



Key Cave NWR Comprehensive Conservation Plan
(CCP; USFWS 2007)

Key Cave National Wildlife Refuge (NWR) is in northwestern Alabama (AL), along the northern shore of Pickwick Lake (a section of the Tennessee River) downstream from Florence, Alabama (Figure 1). The refuge consists of 1,060 acres of rolling hills, upland forests and cropland within a limestone karst area featuring several caves as well as sinkholes and other karst formations. The refuge is located within the Appalachian Landscape Conservation Cooperative. The land was originally acquired by the Conservation Fund in 1992 because it was thought to be in a high-hazard risk area for the groundwater contamination. The U.S. Fish and Wildlife Service bought the land from the Conservation Fund five years later (USFWS, 2007).

Key Cave NWR was established as a refuge in 1997 to protect Key Cave, Collier Cave, Collier Bone Cave and their common aquifer so that it could remain a suitable habitat for several endangered species in the areas. The refuge was authorized by the Fish and Wildlife Act of 1956, the National Wildlife Refuge Administration Act of 1966, and the Endangered Species Act of 1973.

Establishing Authorities and Purposes

Key Cave National Wildlife Refuge is one of seven refuges comprising the Wheeler National Wildlife Refuge Complex and is located in northwestern Alabama on the northern shore of Pickwick Lake. The refuge was established under the following authorities on January 3, 1997, to ensure the biological integrity of Key Cave, Collier Cave, Collier Bone Cave, and their shared aquifer remains intact::

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 U.S.C. § 742f(a)(4) (National Wildlife Refuge Administration Act of 1966)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

Vision
(USFWS 2007)

The Wheeler National Wildlife Refuge Complex will protect, manage, and, where appropriate, restore native systems of lands and waters to provide habitat for wildlife, fisheries, and plants within northern Alabama for the benefit and enjoyment of present and future generations of Americans. In addition, the Complex will seek partnerships that promote environmental stewardship on non-refuge lands, foster research opportunities to enhance resource management and restoration efforts in the Lower Tennessee-Cumberland Ecosystem and protect historical and cultural resources of the Complex. When compatible, wildlife-dependent recreational opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation will be provided, while promoting the public's understanding of the purposes of refuges in the Wheeler Complex and the mission of the National Wildlife Refuge System.

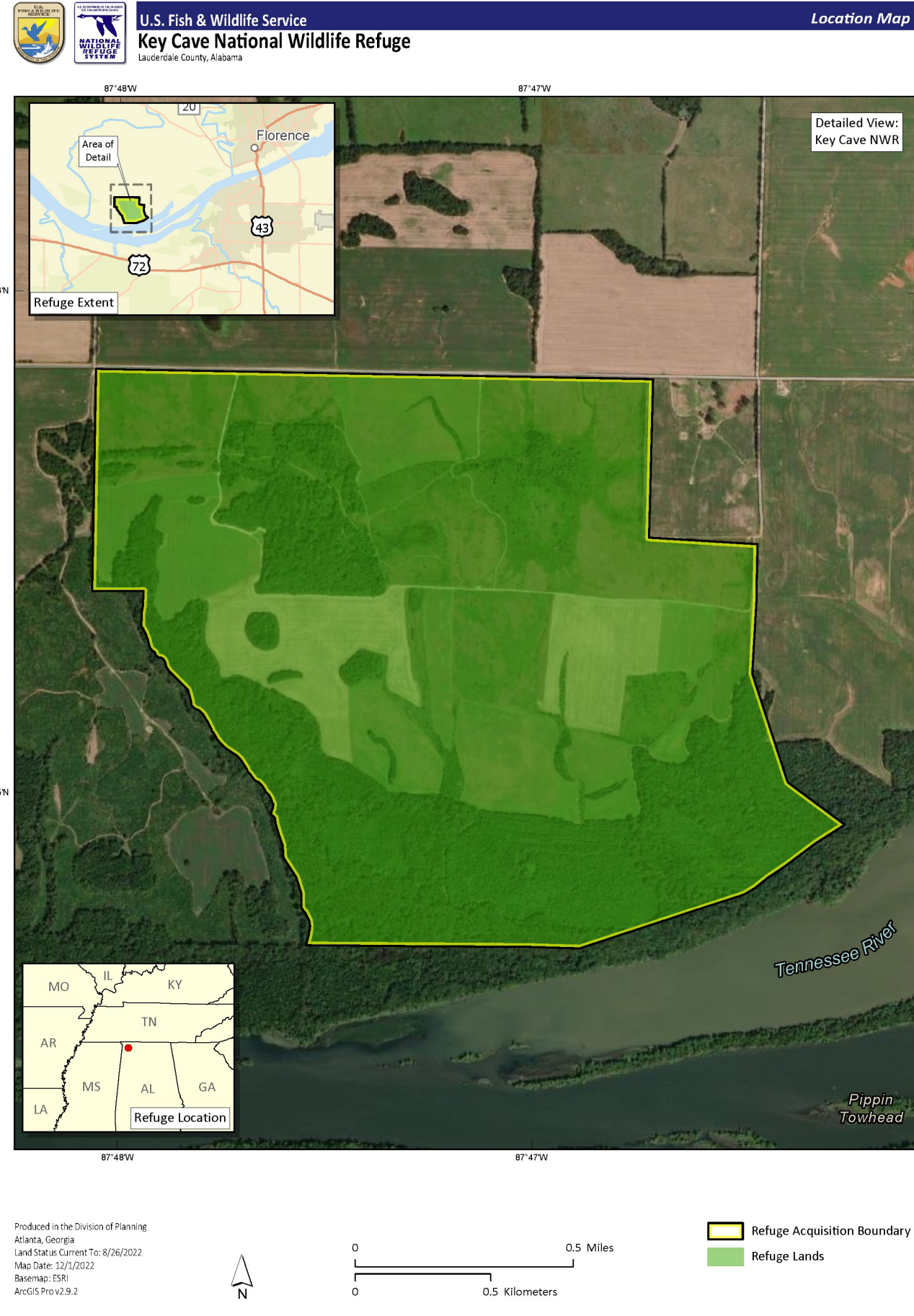


Figure 1. Location of Key Cave National Wildlife Refuge, near Florence, AL.

CCP Supporting Goals
(USFWS 2007)

Goal 1. Fish and Wildlife Population Management. Protect, maintain, enhance, and restore healthy and viable populations of migratory birds, resident wildlife, fish, and native plants, including all federal and state-threatened and endangered species found within northern Alabama in a manner that supports national and international treaties, plans, and initiatives.

Goal 2. Conduct Habitat Restoration and Management. Protect, maintain, enhance, and restore optimum habitat for the conservation and healthy management of migratory birds, resident wildlife, fish, and native plants, including all federal and state-threatened and endangered species found within northern Alabama in a manner that supports national and international treaties, plans, and initiatives.

Goal 3. Provide Resource Conservation and Protection. Provide coordination and cooperation among organizations to enhance effective management and protection of natural and cultural resources within northern Alabama.

Overview and Biological Priorities on Key Cave National Wildlife Refuge

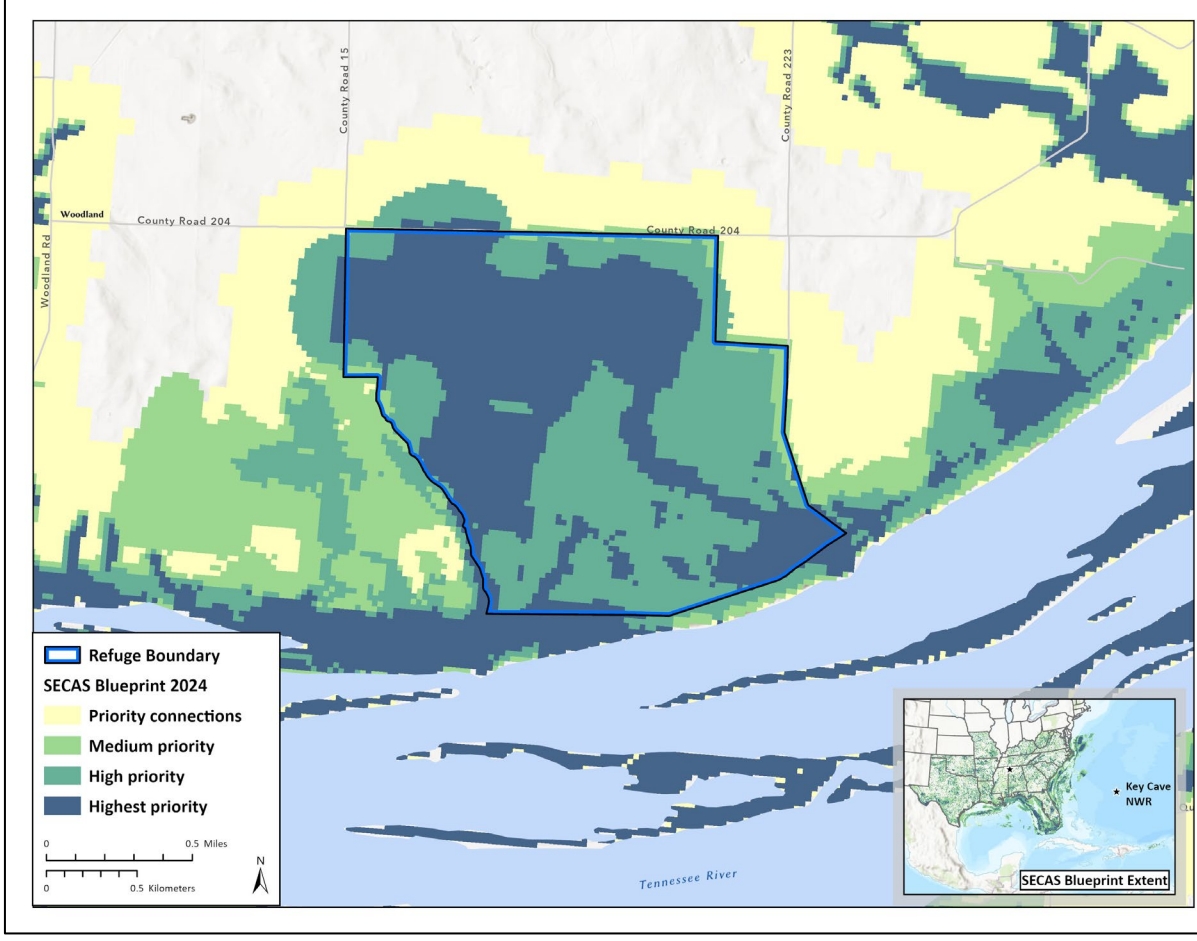


Figure 2. Southeast Conservation Blueprint priorities: 100% of Key Cave NWR is a priority in the Southeast Conservation Blueprint, highlighting its regional importance for shared conservation action.

Southeast Conservation Adaptation Strategy (SECAS) and the Southeast Conservation Blueprint

SECAS is a regional conservation initiative that spans the Southeastern United States and Caribbean. SECAS was started in 2011 by the states of the Southeastern Association of Fish and Wildlife Agencies and the federal agencies of the Southeast Natural Resource Leaders Group. SECAS brings together state and federal agencies, nonprofit organizations, private landowners and businesses, tribes, partnerships, and universities around a shared vision of the future. The Southeast Regional Director of the U.S. Fish and Wildlife Service serves on the Executive Steering Committee.

SECAS also tracks regional metrics of ecosystem health, function, and connectivity to report annually on progress toward achieving the SECAS Goal: A 10% or greater improvement in the health, function, and connectivity of Southeastern ecosystems by 2060.

The primary product of SECAS is the Southeast Conservation Blueprint, a living spatial plan that to achieve the SECAS vision of a connected network of lands and waters that supports thriving fish and wildlife populations and improved quality of life for people. More than 2,000 people from over 500 organizations have participated in the development of the Blueprint so far, including more than 450 U.S. FWS staff. Using the Blueprint ensures this design integrates directly with strategic landscape-scale conservation priorities across the Southeast and Caribbean.

100% of Key Cave NWR is a priority in the Southeast Conservation Blueprint, highlighting its regional importance for shared conservation action (Figure 2). The Refuge falls within a key hub and corridor for connectivity in the Blueprint. It also expands on a large intact habitat core greater than 17,000 acres in size. Restoration actions within the Refuge could help grow this unfragmented patch of natural habitat.

Land Cover and Threats
(USFWS 2019)

Land cover on the refuge consists primarily of upland hardwood forest, native warm season grassland, restored oak savanna, and approximately 295 acres of row crops managed under a cooperative farming agreement in which a portion of the crop is left in the field to provide forage for wildlife (USFWS, 2007). The refuge is predominantly located in a pasture/hay and cultivated crops area. (Figure 3).

A number of potential water quality related threats have been identified at Key Cave, although the degree to which these threats currently affect water quality on the refuge is not well known. These threats include excess fine sediment, nutrients, and pesticides from agricultural runoff from adjacent areas and from past agricultural practices on the site before it became a refuge. Effluent from municipal wastewater treatment facilities for the cities of Florence, Muscle Shoals, Sheffield, and Tuscumbia enter the Tennessee River upstream of the refuge. A very significant potential future threat is industrial or urban development within the recharge area for the Key Cave aquifer.

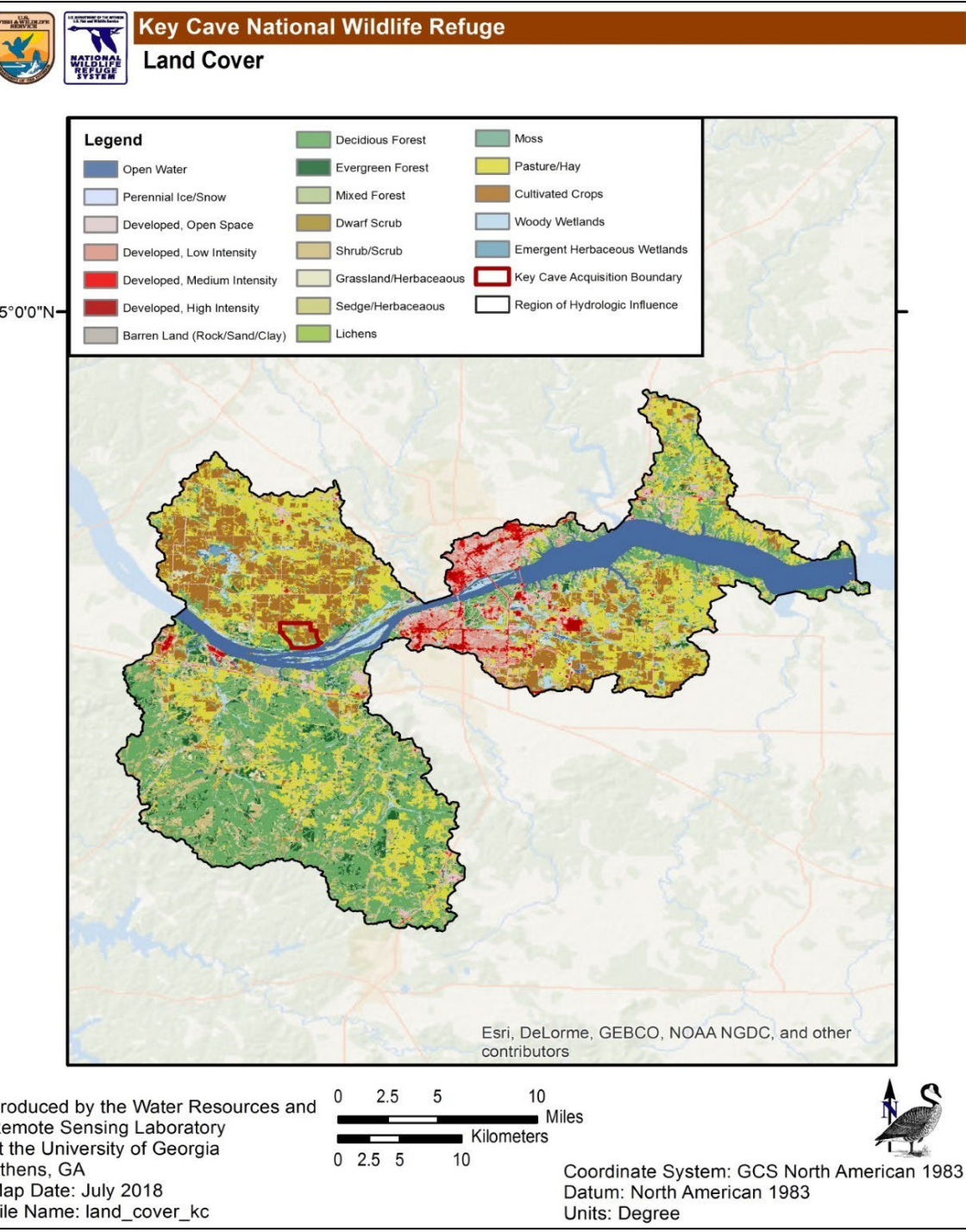


Figure 3. Land cover in the RHI of Key Cave NWR. The developed area east of the refuge is Florence, AL. Source: (USGS, 2014).

Key Cave NWR Physical Resources

Hydrology and Geography
(USFWS 2019)

Key Cave NWR resides along the northern shore of the Pickwick Reservoir of the Tennessee River and is within the Limestone Valley subdivision. This refuge is underlain by Tuscumbia Limestone, where there are numerous karst features, including many springs, sinkholes, and several underground cave systems (USFWS, 2007). The bedrock can barely be seen except for along the bluff line at the Tennessee River (Aley, 1990). Within the area there are flat to gently rolling upland terraces with gentle slopes that range from one to fifteen percent. The general elevation ranges from 500 to 580 feet above mean sea level (MSL) (Kidd et al., 2001) (Figure 4). Key Cave NWR is in the Highland Rim Physiographic Section, which is the southern section of the Interior Low Plateaus province.

Geology

Key Cave lies in a limestone karst area that contains numerous sinkholes and several underground cave systems on the northern bank of the Tennessee River (Figure 4). The karstic limestone plays an integral role in the refuge's geologic features and water resources. The karst in the area creates sinkholes, and created Key Cave, which can be described as a "solutional cave". A "solutional cave", is a cave that has been created through the dissolution of bedrock (limestone) by naturally acidified water seeping through soils and cracks in the bedrock, which erodes the bedrock and creates the cave.

Hydrogeology

The primary control on the hydrogeology in this area is the karst geology, which is characterized by soluble limestone bedrock that creates an intricate cave system through which water can flow. The movement of groundwater through karst has properties that are more similar to surface water flow than traditional groundwater flow. The refuge lies above what is locally known as the Key Cave aquifer, which has a recharge area of about 16-20 square miles. The refuge recharge zone is in a high hazard risk area, which means there is a high risk of groundwater contamination from surface spills or land use activities with potential water quality impacts (USFWS, 2007). The estimated mean annual discharge from the Key Cave aquifer is about 15 to 20 cubic feet per second (cfs) (Aley, 1990).

Based on the national aquifer database, the RHI of the refuge overlies portions of two different national aquifers: the Mississippian aquifer and the Southeastern Coastal Plain aquifer system (Figure 5). The "other rocks" indicates either that significant aquifers are absent or that the area is controlled by more local aquifers (i.e., the Key Cave Aquifer in this case).



Figure 4. Topography of Key Cave NWR. Contour lines are in feet above mean sea level (MSL). Source: (USGS).

Cultural Resources

The refuge is also home to Key Cemetery, which is thought to have been a slave cemetery (USFWS, 2018). The refuge is adjacent to the Seven Mile Island Archaeological District, which is located in the Tennessee River, and which includes the Perry Site midden, Mississippian culture village site and mound, burials, and artifacts dating back to the Archaic Period.

Soils
(USFWS 2019)

The Key Cave National Wildlife Refuge soils are mostly silt loams but range from silty clay loams to gravelly silt loams. These soils are generally deep to very deep, well drained, acidic, and contain fragments of the underlying parent material. Most soils at this site are Decatur ultisols (Figure 7). The typical Decatur pedon is very deep, well drained, acidic, and contain quartzite and chert fragments. The second most prolific soil series is another ultisol suborder: Fullerton. The typical Fullerton pedon is very deep, well drained, strongly acid, and contains chert gravel. The third most prolific soil series is yet another ultisol: Dewey soil series. The typical Dewey pedon is very deep, moderately well drained, strongly acid, and contains gravel-sized chert fragments.

Hydrologic Soil Groups

According to the NRCS Web Soil Survey, hydrologic soil groups indicate the soil's potential for runoff, and are classified based on infiltration rates for wetted, bare soil. Each soil series is classified into one of four hydrologic soil groups (A, B, C, and D), and those classified into Group D may be classified into one of three dual classes (A/D, B/D, C/D) (Figure 8).

Group A consists of soils that have high infiltration and low runoff potential even when thoroughly wet and typically have sandy to gravelly textures. Soils classified as Group B have moderate infiltration rates and runoff potential when wet and are generally moderately fine to moderately coarse textured. Group C consists of soils with slow infiltration rates when wet and generally indicates either a subsurface layer impeding water infiltration or a moderately fine to fine soil texture. Group D indicates soils with very slow infiltration rates and high runoff potentials when wet, and have high water tables, shrink-swell clays, or clay pans near the surface.

Dual classifications indicate that the soil series is classified into Group D in its natural state but fits into a different group when drained. For example, a very sandy soil in a Coastal Plain may be naturally classified into Group D because of the presence of a high-water table, but its dual classification would be A/D because of the infiltration rate in the absence of the water table.

Most of the soils in Key Cave NWR's acquisition boundary are classified into Group B, which makes up 84.82% of the acreage (Figure 8). Group C follows with 9.76% of the soils within the acquisition boundary, Group A comprises 5.36% of the area, and Group B/D makes up the final 0.058%.

Key Cave NWR Physical Resources

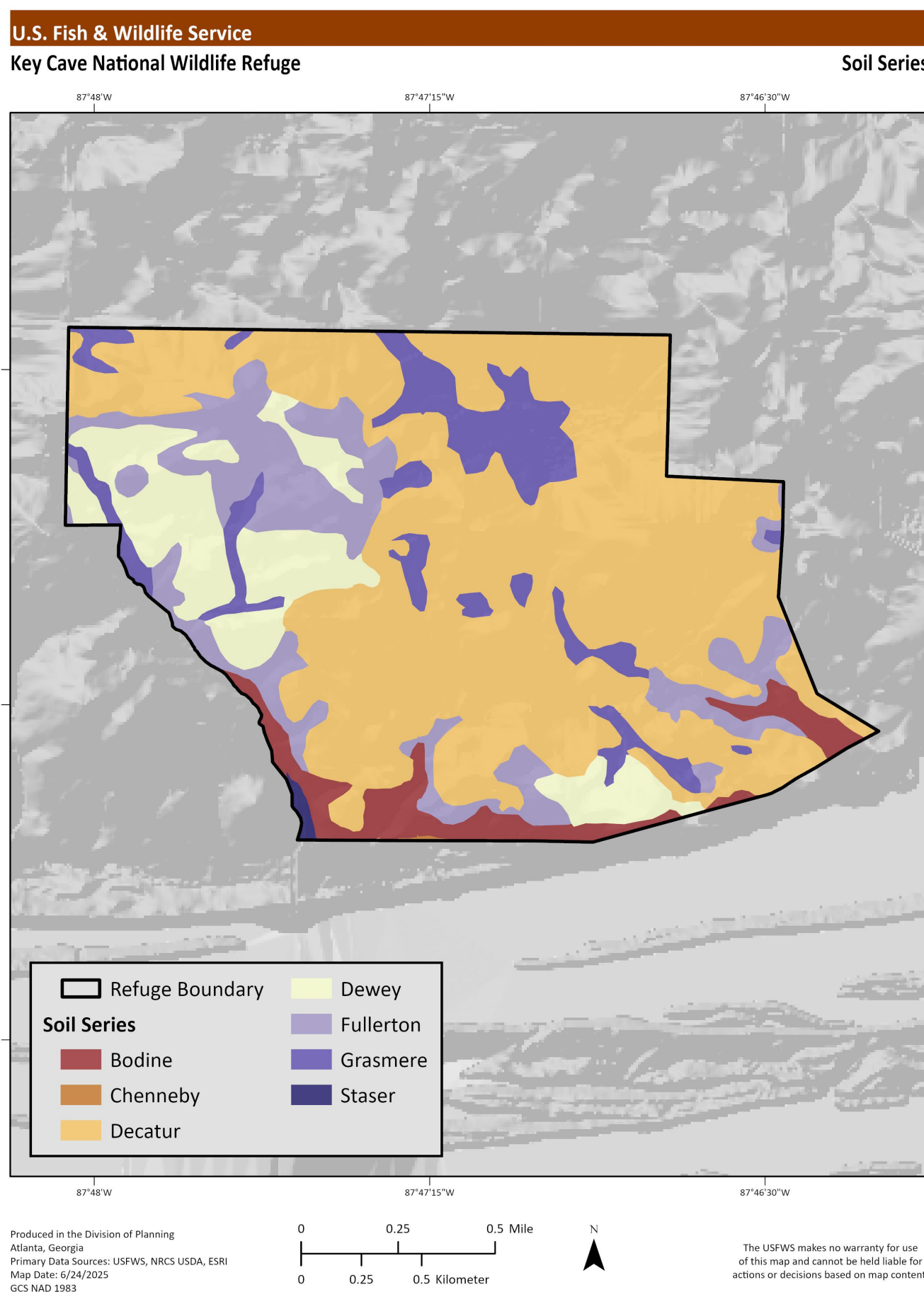


Figure 7. Soil series of Key Cave NWR. Source: (NRCS Soil Survey, 2017).

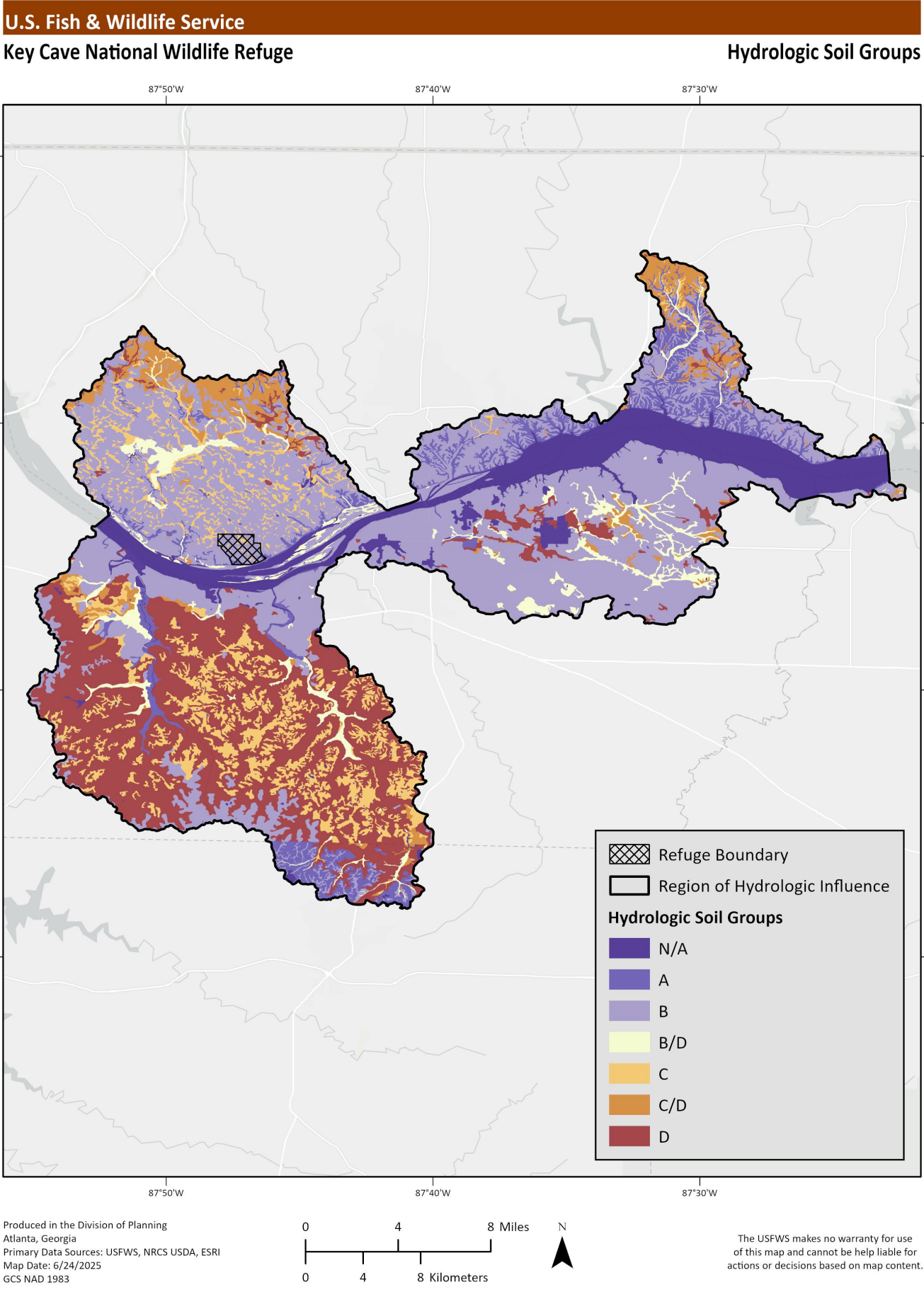


Figure 8. Hydrologic soil groupings in the RHI of Key Cave NWR. Source: (Soil Survey Staff, 2017).

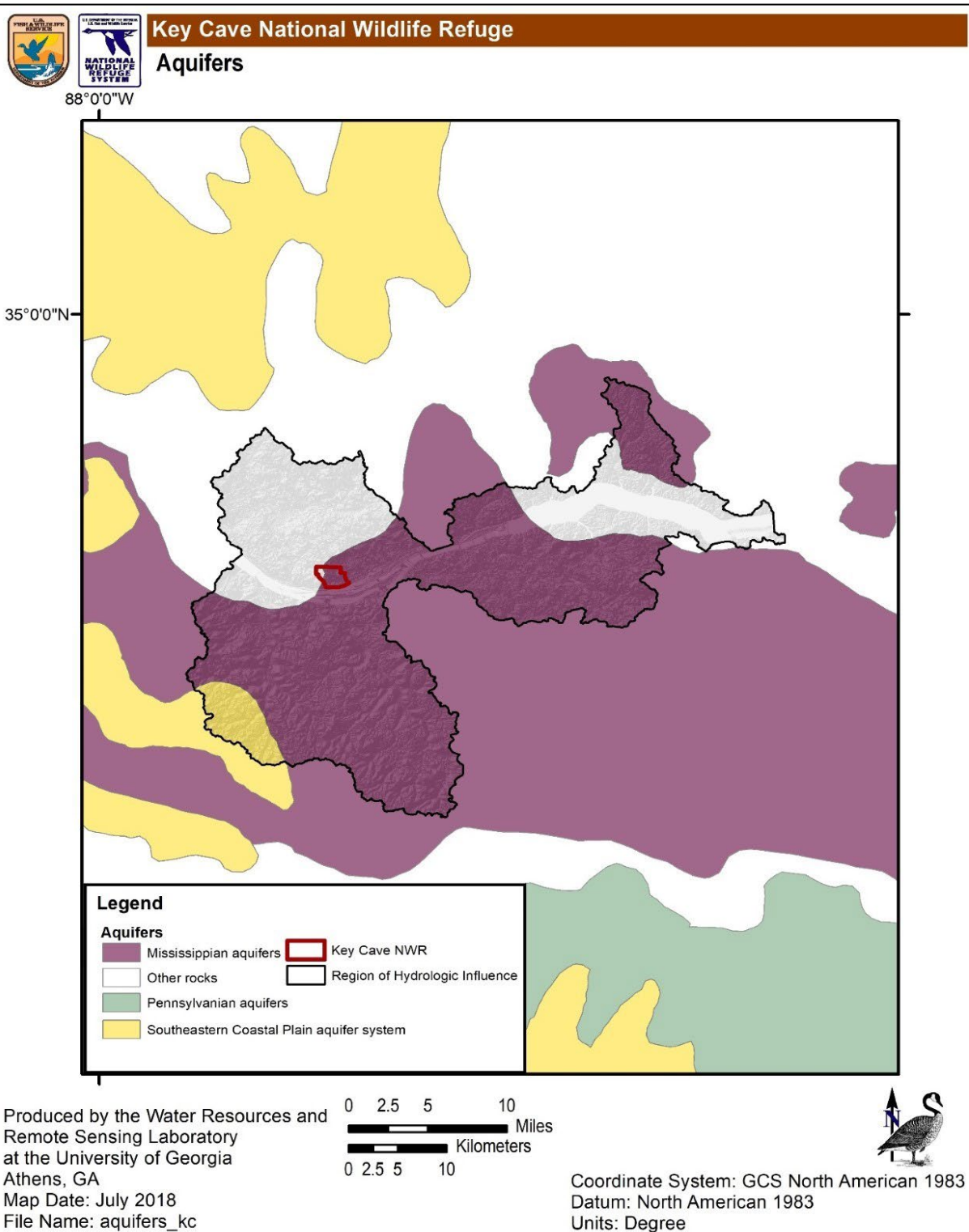


Figure 5. Aquifers surrounding the Region of Hydrologic Influence of Key Cave NWR. Source: (USGS, 2003).

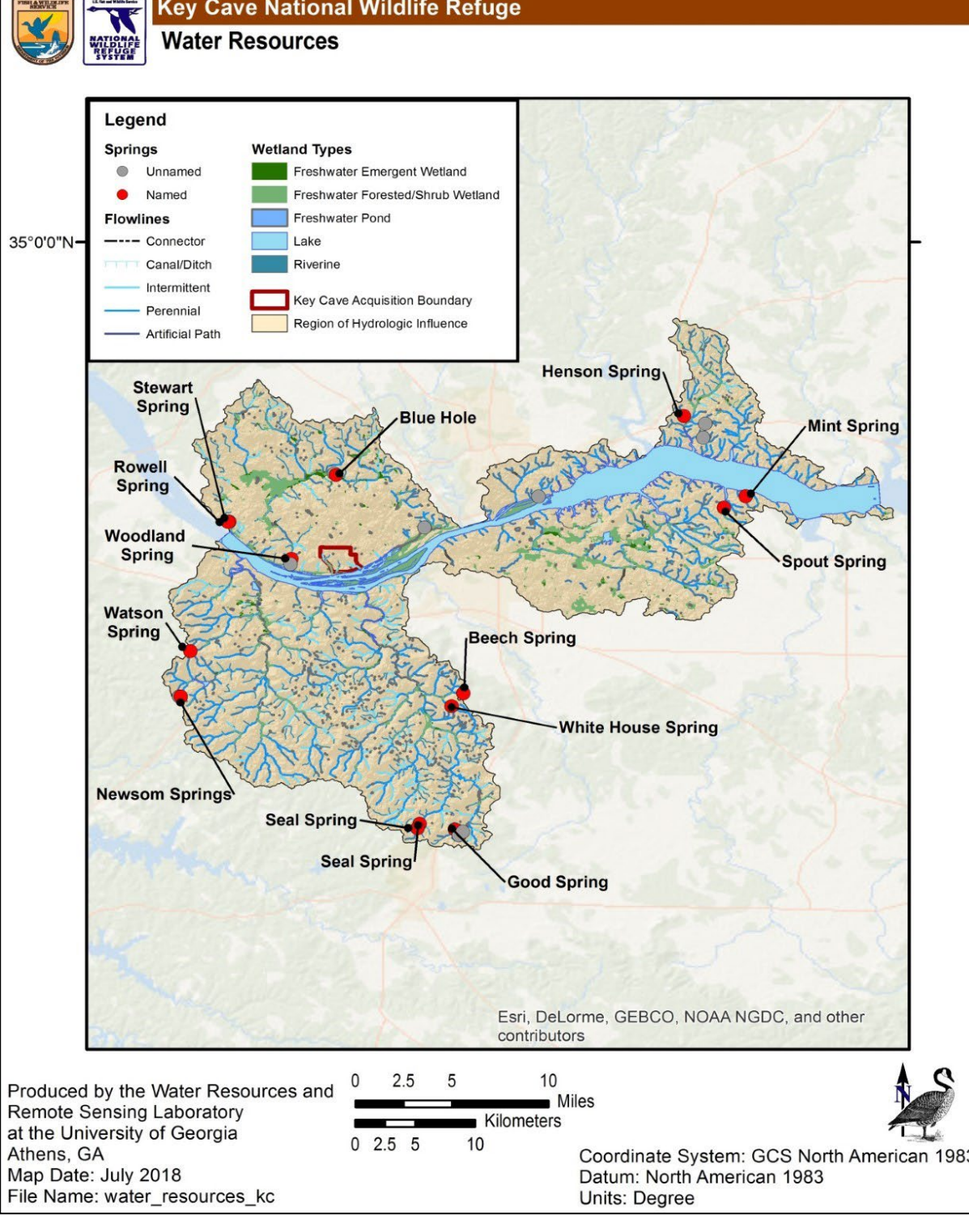


Figure 6. Water resources in the Region of Hydrologic Influence of Key Cave NWR. Source: (USFWS, 2015; USGS, 2013a).

Hydrology
(USFWS 2019)

There are 14 named springs and 10 unnamed springs in the Region of Hydrologic Influence of Key Cave NWR (Figure 6). Within Key Cave, there are unnamed streams or rivers, and the categories featured in the NWR are "artificial path" and "intermittent" adding up to the 2.81 miles of waterways in the refuge. On the southern border of the refuge there are TVA-administered lands that serve as a riparian buffer, so the refuge does not immediately touch the Tennessee River.