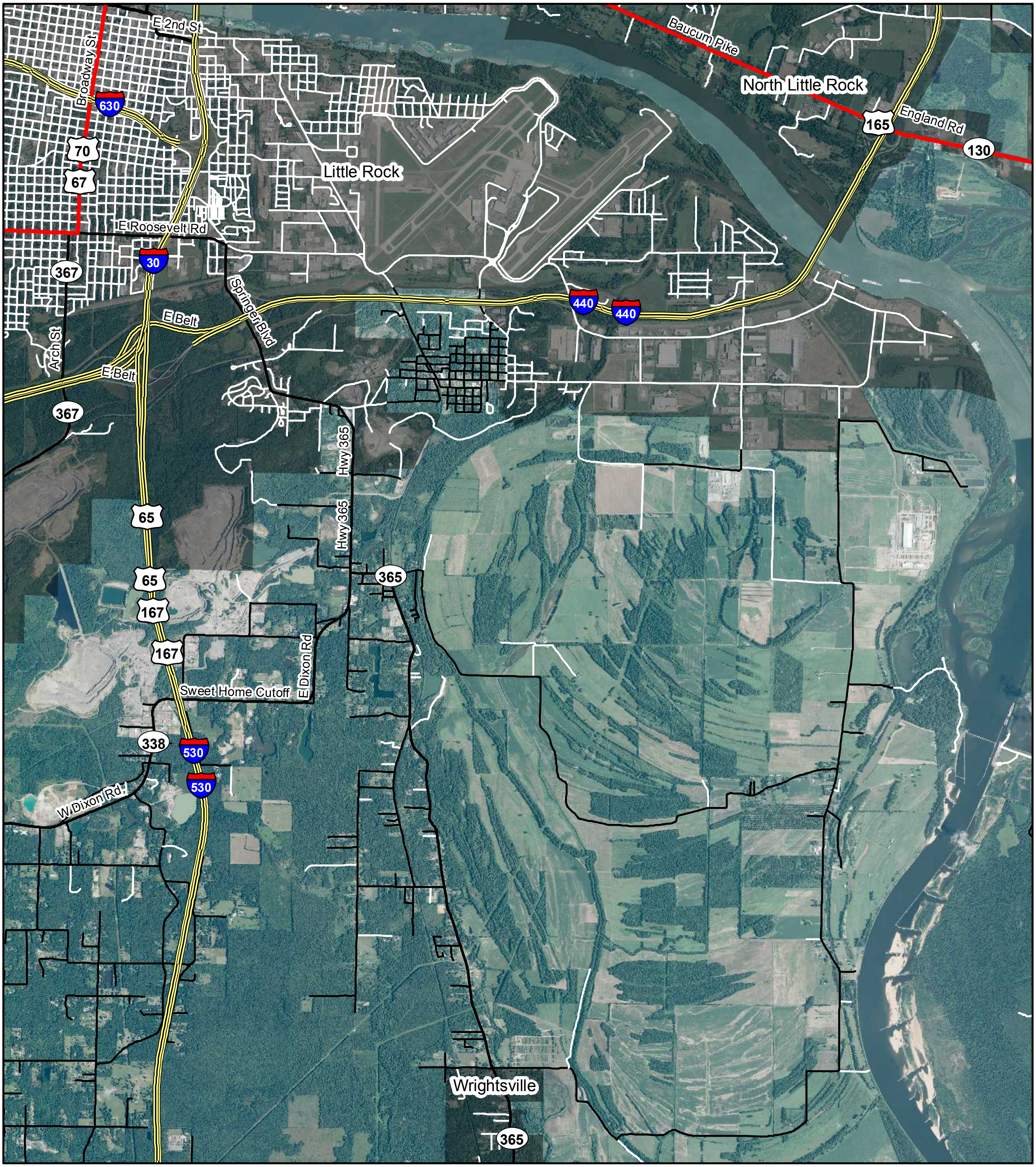


Figure A2. Boeuf-Tensas Basin Map Index: Potential Natural Vegetation.

POTENTIAL NATURAL VEGETATION MAP KEY, BOEUF-TENSAS BASIN ARKANSAS		
HGM Subclass	**General Site Characteristics**	**Principal Dominant Species**
RIVERINE BACKWATER	**WETLANDS MAINTAINED BY RIVERINE BACKWATER FLOODING**	
RB1	Occasionally flooded, well-drained lowlands	Nuttall Oak–Sweet Pecan
RB2	Occasionally flooded, moderately-drained lowlands	Willow Oak–Water Oak
RB3	Occasionally flooded flats	Willow Oak
RB4	Occasionally flooded, poorly-drained lowlands	Nuttall Oak–Sweetgum
RB7	Frequently flooded lowlands	Overcup Oak–Bitter Pecan
RIVERINE OVERBANK	**WETLANDS MAINTAINED BY RIVERINE OVERBANK AND HEADWATER FLOODING**	
RO2	River swamps in underfit channels	Baldcypress–Water Tupelo
RO3	Riverfront natural levee and point bar	Cow Oak–Pecan–Cherrybark Oak–Cottonwood
FLAT	**WETLANDS MAINTAINED BY PRECIPITATION**	
F1	High natural levees	Cottonwood–Water Oak–Pecan
F2	Well-drained recent alluvium in lowlands	Cherrybark Oak–Water Oak–Sweetgum
F3	Well-drained older alluvium in lowlands	Cow Oak–Cherrybark Oak–Water Oak
F5	Poorly-drained Mississippi River sediments	Willow Oak–Cedar Elm
F6	Poorly-drained lowlands	Nuttall Oak–Willow Oak
DEPRESSIONS	**WETLANDS IN DEPRESSIONS**	
D1	Stream-connected depressions in abandoned channels	Baldcypress–Water Tupelo
D2	Stream-connected depressions on Pleistocene outwash terraces	Baldcypress–Water Tupelo
D3	Unconnected depressions in abandoned channels	Baldcypress–Water Tupelo
FRINGE	**WETLANDS FRINGING WATER BODIES**	
FR1	Stream-connected lake and pond fringe wetlands	Baldcypress–Buttonbush–Emergents
FR2	Unconnected lake and pond fringe wetlands	Baldcypress–Buttonbush–Emergents
UPLAND	**UPLANDS**	
U2	Well-drained soils of the Pleistocene terraces	Mixed Hardwood and Pine
U3	Upland forests of the Prairie Terrace	Mixed hardwood
WATER	**WATER**	
W	Permanent water bodies other than lakes and ponds (fringe)	Streams and major drainage ditches
DEVELOPED	**DEVELOPED**	
DEV	Natural soils and geomorphic features not present	Urban areas

Figure A3. Map legend.



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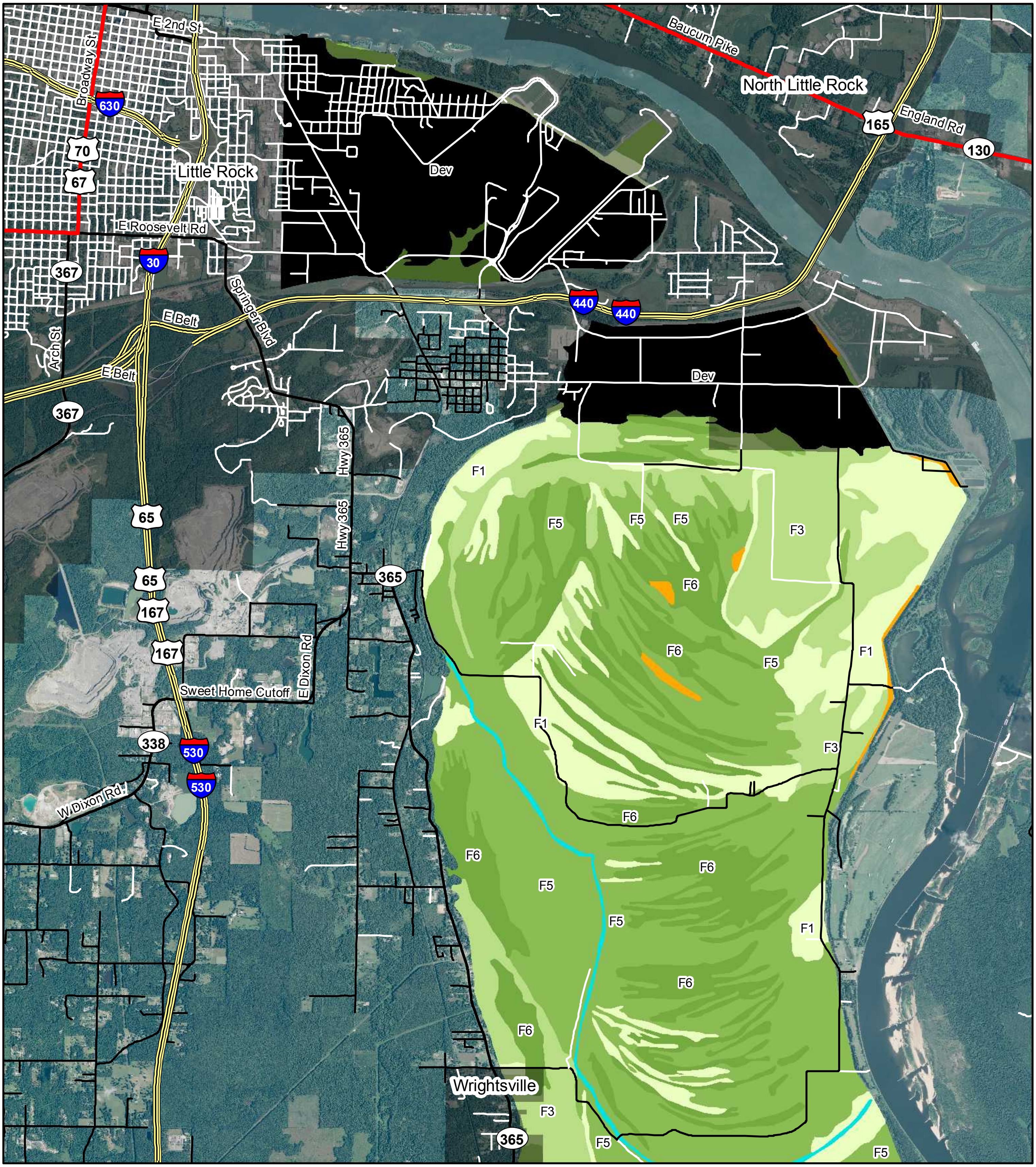

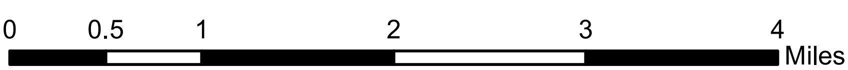

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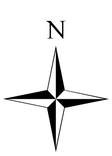

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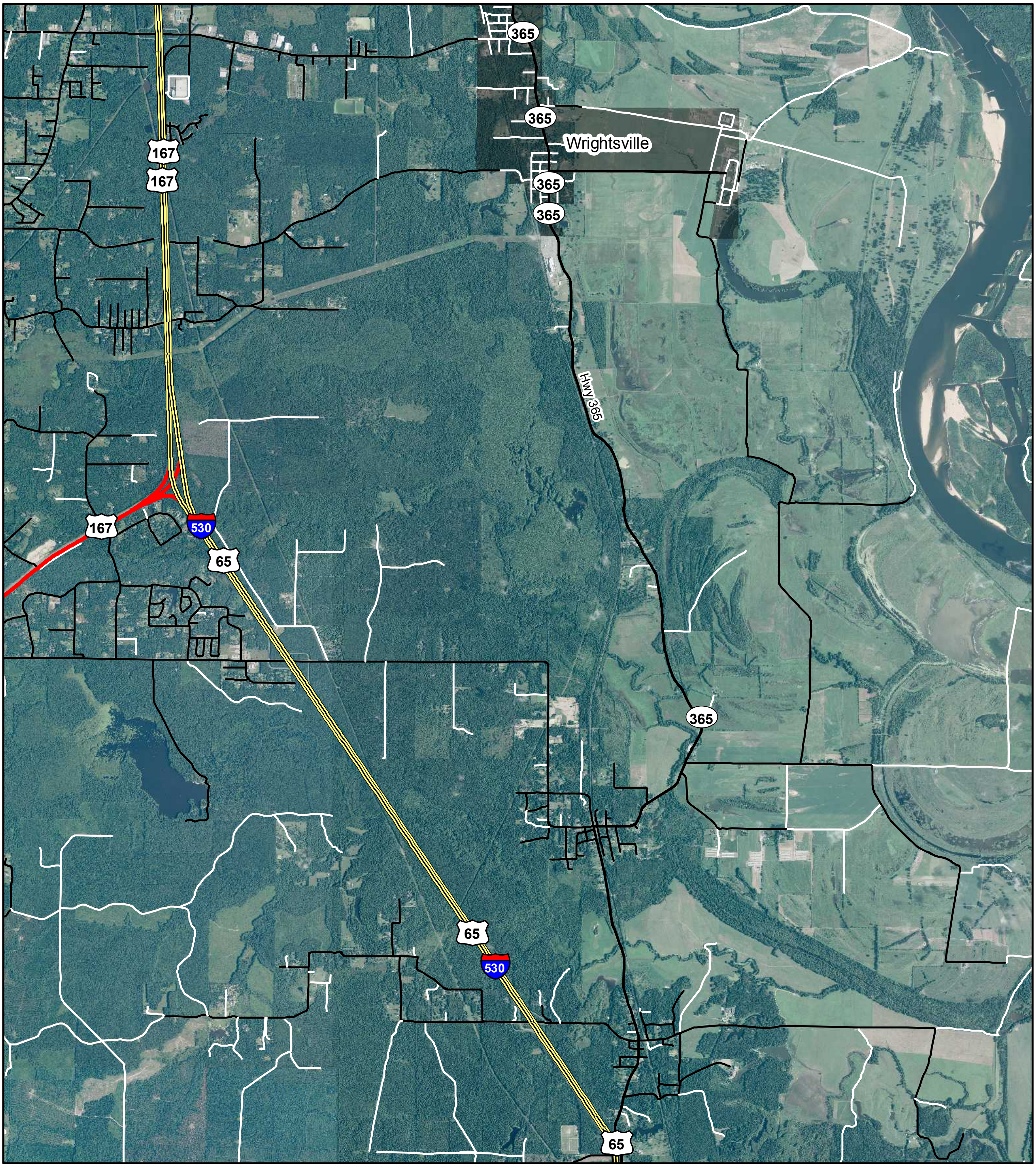

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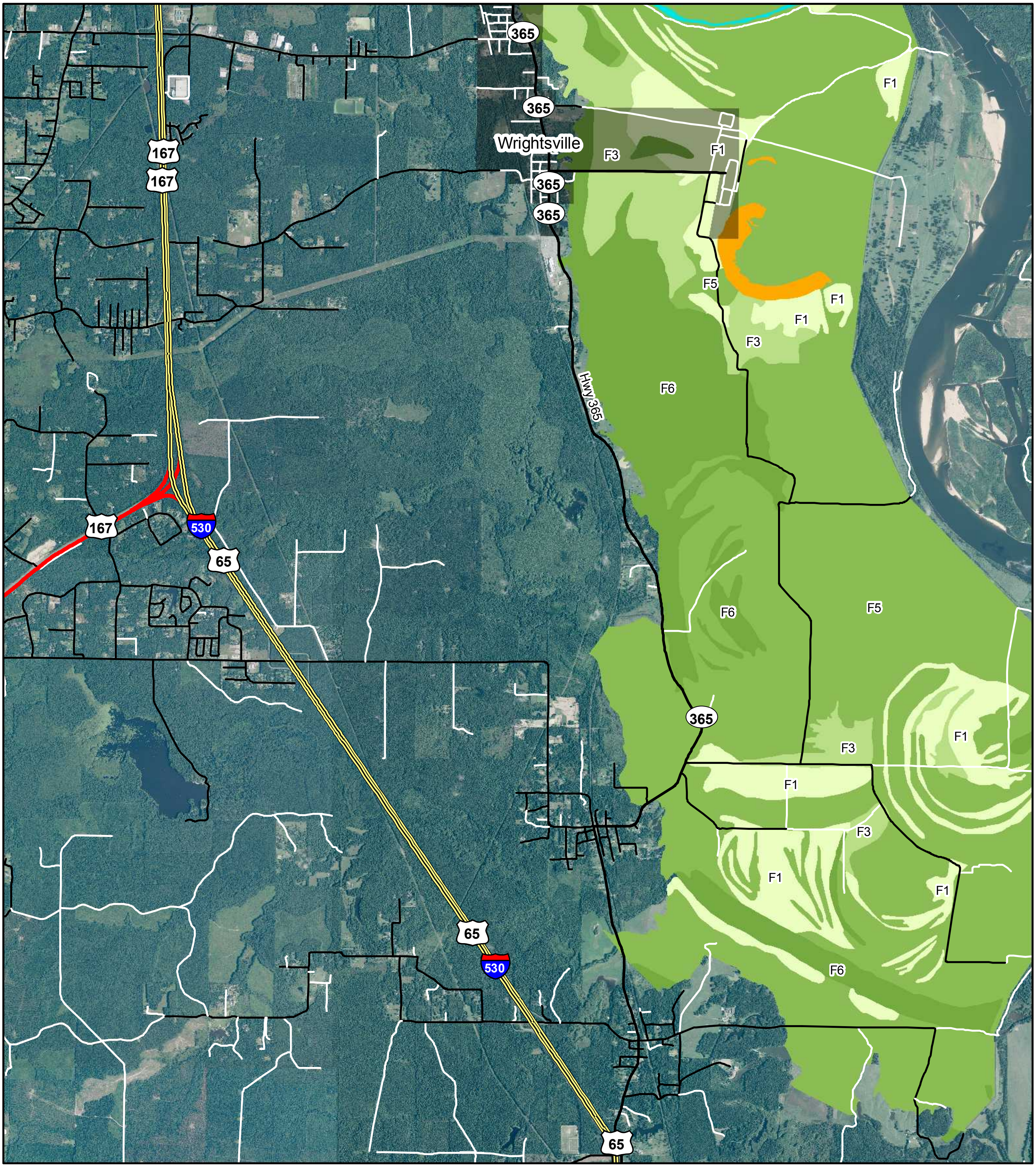

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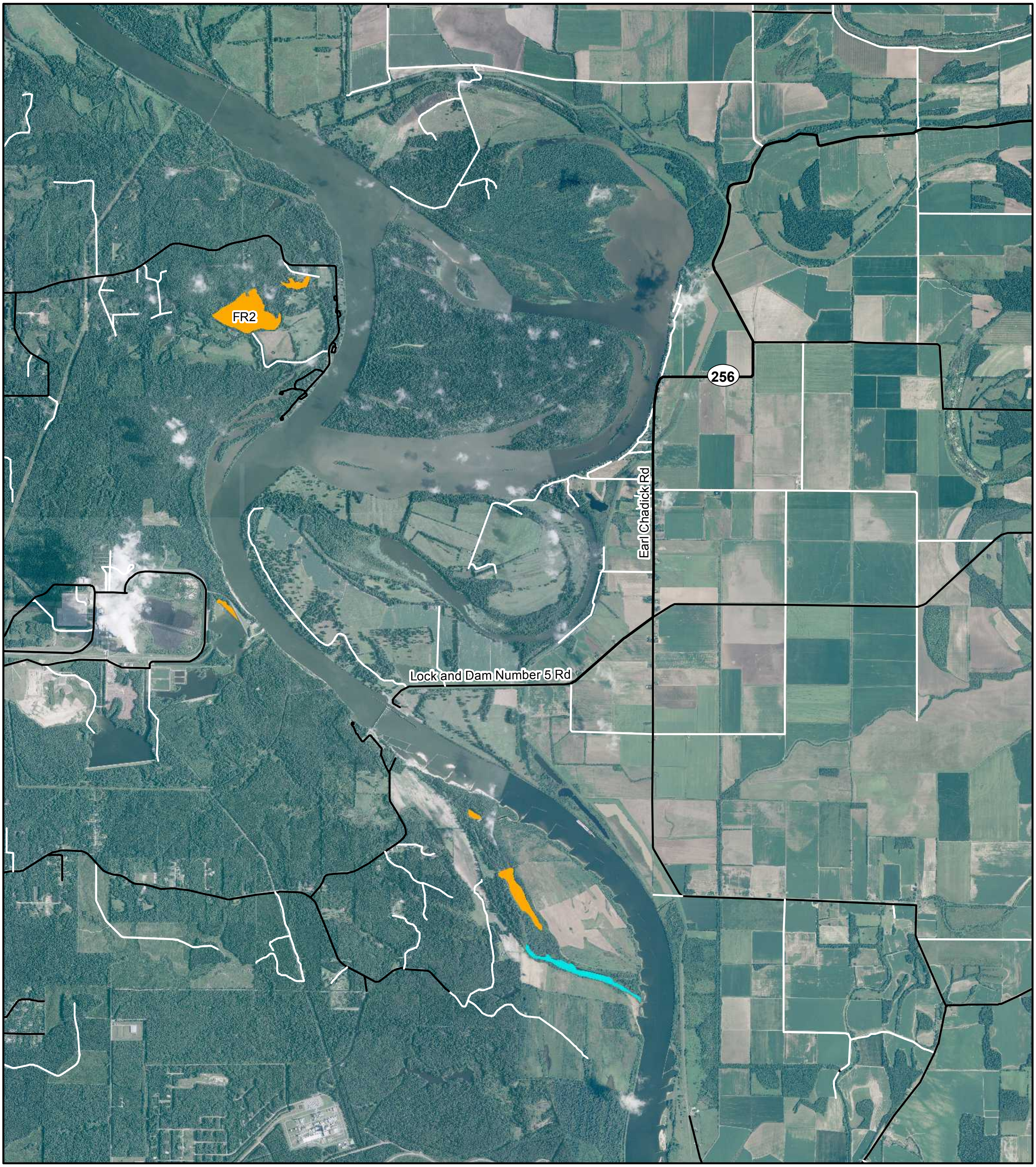

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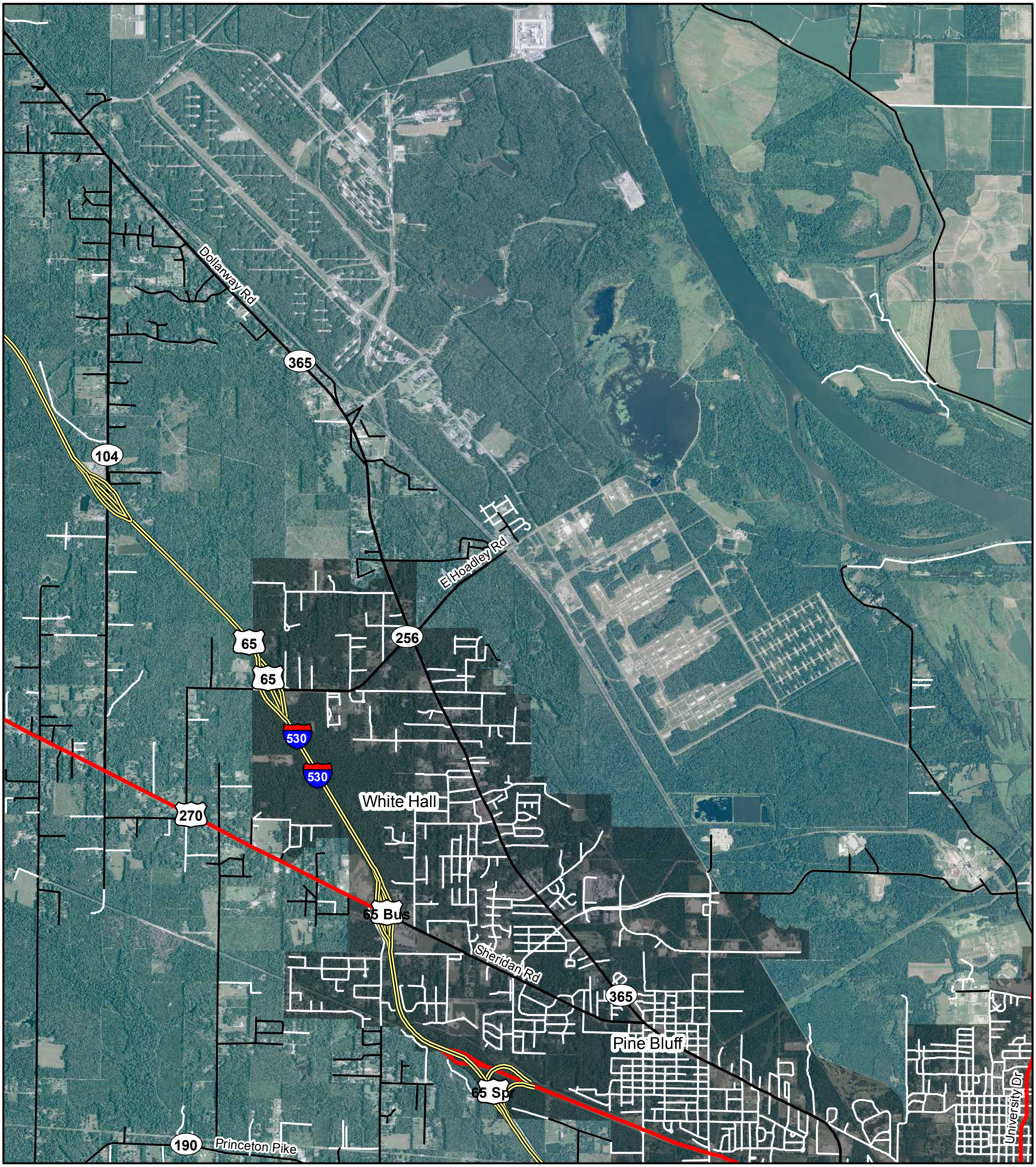

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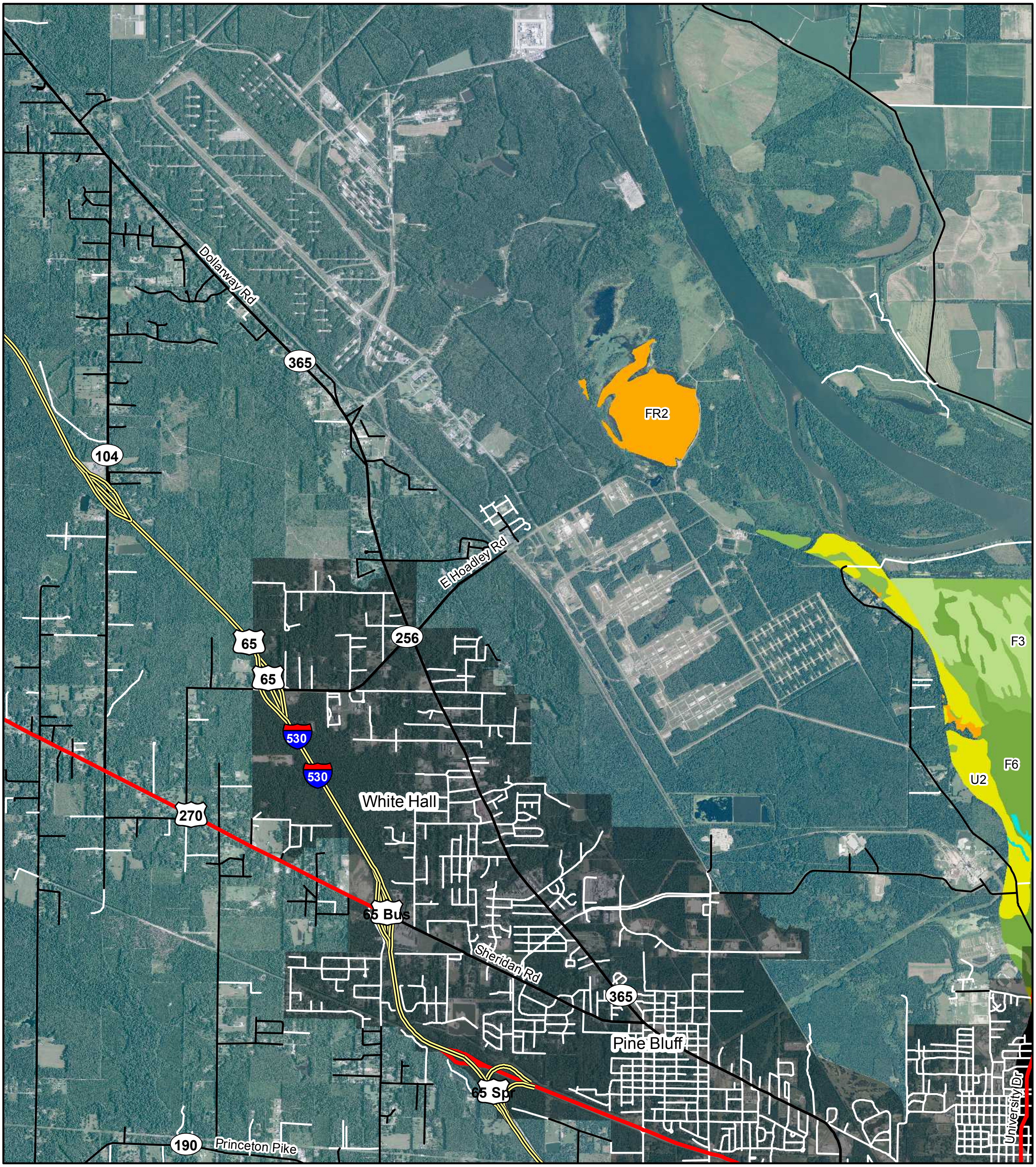

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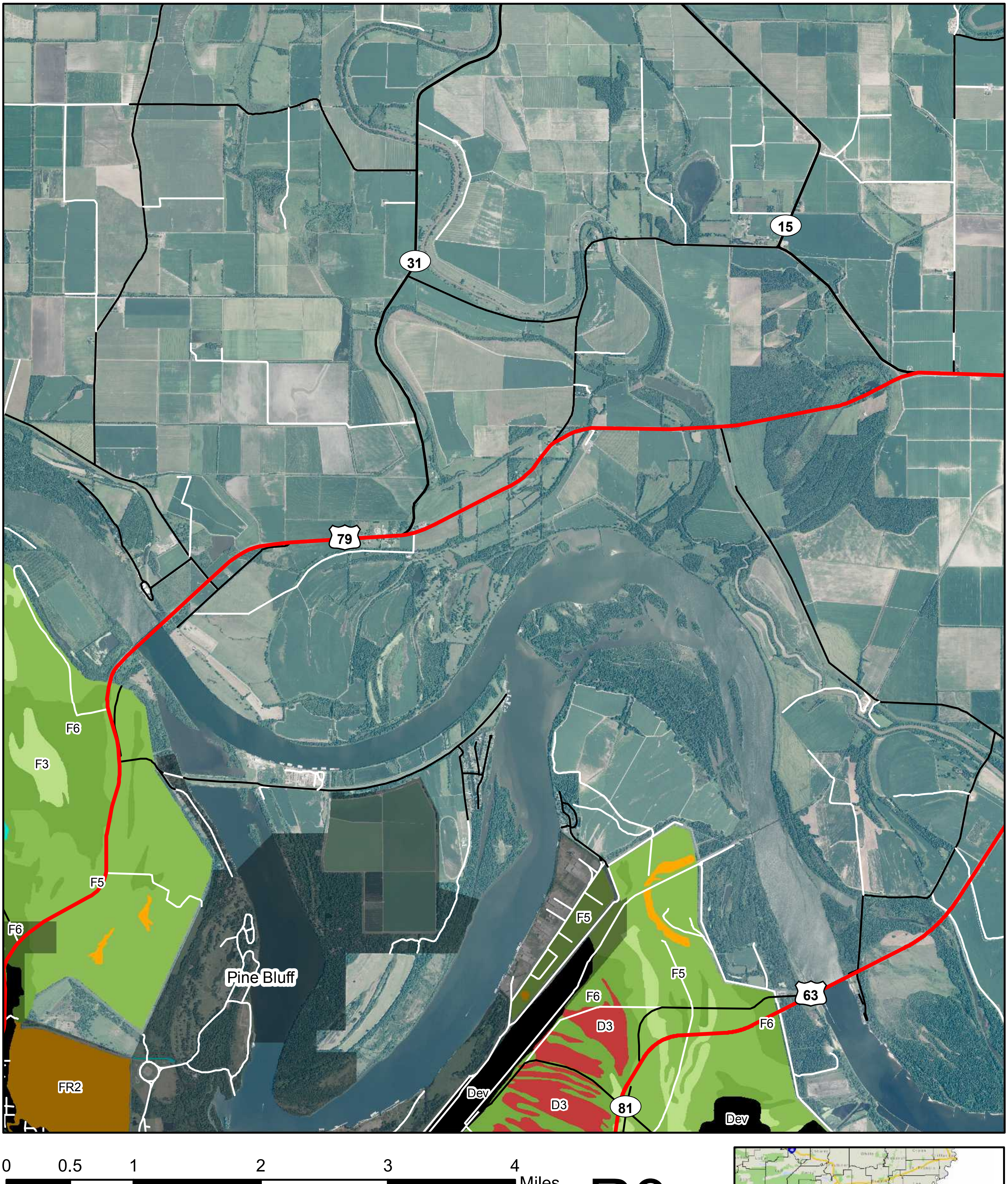

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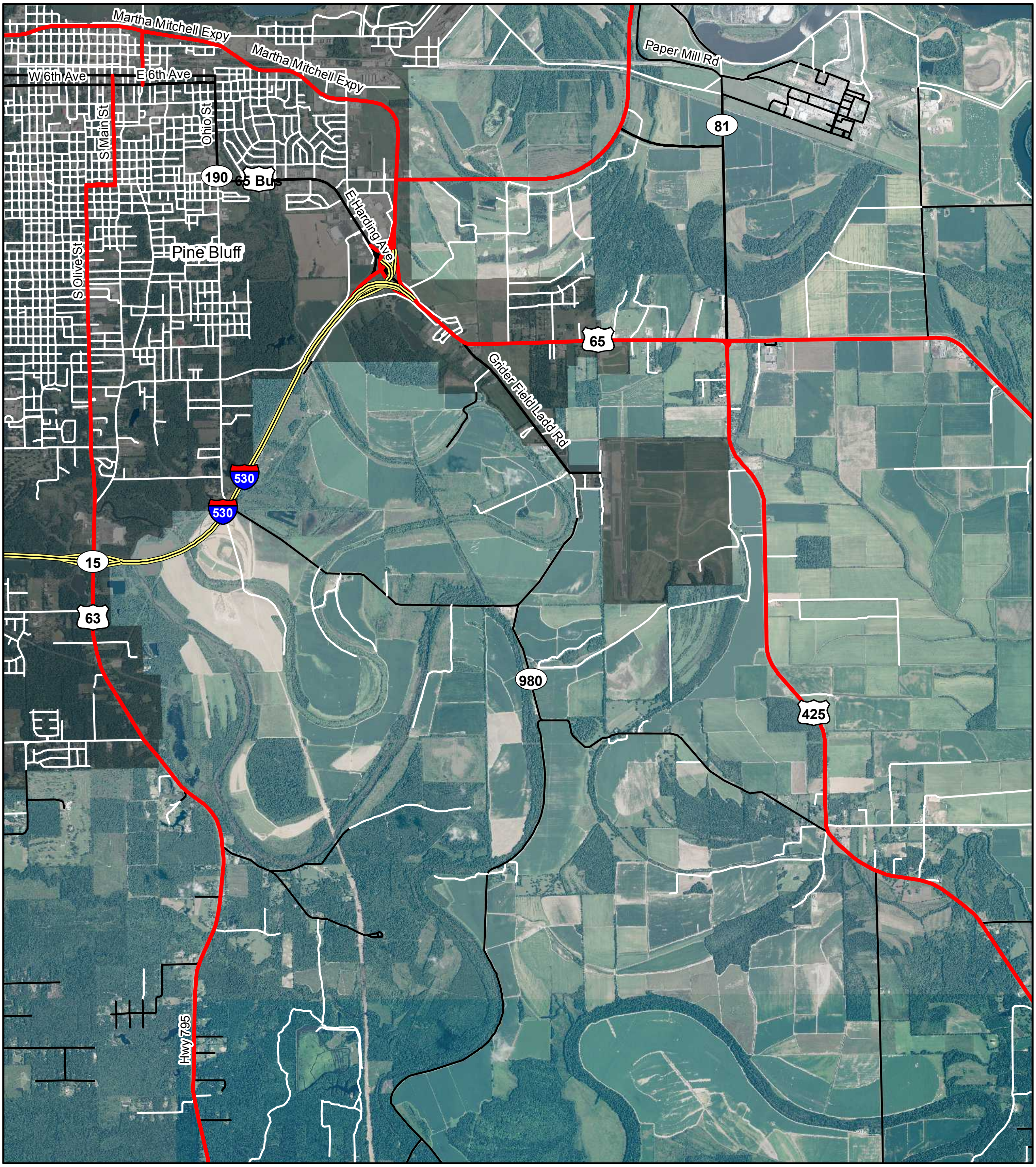

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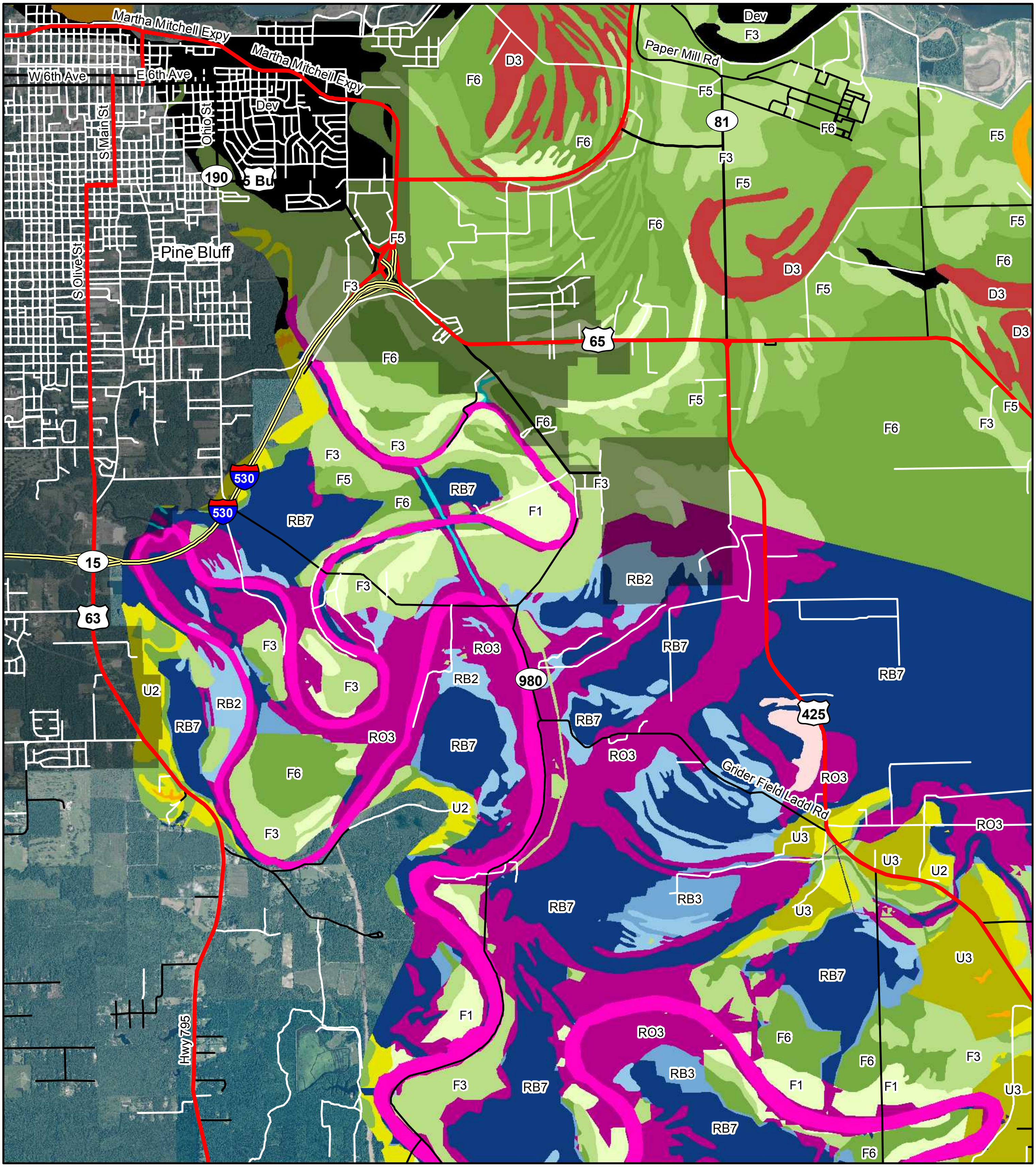

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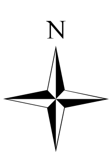

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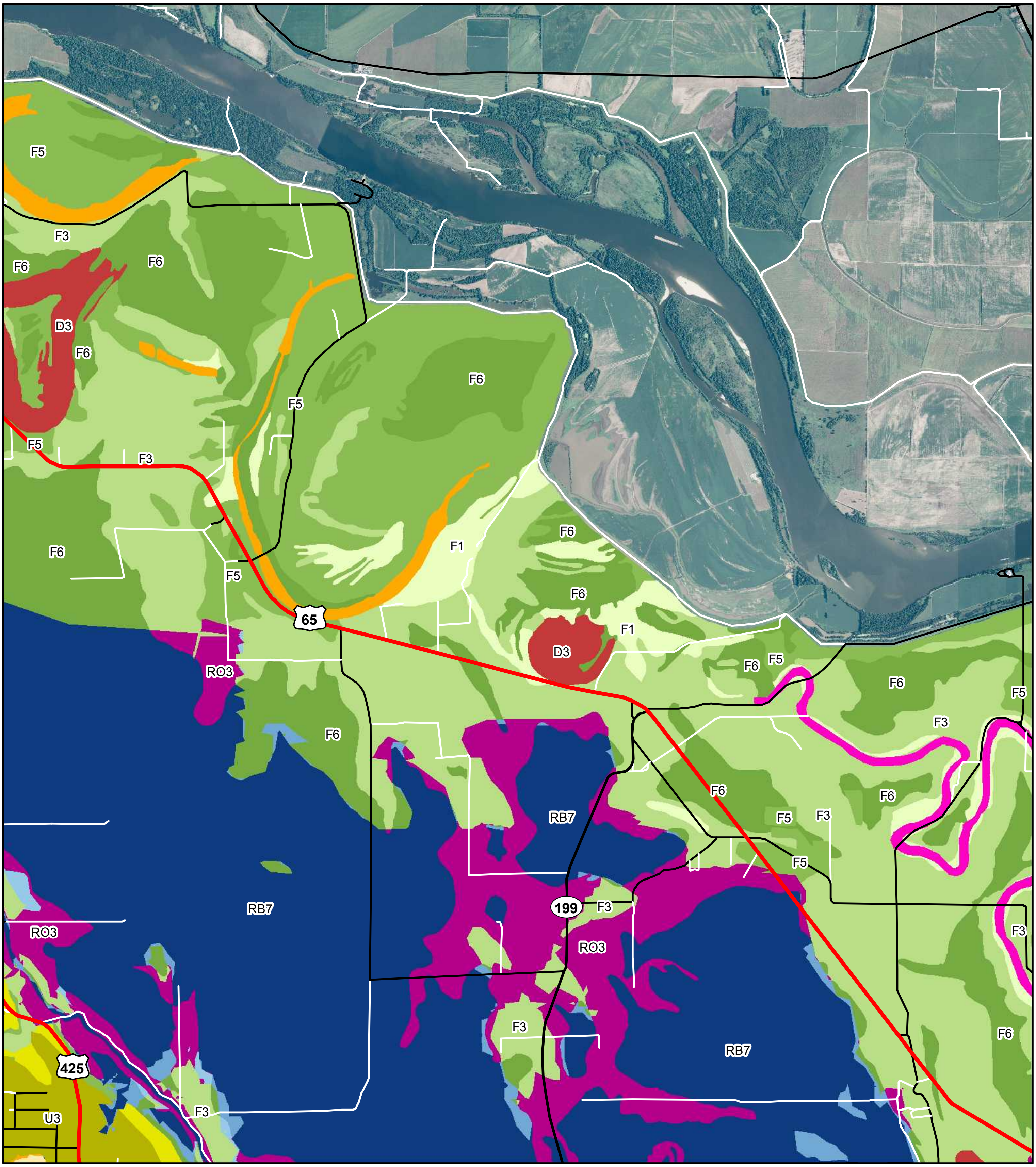

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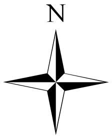

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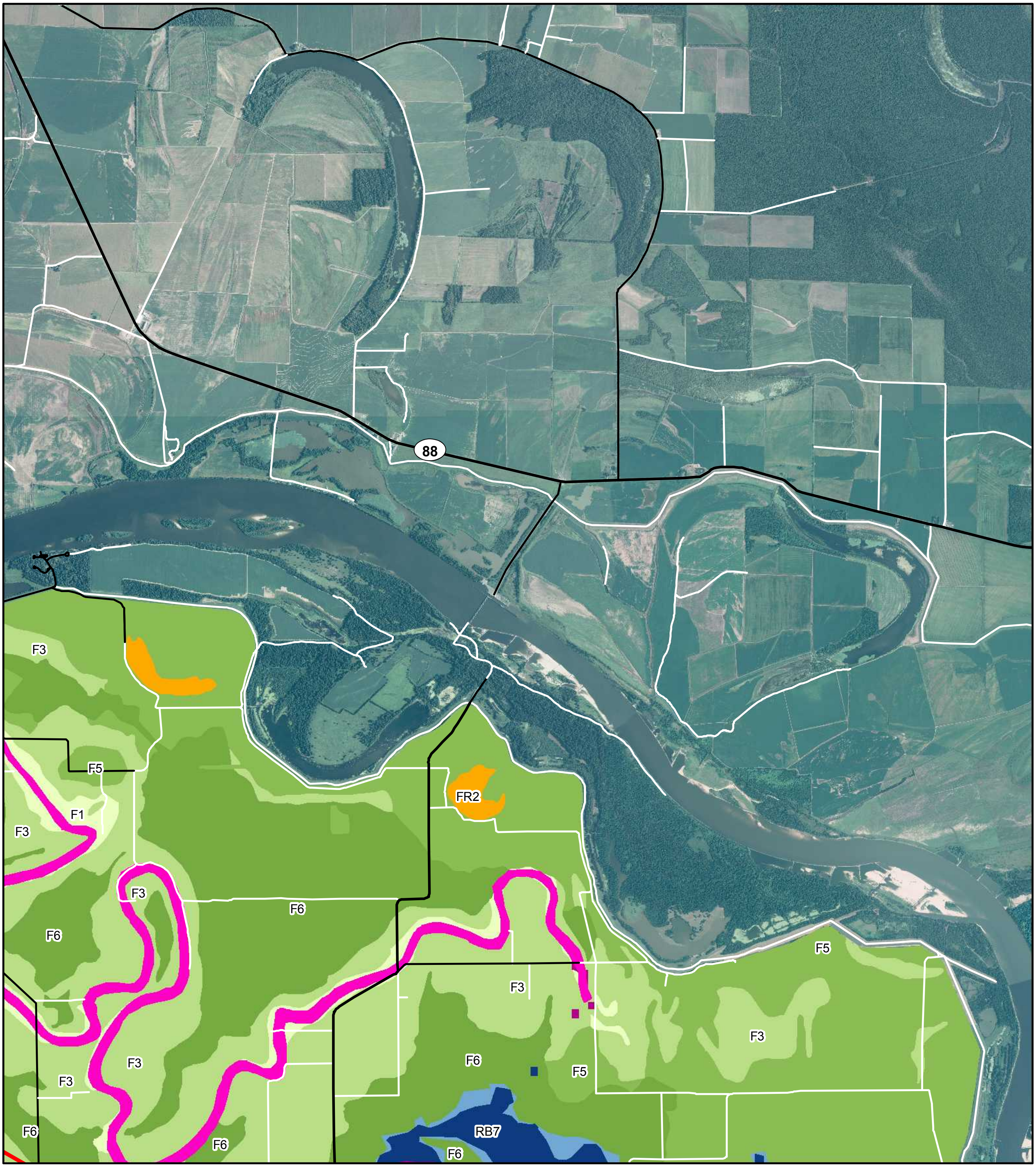

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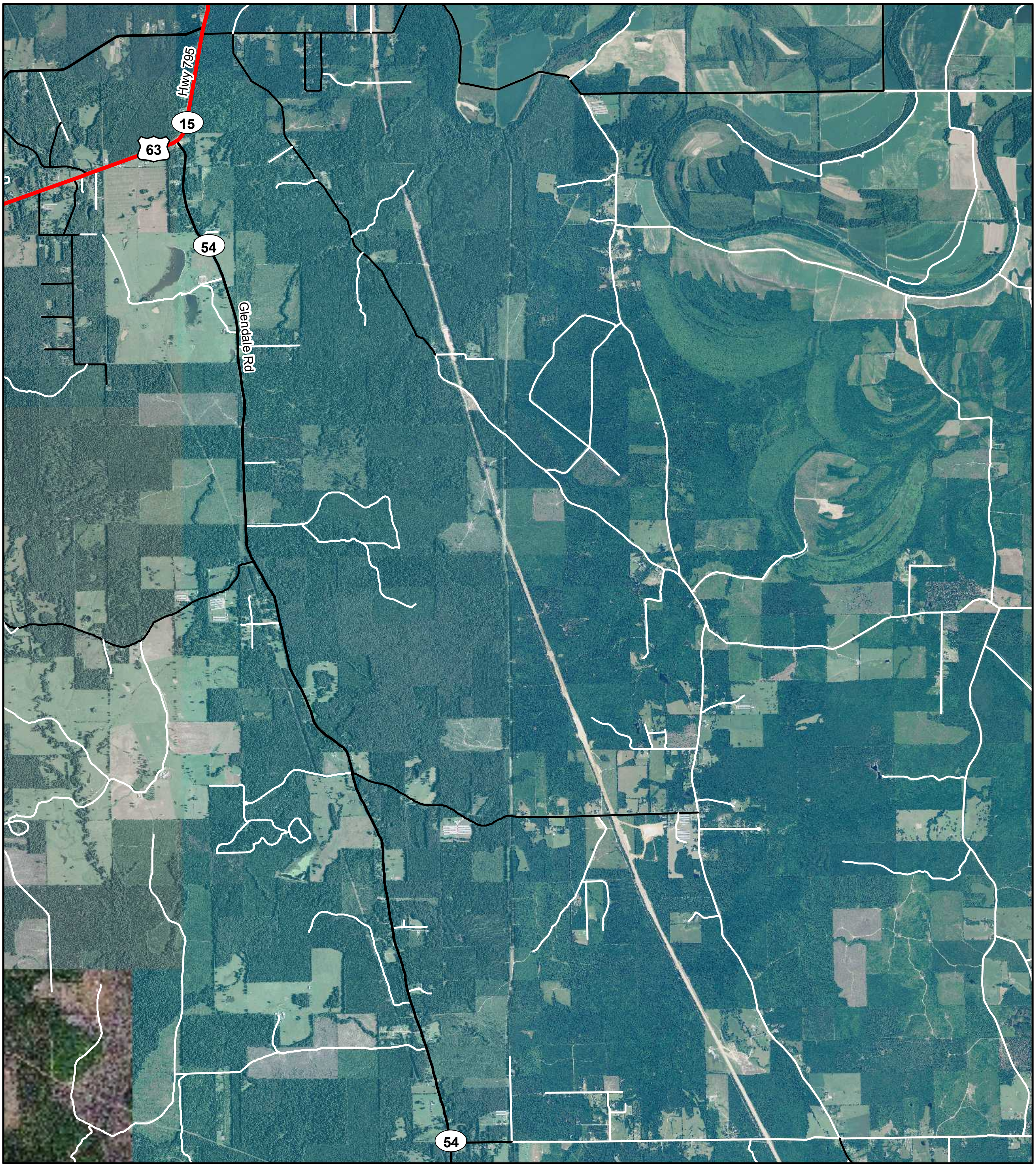
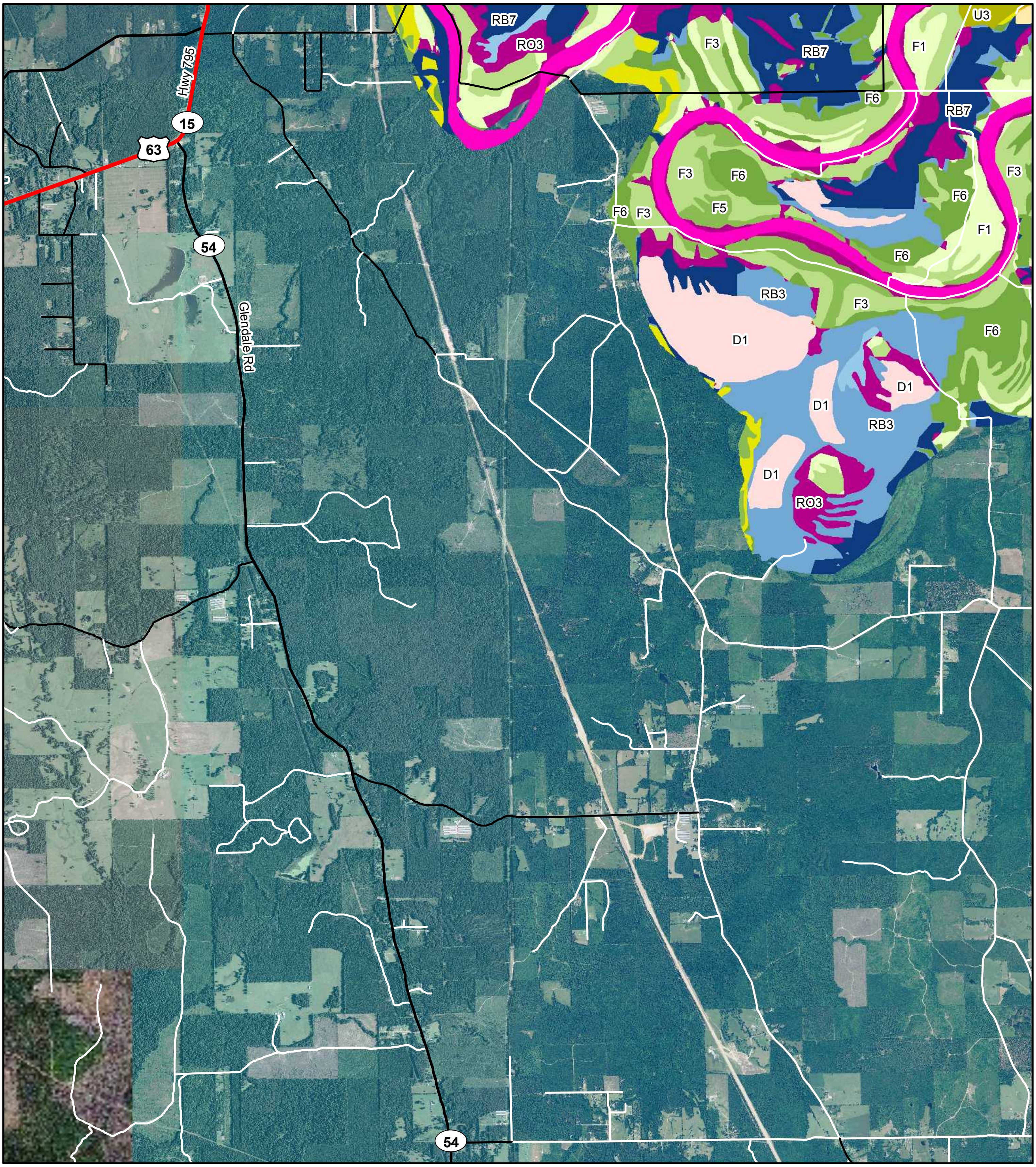


0 0.5 1 2 3 4 Miles

T3

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983



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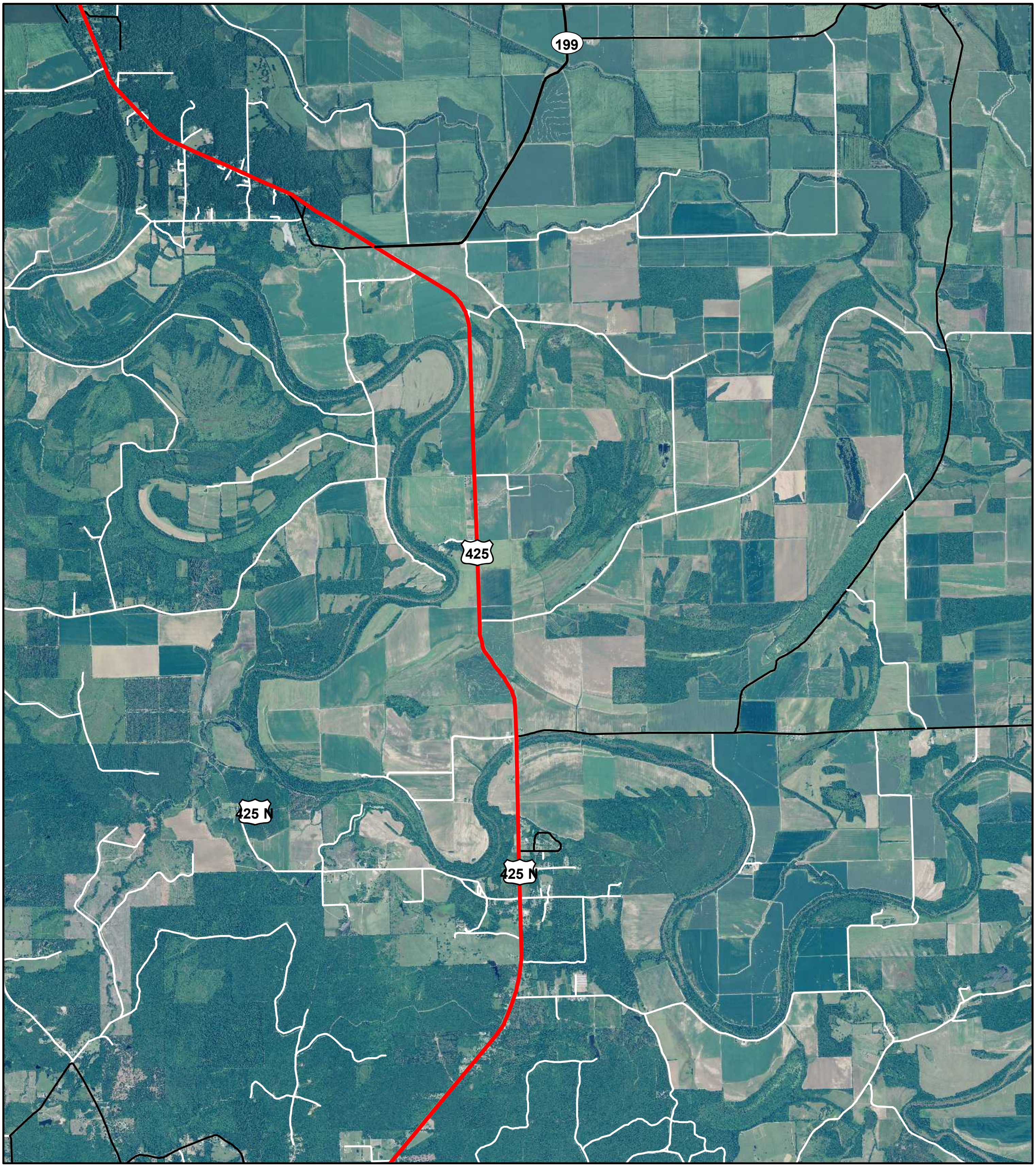
T3

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983

N



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T4

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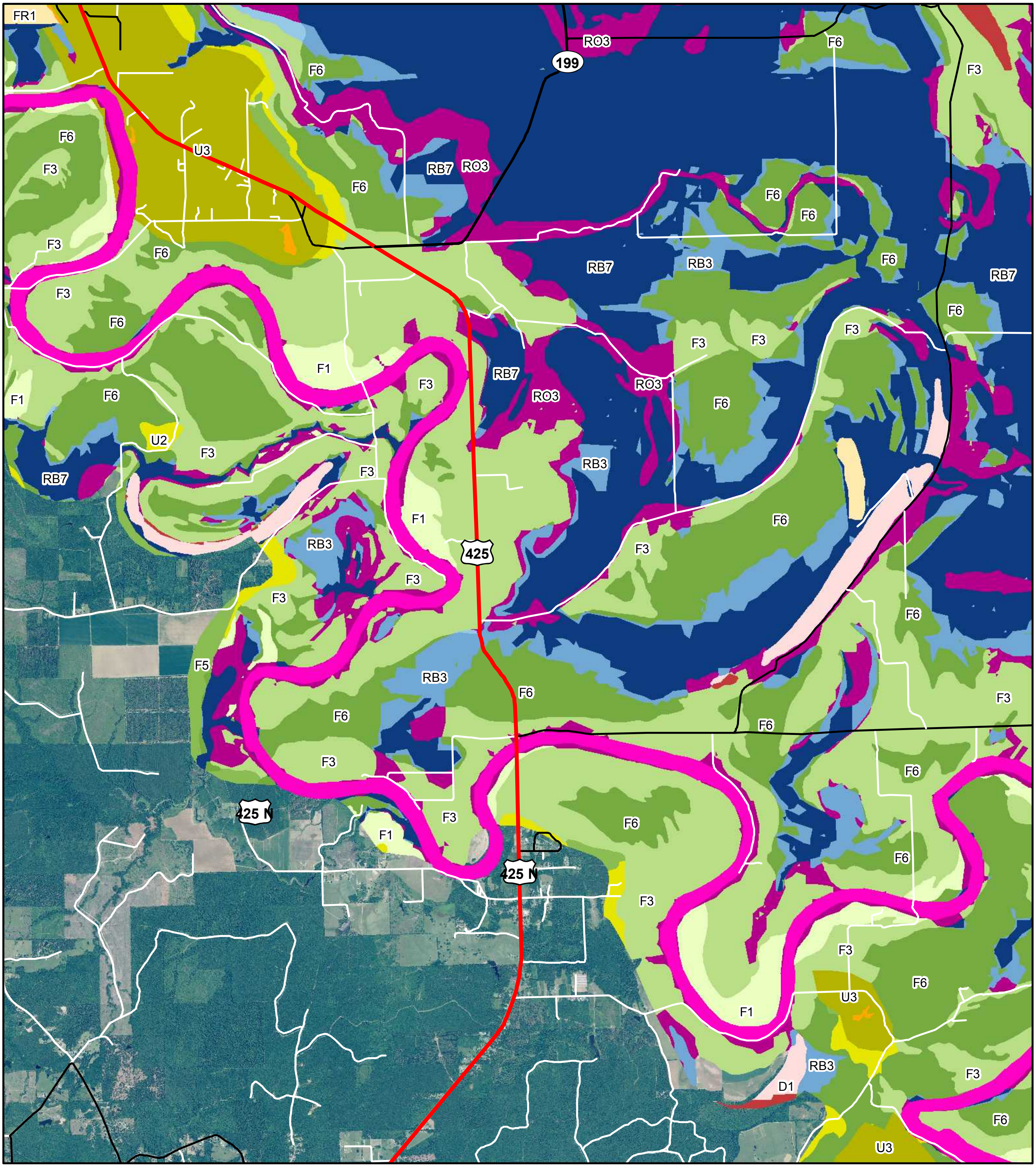
Projection: Transverse Mercator
Datum: North American 1983



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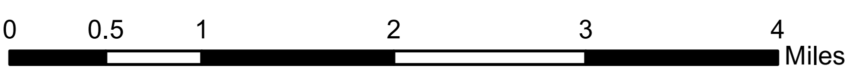
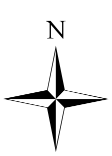
T4



T5



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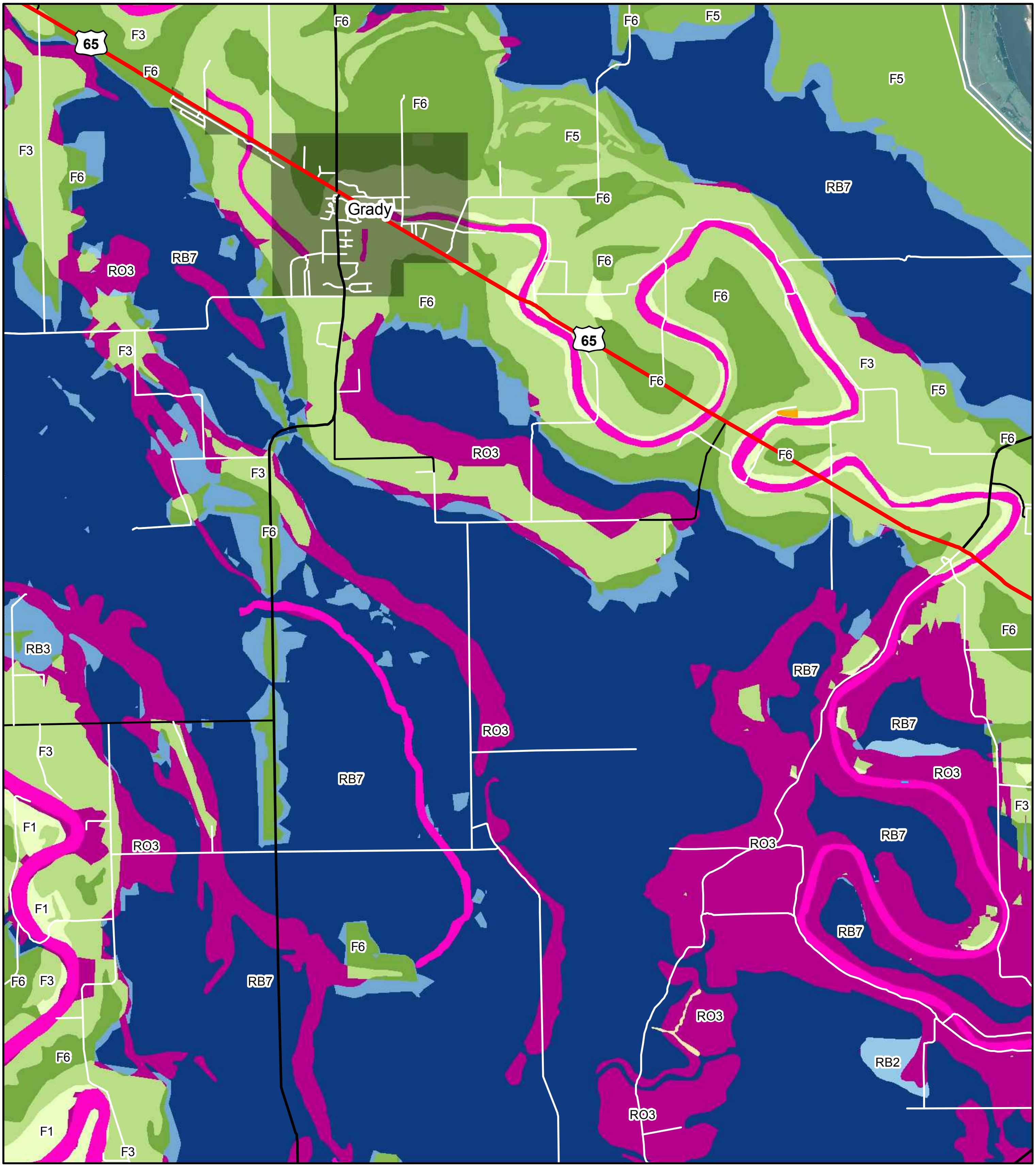

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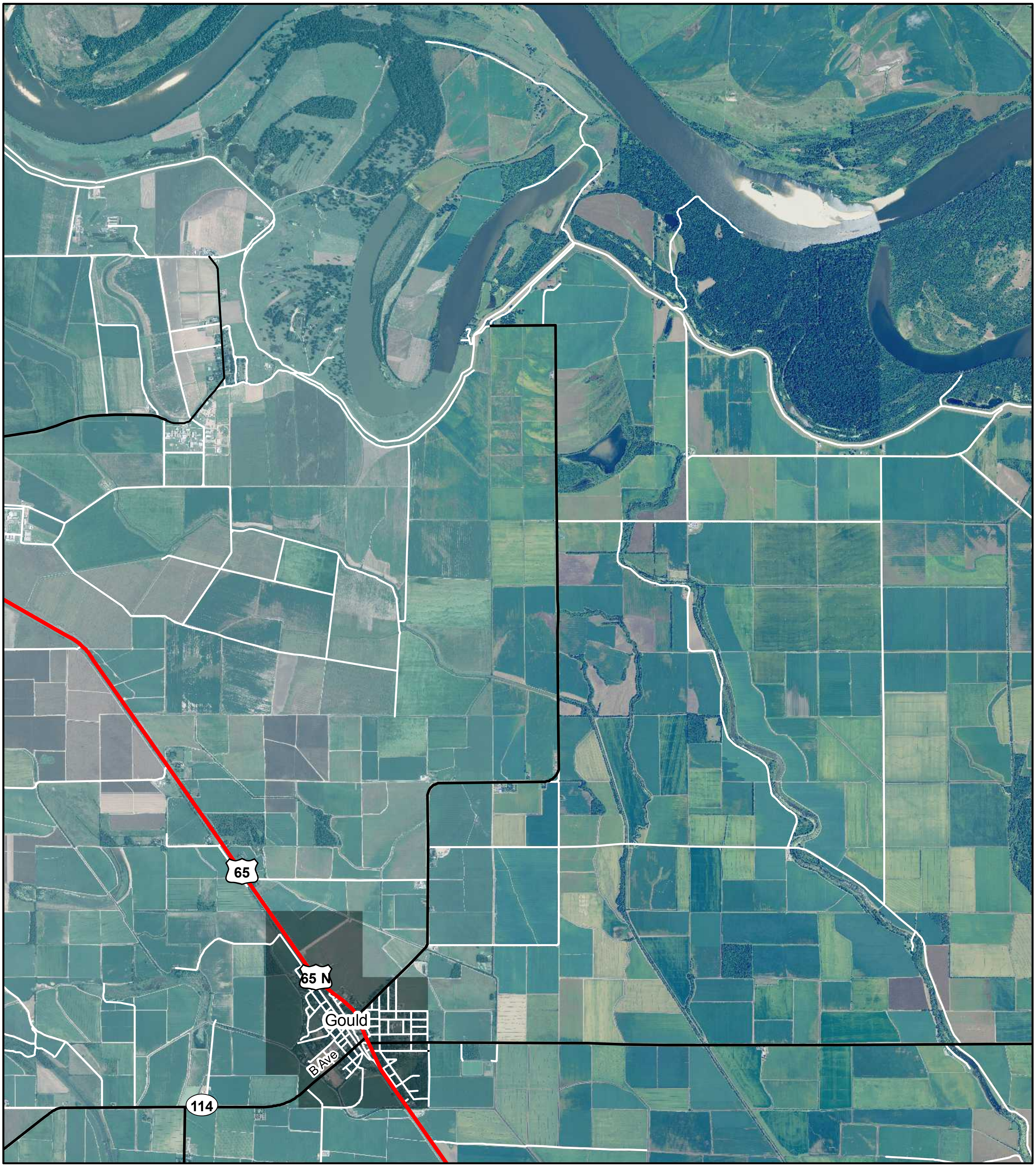

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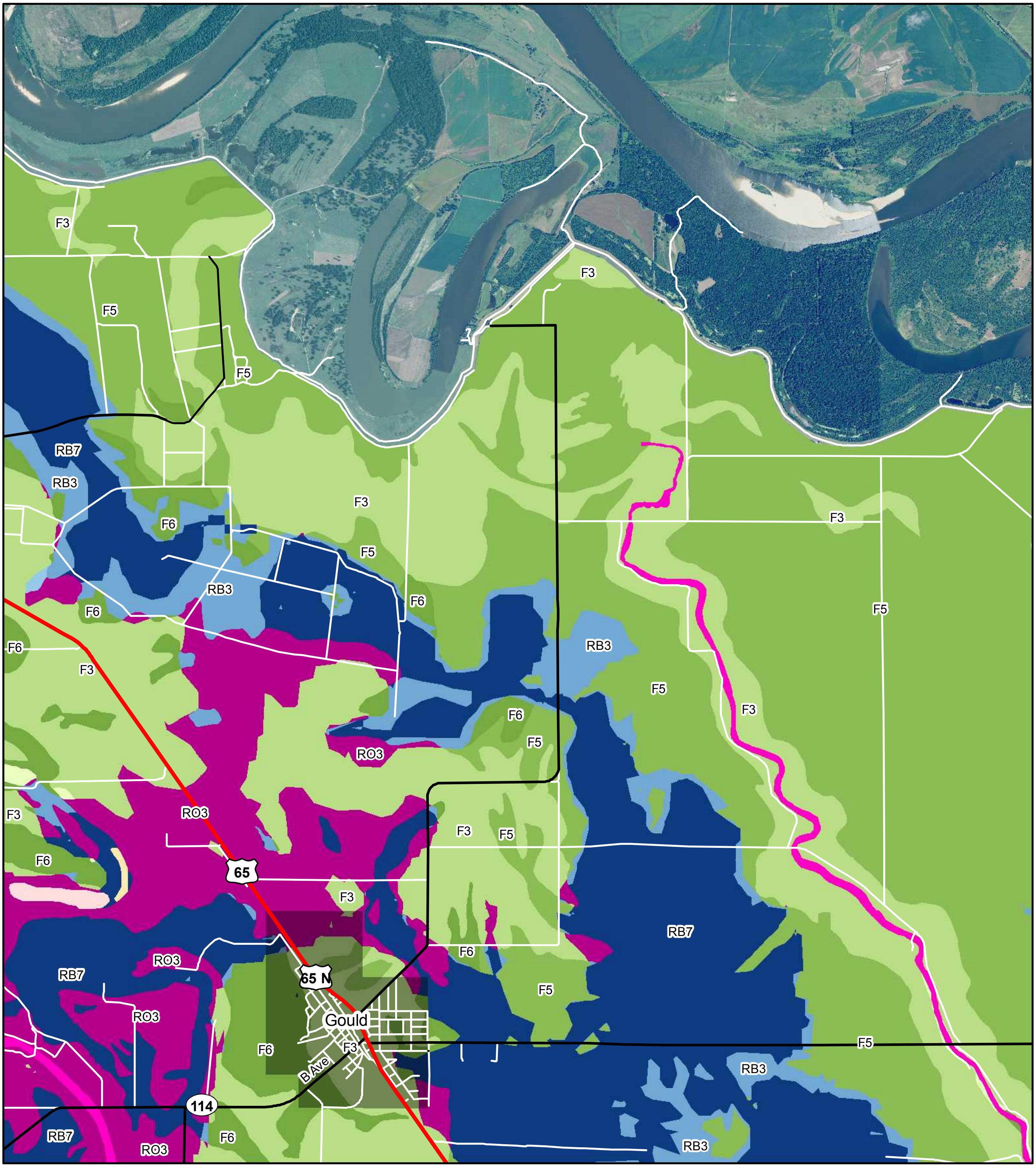
T6



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Projection: Transverse Mercator
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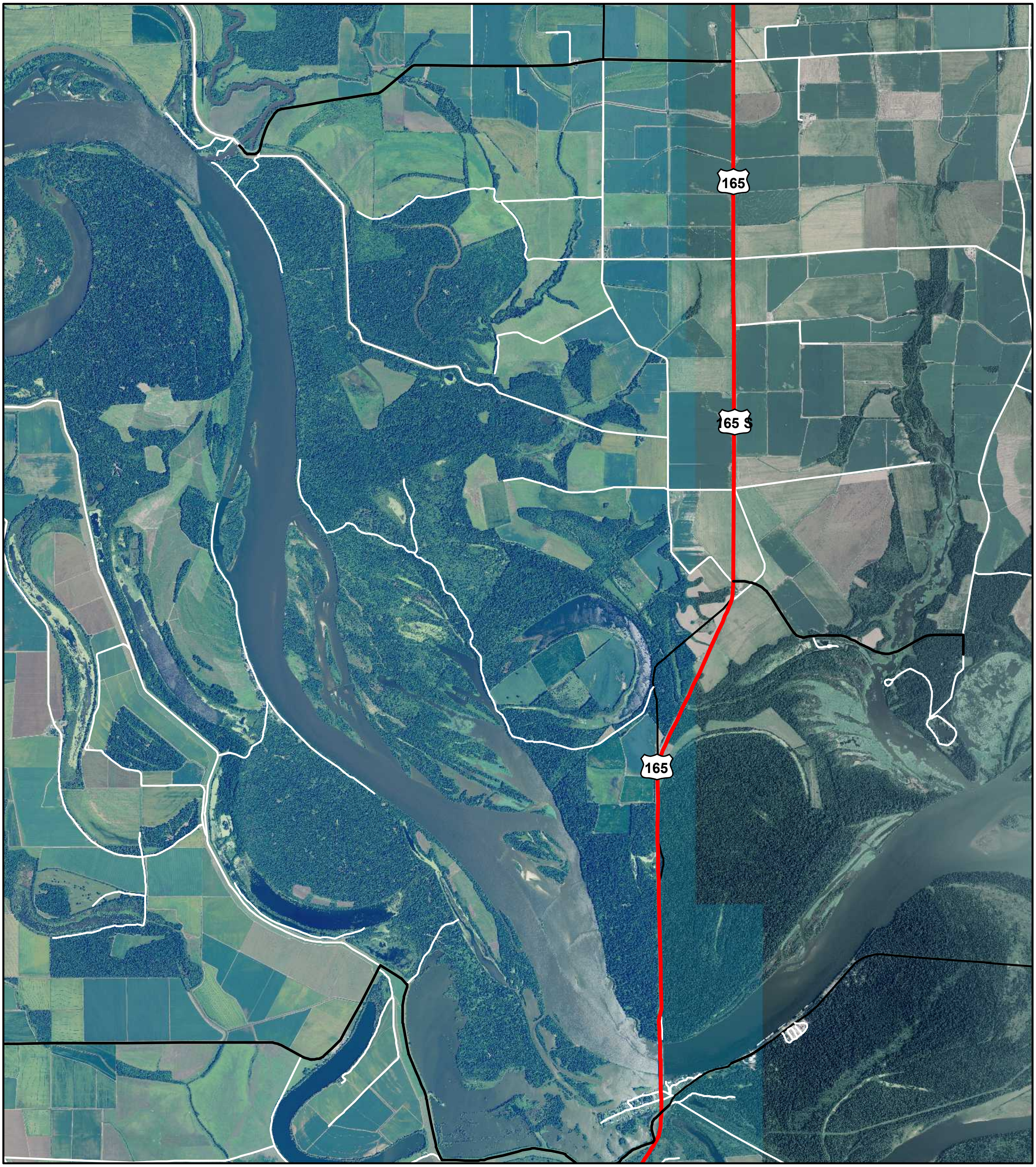

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T7

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Projection: Transverse Mercator
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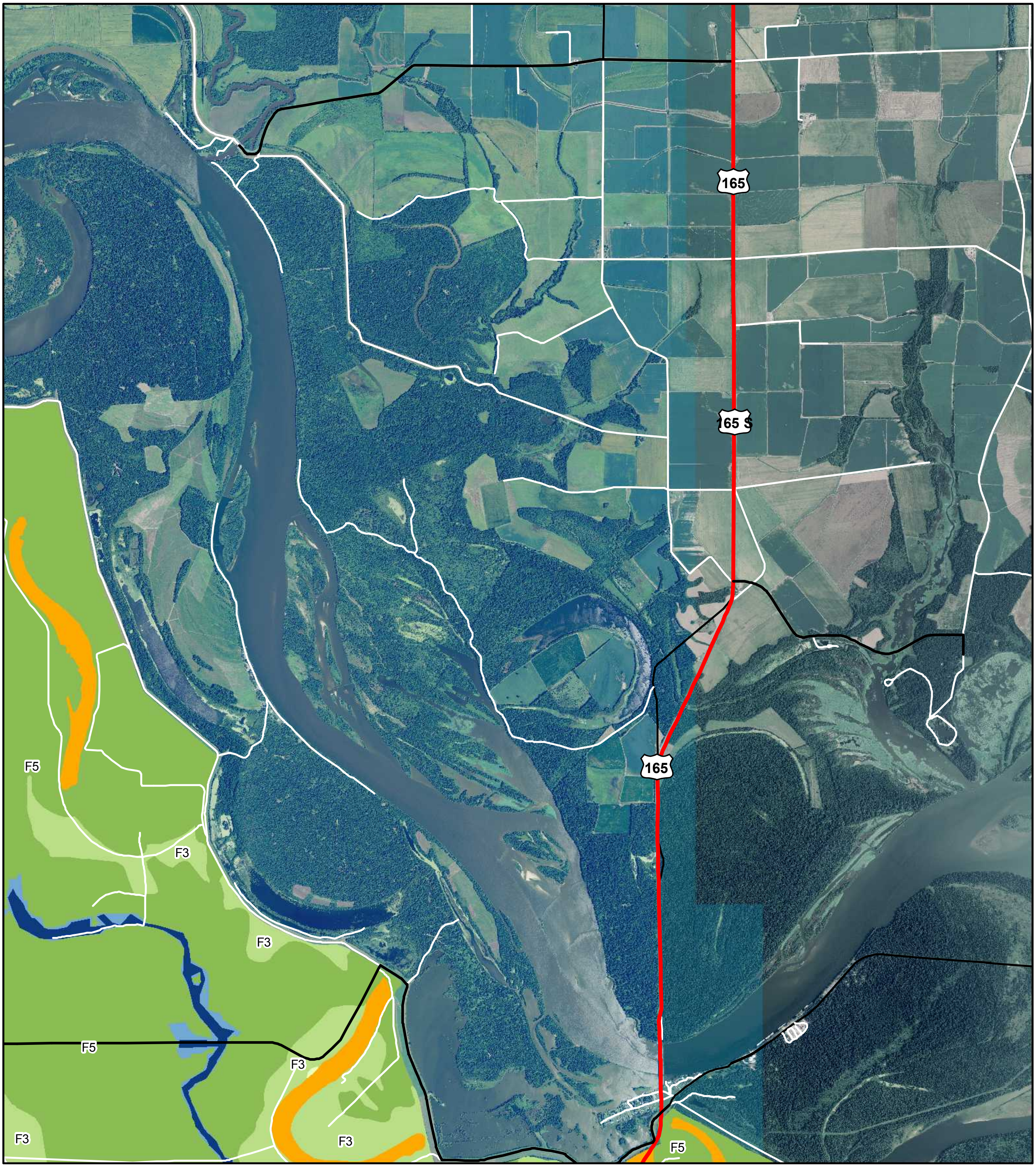

0 0.5 1 2 3 4 Miles

T7

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4
Miles

U4

N

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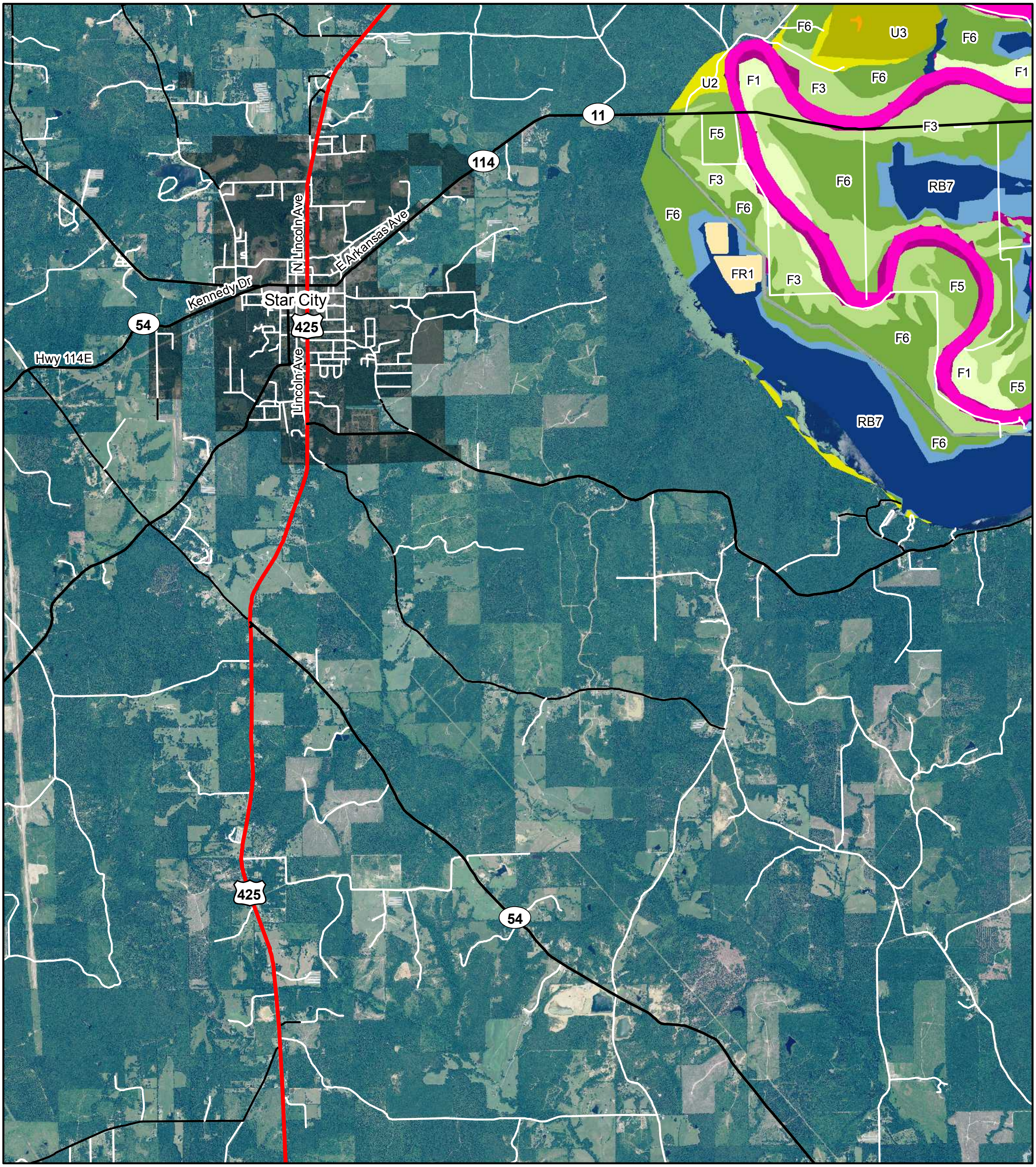

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U4

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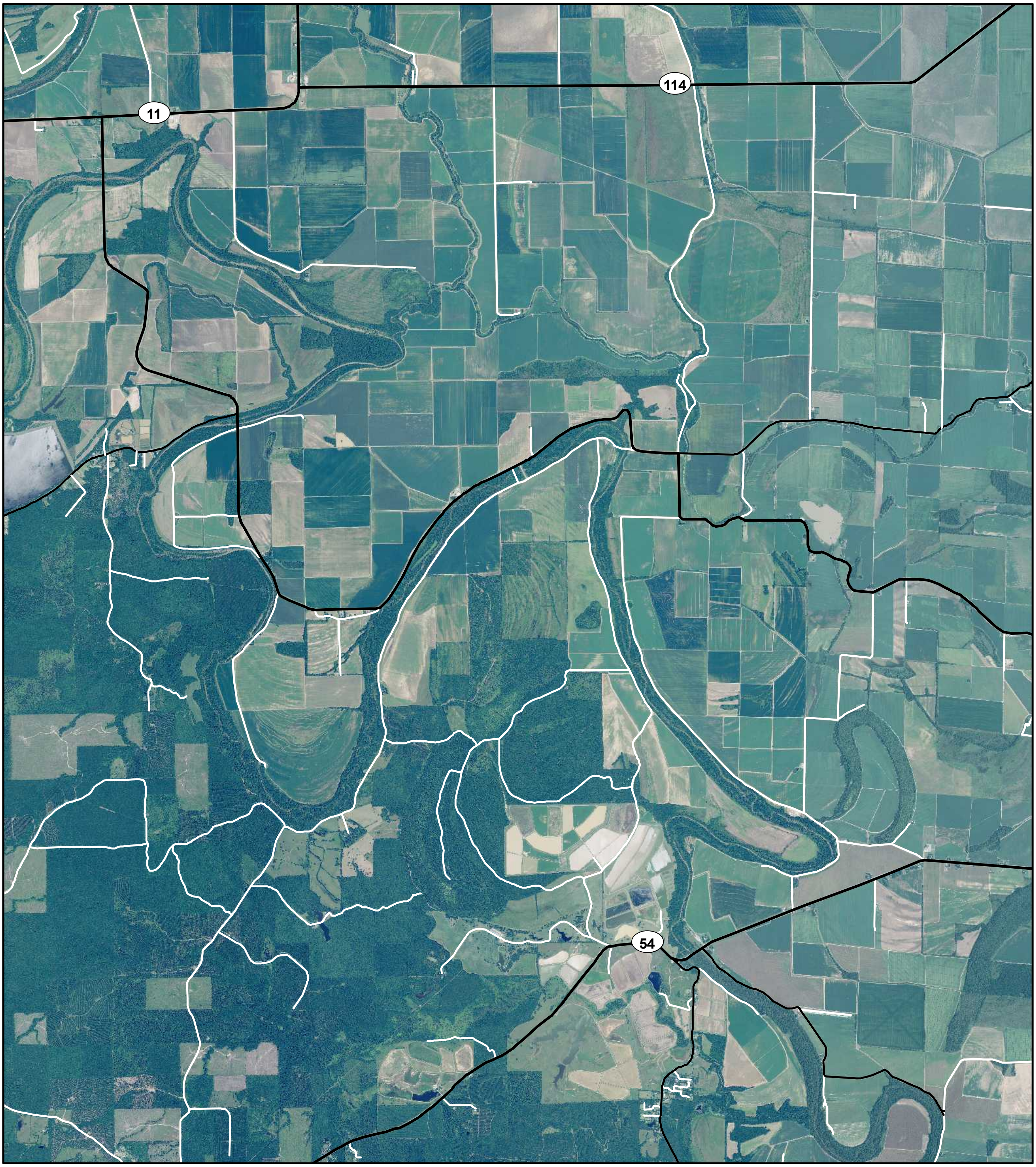

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U5

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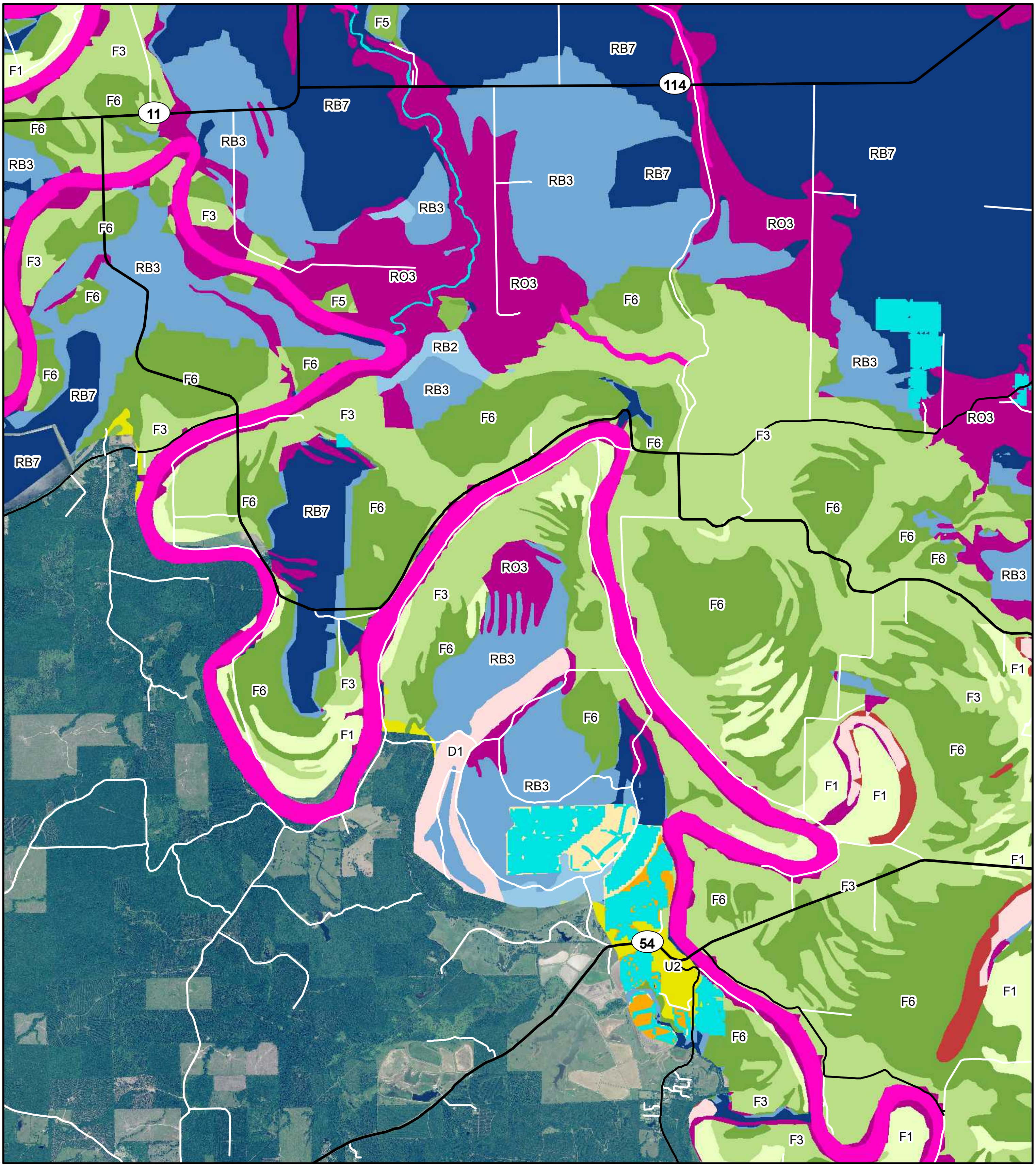

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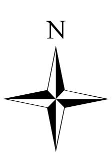

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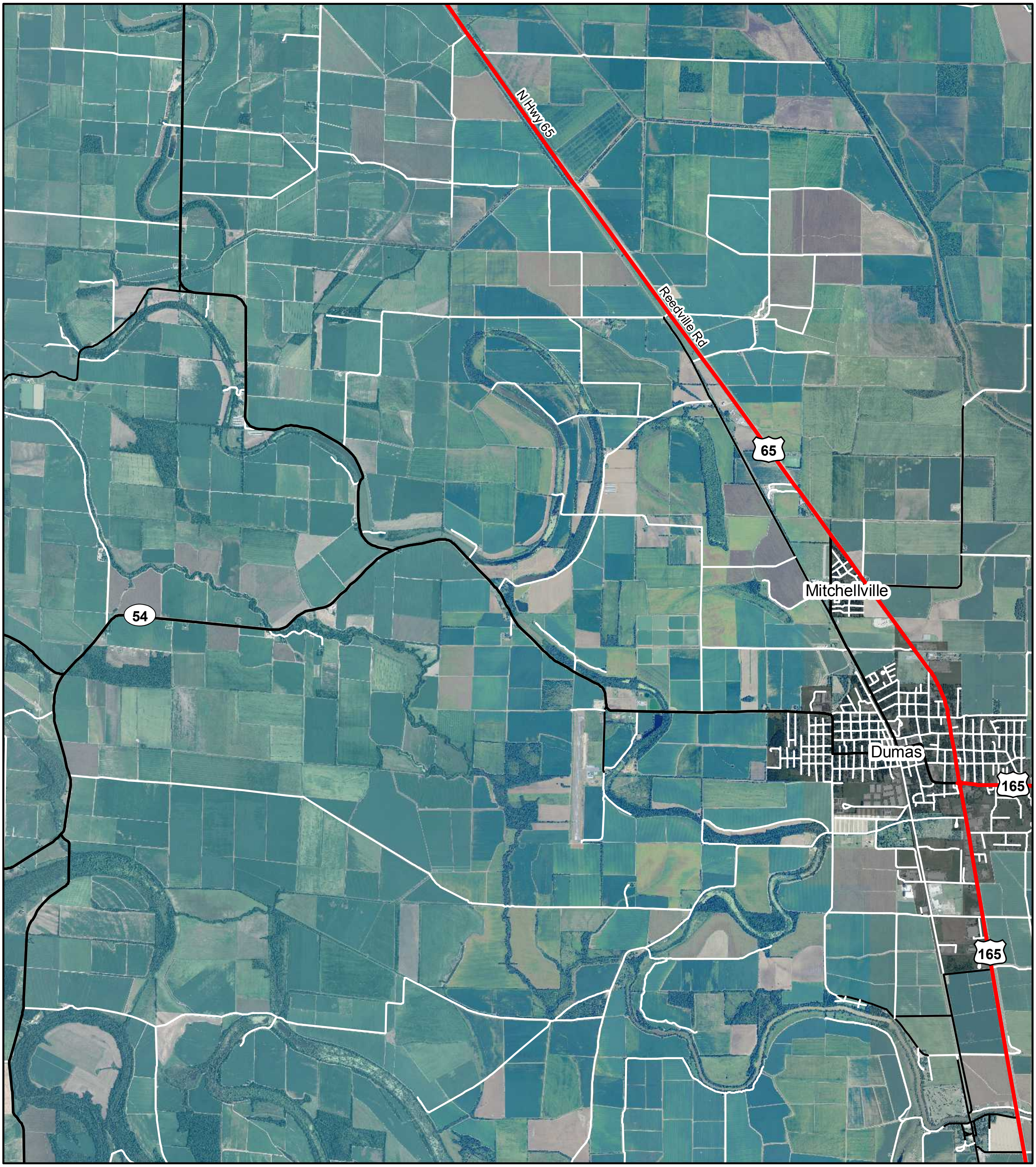

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U6

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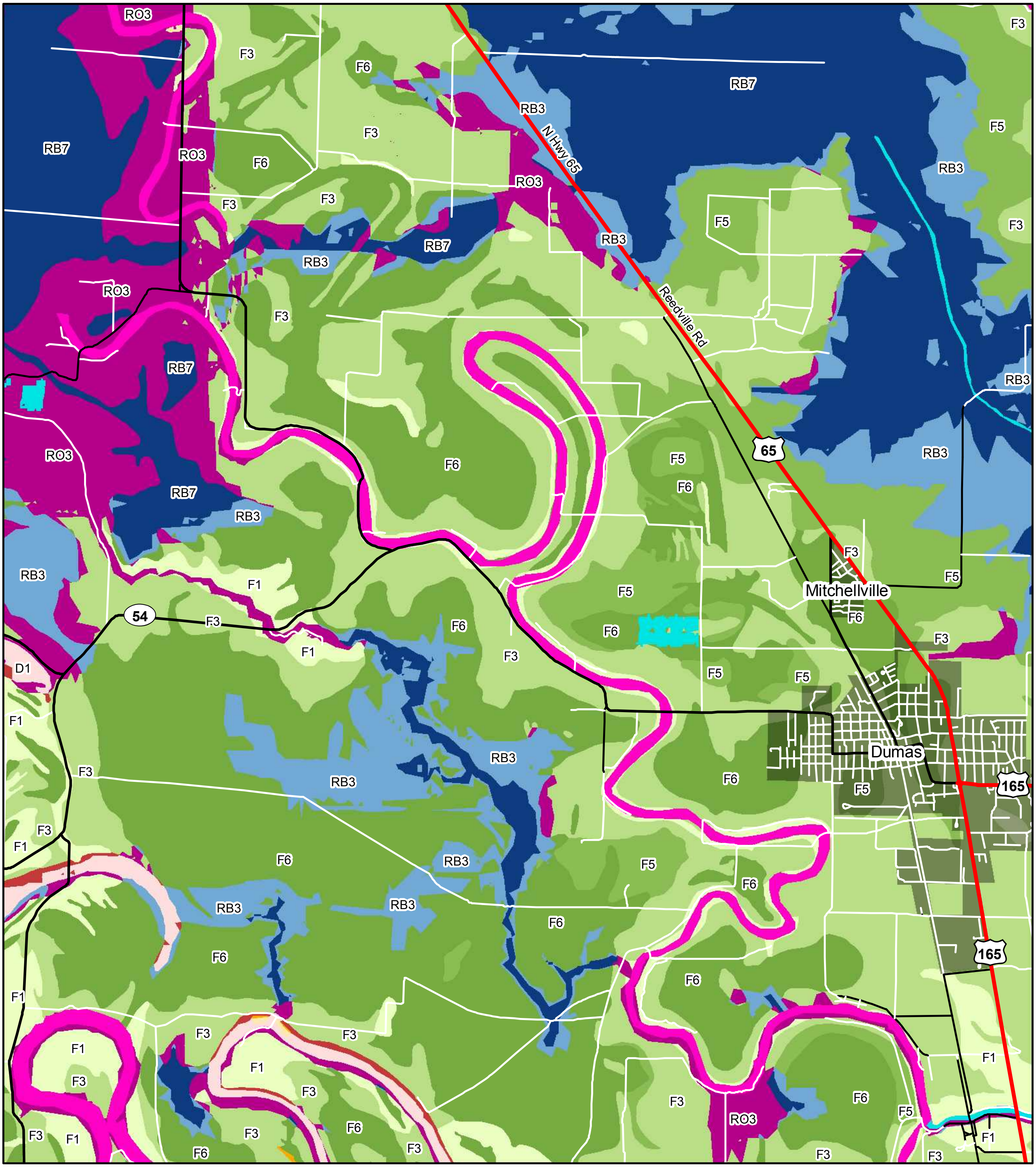

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U6

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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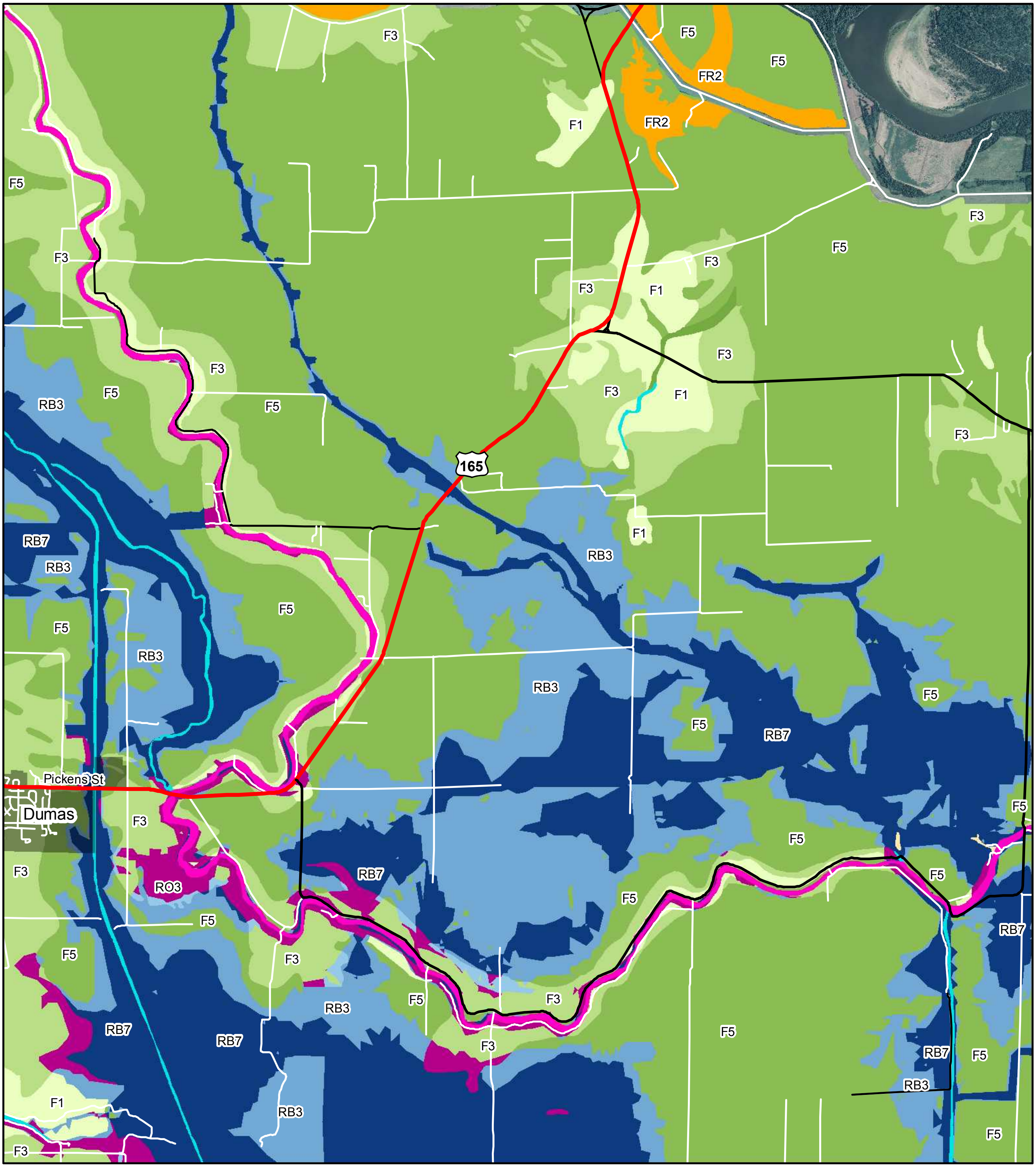
N

0 0.5 1 2 3 4 Miles

U7

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983



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U7

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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0 0.5 1 2 3 4 Miles

U8

N

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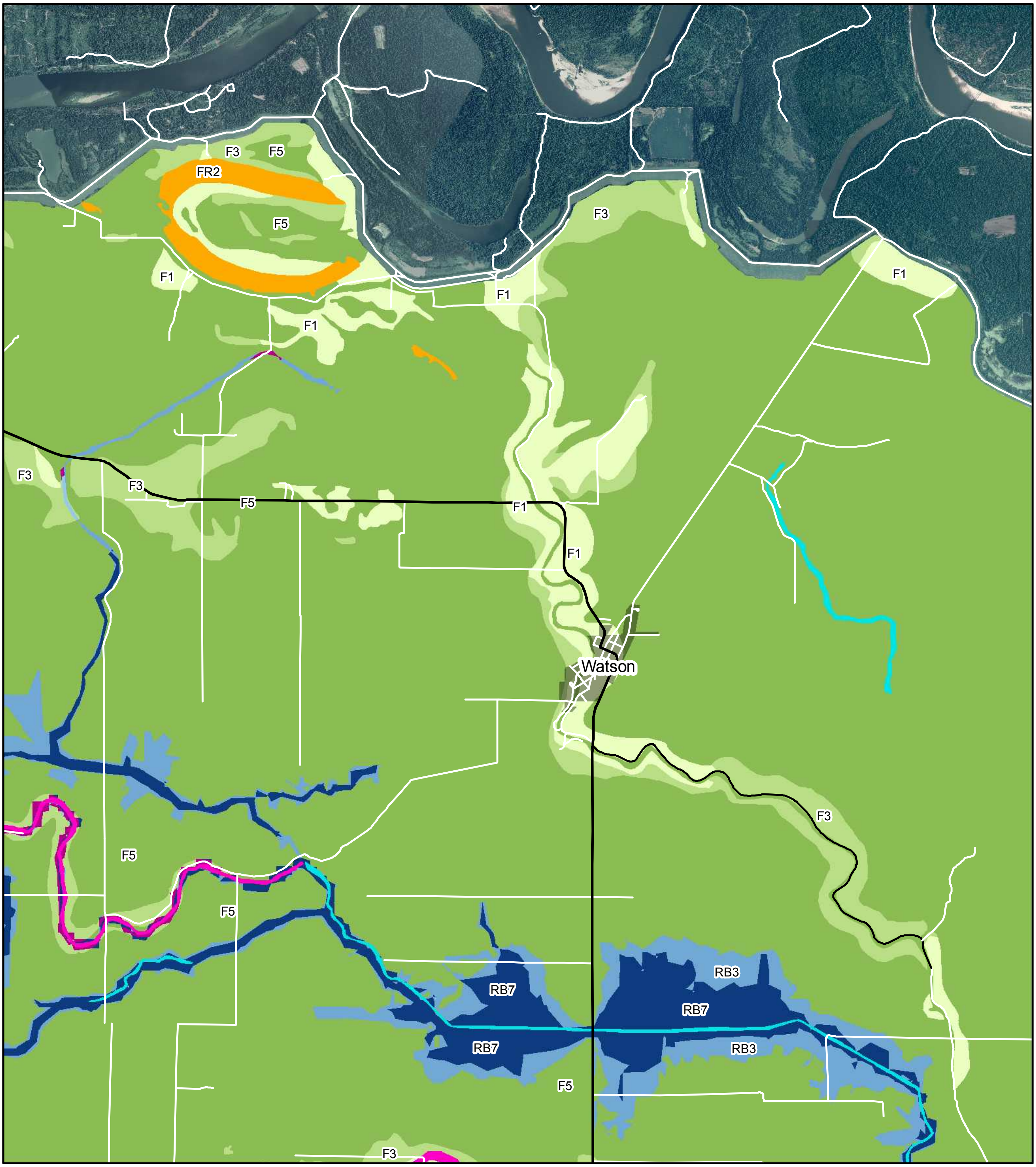
Datum: North American 1983



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U8

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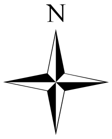
Datum: North American 1983

0 0.5 1 2 3 4 Miles

U9



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0 0.5 1 2 3 4 Miles

U9

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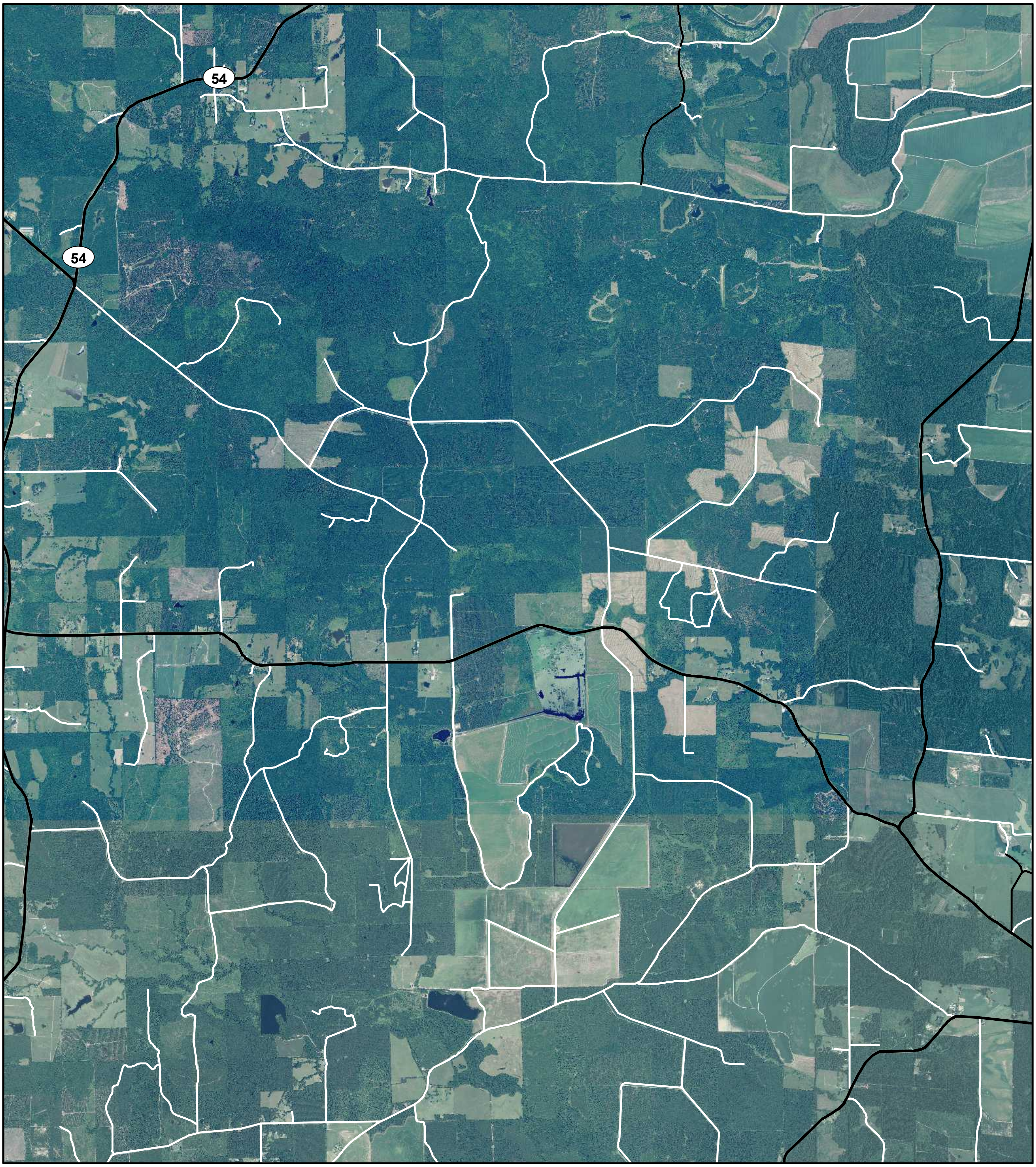

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N

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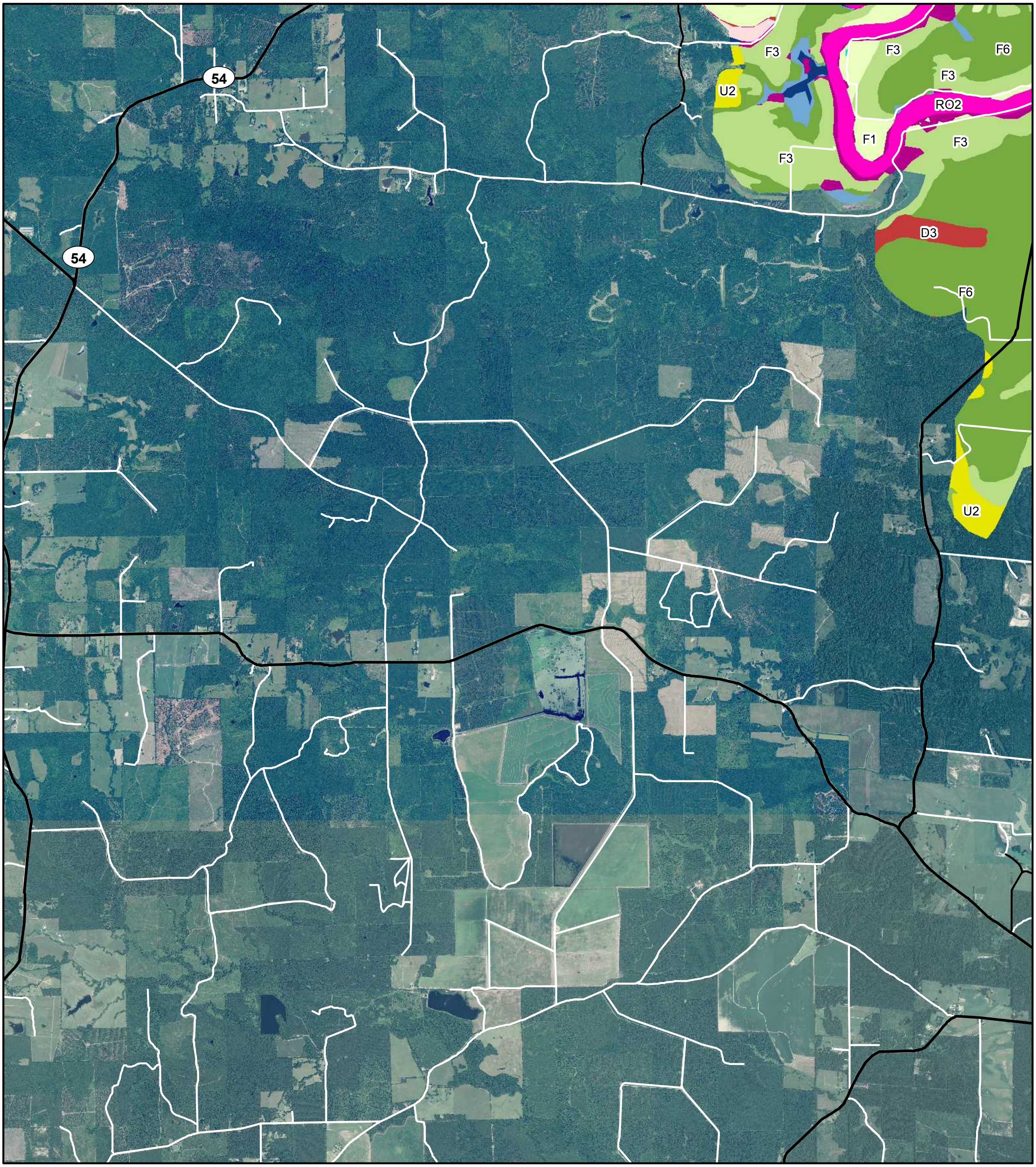
V5



0 0.5 1 2 3 4 Miles

V5

N

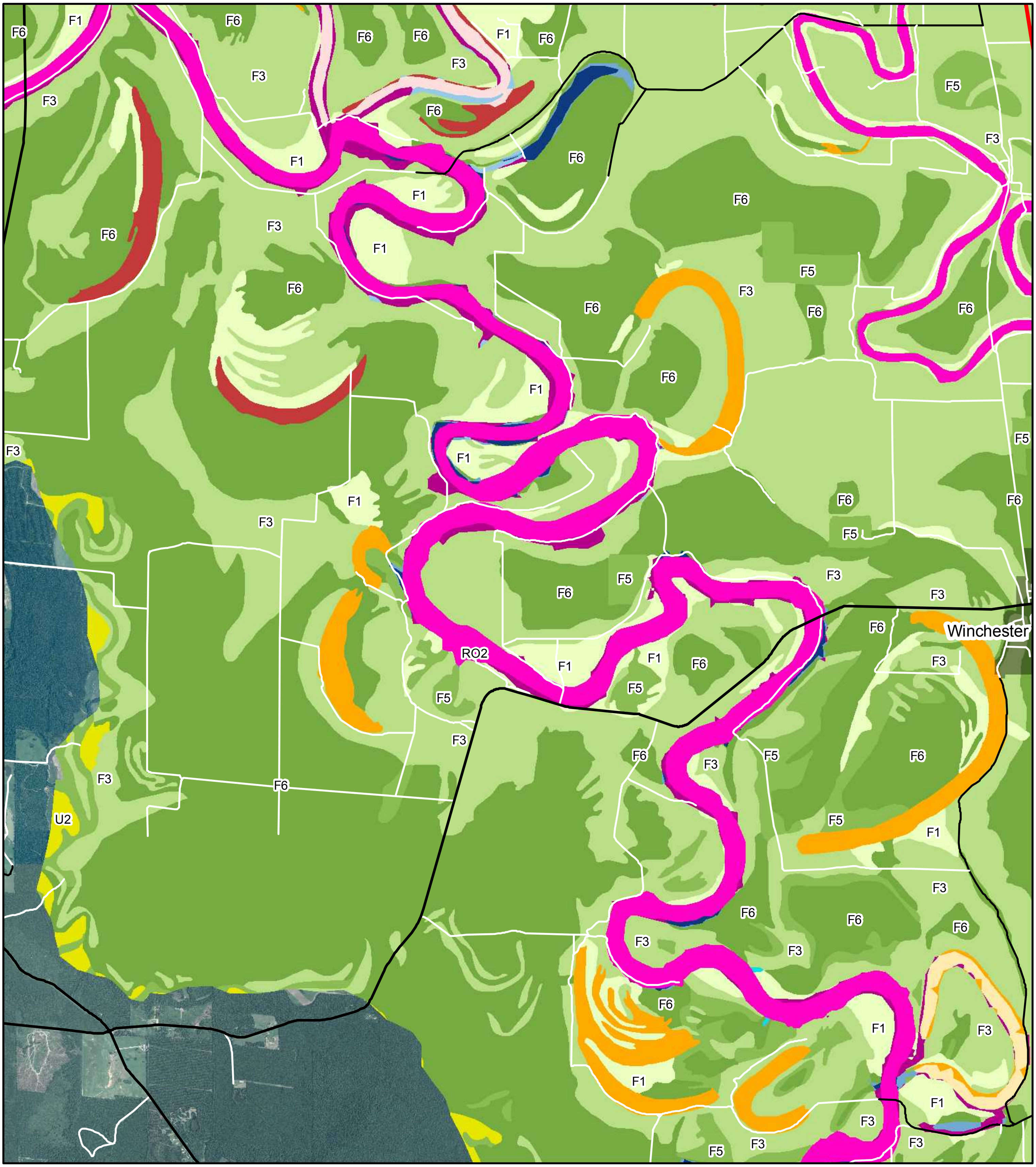
Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4 Miles

V6

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983



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V6

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Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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V7

N

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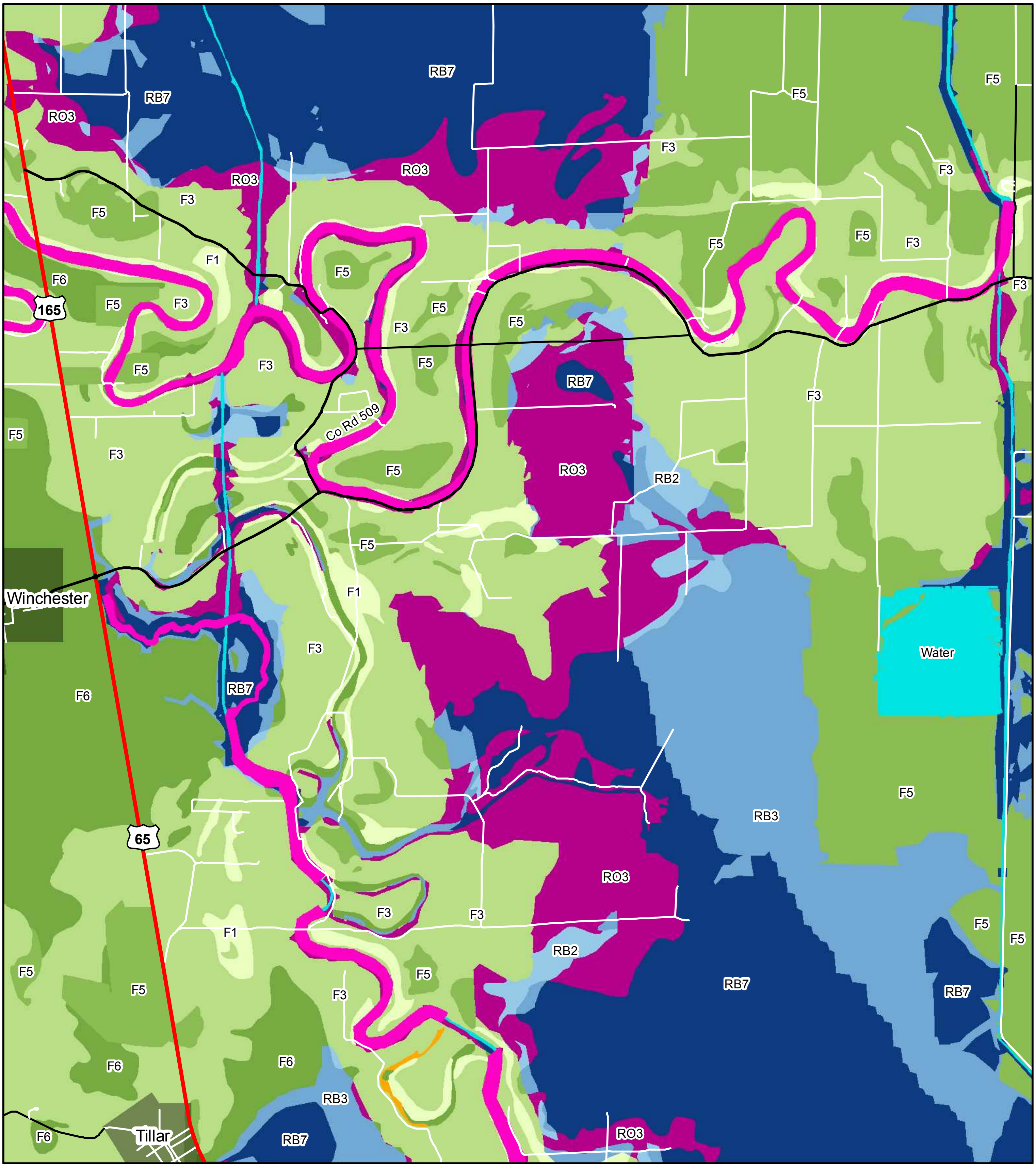

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V7

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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0 0.5 1 2 3 4 Miles

V8

N

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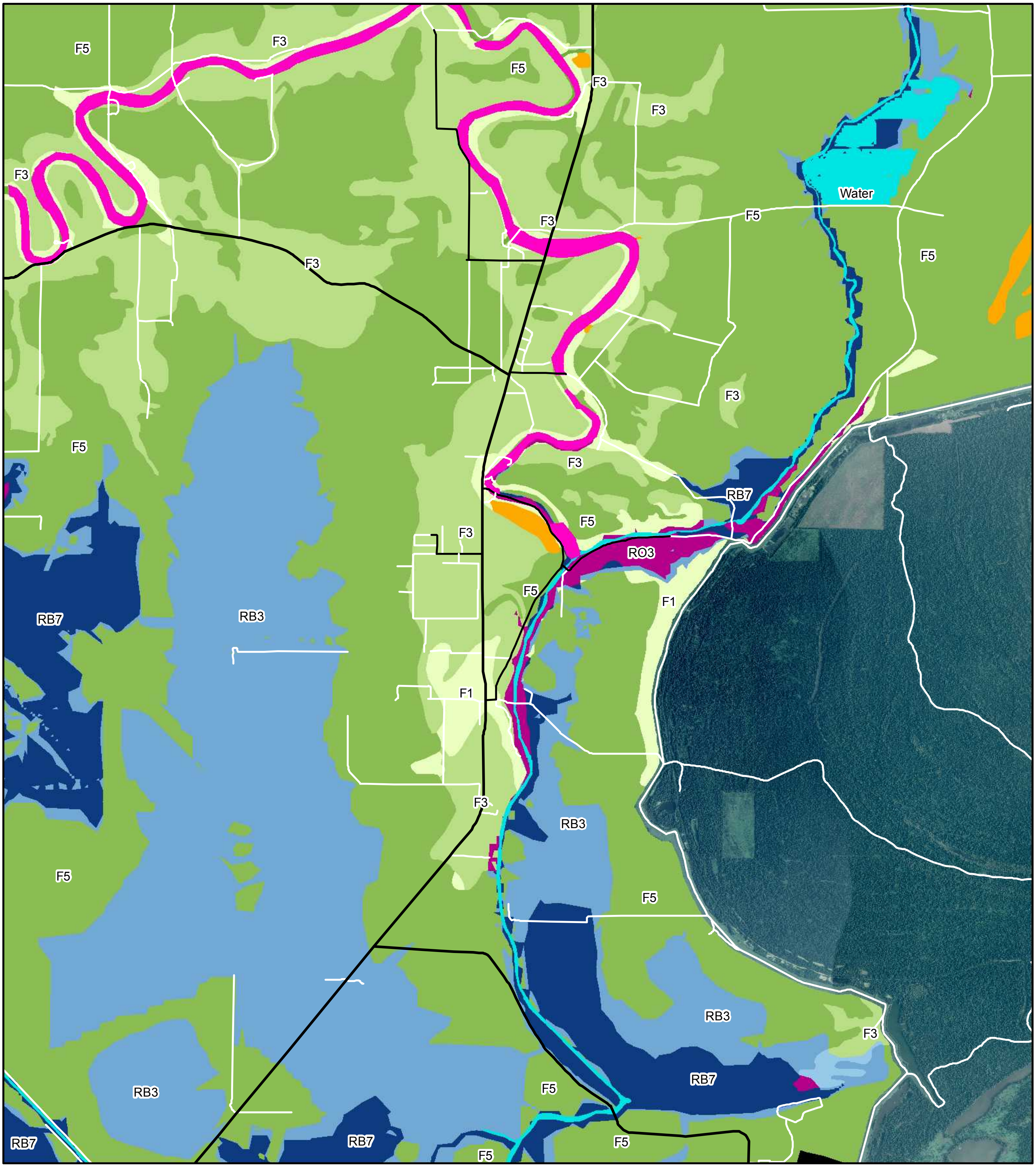

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V8

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Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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0 0.5 1 2 3 4 Miles

V9

N

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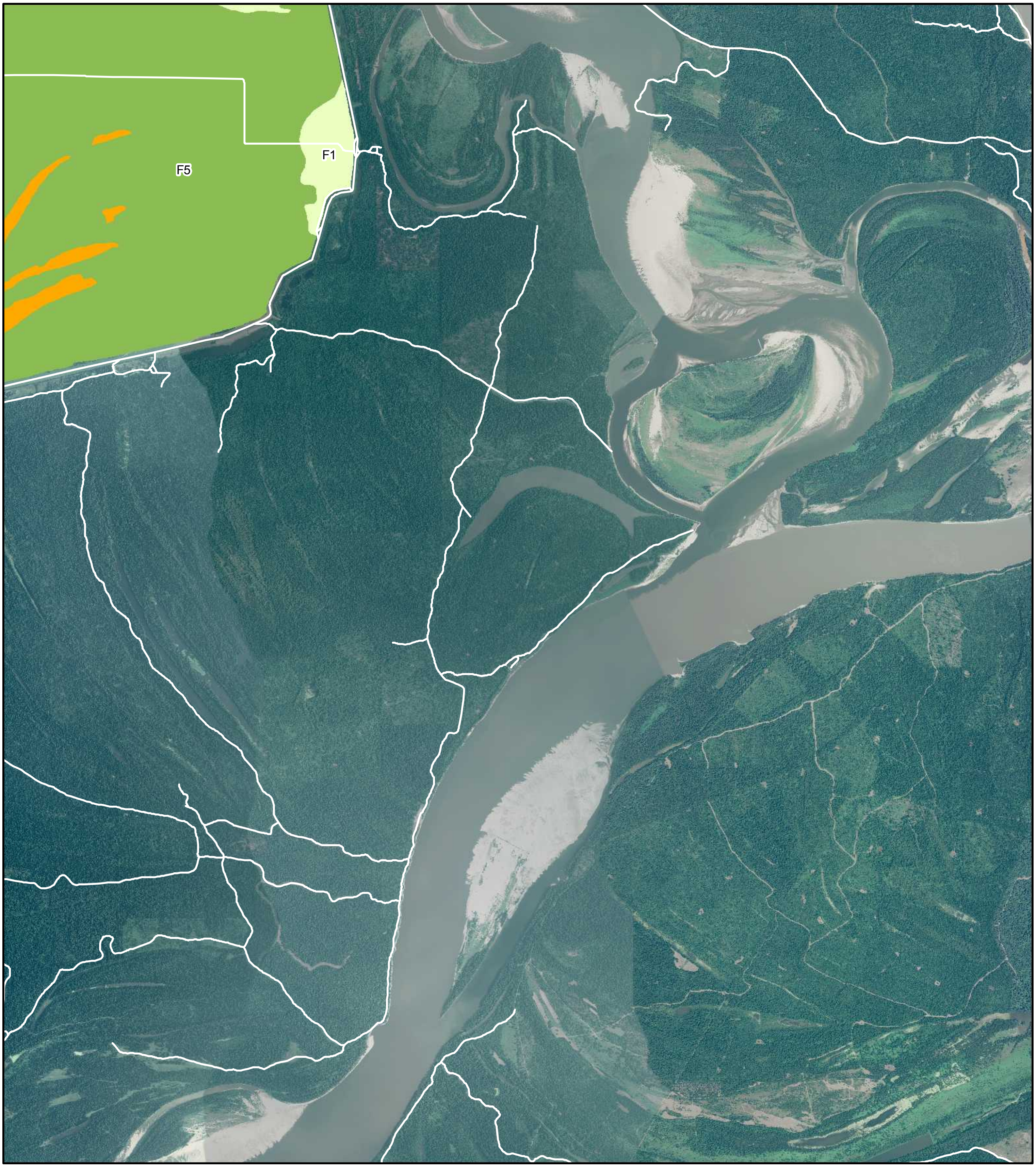

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V9

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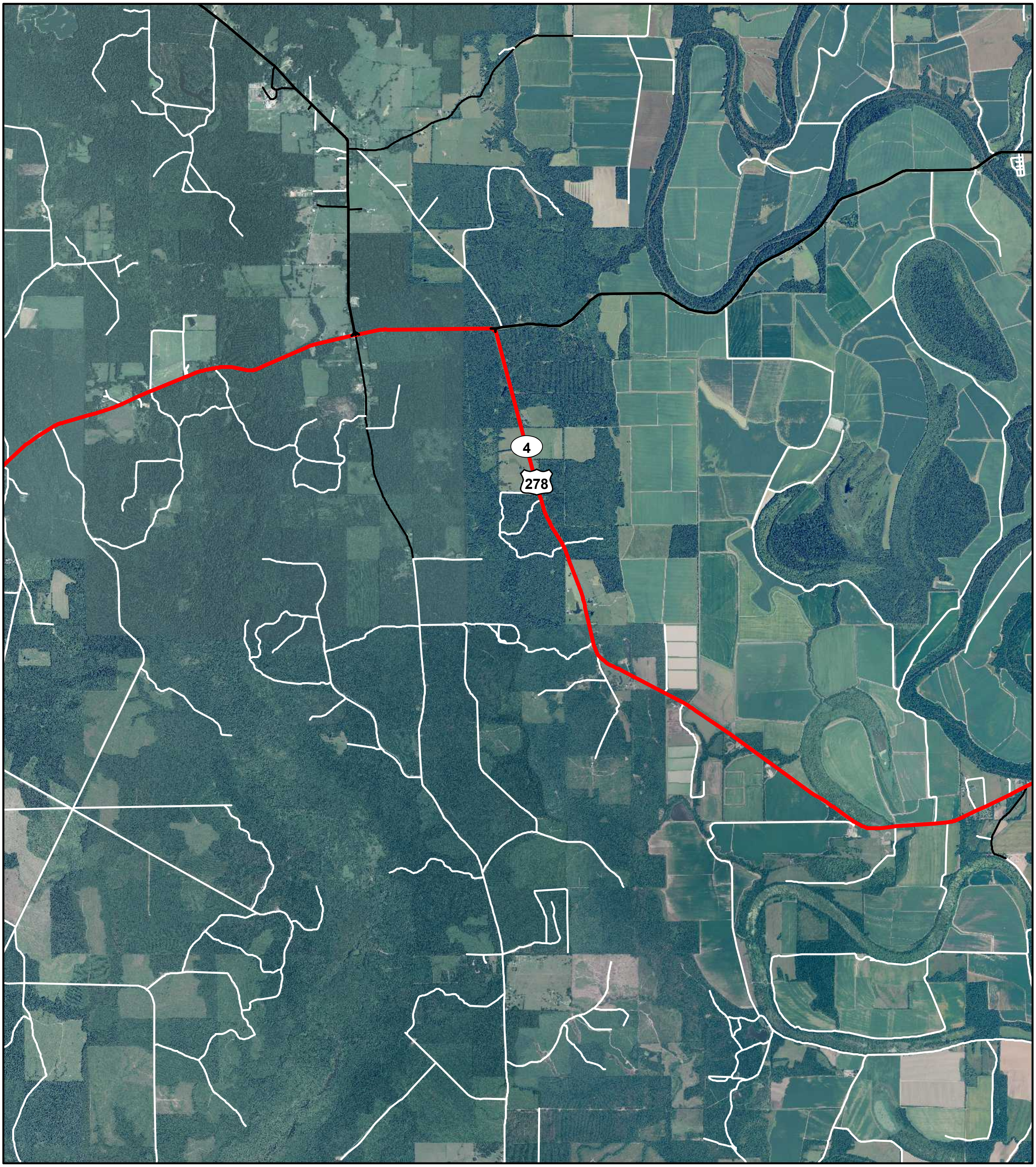

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W6

N

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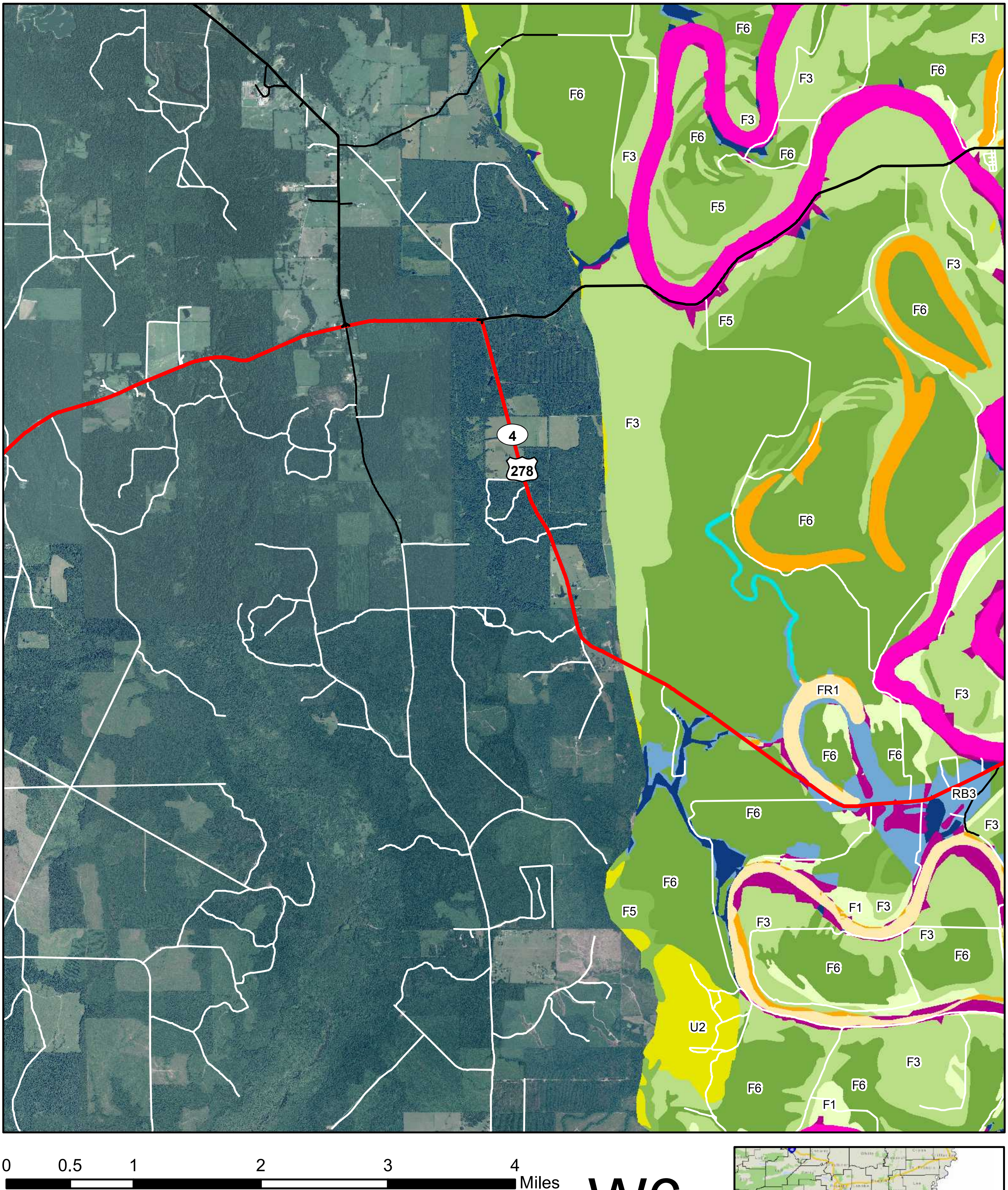

W6

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Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4 Miles

N

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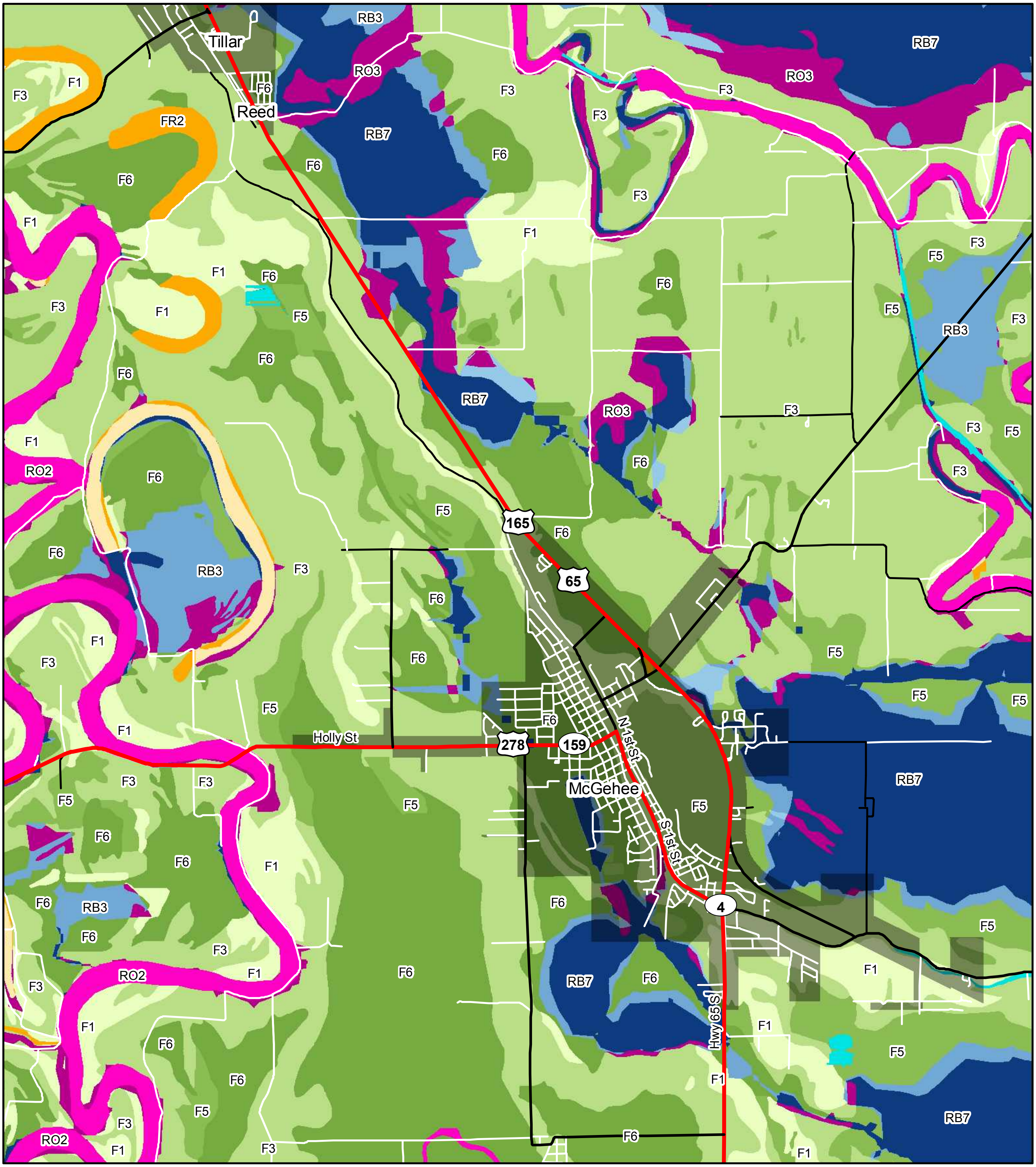
Datum: North American 1983

W7



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W7

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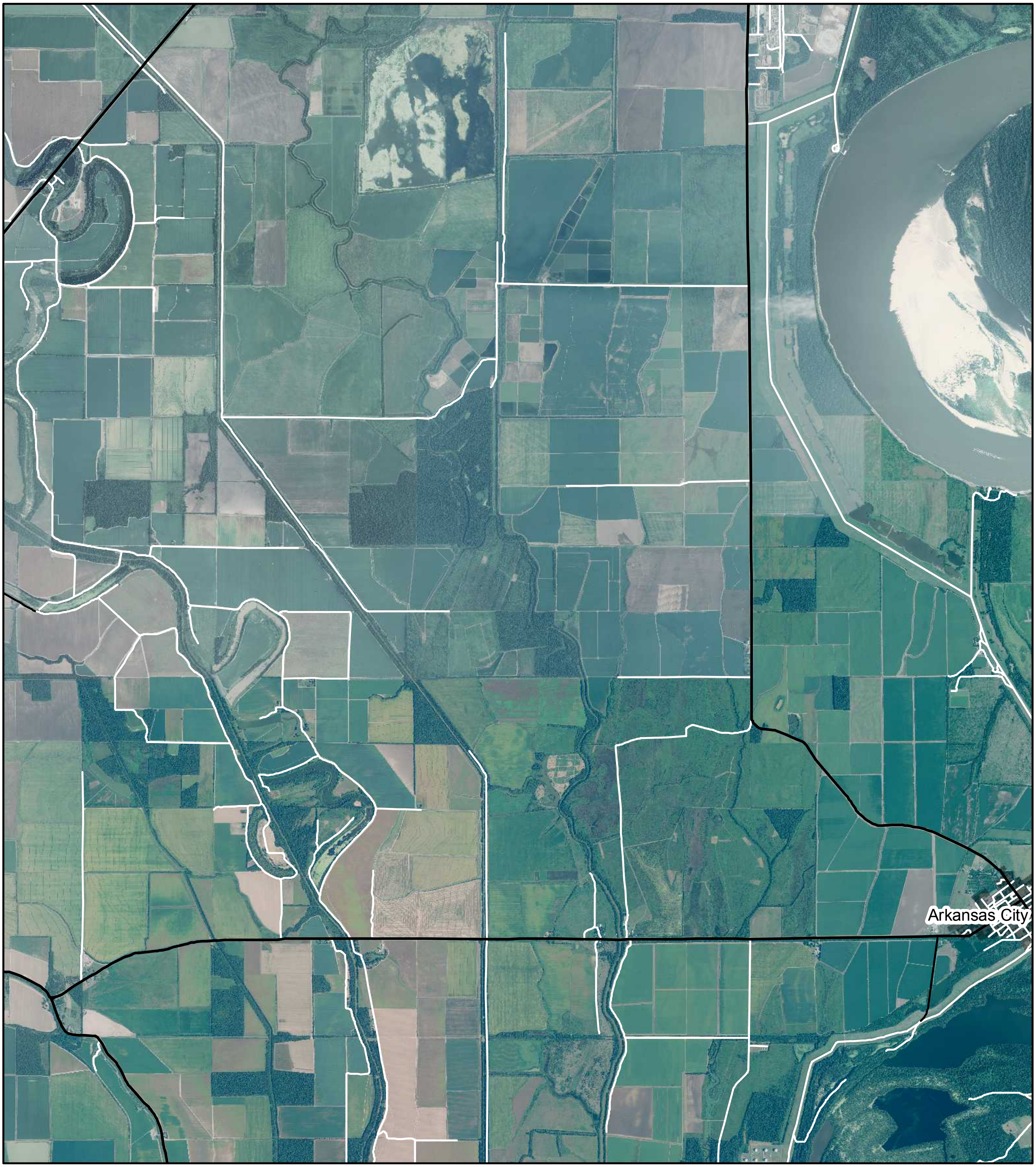

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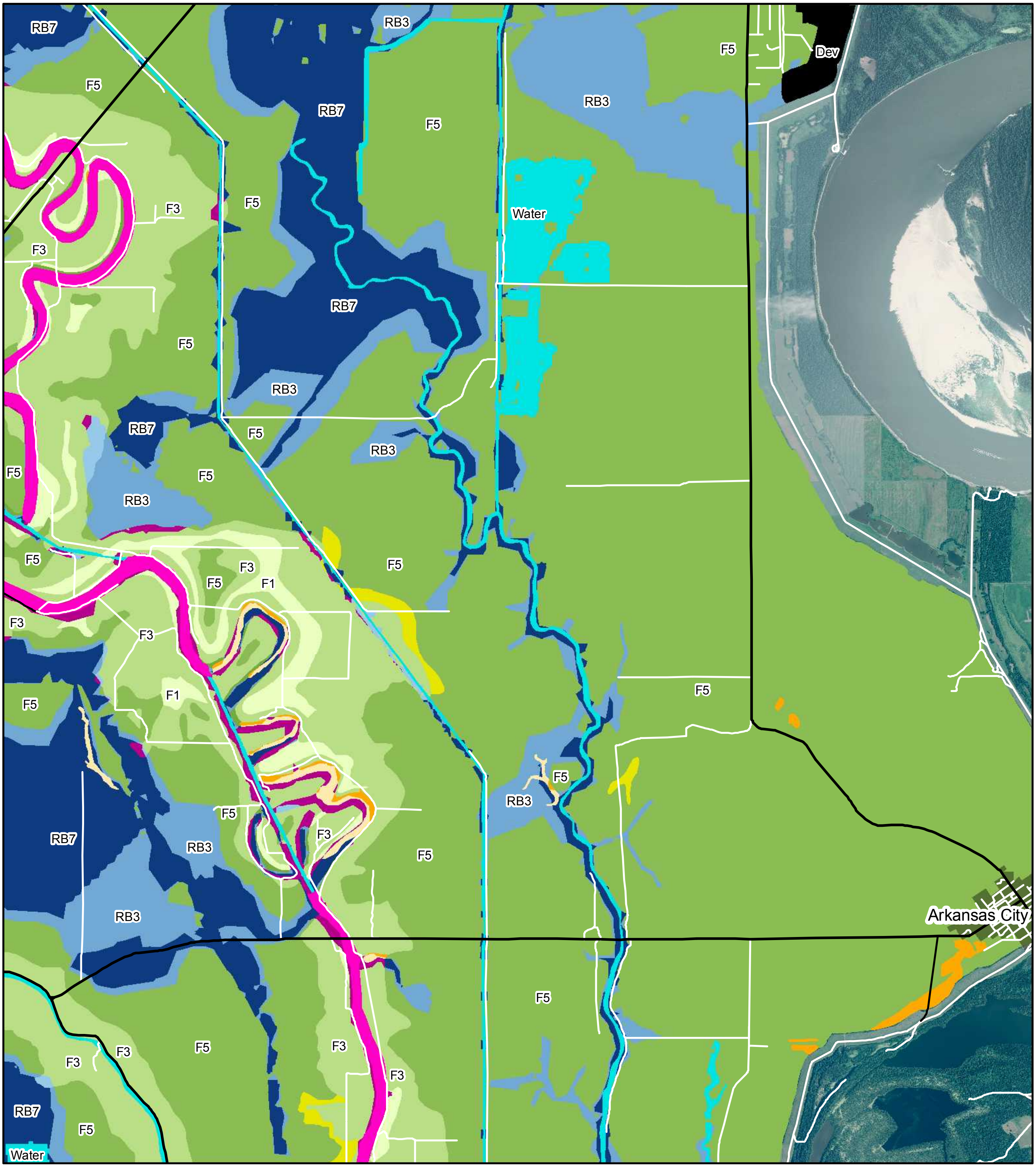
W8



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W8

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Projection: Transverse Mercator
Datum: North American 1983

N

0 0.5 1 2 3 4 Miles

W9

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
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0 0.5 1 2 3 4 Miles

W9

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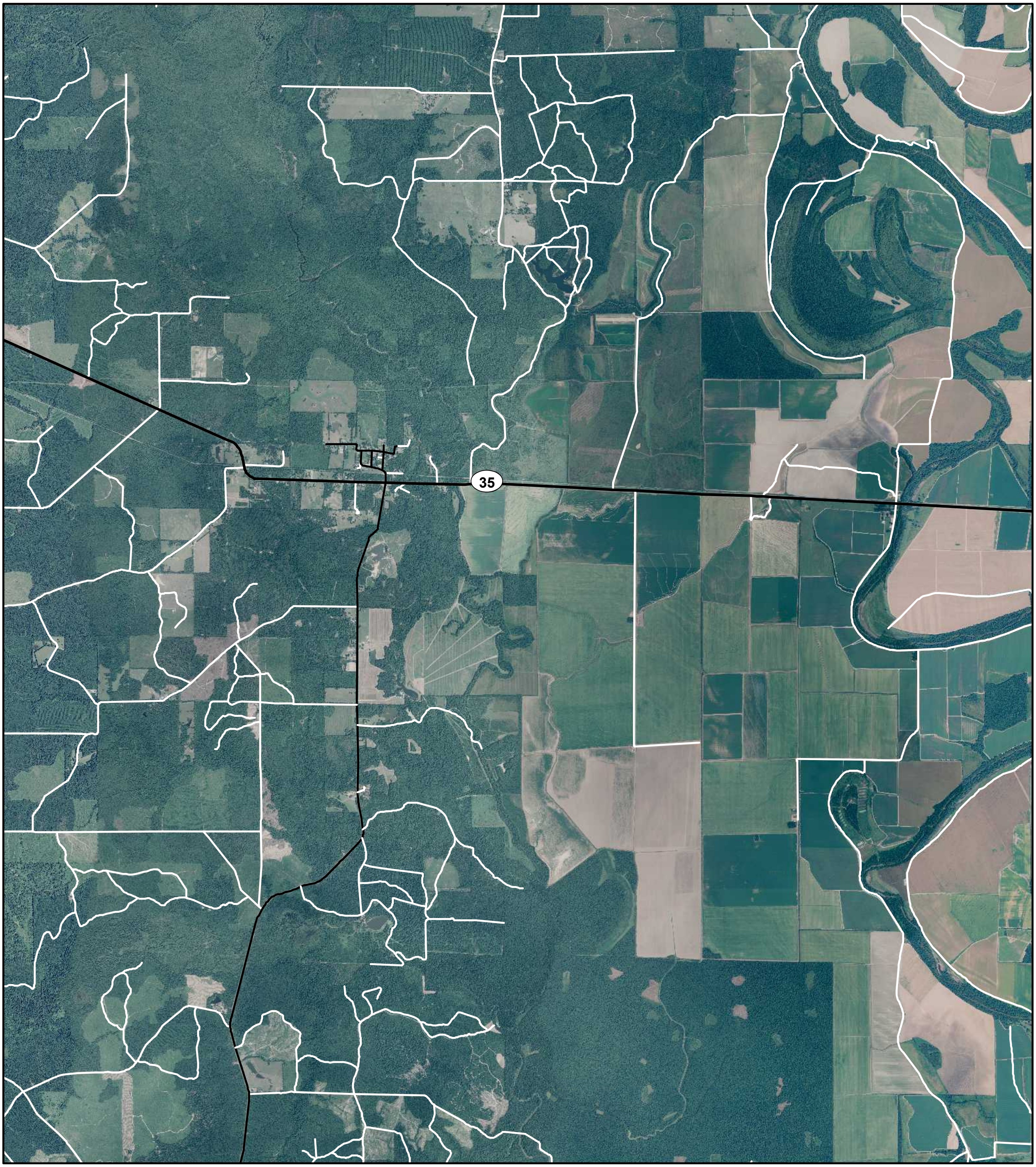

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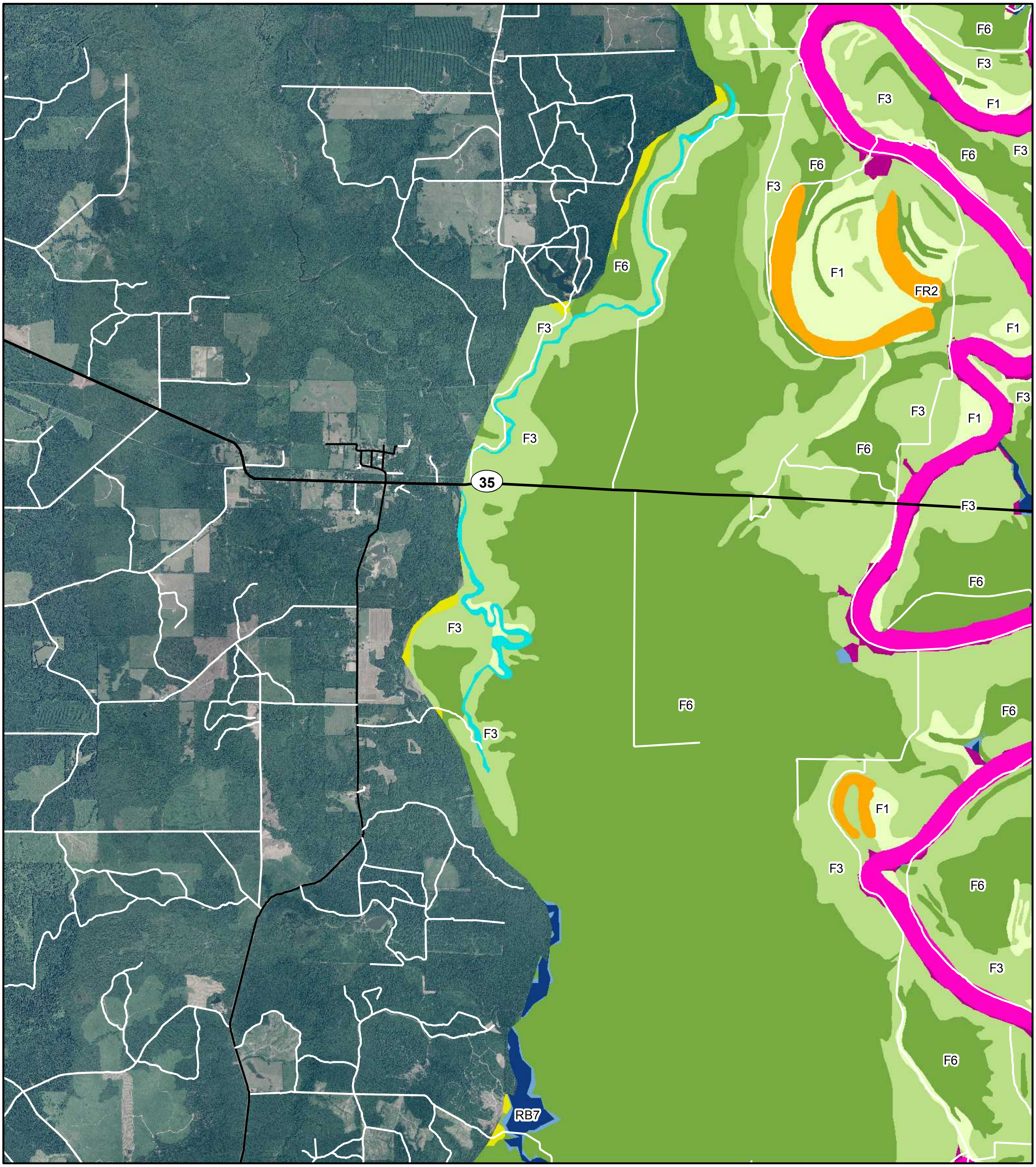

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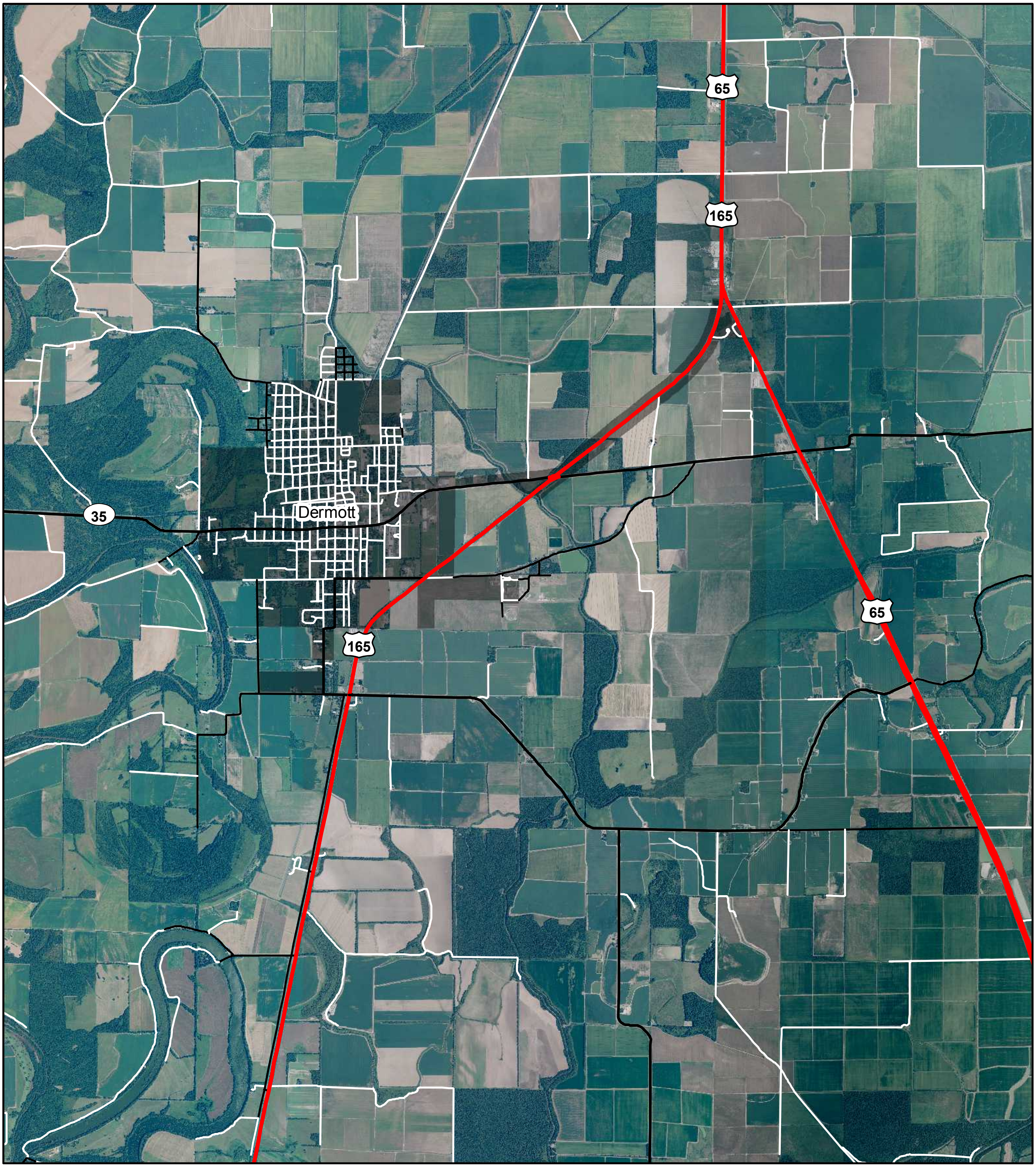

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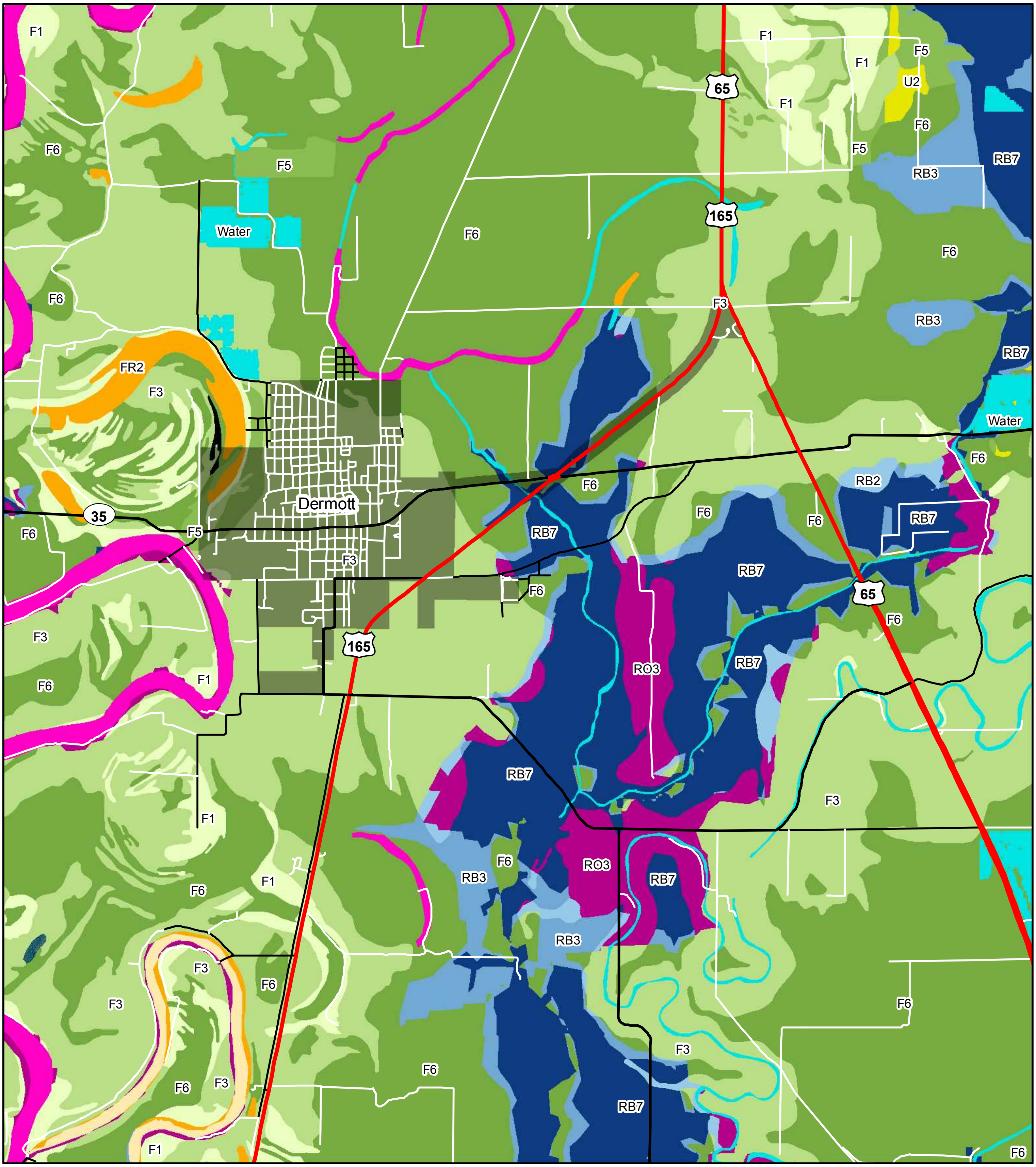

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X7

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Projection: Transverse Mercator
Datum: North American 1983

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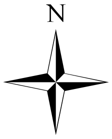
Miles

X8



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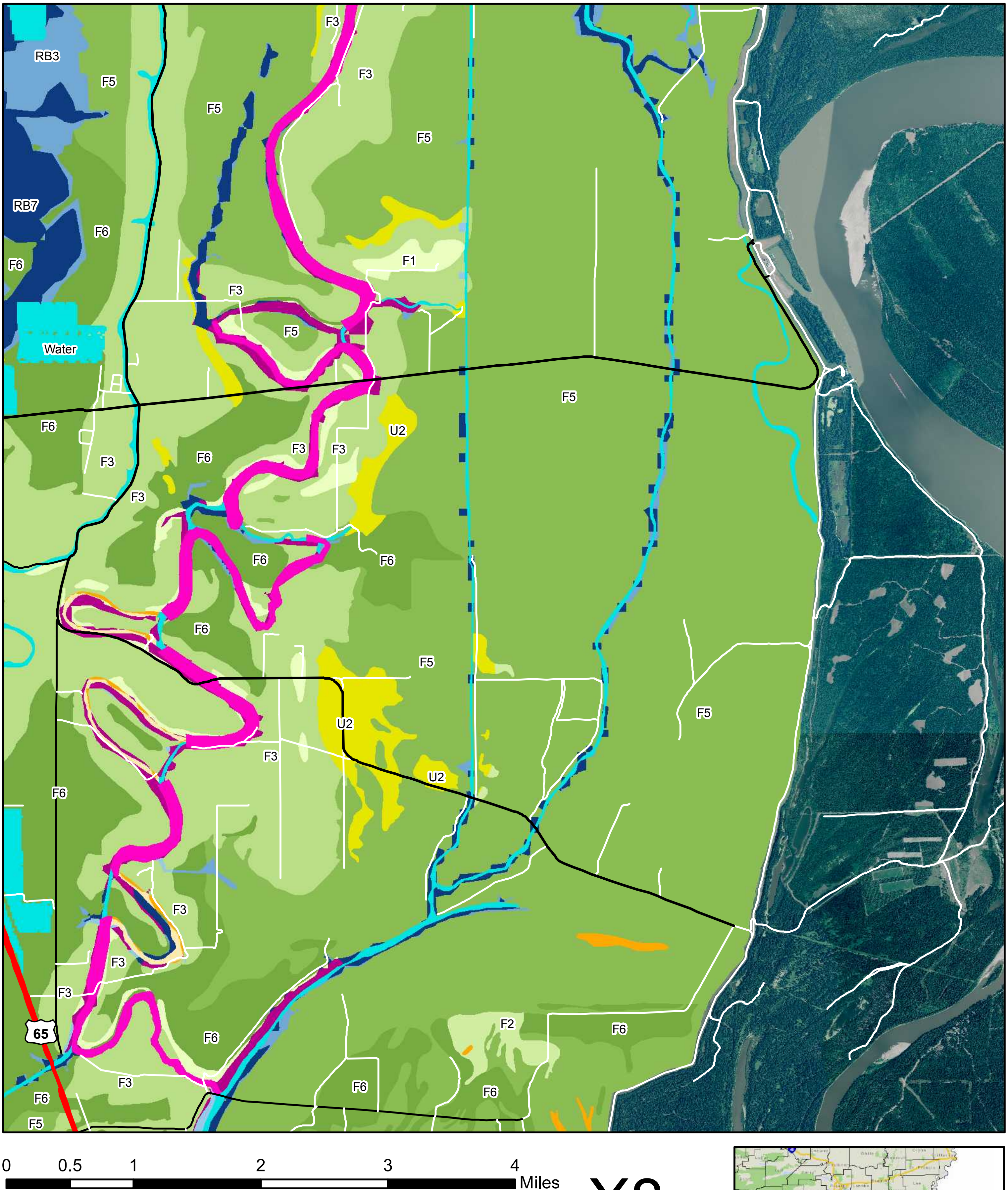

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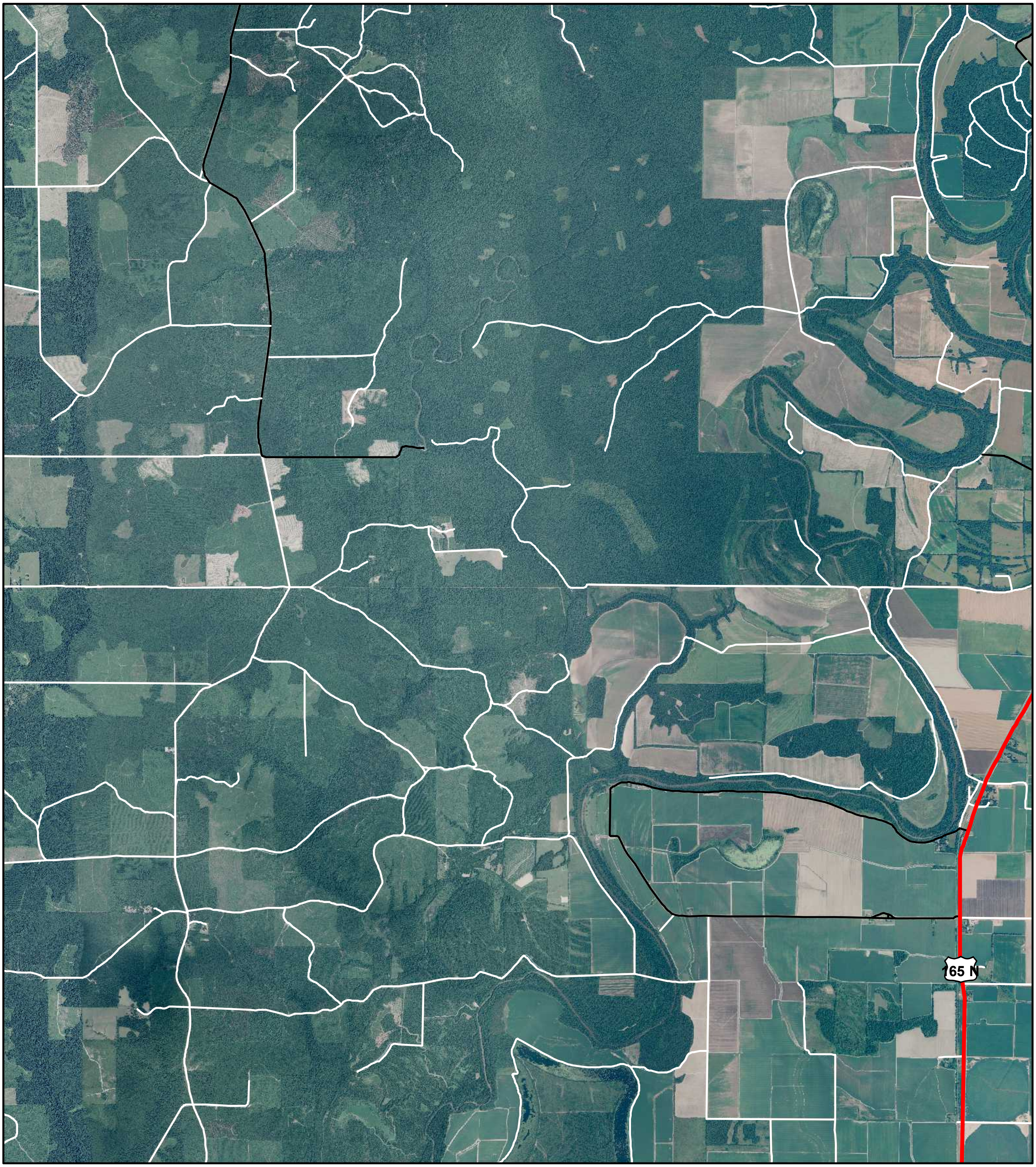
X8



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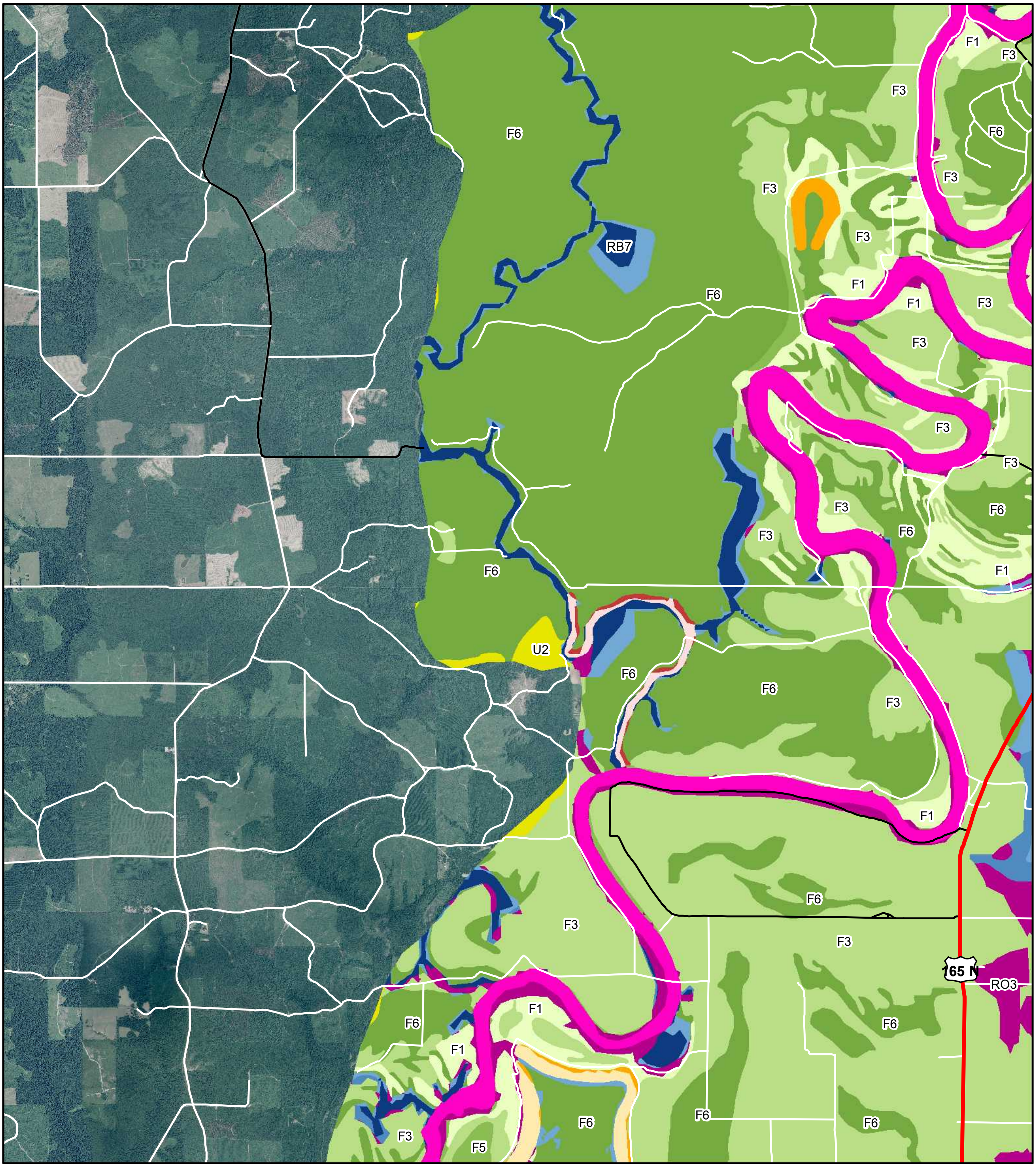

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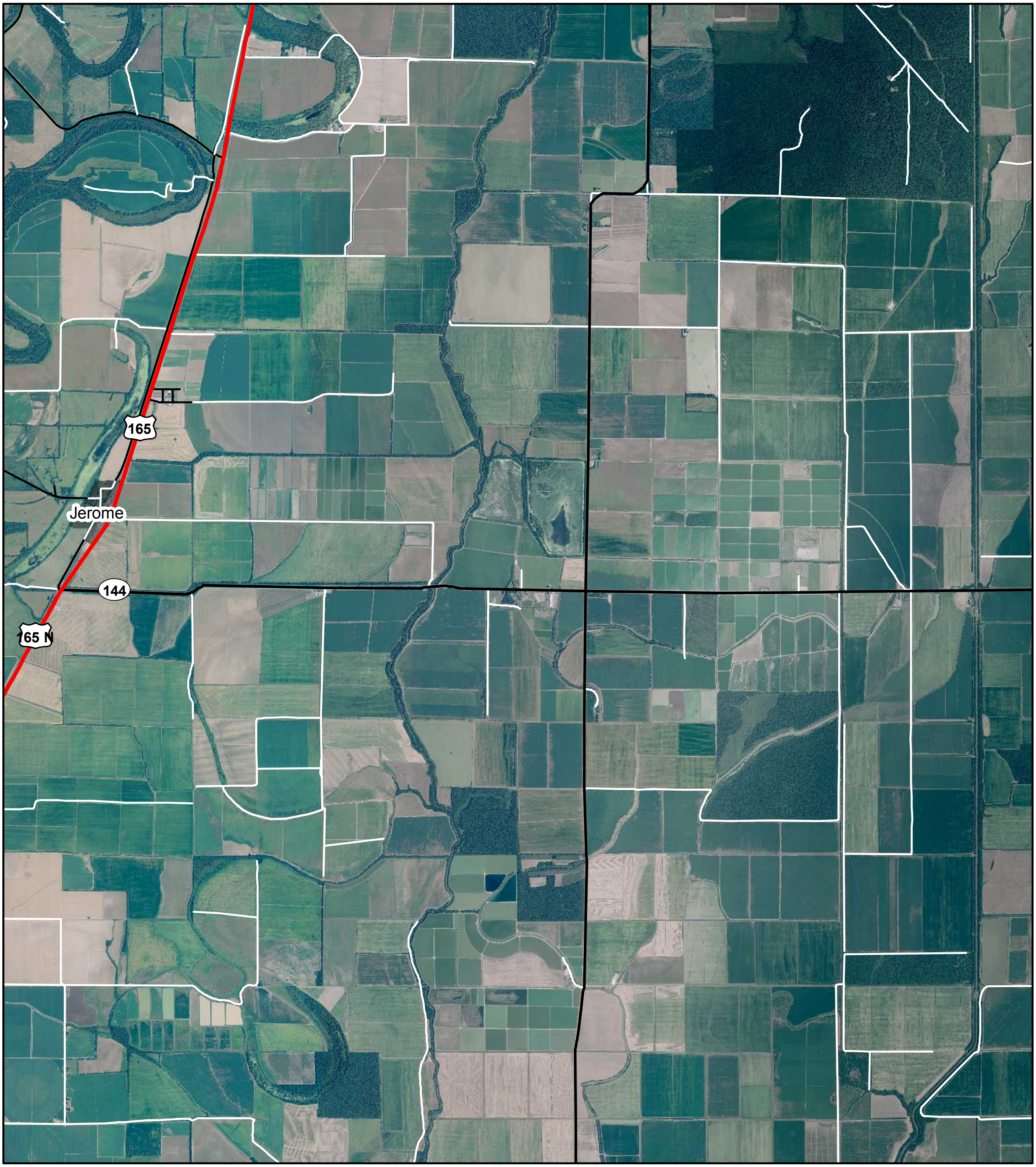

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Y7

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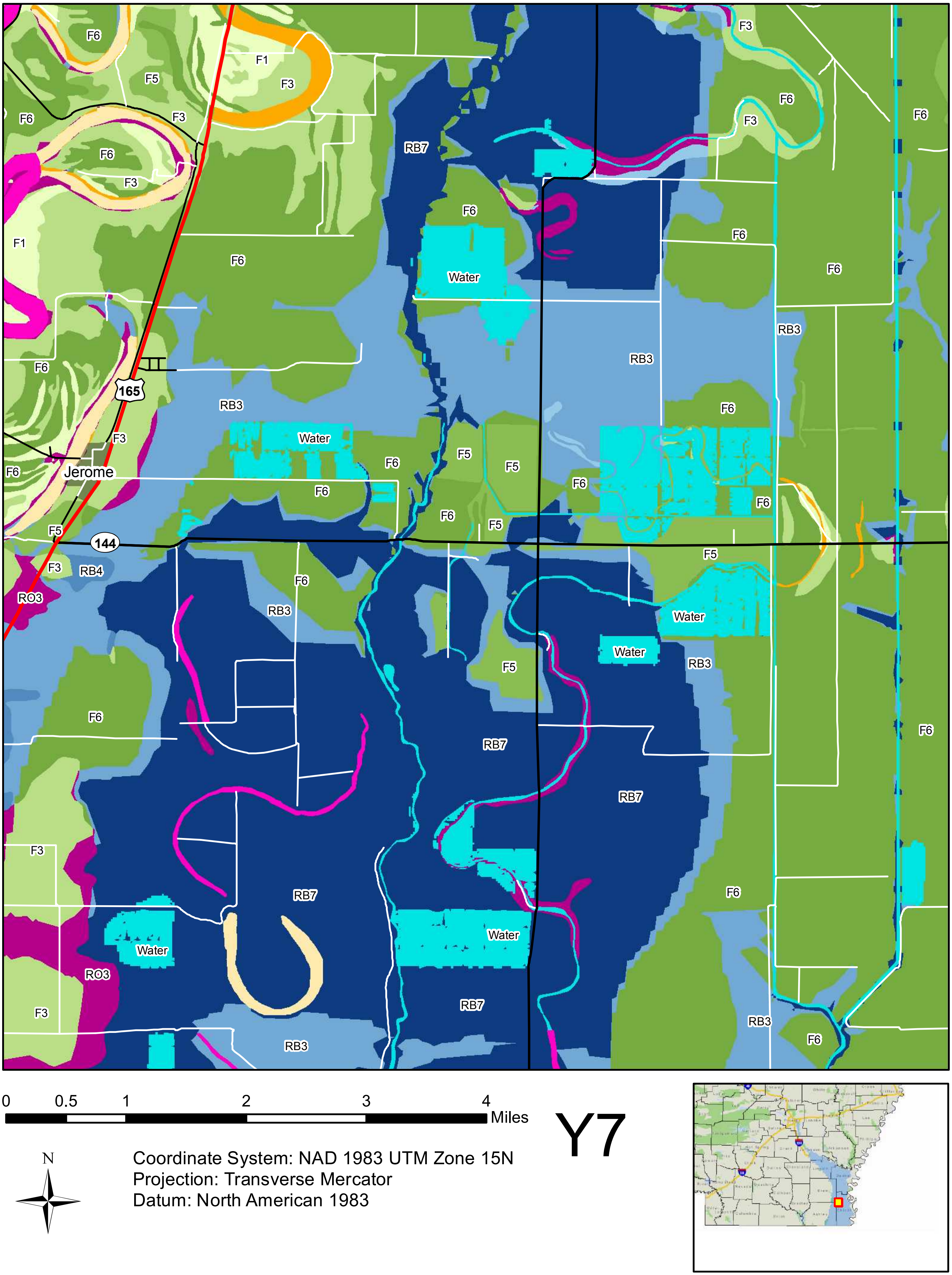

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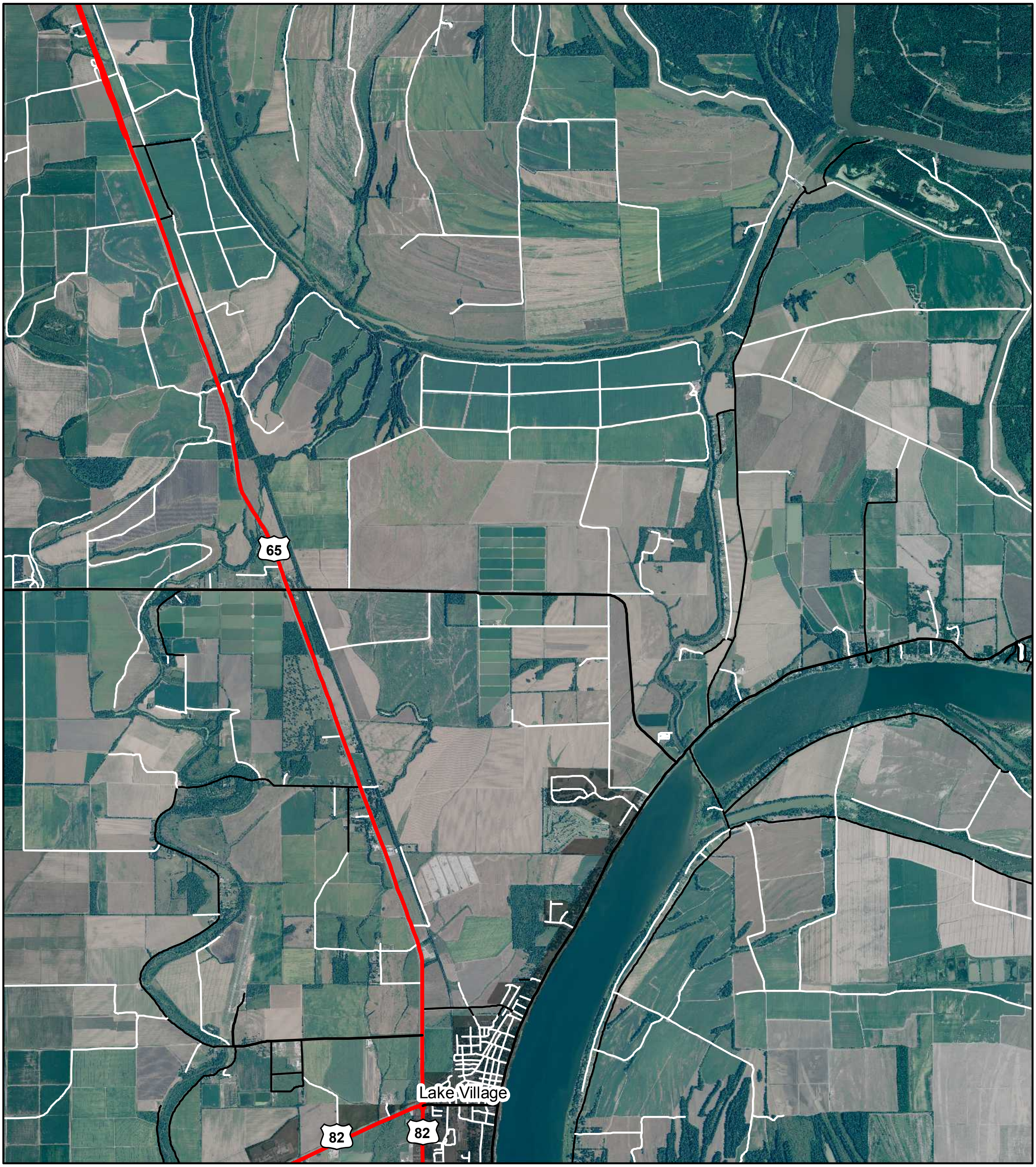

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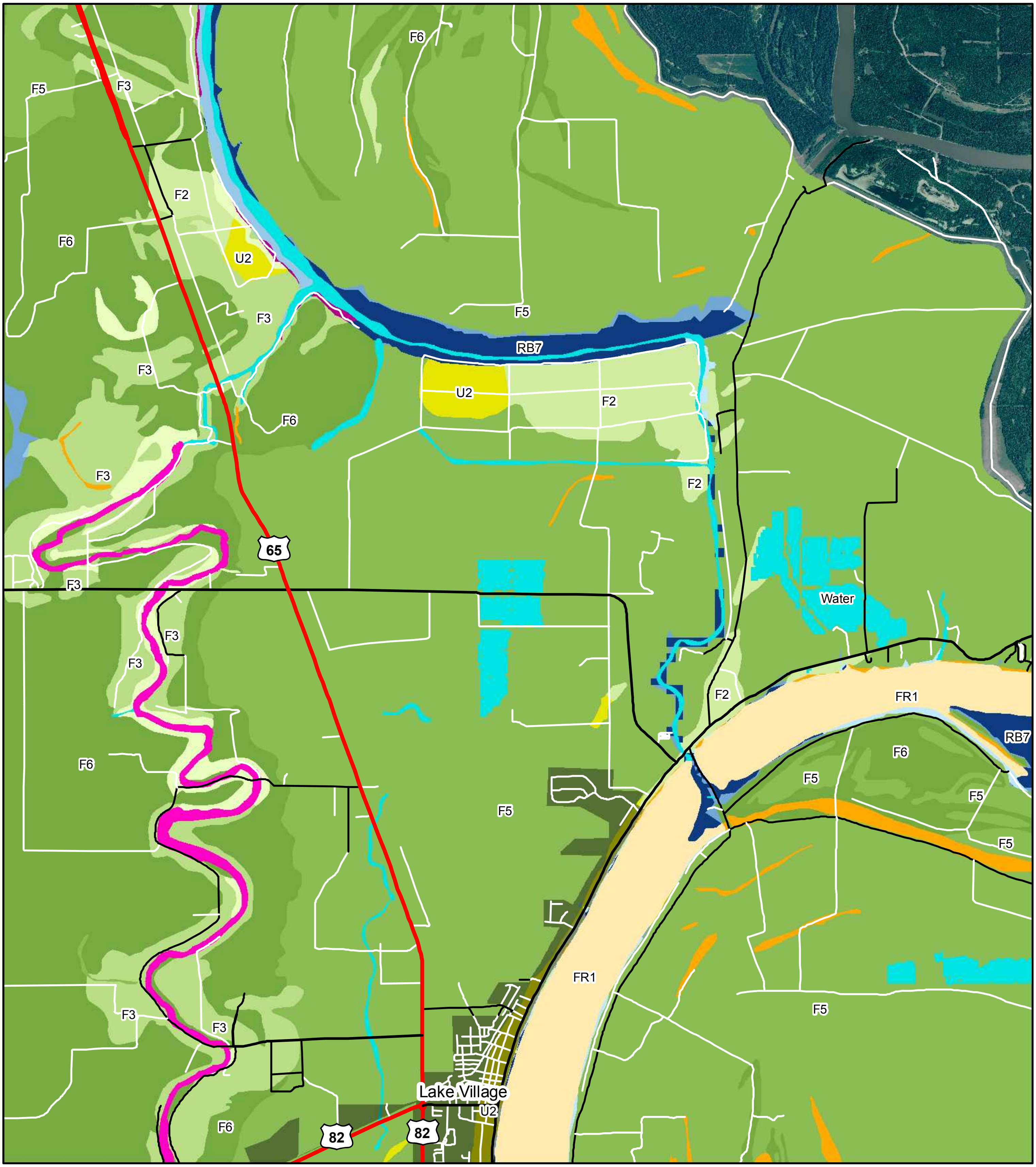
Y8



0 0.5 1 2 3 4 Miles

Y8

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4 Miles

Y9

N

Coordinate System: NAD 1983 UTM Zone 15N
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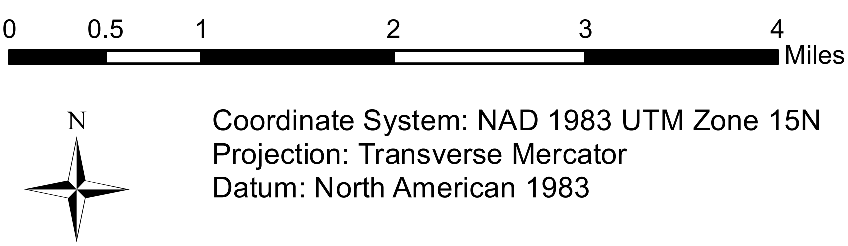

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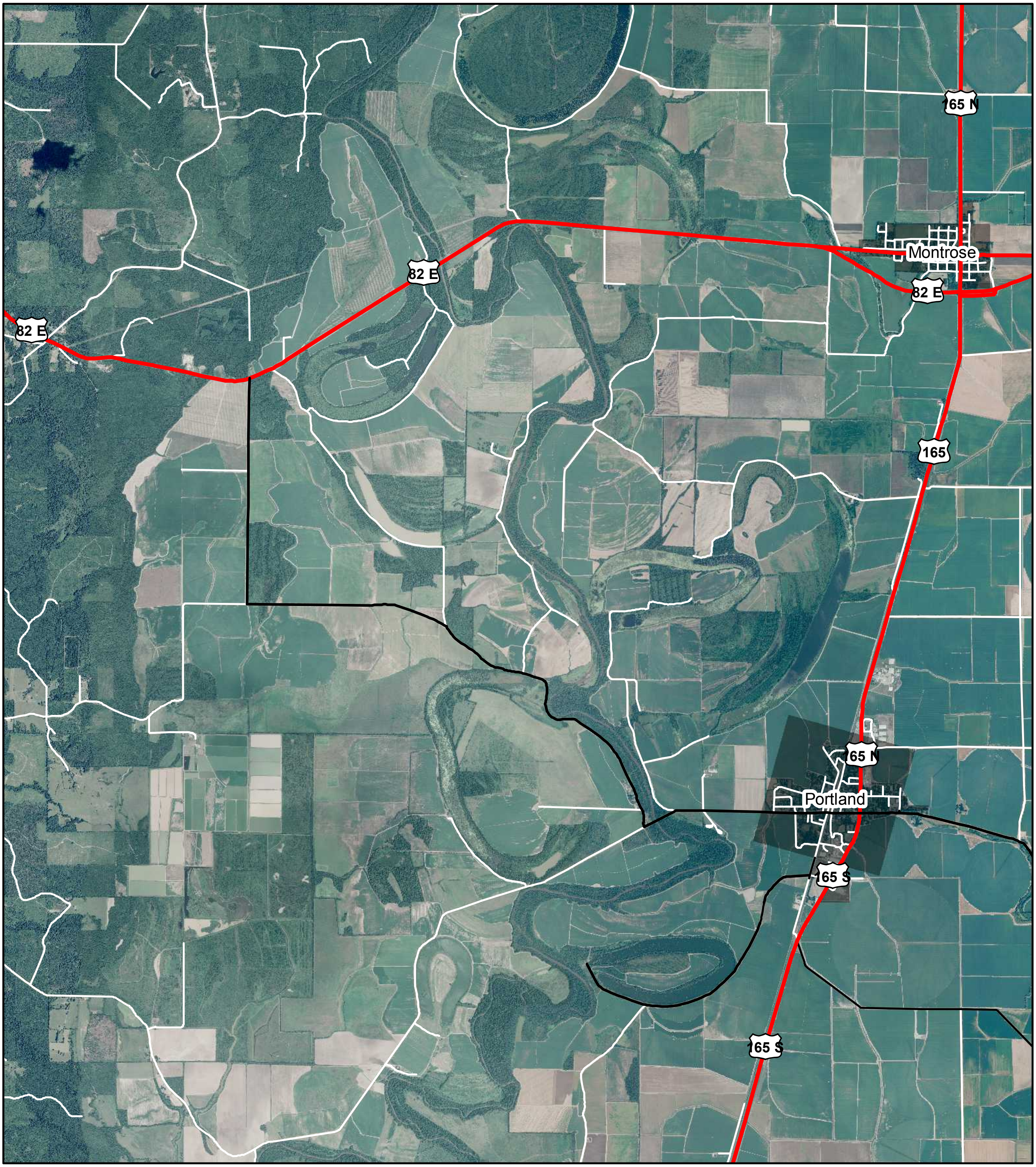

0 0.5 1 2 3 4
Miles

Z6

N

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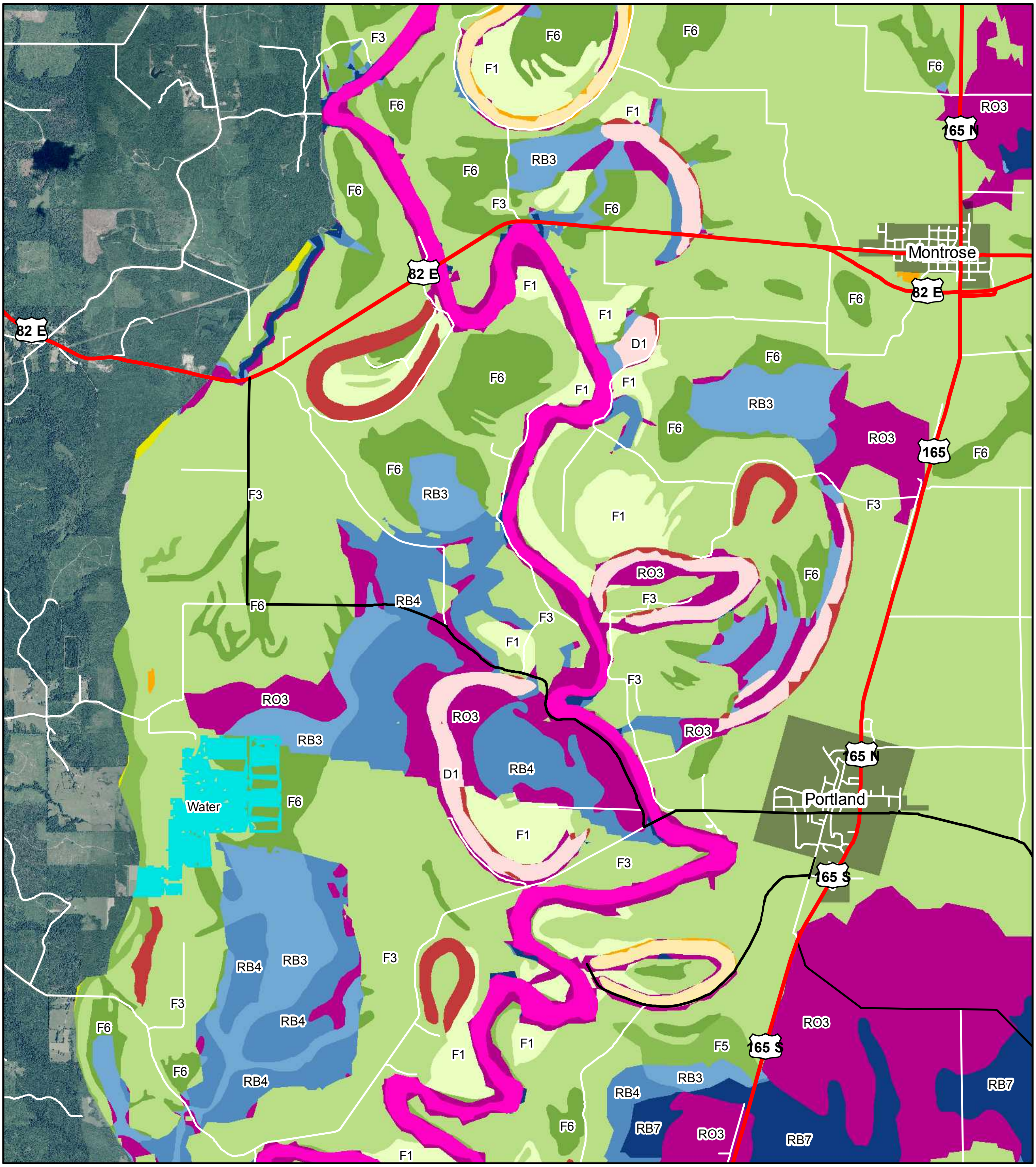
Projection: Transverse Mercator
Datum: North American 1983



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Z6

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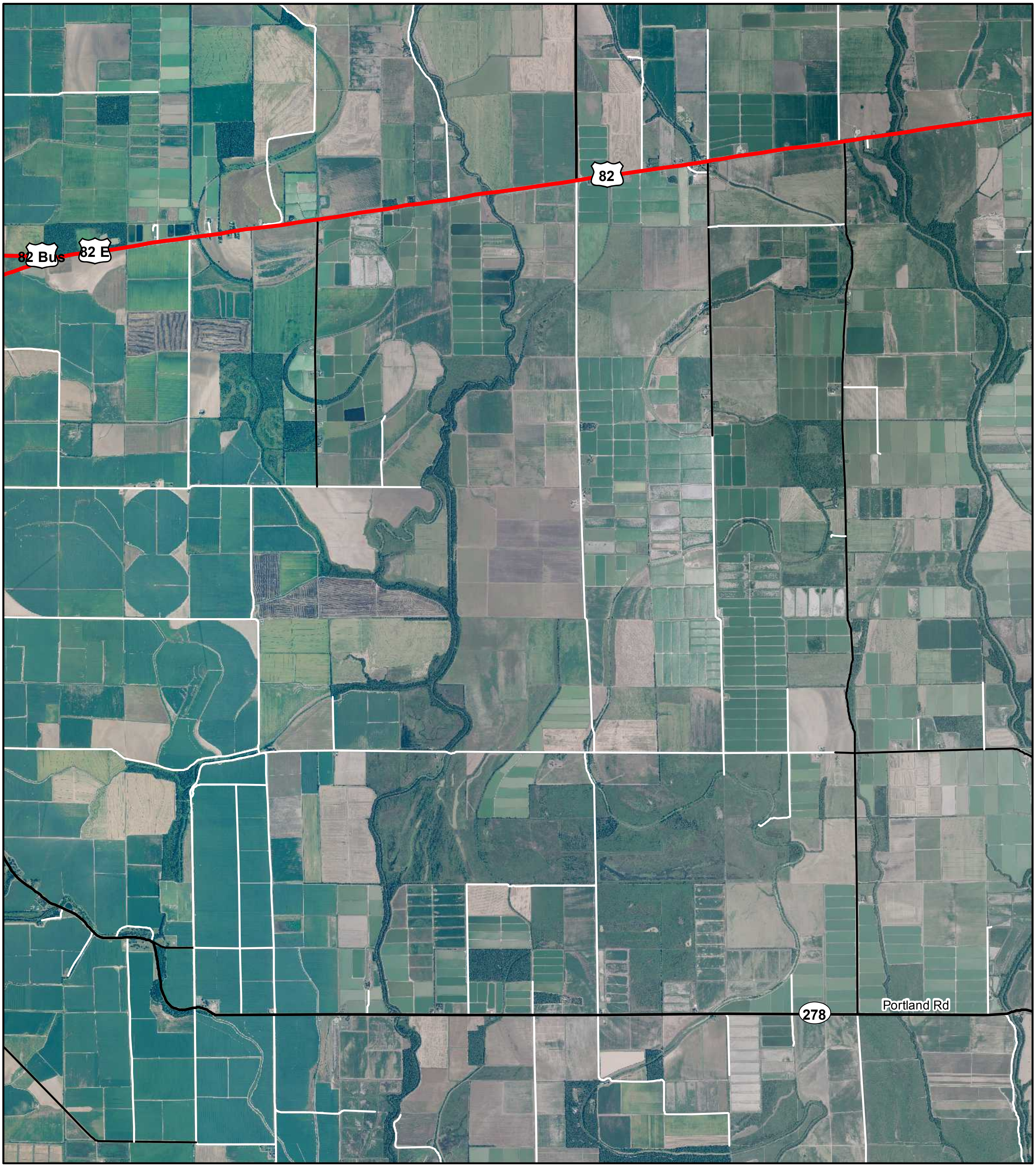

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N

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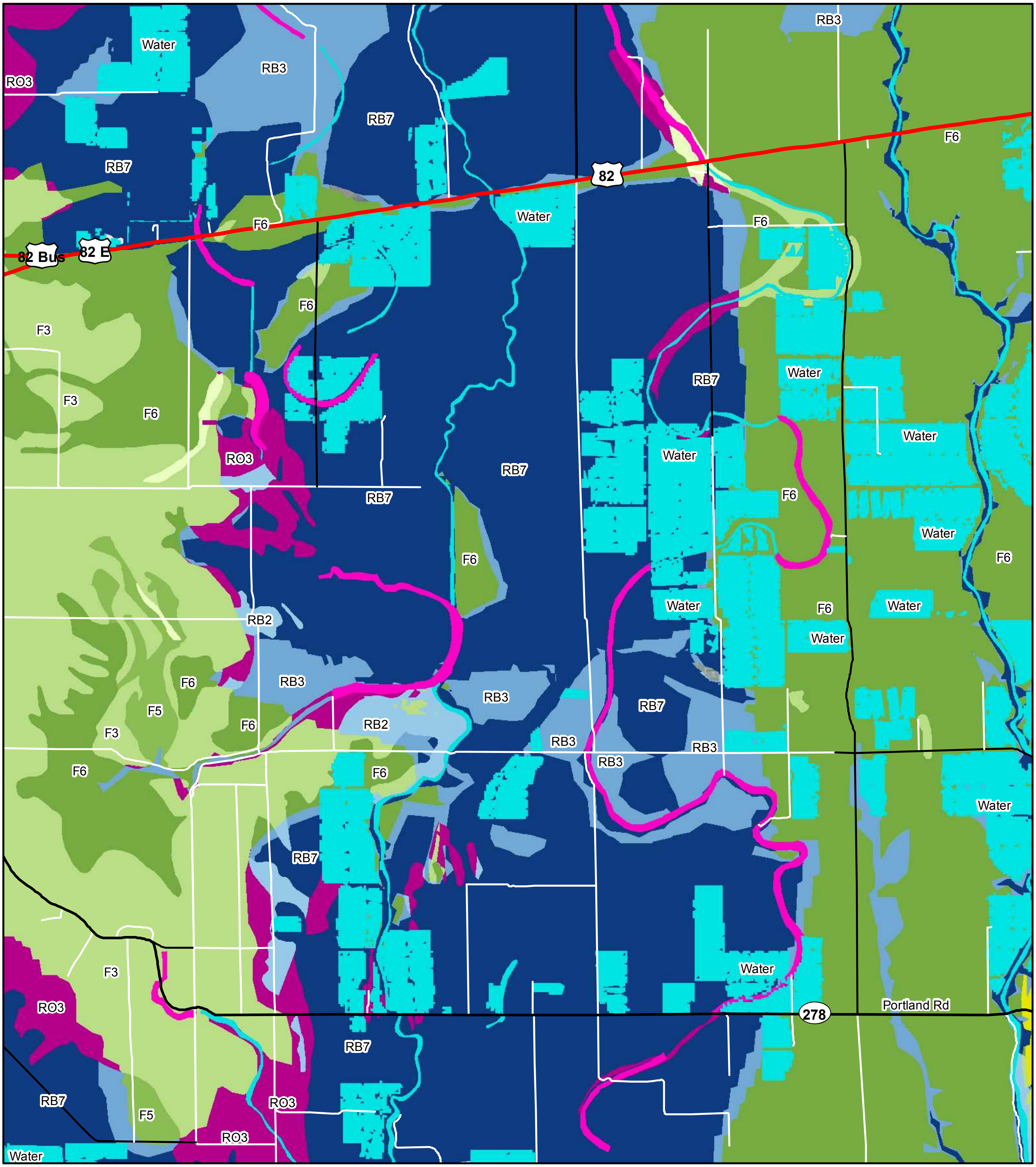
Z7



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Z7

N

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Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4 Miles

Z8

N

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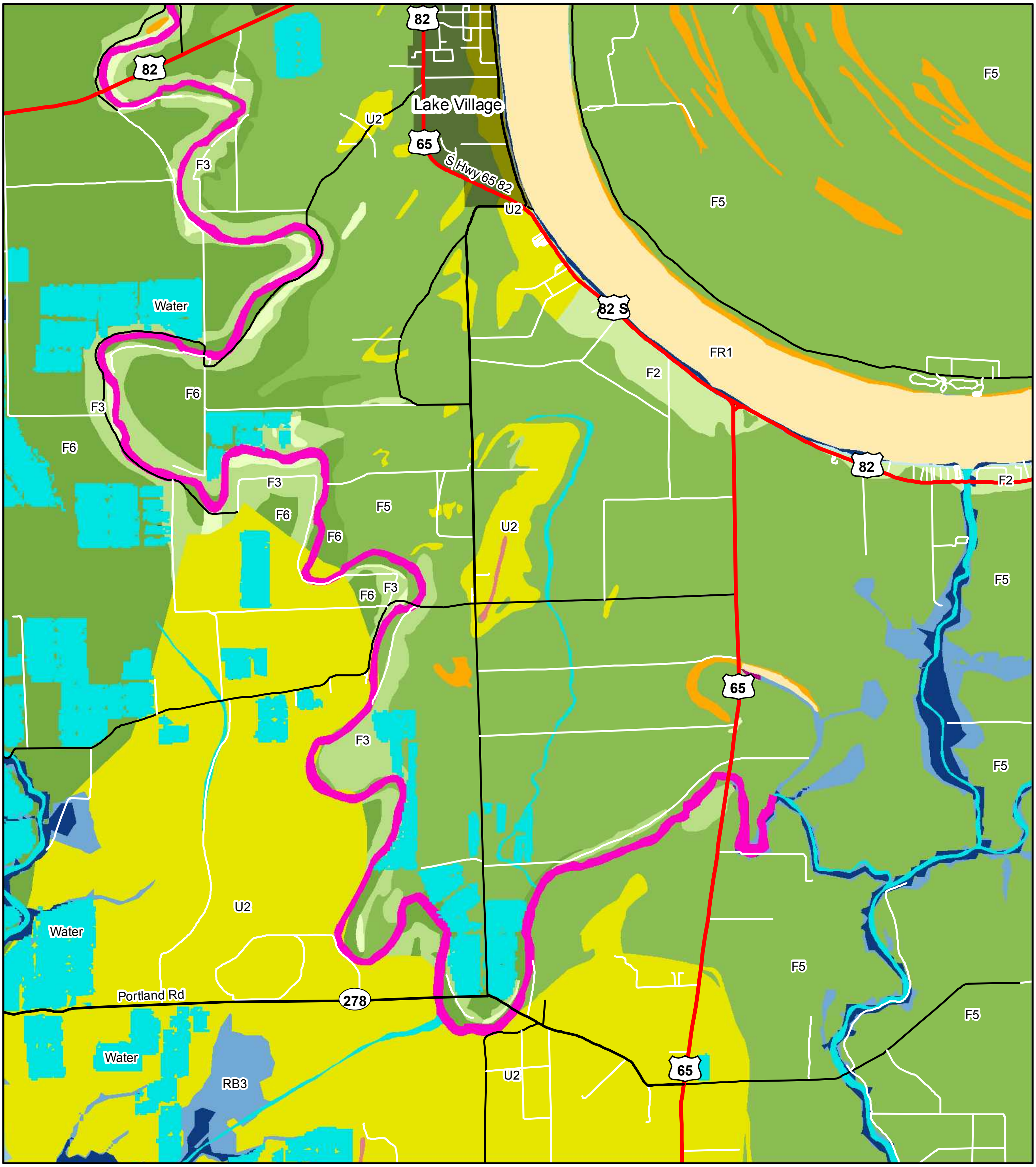


0 0.5 1 2 3 4 Miles

Z8

N

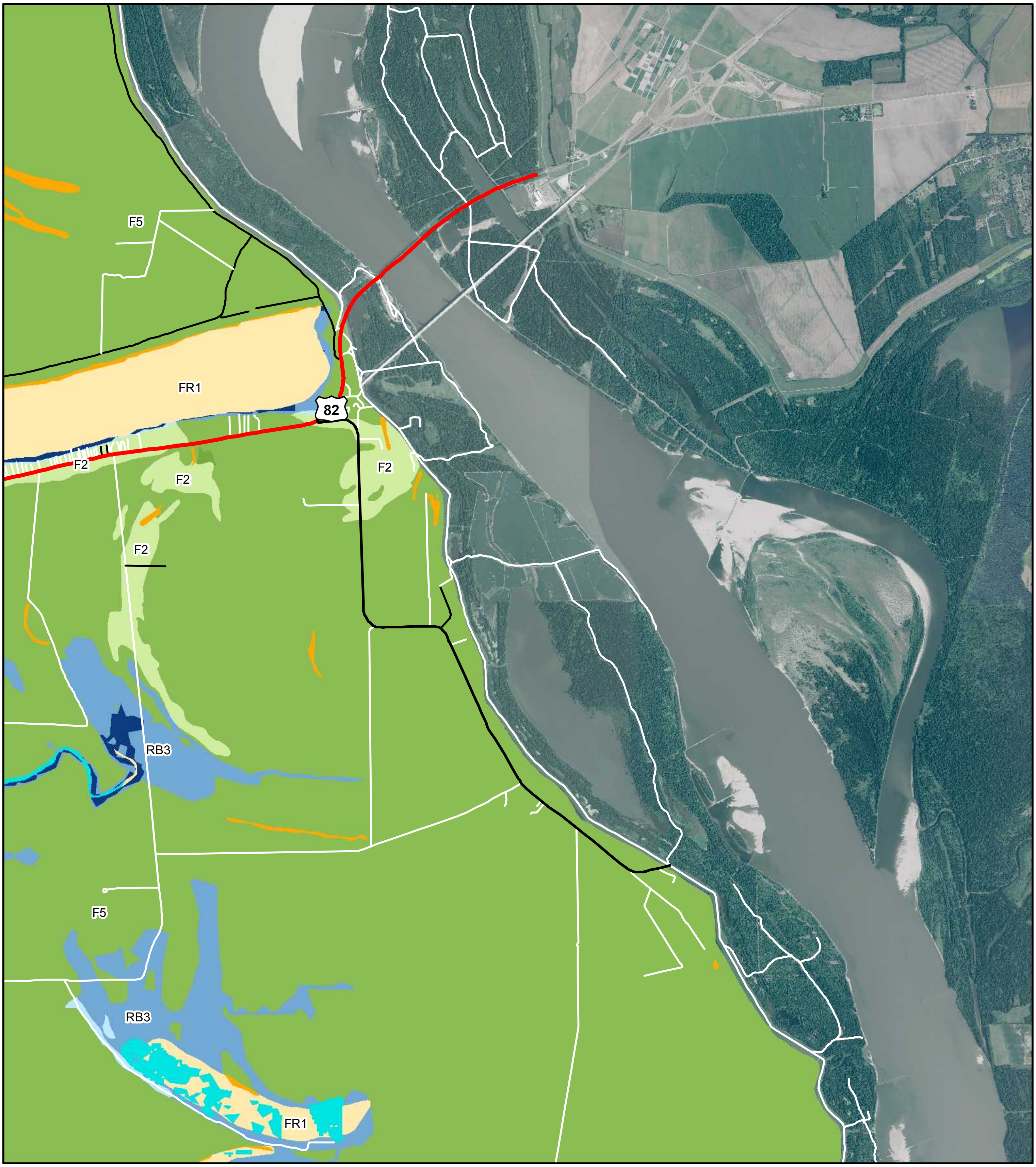
Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983

0 0.5 1 2 3 4
Miles

Z9

N

Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983



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Z9

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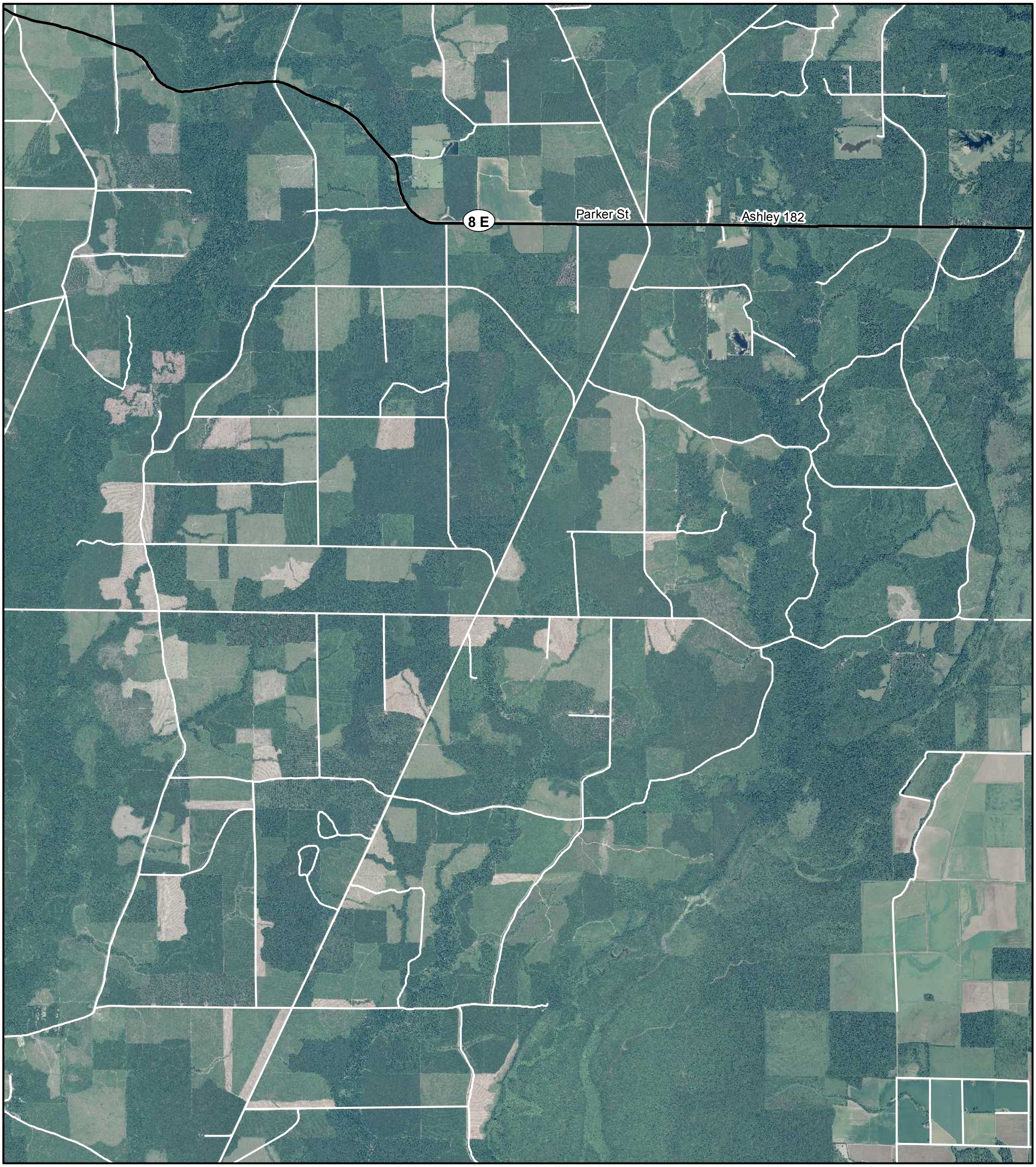

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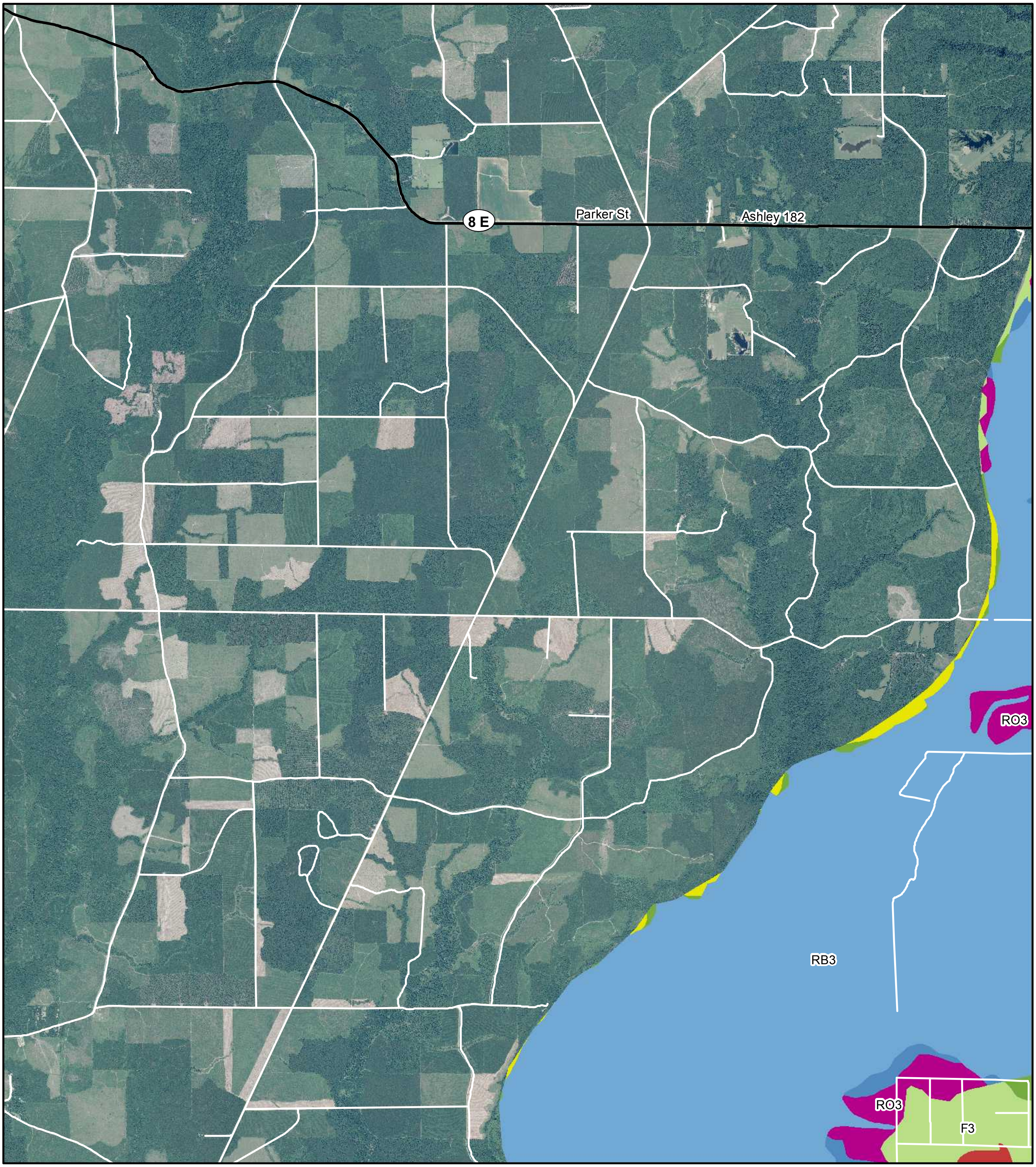

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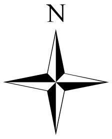

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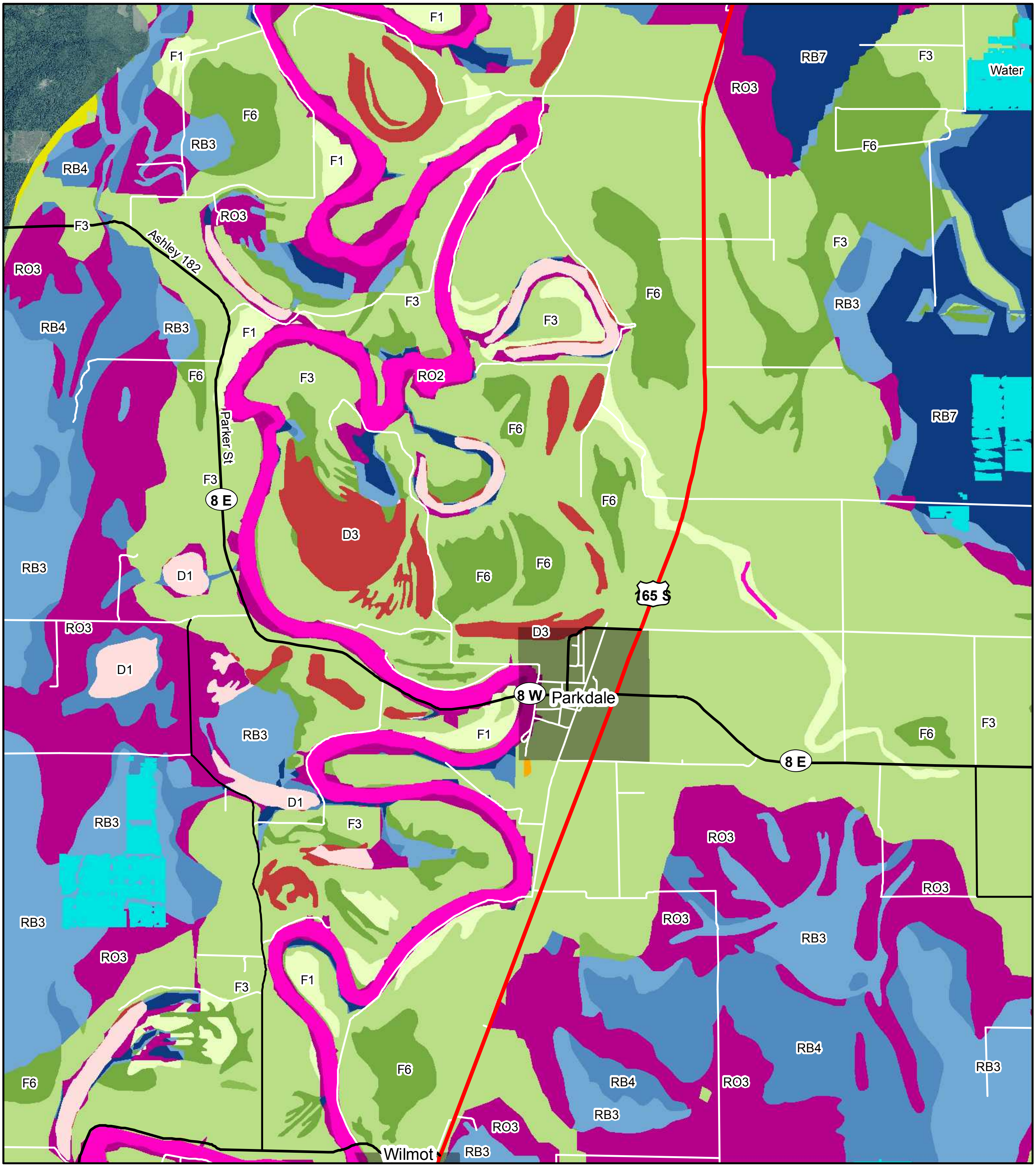

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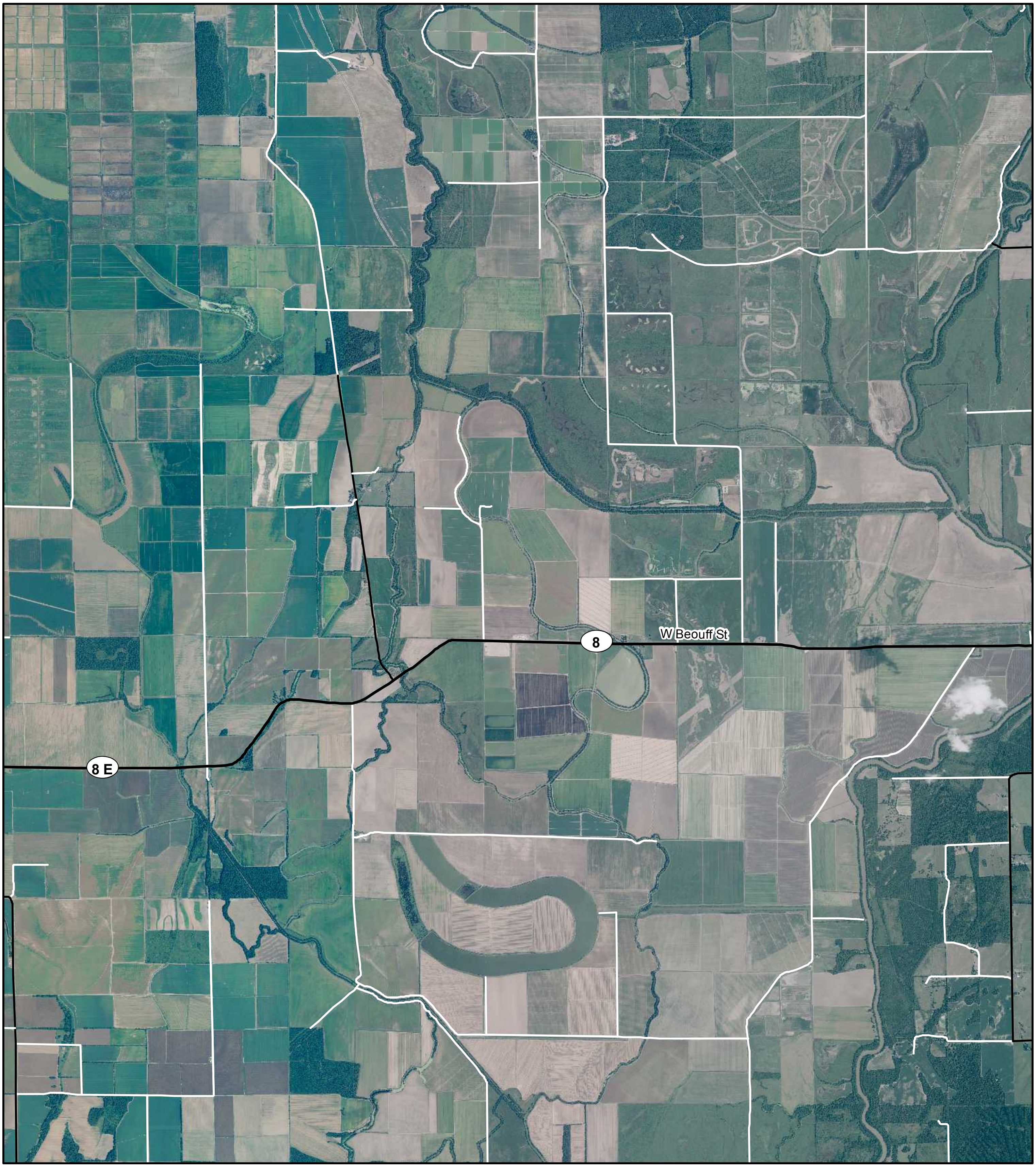

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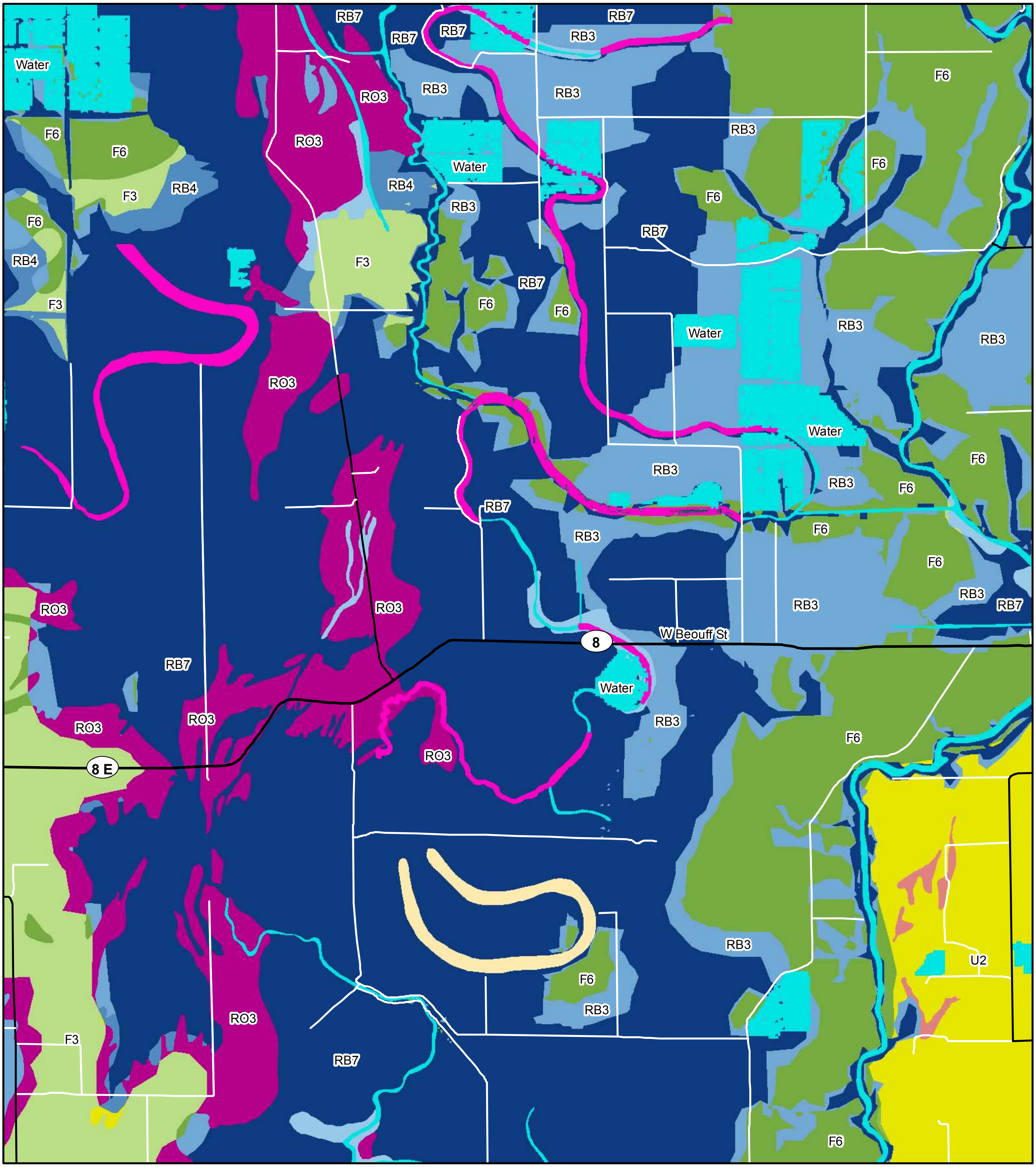

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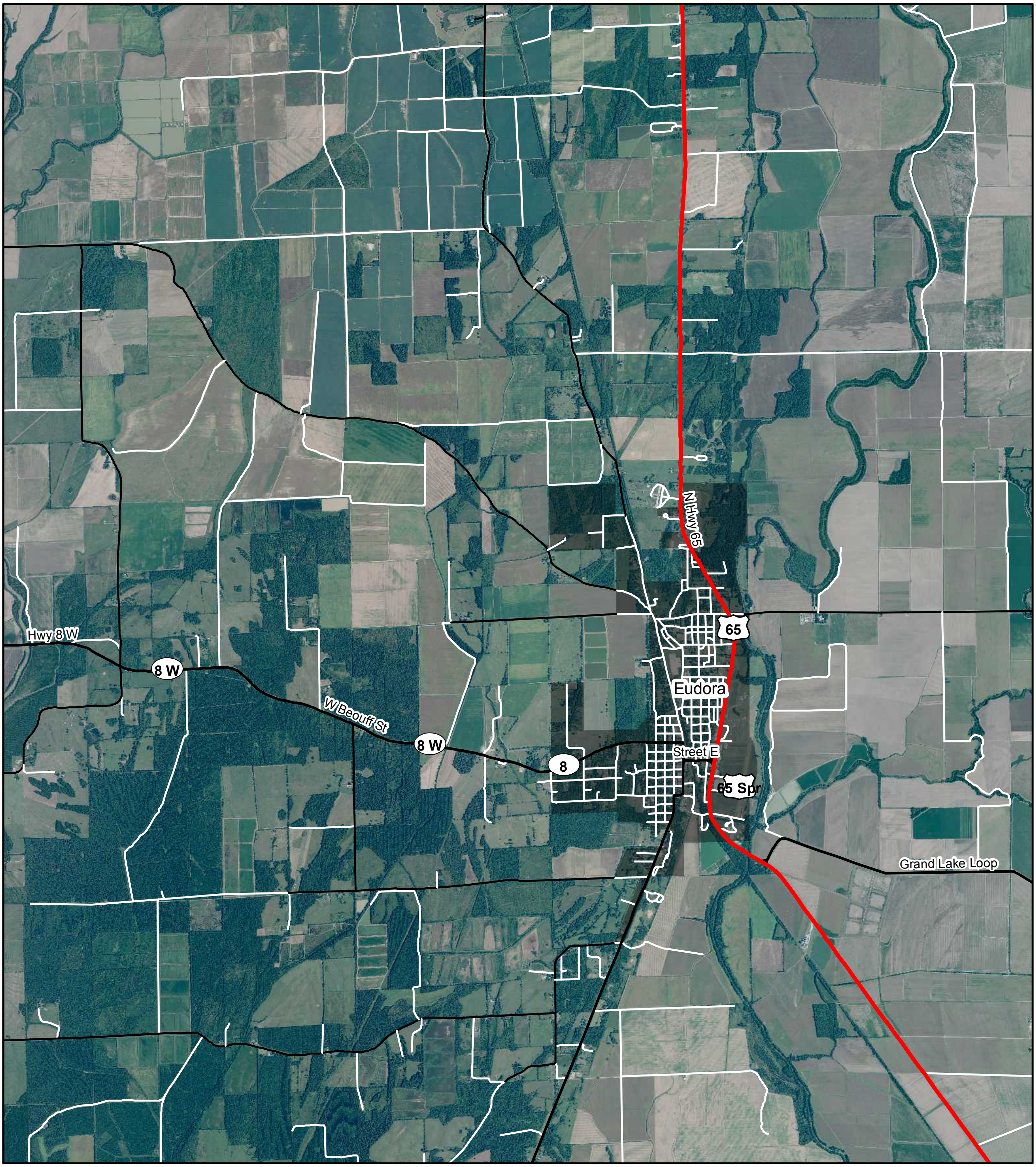

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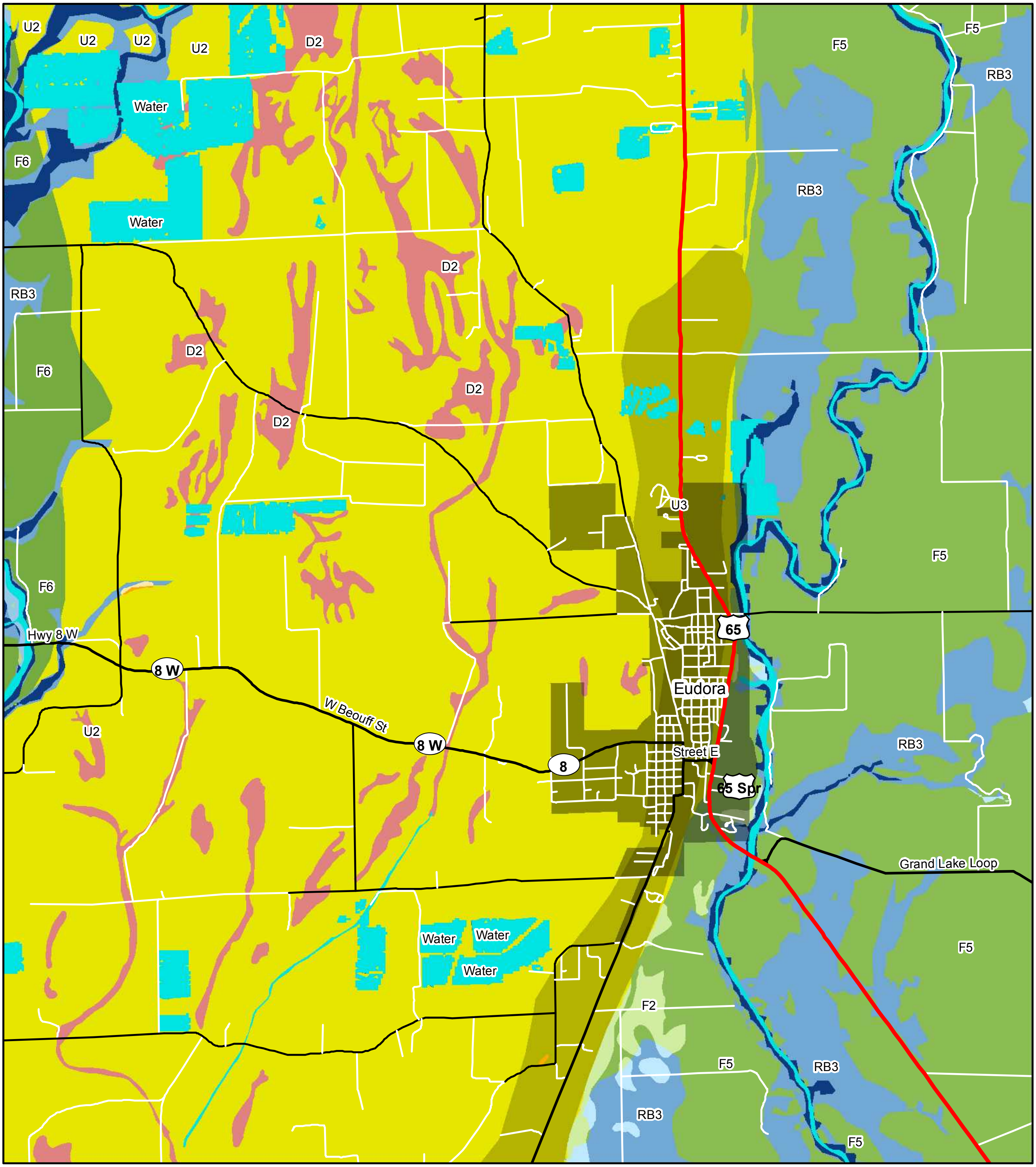

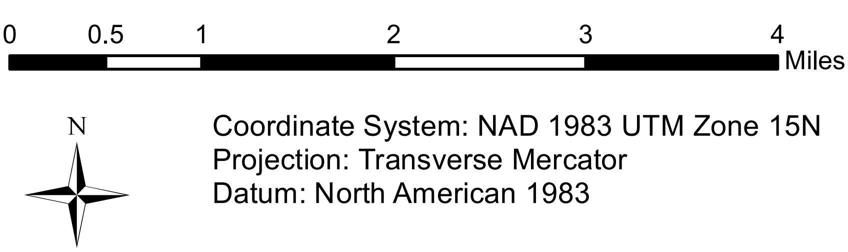

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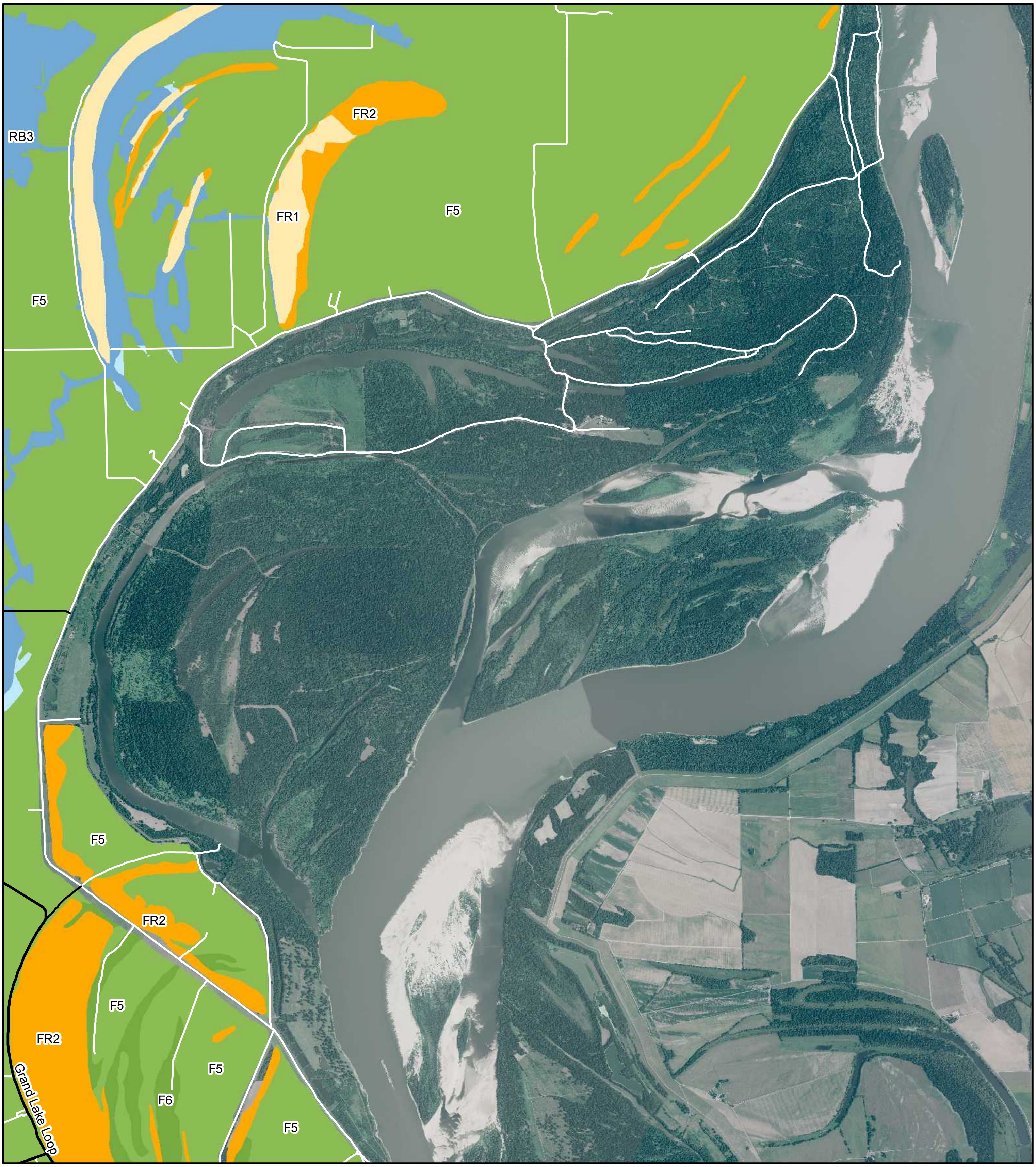

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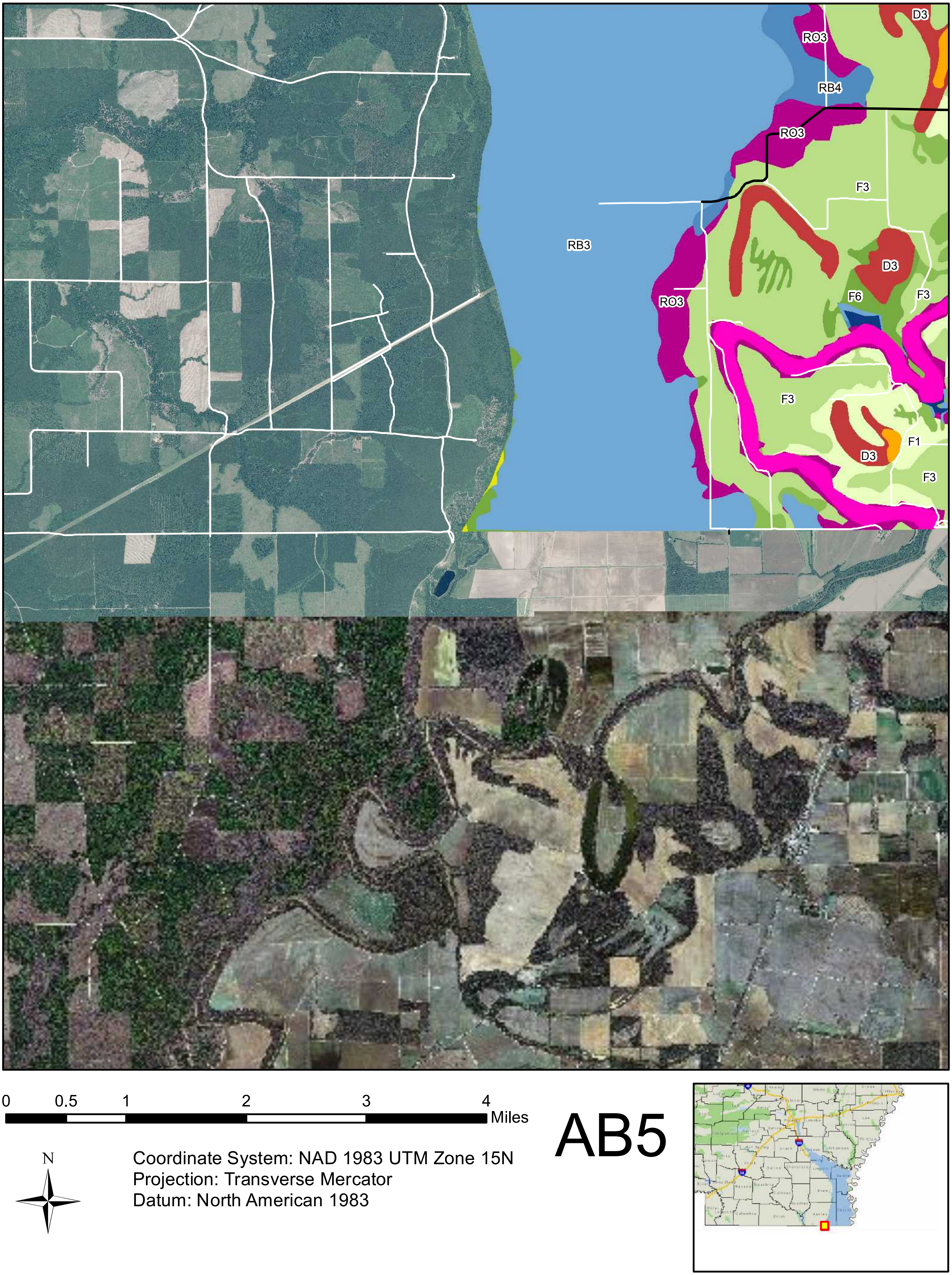

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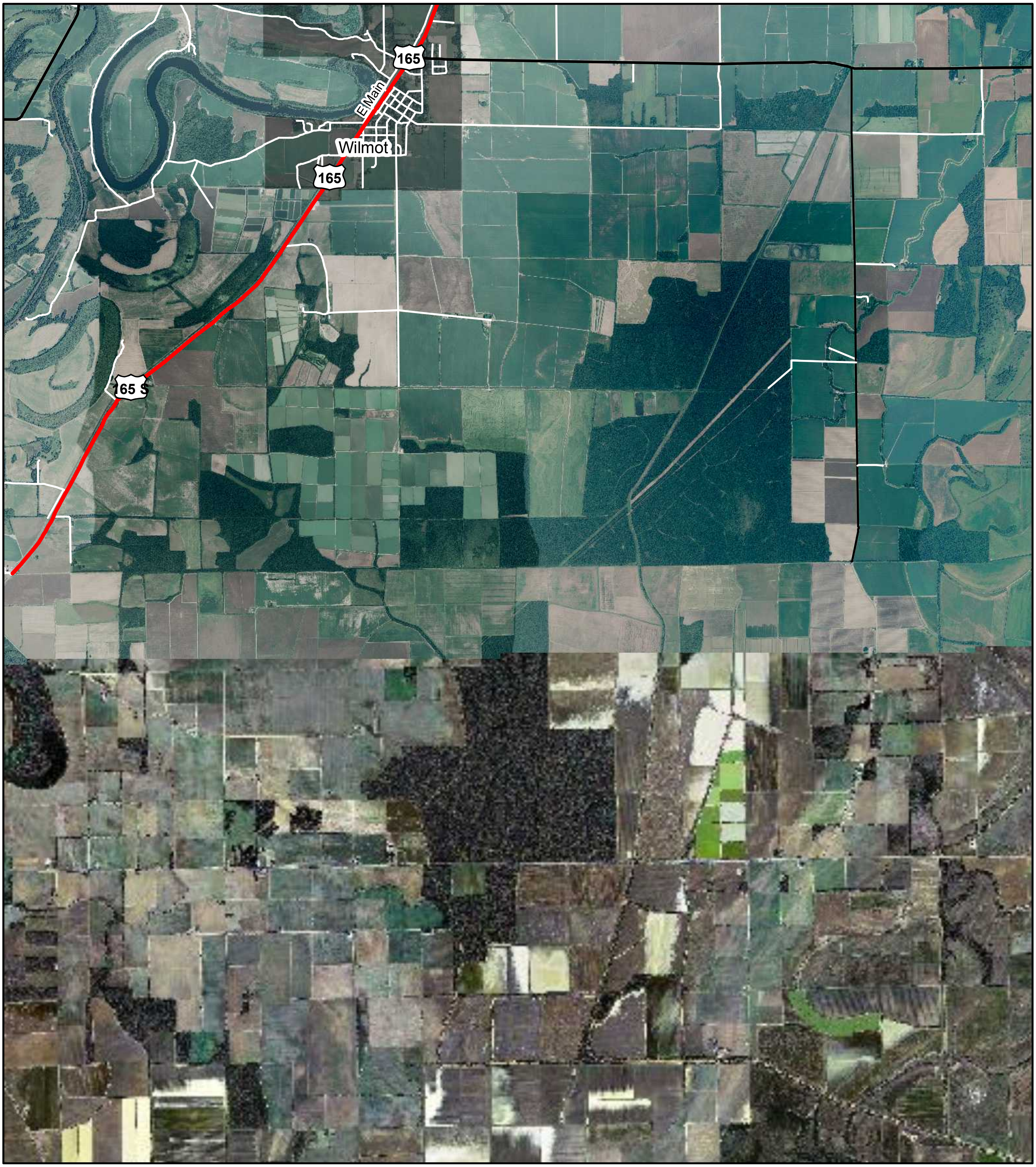

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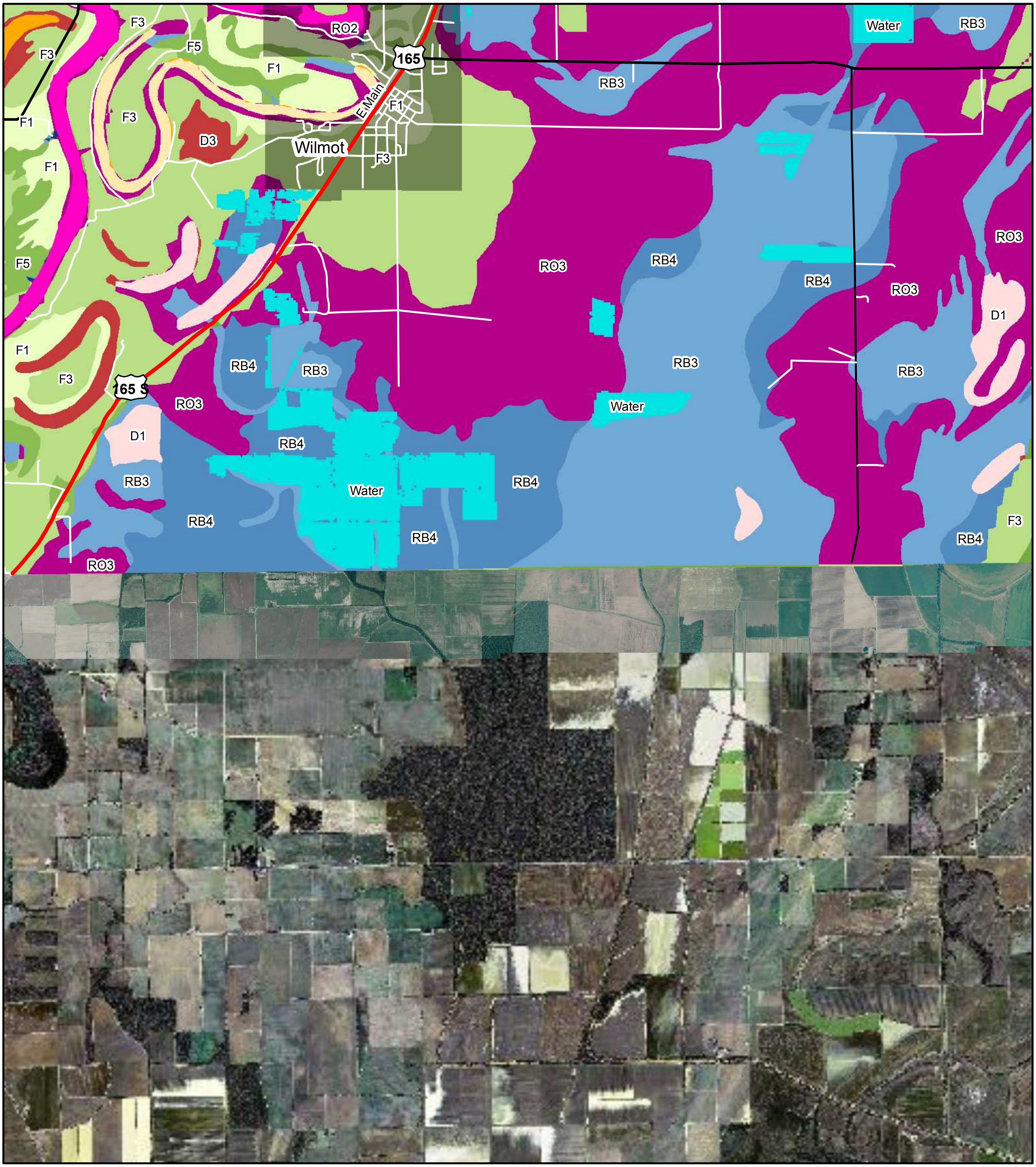

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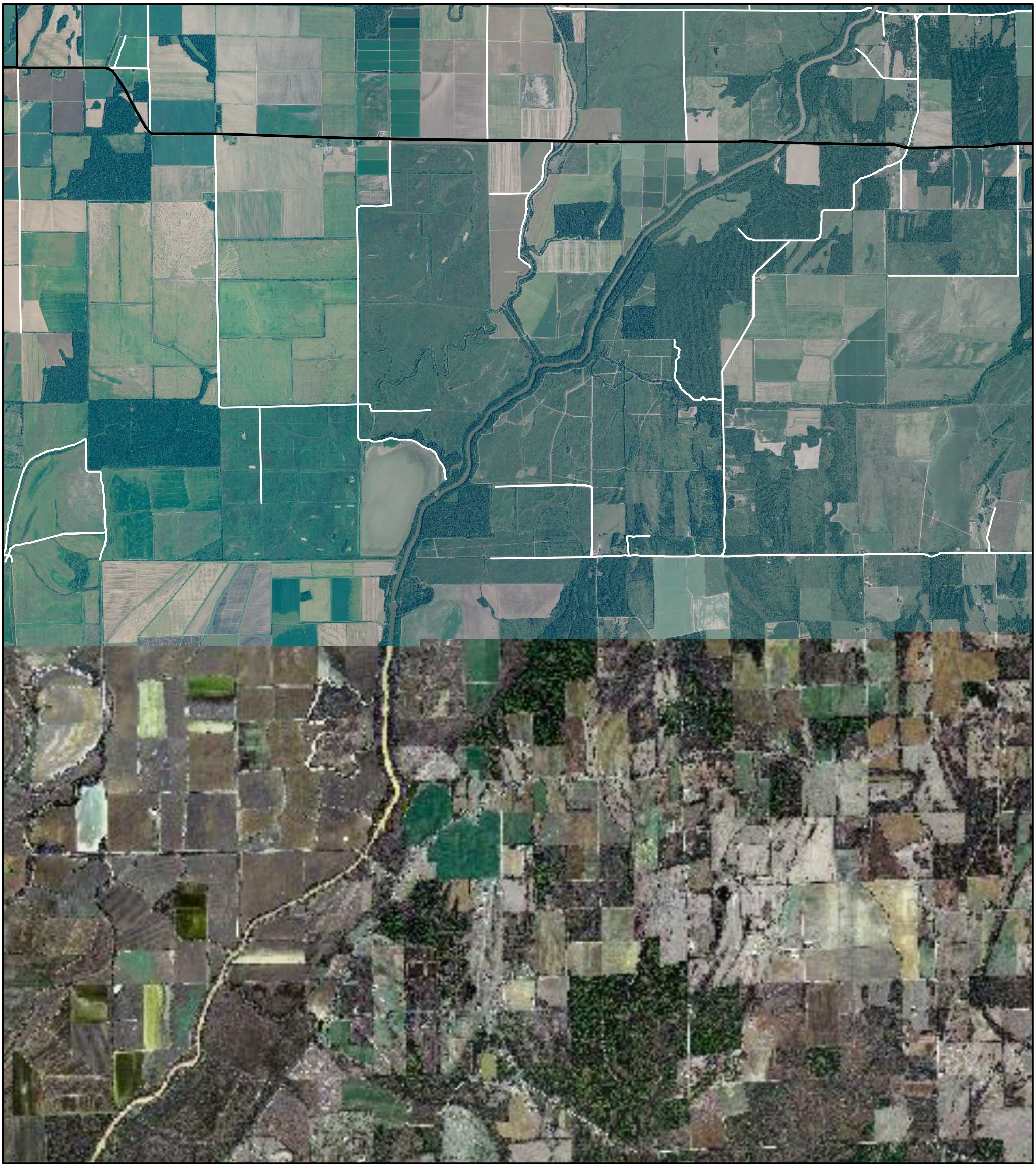

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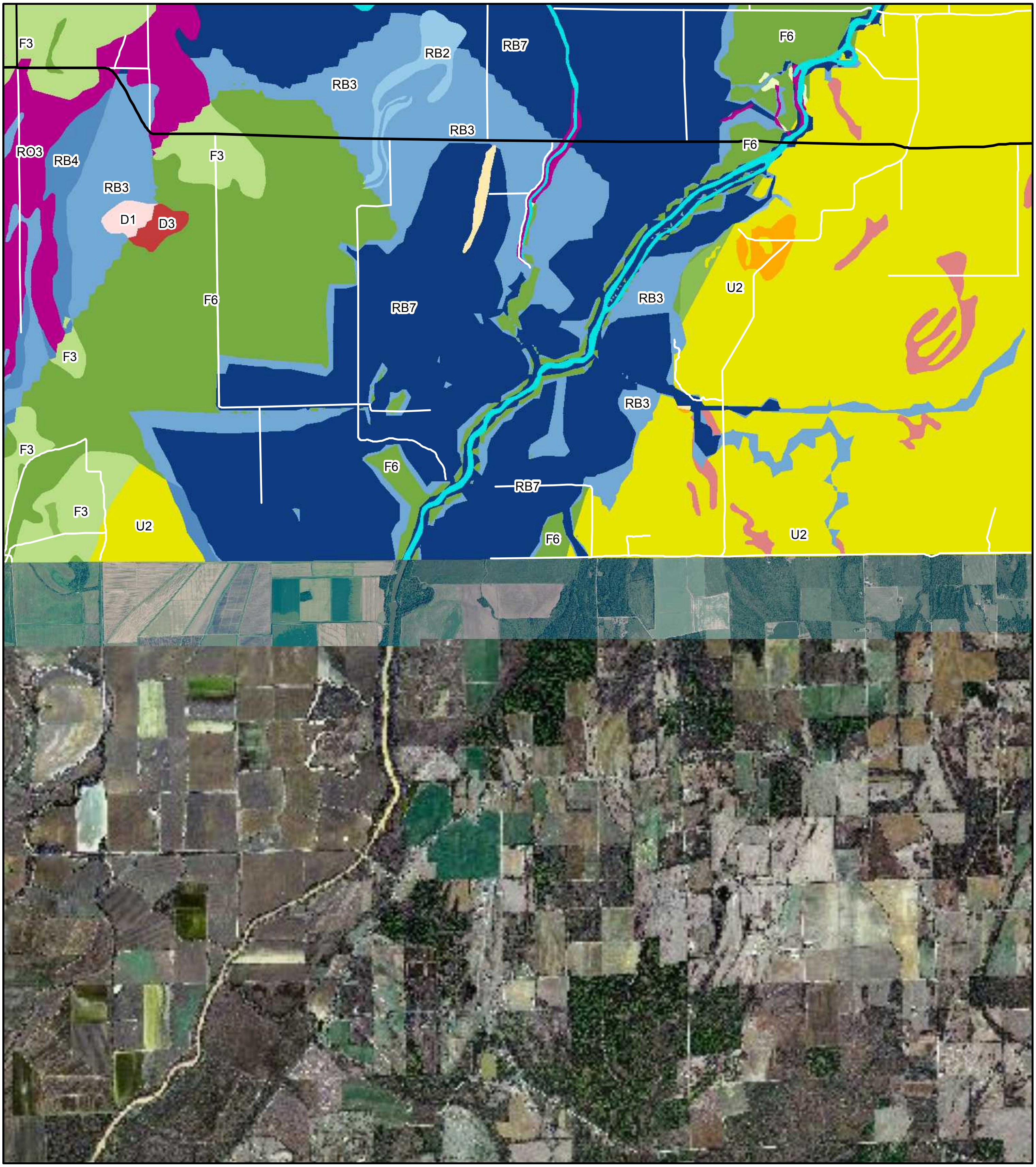

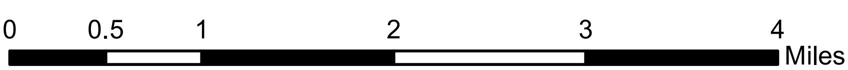

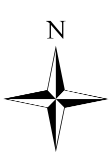

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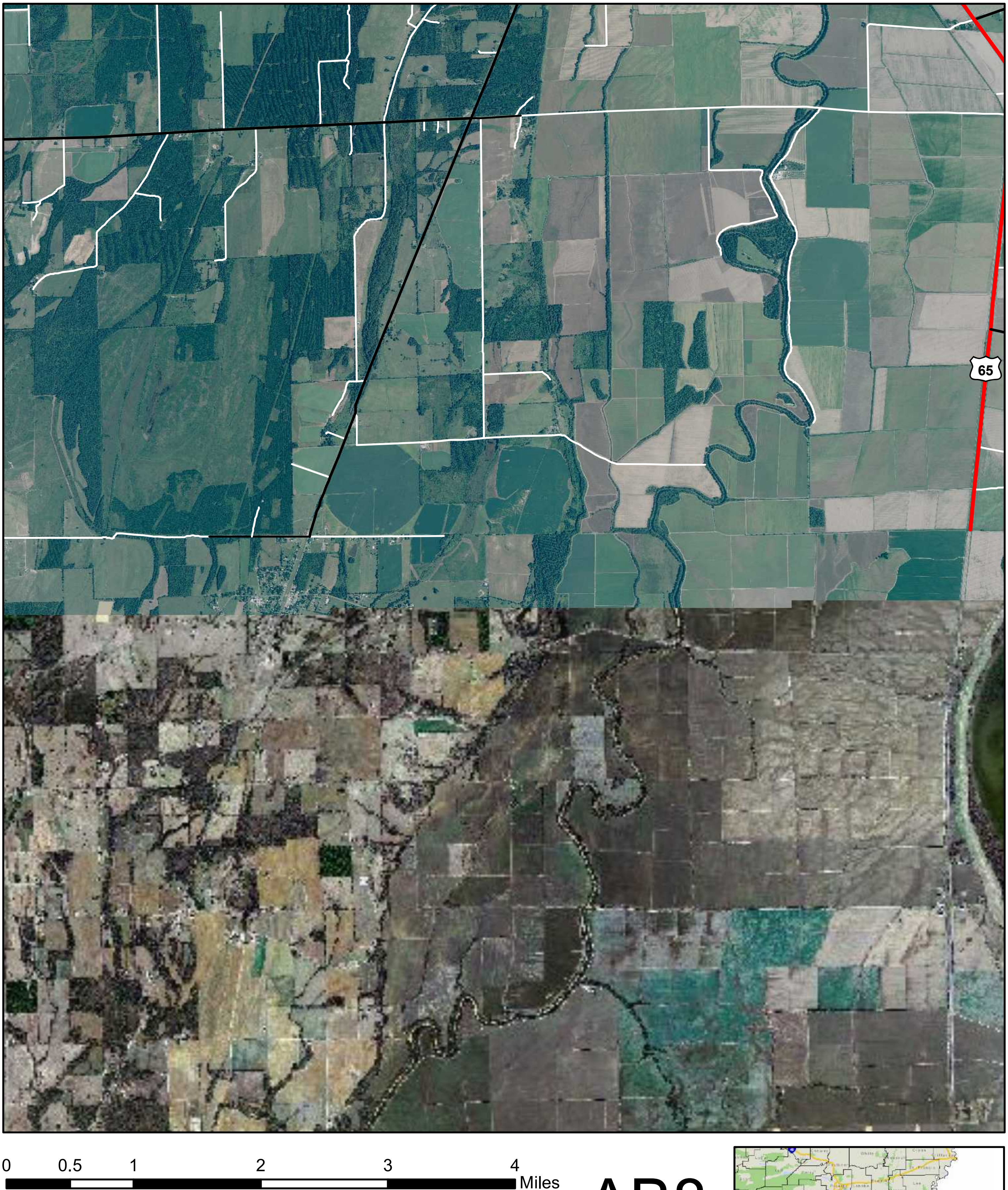

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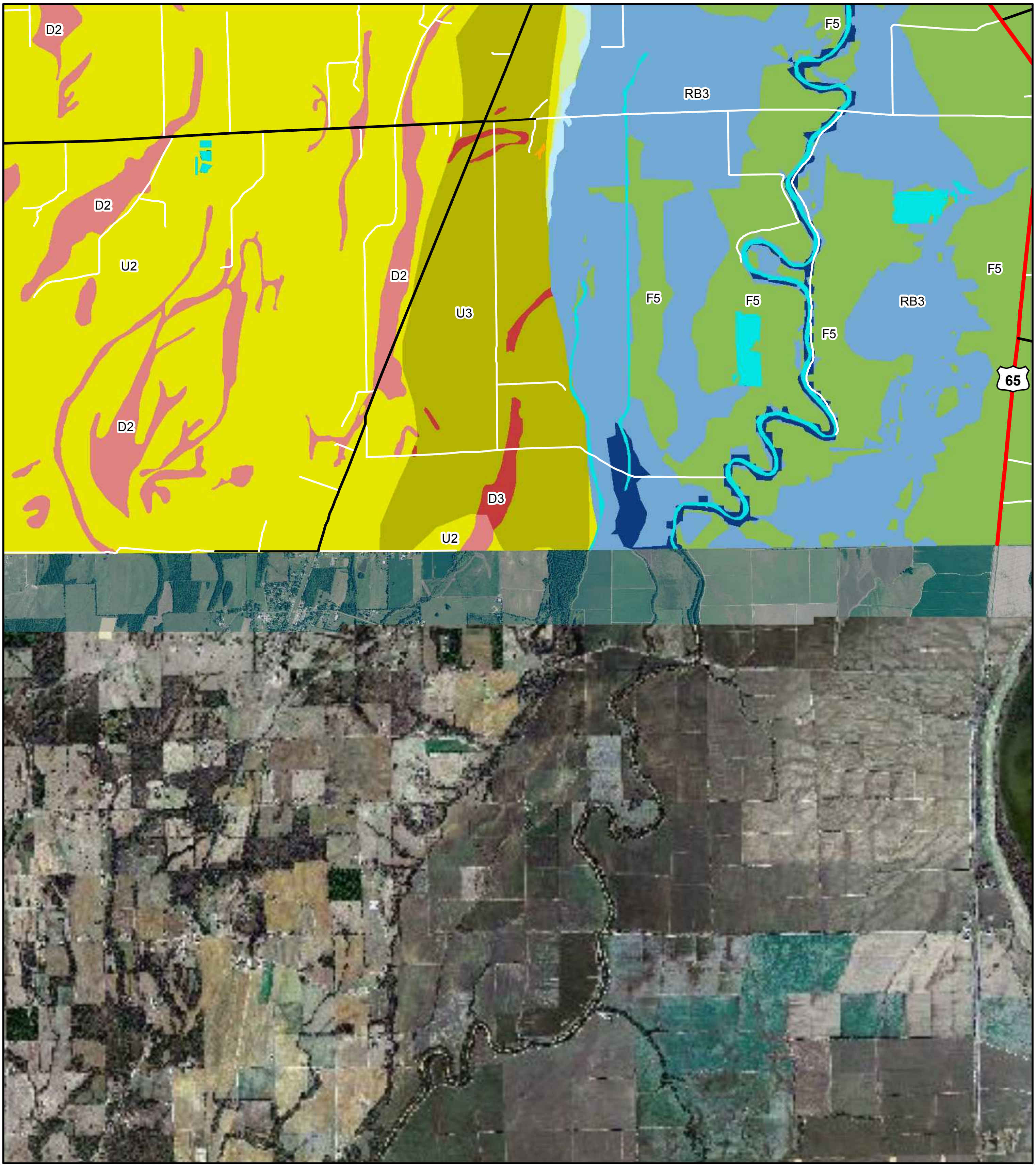

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Appendix B: Potential Natural Vegetation Community Characteristics in the Boeuf-Tensas Basin, Arkansas

This Appendix describes the potential natural vegetation of the Boeuf-Tensas Basin of southeastern Arkansas. Since the purpose of the Field Atlas is to support ecosystem restoration design and planning, the focus is on the predominant long-term equilibrium community composition best adapted to persist on each site under the current hydrologic and climatic regime. This Appendix is also intended to call attention to the presence and scale of topographic features, such as natural levee ridges and shallow vernal pools, that are essential elements of most of the community types. Where those features have been significantly altered, they must be restored to their approximate original extent — prior to revegetation work — in order to establish the community types described here and mapped in the Field Atlas.

The dominant and associated species listed are primarily trees, since most restoration projects in the region focus on reforestation, but understory species or other characteristics strongly associated with a particular community type are noted in some cases. The listed species do not necessarily all occur together in any particular stand, but may all be found on similar sites where mature, compositionally stable communities are present. No early successional communities are described, although seral patches exist in all of the community types, and in some settings — such as point bars within and along active channels — they may be extensive. Similarly, the community descriptions do not necessarily reflect the current vegetation found on many sites, which may have established under a previous hydrologic regime or been extensively manipulated.

The community type names reflect the Hydrogeomorphic (HGM) Classification and landscape setting. See the map legend for the corresponding dominance-type designations.

HGM SUBCLASSES: RIVERINE BACKWATER		
	CHARACTERISTICS	
COMMUNITY TYPE	TYPICAL VEGETATION	DESCRIPTION
RB1 Occasionally flooded, well-drained lowlands	Dominants: Cherrybark oak Willow oak Nuttall oak Sweetgum Associates: Sugarberry Pecan Cottonwood Vernal pools: Overcup oak Bitter pecan	Diverse forest of point bar complexes and adjacent backswamps where natural levee deposits, primarily of Mississippi River origin, blanket the surface. Sweetgum is the characteristic species, but others typically dominate and many are common. Cherrybark oak, Nuttall oak, willow oak, and sugarberry are usually present. This type is distinguished primarily by the abundance of species characteristically found on natural levees, particularly pecan and sugarberry. Overcup oak and bitter pecan dominate in vernal pools that form within the largest point bar swales and sump areas within backswamps. Vernal pools are generally small and infrequent elsewhere, the smaller swales having been filled with veneer deposits.
RB2 Occasionally flooded, moderately drained lowlands	Dominants: Cherrybark oak Willow oak Water oak Associates: Delta post oak Cedar elm Sweetgum Pecan Vernal pools: Overcup oak Green ash	Relatively level or gently undulating lowlands, primarily on Arkansas River point bars and natural levee veneers over backswamps. Only a few species commonly dominate, but there are a variety of potential minor species that do well on these sites. Vernal pools occur in the largest and deepest remnant swales.
RB3 Occasionally flooded flats	Dominants: Willow oak Nuttall oak Cherrybark oak Associated species: Green ash Cedar elm Vernal pools: Overcup oak Water elm Baldcypress	Flat or gently undulating unveneered point bars and backswamps. Dominance shifts between willow oak and Nuttall oak. Vernal pools in swales are relatively uncommon, but the undulating topography maintains a mosaic of wet and dry microsites that favor a diverse species assemblage. Palmetto is often present.
RB4 Occasionally flooded, poorly drained lowlands	Dominants: Nuttall oak Sweetgum	Primarily on backswamp deposits of the Arkansas River within the 2-5 year flood zone, with poorly drained soils and extensive ponding of precipitation. Inclusions of point bar and other

	Willow oak Green ash Overcup oak Associated species: Cow oak Delta post oak Persimmon American elm Characteristic understory species: Palmetto Styrax Deciduous holly	geomorphic settings add diversity to the type except where surface drainage is impeded sufficiently to favor strong dominance by overcup oak.
RB7 Frequently flooded lowlands	Dominants: Overcup oak Bitter pecan Understory: Swamp privet Palmetto Associates on wetter sites: Baldcypress Water tupelo Associates on drier sites: Nuttall oak Green ash Willow oak American elm Persimmon	This community type occurs on a wide variety of geomorphic settings and soil types where forest composition is strongly controlled by extended periods of backwater flooding in most years. The characteristic community is dominated by overcup oak, bitter pecan, and a limited group of associated canopy and understory species. Vines and ground cover species are less abundant and diverse than on less flooded sites. Dominance may shift to baldcypress and water tupelo in sumps and along minor interior drainageways. A more diverse species composition may develop on the margins of this type or on somewhat higher microsites within it.
HGM SUBCLASSES: RIVERINE OVERBANK		
COMMUNITY TYPE	CHARACTERISTICS	
	TYPICAL VEGETATION	DESCRIPTION
RO2 River swamps in underfit channels	Channel bottom zone: Dominants: Baldcypress Water tupelo Buttonbush Lower bank or narrow terrace adjacent to stream:	"River swamps" of slow-moving streams that have occupied large abandoned courses of the Arkansas River. Typically a swamp forest of baldcypress dominates the zone occupied by the modern stream at normal flows. The rest of the former channel sideslope supports a series of forest species reflecting flood frequency, from overcup oak adjacent to the cypress community through natural levee species such as cow oak along the channel rim. A wide variety of other species may occupy the intervening zones. A standard buffer along the center lines of the abandoned courses as mapped on 1:24,000 quad

	Dominants: Overcup oak Water locust Bitter pecan Associates: Nuttall oak Water elm Swamp privet Side slopes of abandoned channel: Mixed hardwoods and riverfront species	sheets was used to delimit this type, and therefore the boundaries are less precise than other mapped features.
RO-3 Riverfront natural levee and point bar	Dominant species: Cottonwood Cow oak Pecan Cherrybark oak Sweetgum Associated species: Shagbark hickory Sycamore Sugarberry American elm Box elder White oak Cedar elm Persimmon Vernal Pools: Overcup oak Bitter pecan Water elm	Diverse communities of natural levees and upper banks of abandoned stream courses and active channels, as well as small tributary floodplains. Vegetation composition and structure on these sites is related to proximity to the channel and associated high flows, light availability, and sedimentation. Most of these sites are on substantial natural levee deposits, but active point bars occupied by pioneer riverfront species are included. They are also where large swales occur between levee deposits, narrow vernal pools support overcup oak, bitter pecan, and similar species.
HGM SUBCLASS: FLAT		
COMMUNITY TYPE	CHARACTERISTICS	
	TYPICAL VEGETATION	DESCRIPTION
F1 High natural levees	Dominants: Cottonwood Water oak Cow oak Pecan Cherrybark oak Associates: Sweetgum Sugarberry Shagbark hickory	High, well-drained linear features that were originally formed along the banks of the Arkansas or Mississippi Rivers, though they may be far removed from those rivers now. They are diverse sites of marginal wetland character, and may have substantial slope, but are classified as flats because the principal source of water is precipitation. Giant cane is usually present in the understory. Cottonwood is common only within the most recent Mississippi River meander belt. Sycamore is common only on the Arkansas River deposits.

	White oak Willow oak	
F2 Well-drained recent alluvium in lowlands	Dominants: Cherrybark oak Water oak Sweetgum Associates: Cow oak Sugarberry Shagbark hickory	Diverse communities on well-drained sites not subject to regular flooding. Commonly on natural levee and point bar deposits, including those along abandoned channel segments such as oxbow lakes. Also found on some older surfaces, such as tributary terraces. Water oak and cherry bark oak are characteristic.
F3 Well-drained older alluvium in lowlands	Dominant species: Cow oak Cherrybark oak Water oak Sweetgum Associates: Delta post oak Cedar elm Blackgum Pecan Sugarberry Vernal pools: Overcup oak Nuttall oak	Relatively flat topographic settings of older backswamps, point bars, and tributary terraces. Cherrybark oak is characteristic and palmetto is usually present. Vernal pools are common but not large. Extensive tracts of this type have been cleared and leveled for agriculture, and restoration requires re-establishment of vernal pools to store precipitation and maintain the original wetland character and diversity.
F5 Poorly drained Mississippi River sediments	Dominants: Nutall oak Sweetgum Willow oak Associated species: Cedar elm Water oak Green ash Persimmon American elm Sugarberry Vernal pools: Overcup oak Baldcypress	Poorly drained, often ponded ridge-and-swale topography or flats, usually strongly dominated by Nuttall oak or willow oak, and with cedar elm consistently present. Vernal pools tend to be long, arcuate features in point bar swales, and some include baldcypress at the deepest points.
F6 Poorly drained lowlands	Dominants: Nuttall oak Cherrybark oak Associates: Green ash	Poorly drained flats, primarily in backswamp deposits of Arkansas River origin, dominated by Nuttall oak. Palmetto is characteristic in the understory. Large shallow vernal pools are common. Better-drained sites within this type

	Cedar elm Vernal pools: Overcup oak	often include cherrybark oak. Wet conditions and extensive ponding have deterred clearing in many places.
HGM SUBCLASSES: CONNECTED AND UNCONNECTED DEPRESSION		
	CHARACTERISTICS	
COMMUNITY TYPE	TYPICAL VEGETATION	DESCRIPTION
D1 D3 Stream-connected and unconnected depressions in abandoned channels	Dominants: Baldcypress Water tupelo Overcup Oak Bitter pecan Understory and associated species: Water elm Waterlocust Swamp privet Buttonbush Swamp cottonwood	Topographic depressions with very poorly drained soils in former stream channels and large swales. Connected depressions are connected to downstream systems by a perennial stream channel or are within the 5-year floodplain. Unconnected depressions meet neither of these criteria. Species composition is restricted to the most water-tolerant plants, a factor that helps individuals distinguish true depressions from vernal pools. Vines and ground cover species are uncommon.
D2 Stream-connected depressions on Pleistocene outwash terraces	Dominants: Overcup oak Baldcypress Water tupelo Water elm Associates: Bitter pecan Drummond's red maple Green ash Persimmon Included Interfluves: Nuttall oak Willow oak Delta post oak Cherrybark oak Sweetgum Sugarberry	These Valley Train Ponds are depressions that occur in the remnants of glacial outwash channels on Pleistocene valley train terraces. The original coarse channel materials have mostly been veneered with fine-grained sediments and support swamp and floodplain species. Localized areas where the veneer is thin may be sandy and support individual trees or small groups of riverfront species such as river birch and sycamore. Small areas of higher ground (interfluves) not identified on soils maps are included in these units.
HGM SUBCLASSES: CONNECTED AND UNCONNECTED FRINGE		
	CHARACTERISTICS	
COMMUNITY TYPE	TYPICAL VEGETATION	DESCRIPTION
FR1 FR2 Stream-connected and unconnected lake and pond fringe wetlands	Common dominants in systems with natural fluctuation patterns: Baldcypress Water tupelo Buttonbush	Wetlands within permanent lakes and ponds, including borrow pits, but not aquaculture ponds. Natural systems typically support baldcypress and tupelo forests within the fluctuation zone and in the immediate lakefront zone where water tables remain near the surface. Buttonbush thickets may dominate in shallow, near-permanent water, and

	Numerous herbaceous species Common dominants in systems with highly modified fluctuation patterns: Black willow Buttonbush American lotus	zones of emergent species are usually present, with erect rooted species in shallow water, floating-leaved species in deeper water, and submerged aquatics present throughout the open water area. Where water levels are manipulated, these patterns are usually altered in various ways. Because water depths and fluctuation patterns are unknown, the entire water body is mapped as fringe wetland. Connected fringe wetlands are connected to downstream aquatic systems by a perennial stream channel or are within the 5-year floodplain. Unconnected fringe wetlands meet neither of these criteria.
HGM SUBCLASS: UPLAND		
	CHARACTERISTICS	
COMMUNITY TYPE	TYPICAL VEGETATION	DESCRIPTION
U2 Upland forests of Pleistocene outwash terraces and alluvial fans	Dominant species: Southern red oak Cherrybark oak Water oak Sweetgum Shagbark hickory Associated species: Post oak Willow oak	Upland forests of the Pleistocene terraces and alluvial fans. Species composition can vary widely depending on local soils and drainage conditions, but generally is similar to other upland forests of the West Gulf Coastal Plain region.
U3 Upland forests of the Prairie Terrace	Dominants: Southern red oak Post oak Water oak White oak Associated species: Cherrybark oak Cow oak Vernal pools: Swamp cottonwood Overcup oak American elm Persimmon Willow oak Green ash	Upland forests that include a range of community types which reflect differing soil and drainage conditions. Vernal pools may occur in the remnant ancient channels of the Arkansas River, as well as changes in fire.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE ***(DD-MM-YYYY)***	**2. REPORT TYPE**	**3. DATES COVERED** ***(From - To)***
September 2012	Final report	

4. TITLE AND SUBTITLE

Potential Natural Vegetation of the Mississippi Alluvial Valley: Boeuf-Tensas Basin, Arkansas, Field Atlas

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Charles Klimas, Thomas Foti, Jody Pagan, Malcolm Williamson, and R. Daniel Smith

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Environmental Laboratory
U.S. Army Engineer Research and Development Center
3909 Halls Ferry Road, Vicksburg, MS 39180;
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5-Oaks Wildlife Services, L.L.C.
620 East 22nd St. Suite 206, Stuttgart, AR 72160;
Center for Advanced Spatial Technologies
1 University of Arkansas, Fayetteville AR 72701

8. PERFORMING ORGANIZATION REPORT NUMBER

ERDC/EL TR-12-28

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Corps of Engineers
Washington, DC 20314-1000

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Over the past three decades, extensive field studies of wetland plant communities have been conducted in the Mississippi Alluvial Valley. These field studies have been carried out for various purposes under the auspices of federal and state research programs or in conjunction with Corps of Engineers project planning efforts. In the process, a wetland site classification approach has evolved based on hydrology, soils, and geomorphic setting. The research data and classification system have been recently used for a new purpose: to create a set of Potential Natural Vegetation (PNV) maps covering more than 26,000 square miles within the region. The purpose of PNV maps is to serve as blueprints for restoration planning and prioritization. Due to the fact that the hydrology of the landscape has been permanently changed by major flood control projects, the PNV maps do not represent the distribution of the original, pre-settlement vegetation. Rather, they identify the natural communities that are appropriate to the modern altered site conditions. By using these maps, persons interested in restoring particular tracts of land can identify the plant communities appropriate to the conditions present. Conversely, individuals interested in restoring particular plant communities can identify parts of the landscape that can support each respective type. The PNV maps are available for use in a Geographic Information System, where a range of complex restoration scenarios (such as the development of wildlife travel corridors or refuge areas) can be explored efficiently and alternative approaches can be compared to one another in terms of relative costs and ecological effectiveness. This report is one of six Field Atlases that present the same data in a downloadable, printable format at a scale of 1 inch = 1 mile.

15. SUBJECT TERMS

Boeuf-Tensas Basin, AR
Mississippi Alluvial Valley
Plant communities
Potential Natural Vegetation (PNV) maps
Restoration planning
Wetland site classification

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** ***(include area code)***
Unclassified	Unclassified	Unclassified		125	