MONROE LAKE MASTER PLAN

Monroe Lake, Ohio River Basin
Salt Creek, Indiana

US Army Corps of Engineers
Louisville District

WOOLPERT

Final Submittal
March 4, 2016

Contract W912QR-14-D-0002

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1.0 Introduction and Background

The Monroe Lake Master Plan, hereinafter referred to as the plan or master plan, is the strategic land-use management document that guides the comprehensive management, development and use for recreation, natural resources and manmade resources that are efficient and cost-effective throughout the life of the Monroe Lake project. It is a vital tool for responsible stewardship and sustainability of the facility's resources for the benefit of present and future generations. This plan guides and articulates the United States Army Corps of Engineers (Corps or USACE) responsibilities pursuant to federal laws to preserve, conserve, restore, maintain, manage and develop the land, water and associated resources at the Monroe Lake project. It is dynamic and flexible based on changing conditions. This plan focuses on goals and objectives. Details of design, management and administration, and implementation are addressed in the Monroe Lake Operational Management Plan (OMP). This master plan does not address the specifics of regional water quality, shoreline management or water-level management. The operation and maintenance of project operations facilities are not included in this master plan.

Monroe Lake Dam

This master plan covers Monroe Lake located in Monroe, Jackson and Brown Counties, Indiana. Construction began in 1960 to impound Salt Creek by the USACE, and work was completed in 1965 creating Monroe Lake (USACE, 1998). The USACE purchased approximately 24,630.03 acres; 23,604.21 acres were acquired in fee, 11.85 acres are under flowage easement, and 1,014.00 acres are under use permit. Of the overall area, 14,371 acres exist above the seasonal pool elevation. The lake is used for flood protection, water supply/water quality, low flow augmentation, fish and wildlife management, and recreation. The Monroe Lake project, which includes project operation and recreation areas, is referred to as the project for the purposes of this document.

This master plan is intended to guide the USACE in achieving its goal of managing, conserving and enhancing natural resources, while providing quality opportunities for outdoor recreation to the public. This master plan was developed in response to regional and local needs, resource capabilities and suitability, and expressed public interests consistent with authorized project purposes and relevant legislation and regulations.

The Master Plan provides a summary of the purposes and history of the project; the applicable federal laws and directives that govern its use; resource objectives; and a detailed analysis of existing natural resources, recreational resources and land uses. It includes projections of future demands for recreational use of the area and a resource-use plan so that the project will continue to meet USACE goals of promoting awareness of the natural environment, adhering to sound environmental stewardship principles and providing outdoor recreation opportunities for current and future generations in an efficient and effective manner. The Master Plan proposes actions for modifying recreational facilities and wildlife management approaches that are consistent with the USACE's established purposes.

To facilitate reading this document, a list of acronyms used is in Appendix A. Appendix B contains a bibliography of references used during the planning process.

1.1 Authorization

The Monroe Lake project was authorized as a component of the Flood Control Plan for the Ohio River Basin. The plan was approved by an Act of Congress on July 3, 1958 (Public Law No. 85-500, 85th Congress, 72 Stat. 297-320) (USACE, 1998).

1.2 Authorized Project Purposes

The Monroe Lake dam was constructed on Salt Creek, a tributary of the White and Wabash Rivers, to serve several purposes. Authorized purposes are flood risk management, water supply/water quality, fish and wildlife management, and recreation (USACE, 1998).

1.2.1 Flood Risk Management

The Flood Control Act of 1936 recognized that flood risk management was, “a proper activity for the Federal Government in cooperation with states, their political subdivisions, and localities thereof.” Congress gave responsibility for federal flood projects to the USACE. One year later, in 1937, one of the most damaging floods along the Ohio River occurred, causing widespread flooding and damage along the Ohio River from Pittsburgh to Cairo, Illinois.

In the years following passage of the law, the USACE built, pursuant to congressional authorization and appropriation, close to 400 reservoirs whose primary benefit was flood risk management. The series of flood risk management reservoirs subsequently constructed by the USACE is estimated to have prevented more than $19 billion in flood damages in the Ohio River Basin since the 1930s (USACE, 2009b).

1.2.2 Water Supply

Monroe Lake

National policy regarding water supply states that the primary responsibility for water supply rests with states and local entities. The USACE is authorized under the Water Supply Act of 1958 (PL 85-500) to provide storage in multipurpose reservoirs for municipal and industrial water supply and for agricultural irrigation. Some facilities that release or withdraw the stored water can be included in the project structure. The cost of storage and associated facilities must be repaid by the non-federal sponsor. The Secretary of the Army is authorized to make agreements with states, municipalities and non-federal entities for the right to storage in USACE reservoirs. Existing USACE projects may be modified to add storage for municipal and industrial water supply. Storage also may be reallocated from other purposes to municipal and industrial uses. USACE allows water withdrawals to private entities for irrigation. During drought conditions, private entities may withdraw water for livestock watering and for human consumption, but withdrawing water for crop irrigation (even during a drought) is not allowed.

While Monroe Lake’s primary purpose is flood control, the lake serves as the primary water supply source for the city of Bloomington and seven rural water companies. The water supply serves approximately 100,000 users. The intake for the city of Bloomington Utilities Department is at the Moore’s Creek embayment, and raw water is piped from there to the Monroe Water Treatment Plant on Shields Ridge Road for distribution to customers. According to the City of Bloomington Utilities, monthly water sales average 15 million gallons per day with a contract limit of 24 mgpd. Approximately 25 percent goes to rural water companies with the remainder being consumed by the city of Bloomington customers (Jones, 1997).

1.2.3 Water Augmentation

According to Article 3 of the contract between the United States and Indiana for the construction and operation of Monroe Reservoir, Indiana, the USACE must release a minimum of 50 cubic feet per second of lake flow when the reservoir is above an elevation of 515 mean sea level (msl). This low flow augmentation should improve the water quality of Salt Creek and provide water for downstream water withdrawals (USACE, 1998).

1.2.4 Recreation

Monroe Lake Has Several Marinas

Section 4 of the Flood Control Act of 1944 authorized the Chief of Engineers "…to construct, maintain, and operate public parks and recreational facilities in reservoir areas under the control of (the Secretary of the Army), and to permit the construction, maintenance, and operation of such facilities." The Flood Control Act of 1962 broadened the 1944 authority to include recreation all types of USACE water resources projects. The Corps has since recognized long-term recreational development as a full-scale project purpose on an equal basis with other established purposes of water resources development.

The traditional policy of the USACE has been to encourage non-federal participation in the administration of recreation opportunities provided at USACE projects. Since 1944, the USACE has entered into leases, which permit state and local development and administration of recreation areas at civil works projects. The policies were reaffirmed by Congress through the passage of the Federal Water Project Recreation Act of 1965 (PL 89-72). This act directs "...that in investigating and planning any Federal navigation, flood control, reclamation, hydroelectric, or multipurpose water resource project, full consideration shall be given to the opportunities, if any, which the project affords for outdoor recreation." The act further defined the basis for sharing the financial responsibilities in joint federal/non-federal development, enhancement and management of recreation and, fish and wildlife resources of federal water projects. However, there are a substantial number of recreation areas which were developed prior to implementing the cost-sharing principles of PL 89-72 that continue to be operated directly by the USACE.

Non-consumptive recreation opportunities offered at the project through leases with the state, county and other entities (including land owned by the U.S. Forest Service) include camping, bird-watching, foraging, swimming, water skiing, cross-country skiing, wildlife observations, boating, and hiking. The projectalso provides opportunities for consumptive recreation including fishing, hunting and trapping. Recreation areas vary from undeveloped forested land to well-developed and extensively used campgrounds and marinas. Intensive public-use areas are centered around the beach, campgrounds and boat ramps (IDNR Annual Management Plan, 2015; USACE, 1998).

1.2.5 Fish and Wildlife Management

The Fish and Wildlife Coordination Act of 1958, PL 85-624, provides authority to the USACE to modify projects to conserve fish and wildlife resources. The Endangered Species Act of 1973, PL 93-205, provides additional authority for operating projects to protect threatened or endangered fish and wildlife. PL 89-72, The Federal Water Project Recreation Act-Uniform Policies, requires consideration of opportunities for fish and wildlife enhancement in planning water resources projects. Non-federal entities are encouraged to operate and maintain the project fish and wildlife enhancement facilities. If non-federal entities agree in writing to administer the facilities at their expense, the fish and wildlife benefits are included in the project benefits and project costs are allocated to fish and wildlife. Fees may be charged by the non-federal interests to repay their costs. If non-federal entities do not so agree, no facilities for fish and wildlife may be provided. Fish and wildlife management at Monroe Lake is provided by the Indiana Department of Natural Resources (IDNR), and its management responsibility is divided into five wildlife management units (Fish and Wildlife Plan, 1978).

Stillwater Marsh

1.3 Prior Master Plans

The original Master Plan-Monroe Reservoir, Indiana was approved in 1967 as Design Memorandum (DM) No. 4B. This document serves to update the 1967 master plan, by updating land use and applicable statutes. It does not negate projects proposed in the 1967 Master Plan. However, detailed projects will be handled in the OMP.

1.4 Application of Public Laws

Development and management of federal reservoirs are regulated by several laws covering recreation; water resource protection and flood risk management; fish and wildlife resources; forest resources; leases, easements and rights-of-way; and cultural resources. Decisions about development within USACE-controlled areas must abide by the relevant regulations, be consistent with Executive Orders (EOs) and be guided by USACE documents. The following sections provide a summary of relevant laws.

1.4.1 Recreation

Each PL and policy discussed below addresses development and management of recreation facilities on public lands and is pertinent to USACE project lands in Indiana:

- PL-78-53, *Flood Control Act of 1936* (22 June 1936), authorizes the construction of civil engineering projects such as dams, levees, dikes and other flood risk management measures through the USACE.
- PL 78-534, *Flood Control Act of 1944* (22 December 1944), authorizes the Chief of Engineers to provide facilities in reservoir areas for public use, including recreation and conservation of fish and wildlife.
- PL 79-526, *Flood Control Act of 1946* (24 July 1946), amends PL 78-534 to include authority to grant leases to non-profit organizations at recreation facilities in reservoir areas at reduced or nominal charges.
- PL 83-780, *Flood Control Act of 1954* (3 September 1954), further amends PL 78-534 and authorizes the Secretary of the Army to grant leases to Federal, State, or governmental agencies without monetary considerations for use and occupation of land and water areas under the jurisdiction of the Department of the Army for park and recreation purposes when in the public interest.
- *Joint Land Acquisition Policy for Reservoir Projects* (Federal Register, [Volume 27, 22 February 1962]), allows the Department of the Army to acquire additional lands necessary for the realization of potential outdoor recreational resources of a reservoir.
- PL 88-578, *Land and Water Conservation Fund Act of 1965* (1 September 1964), prescribes conditions under which the USACE may charge for admission and use of its recreation areas.
- PL 89-72, *Federal Water Project Recreation Act* (9 July 1965), requires sharing of financial responsibilities in joint federal and non-federal recreation and fish and wildlife resources with no more than half of the first cost being borne by the Federal government.
- PL 90-480, *Architectural Barriers Act of 1968* (12 August 1968), requires access for persons with disabilities to facilities designed, built, altered or leased with federal funds.
- PL 101-336, *Americans with Disabilities Act* (ADA) (26 July 1990) as amended by the *ADA Amendments Act of 2008* (PL 110-325), prohibits discrimination based on disabilities in, among others, the area of public accommodations and requires "reasonable accommodation" to persons with disabilities.
- PL 102-580, *Water Resources Development Act of 1992* (31 October 1992), authorizes the USACE to accept contributions of funds, materials and services from non-federal public and private entities to be used in managing recreation facilities and natural resources.
- PL 103-66, *Omnibus Budget Reconciliation Act–Day Use Fees* (10 August 1993), contains provisions by which USACE may collect fees for the use of developed recreation sites and facilities, including campsites, swimming beaches, and boat launching ramps.
- PL 104-333, *Omnibus Parks and Public Lands Management Act of 1996* (12 November 96), creates a nine-member advisory commission to review the current and anticipated demand for recreational opportunities at lakes and reservoirs managed by the federal government, and to develop alternatives to enhance the opportunities for such use by the public.

1.4.2 Water Resource Protection and Flood Risk Management

A number of PLs address water resources protection and flood risk management and the integration of these goals with other project purposes, such as recreation. The following are pertinent to USACE project lands in Indiana:

- PL 74-738, *Flood Control Act of 1936* (22 June 1936), declares flood risk management to be a proper federal activity.
- PL 78-534, *Flood Control Act of 1944* (22 December 1944), specifies the rights and interests of the States in water resource development and requires cooperation and consultation with State agencies in planning for flood risk management.
- PL 85-500, *Water Supply Act of 1958* (3 July 1958), authorizes the USACE to include municipal and industrial water supply storage in multiple-purpose reservoir projects.
- PL 87-88, *Federal Water Pollution Control Act Amendments of 1961* (20 July 1961), requires federal agencies to address the potential for pollution of interstate or navigable waters when planning a reservoir project.

- PL 87-874, *Flood Control Act of 1962* (23 October 1962), authorizes the construction of civil engineering projects such as dams, levees, dikes and other flood risk management measures through the USACE.
- PL 89-80, *Water Resources Planning Act of 1965* (22 July 1965), provides for the optimum development of the nation's natural resources through coordinated planning of water and related land resources.
- PL 89-298, *Flood Control Act of 1965* (27 October 1965), authorizes the Secretary of the Army to design and construct navigation, flood risk management and shore-protection projects if the cost of any single project does not exceed $10 million.
- PL 95-217, *Clean Water Act of 1977* (15 December 1977), amends PL 87-88 and requires the United States Environmental Protection Agency (USEPA) to enter into written agreements with the Secretaries of Agriculture, the Army, and the Interior to provide maximum utilization of the laws and programs to maintain water quality.
- PL 99-662, *Water Resource Development Act of 1986* (17 November 1986), establishes cost-sharing formulas for the construction of harbors, inland waterway transportation and flood risk management projects.
- PL 93-523, Safe Drinking Water Act of 1974 (16 December 1974), amended in 1986 and 1996, regulates quality of municipal potable water, with jurisdiction given to municipal treatment.
- 312 IAC 6.3, *Water Withdrawal Contracts from State Reservoirs,* provides procedures for state requests of water withdrawal or release from a reservoir.
- IC 15-25-2, *Minimum Stream Flow and Water Sale Contracts,* describes procedures for provisions of minimum stream flows, sales of water, and rates of compensation.

1.4.3 Fish and Wildlife Resources

A number of PLs address protection and maintenance of fish and wildlife resources. The following are pertinent to USACE project lands in Indiana:

- PL 79-732, *Fish and Wildlife Coordination Act* (10 March 1934), provides authority for making project lands available for management by interested state agencies for wildlife purposes.
- United States Code (USC) 668-668d, 54 Statute 250, *Bald and Golden Eagle Protection Act of 1940* (8 June 1940) as amended, prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their nests or eggs.
- PL 85-624, *Fish and Wildlife Coordination* Act (12 August 1958), states that fish and wildlife conservation will receive equal consideration with other project purposes and be coordinated with other features of water resources development programs.
- PL 91-190, *National Environmental Policy Act of 1969* (NEPA) (1 January 1970), establishes a broad federal policy on environmental quality stating that the federal government will "...assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings...preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety..."
- PL 93-205, *Conservation, Protection, and Propagation of Endangered Species* (28 December 1973), requires that federal agencies will, in consultation with the USFWS, further conservation of endangered and threatened species and ensure that their actions are not likely to jeopardize such species or destroy or modify their critical habitat.
- PL 95-632, *Endangered Species Act Amendments of 1978* (10 November 1978), specifies a consultation process between federal agencies and the Secretaries of the Interior, Commerce or Agriculture for carrying out programs for the conservation of endangered and threatened species.
- PL 101-233, *North American Wetland Conservation Act* (13 December 1989), directs the conservation of North America wetland ecosystems and requires agencies to manage their lands for wetland/waterfowl purposes to the extent consistent with missions.
- PL 106-147, *Neo-tropical Migratory Bird Conservation Act* (20 July 2000), promotes the conservation of habitat for neo-tropical migratory birds.

- 16 U.S.C. §§ 668-668d, *Golden and Bald Eagle Protection Act of 1940, prohibits anyone (without a permit issued by the Secretary of the Interior) from taking bald eagles, including their parts, nests, or eggs.*
- 16 U.S.C. §§ 703-712, *Migratory Bird Treaty Act of 1918, makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter; or offer for sale, purchase, or barter; any migratory bird (or the parts, nests, or eggs of such a bird), except under the terms of a valid permit issued pursuant to Federal regulations.*

1.4.4 Forest Resources

The following PL pertains to management of forested lands and is pertinent to USACE project lands in Indiana:

- PL 86-717, *Protection and Improvement of Natural Resources* (6 September 1960), provides for the protection of forest cover in reservoir areas and specifies that reservoir areas of projects developed for flood risk management or other purposes that are owned in fee and under the jurisdiction of the Secretary of the Army and the Chief of Engineers will be developed and maintained so as to encourage, promote and ensure fully adequate and dependable future resources of readily available timber. Timber production can be implemented through sustained yield programs, reforestation and accepted conservation practices, provided that such development and management shall be accomplished to the extent practicable and compatible with other uses of the project (PL. 86-717 Sec 1.)

1.4.5 Leases, Easements, and Rights-of-Way

A number of PLs and regulations govern the granting of leases, easements and rights-of-way on federal lands. The following are pertinent to USACE project lands in Indiana:

- USC Title 10, § 2667, authorizes the lease of land at water resource projects for any commercial or private purpose not inconsistent with other authorized project purposes.
- USC Titles 10, 16, 30, 32, and 43, address easements and licenses for project lands.
- USC Title 16, § 460d, authorizes use of public lands for any public purpose, including fish and wildlife, if it is in the public interest.
- USC Title 16, § 470h-3, *National Historic Preservation Act*, for historic property
- USC Title 16, § 663, *Impoundment or Diversion of Waters* (10 March 1934), for wildlife resources management in accordance with the approved general plan
- USC Title 16, § 2601-13, supports project partnership agreements or other cost-share agreements.
- USC Title 30, §§ 181-263, *Mineral Leasing Act of 1920* (25 February 1920), promotes the mining of coal, oil and gas on the public domain and specifies conditions of leasing agreements.
- USC Title 30, § 351-359, *Mineral Leasing Act for Acquired Lands* (7 August 1947), provides that minerals subject to the *Mineral Leasing Act of 1920* that are located on acquired federal lands are subject to the federal mineral leasing system.
- PL 91-631, *Mining and Minerals Policy Act* (28 April 1971), specifies the federal policy for economically sound development of domestic mining.
- PL 91-646, *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (2 January 1971), establishes a uniform policy for fair and equitable treatment of persons displaced as a result of federal or federally assisted programs.
- PL 94-579, *Federal Land Policy and Management Act of 1976* (FLPMA) (21 October 1976) establishes a policy that the federal government receives fair market value for the use of the public lands and its resources unless otherwise provided for by statute. It provides for the inventory of public land and land use planning and establishes the extent to which the executive branch may withdraw lands without legislative action.
- PL 95-87, *Surface Mining Control and Reclamation Act* (SMCRA) (3 August 1977), regulates surface mining and requires permits and inspections.

1.4.6 Cultural Resources

A number of PLs mandate the protection of cultural resources on public lands. The following are pertinent to USACE project lands in Indiana:

- PL 59-209, *Antiquities Act of 1906* (8 June 1906), applies to the appropriation or destruction of antiquities on federally owned or controlled lands and has served as the precedent for subsequent legislation.
- PL 74-292, *Historic Sites Act of 1935* (21 August 1935), declares that it is a national policy to preserve for-public-use historic sites, buildings and objects of national significance for the inspiration and benefit of the people of the United States.
- PL 86-523, *Reservoir Salvage Act of 1960* (27 June 1960), provides for the preservation of historical and archaeological data which might otherwise be lost as the result of the construction of a dam and attendant facilities and activities.
- PL 89-665, *National Historic Preservation Act of 1966* (NHPA) (15 October 1966), establishes a national policy of preserving, restoring and maintaining cultural resources. It requires federal agencies to take into account the effect an action may have on sites that may be eligible for inclusion on the National Register of Historic Places.
- PL 93-291, *Archaeological and Historic Preservation Act of 1974* (24 May 1974), amends PL 86-523 and provides for the Secretary of Interior to coordinate all federal survey and recovery activities authorized under this expansion of the *Reservoir Salvage Act of 1960*. The federal construction agency may expend up to one percent of project funds on cultural resource surveys.
- PL 96-95, *Archaeological Resources Protection Act of 1979* (31 October 1979), updates PL 59-209 and protects archaeological resources and sites on public lands and fosters increased cooperation and exchange of information among governmental authorities, the professional archaeological community and private individuals.
- PL 101-601, *Native American Graves Protection and Repatriation Act* (16 November 1990), requires federal agencies to return Native American human remains and cultural items, including funerary objects and sacred objects, to their respective peoples.

1.4.7 Executive Orders

Executive Orders (EOs) are issued by the President of the United States and do not require congressional approval. The following are pertinent to USACE project lands in Indiana:

- EO 11514, *Protection and Enhancement of Environmental Quality* (5 March 1970), outlines the responsibilities of federal agencies in consonance with NEPA. EO 11514 was amended by EO 11991 in 1977.
- EO 11593, *Protection and Enhancement of the Cultural Environment* (13 May 1971), outlines the responsibilities of federal agencies in consonance with NHPA, NEPA, the Historic Sites Act and the Antiquities Act.
- EO 11644, *Use of Off-Road Vehicles on Public Lands* (8 February 1972), establishes a uniform federal policy regarding the use of vehicles such as trail bikes, snowmobiles, dune buggies and others on public lands.
- EO 11988, *Flood Plain Management* (24 May 1977), requires federal agencies to take actions to reduce the risk of flood loss and to restore and preserve the natural and beneficial functions of floodplains.
- EO 11989, *Off-Road Vehicles on Public Lands* (24 May 1977), amends EO 11644 and authorizes federal agencies to close areas or trails to off-road vehicles that cause adverse effects to soil, vegetation, wildlife, wildlife habitat, and cultural or historical resources.
- EO 11990, *Protection of Wetlands* (24 May 1977), restricts federal agencies from taking actions that would destroy or modify wetlands when there is a practicable alternative.
- EO 11991, *Relating to Protection and Enhancement of Environmental Quality* (24 May 1977), amends EO 11514 by directing the Council of Environmental Quality to issue guidance to federal agencies for implementing procedural provisions of NEPA.

- EO 12088, *Federal Compliance with Pollution Control Standards* (12 Oct 1978), requires all federal agencies to be in compliance with environmental laws and fully cooperate with USEPA, state, interstate and local agencies to prevent, control and abate environmental pollution. EO 12088 was amended by EO 12580 in 1987. EO 12088 was amended by EO 12777 in 1991, EO 13016 in 1996, and EOs 13286 and 13308 in 2003.
- EO 12962, *Recreational Fisheries* (7 June 1995), directs federal agencies to improve the quantity, function, sustainable productivity and distribution of United States aquatic resources for increased recreational fishing opportunities. EO 12962 was amended by EO 13373 in 2008 and EO 13474 in 2008.
- EO 13112, *Invasive Species* (3 February 1999), directs each federal agency to prevent the introduction of invasive species, to detect and respond rapidly to and control populations of invasive species in a cost-effective and environmentally sound manner, to monitor invasive species populations accurately and reliably, and to provide for the restoration of native species and habitat conditions in ecosystems that have been invaded.
- EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (10 January 2001), directs federal agencies, pursuant to its Memorandum of Understanding with the USFWS, to support the conservation intent of migratory bird conventions by integrating bird conservation principles, measures and practices into agency activities and by avoiding or minimizing, to the greatest extent practicable, adverse impacts on migratory bird resources.
- EO 13327, *Federal Real* Property *Asset Management* (4 February 2004), promotes the efficient and economical use of federal real property resources in accordance with their value as national assets and in the best interest of the nation. EO 13327 was amended by EO 13423 in 2007.
- EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (24 January 2007), instructs federal agencies to conduct their environmental, transportation and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient and sustainable manner.
- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (5 October 2009), expands on the energy reduction and environmental performance requirements for Federal agencies identified in EO 13423 and requires Federal agencies to make reductions in greenhouse gas emissions (GHG).

1.5 Purpose of the Master Plan

The purpose of this Master Plan is to provide guidance for the preservation, conservation, restoration, maintenance, management and development of project lands, waters and associated resources. The Master Plan is intended to aid responsible stewardship of project resources for the benefit of present and future generations. The Master Plan evaluates the present use and future potential of those resources and recommends strategies for the future management and development of those resources. Because this Master Plan is conceptual in nature; it identifies general types, intensities and locations of activities, not specific designs or programmatic descriptions.

The Master Plan is based on responses to regional and local needs, resource capabilities and suitability, and expressed public interests that are consistent with authorized project purposes and pertinent legislation and regulations. The Master Plan provides a USACE district-level plan that is consistent with national objectives and other state and regional goals and programs. Future actions by the USACE and by the agencies and individuals granted leases or licenses for use of project lands must be consistent with the master plan. The Master Plan is distinct from the project-level implementation emphasis of the Operational Management Plan (OMP). Policies in the Master Plan are guidelines that will be implemented through provisions of the OMP, specific DM and other planning mechanisms.

The broad objectives of this Master Plan are to:

- Determine appropriate uses and intensities of development for project resources;
- Provide a framework within which the OMP and other planning mechanisms can be developed and implemented; and
- Establish a basis on which outgrants and recreational development proposals can be evaluated.

1.6 Project Description

1.6.1 Location

The Monroe Lake dam is located on Salt Creek in Monroe County, Indiana, approximately 11 miles south of Bloomington, Indiana and 16 river miles upstream from the confluence of Salt Creek and East Fork White River near Bedford, Indiana. It is 166 river miles from the confluence of the White River and the Wabash River near Mt. Carmel, Indiana. Figures 1-1 and 1-2 show the location and vicinity of the lake.

SR 37 is the nearest major highway (approximately 1.5 miles west of the dam), providing access north to Bloomington and south to Bedford. SR 37 continues north 42 miles from Bloomington to Indianapolis. An extension of I-69 at Bloomington, finished in December 2015, allows interstate access 97 miles southwest to Evansville, Indiana.

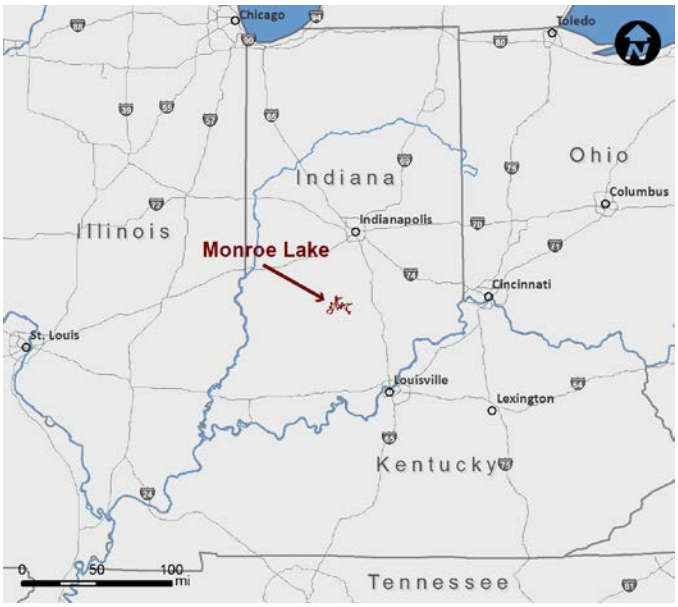


Figure 1-1 *State Vicinity. Sources: USACE, ESRI*

The dam is accessed by vehicle from numerous points. The dam area is accessed from SR 37 by traveling Monroe Dam Road east to East Monroe Dam Road. The south part of the lake is accessed by multiple dead end roads intersecting with Valley Mission Road, Hardin Ridge Road, and South Chapel Hill Road. The lake is roughly bisected by SR 446 crossing the lake over a bridge and causeway. SR 446 provides lake access from Bloomington (to the north) and US 50 (to the south near Bedford). The north part of the lake (west of SR 446) is accessed by East Pointe Road, South Fairfax Road, East Ramp Creek Road, South Shields Ridge Road, East Stipp Road and Swartz Ridge Road. Lake areas east of SR 446 are not as easily accessible by car with the main connecting roads being TC Steele Road and Crooked Creek Road.

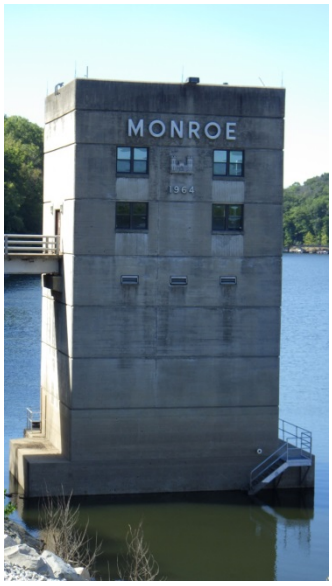
1.6.2 History of the Project

The Monroe Reservoir project was selected for construction under the general authorization for flood control in an Act of Congress approved 3 July 1958, Public Law No. 85-500, 85th Congress. The estimated land acquisition cost was $9,347,374 and the total asset acquisition cost was $4,832,165. Construction started in November 1960 and the project was dedicated in October 1964.

1.6.3 Land Acquisition History

Land for Monroe Lake was acquired according to land acquisition policies of 1953-1962, commonly known as the Eisenhower policy. This called for fee acquisition to the five-year flood frequency line and flowage easement from the five-year line to an established contour four feet above the flood control pool. Real Estate Design Memorandum No. 8, approved by ENGRE-AP 2nd, dated 4 October 1961, recommended fee acquisition to elevation 560 instead of elevation 551 because of terrain steepness in the river valley and its tributaries. Additional fee land was acquired where needed for recreation areas. Easements were acquired mostly for required road relocations. The total project area is 24,630.03 acres; 23,604.21 acres were acquired in fee, 11.85 acres are under flowage easement, and 1,014.00 acres are under use permit. There are 14,371 acres of fee land above the seasonal pool elevation. An estimated 1,910 acres were acquired specifically for recreation (USACE, 1998).

The policy of acquisition by a guide elevation required the severance of many tracts along the boundary. In nearly every case where access was lost, the landowner was required to waive his or her rights to access and was compensated with severance pay (USACE, 1998).



Monroe Lake Control Tower

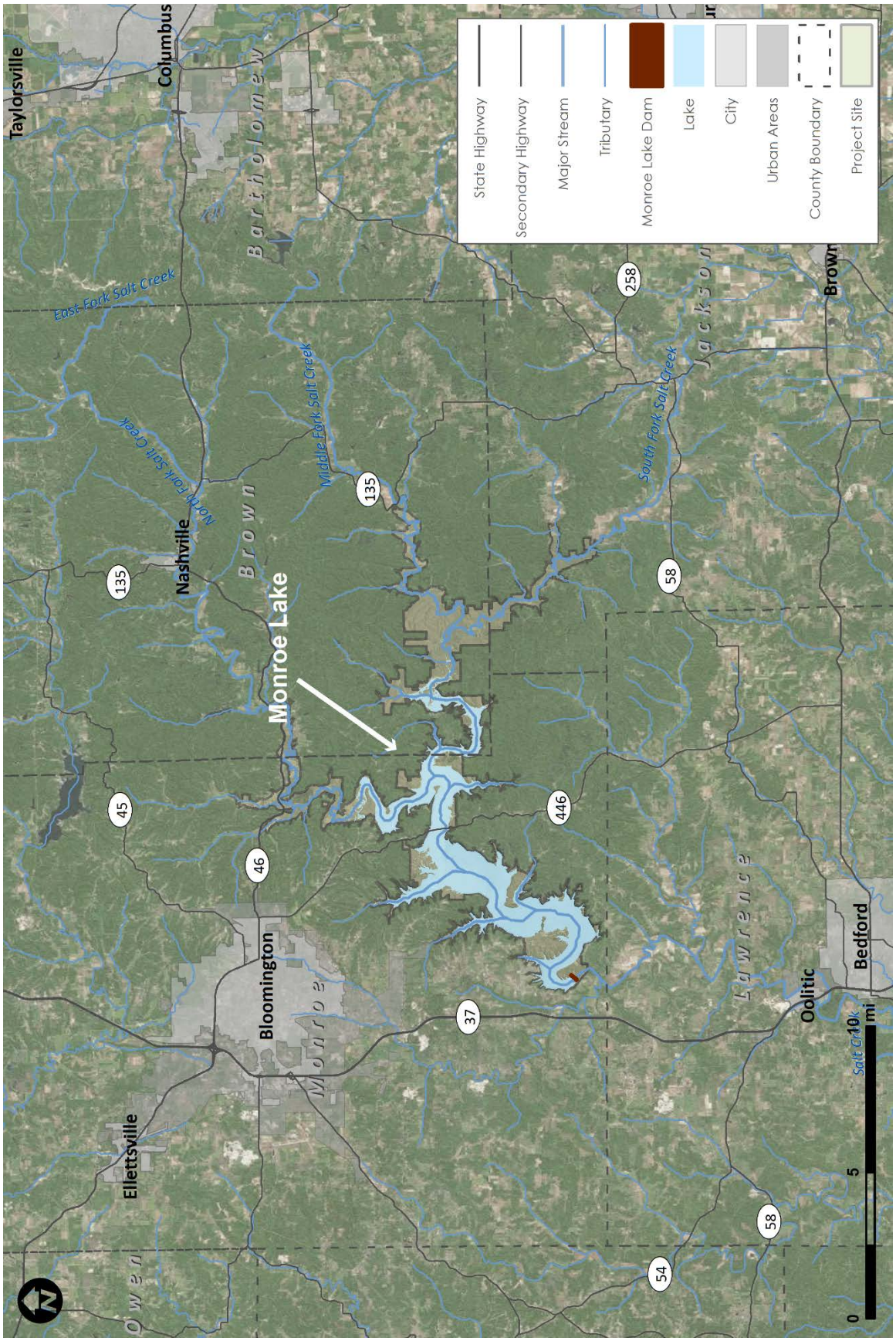


Figure 1-2 *Location. Sources: USACE, ESRI, USDA-NCRS, U.S. Census Bureau*

1.6.4 Federal Areas and Recreational Facilities

The Corps retains title to all lands and facilities specifically acquired for project purposes or constructed with government assistance for recreation and wildlife enhancement. The Corps periodically inspects these lands and facilities to insure proper and continued maintenance by the State of Indiana and/or its concessionaires and tenants. The Corps reviews the annual management plans submitted by the state of Indiana to insure that the use of project resources is in the best interest of the federal government. The Corps retains total operational jurisdiction over approximately 171.71 acres of land and water at the dam site which are essential for the operation and maintenance of Monroe Lake as a flood control project.

This area includes the Corps office, the control tower, the dam, the overlook picnic area and all of the tailwaters recreation site. Recreation and wildlife improvement programs are developed by the Corps at these locations. Corps personnel perform all flood control functions. The Corps manager has citation authority under Title 36, of the United States Code of Federal Regulations, and works closely with state personnel to prevent trespasses and encroachments on federal property. Monroe Lake was constructed before the adoption of ER 1130-2-406, which disallows private shoreline uses on water resource projects where construction was initiated after December 13, 1974. Therefore, there are multiple licenses, easements and permits between other entities and the USACE which allow shoreline uses to other entities. (USACE, 1998).

The United States Forest Service (USFS) owns land adjacent to Monroe Lake (see Figure 1-3) and operates the Hardin Ridge Recreation area on the lake. This area is under the sole jurisdiction of the USFS. The Corps has entered into a "Memorandum of Understanding" with the USFS regarding the jurisdiction and management responsibilities of land at Monroe Lake. The USFS is responsible for management of 1,419 acres within the Hardin Ridge Recreation area. The USFS is solely responsible for bearing all costs of operation, maintenance and replacement of structures and facilities involved in recreation and wildlife management. The USFS is responsible for all law enforcement activities involving USFS property, which extends beyond the project area. Its law enforcement authority comes under Title 36, Title 16, Title 18 and Title 21, of the United States Code of Regulations (USACE, 1998).

1.6.5 Outgrants

An outgrant is the written interest granted to an entity or individual that allows that entity or individual to make use of government property through lease, license, easement or permit. Outgrants typically establish a timeframe, conditions and restrictions on the use of the property. Some outgrants are issued through lease agreements, which are contracts between the USACE and another party. One outgrant with IDNR for the recreation areas has been established at the project through a lease agreement.

Indiana Department of Natural Resources (IDNR): A lease (DACW-27-1-68-2174 [1 June 1975]) was granted to the IDNR in 1967 granting use and occupancy of 22,663 acres of land and water areas for public park and recreational and fish and wildlife for 40 years. The lease was amended in 1989 to extend the lease term to 30 April 2032. Additionally, IDNR has agreements with various concessionaires for management of recreation areas throughout the project, which are discussed in Section 4.

Boy Scouts of America Camp Ransburg

Boy Scouts of America-Ransburg Scout Reservation: The Crossroads of America Council of the Boy Scouts of America own and operate a 624-acre camp on the south shore of the lake (Ransburg Flyer). The council is not a lease holder of property but, it does maintain a group dock permit granted by IDNR's lake property office (IDNR Email from Brian Pavlik, October 5, 2015).

Farming and Utility Leases: IDNR enters into short-term leases with local farmers for the cultivation of food plots in wildlife management areas. Typical leases are two years for trapping and four years for farming. Occasionally, unauthorized access roads to private lands through Corps property are discovered. When this occurs, users are required to remove and restore unauthorized access roads or on rare occasions apply for a license to allow continued use of the access roads; however, these licenses are rarely granted by the USACE. Pipeline and utility easements that do not interfere with the authorized project purposes, are granted by the USACE under the appropriate authorities (USACE, 1998).

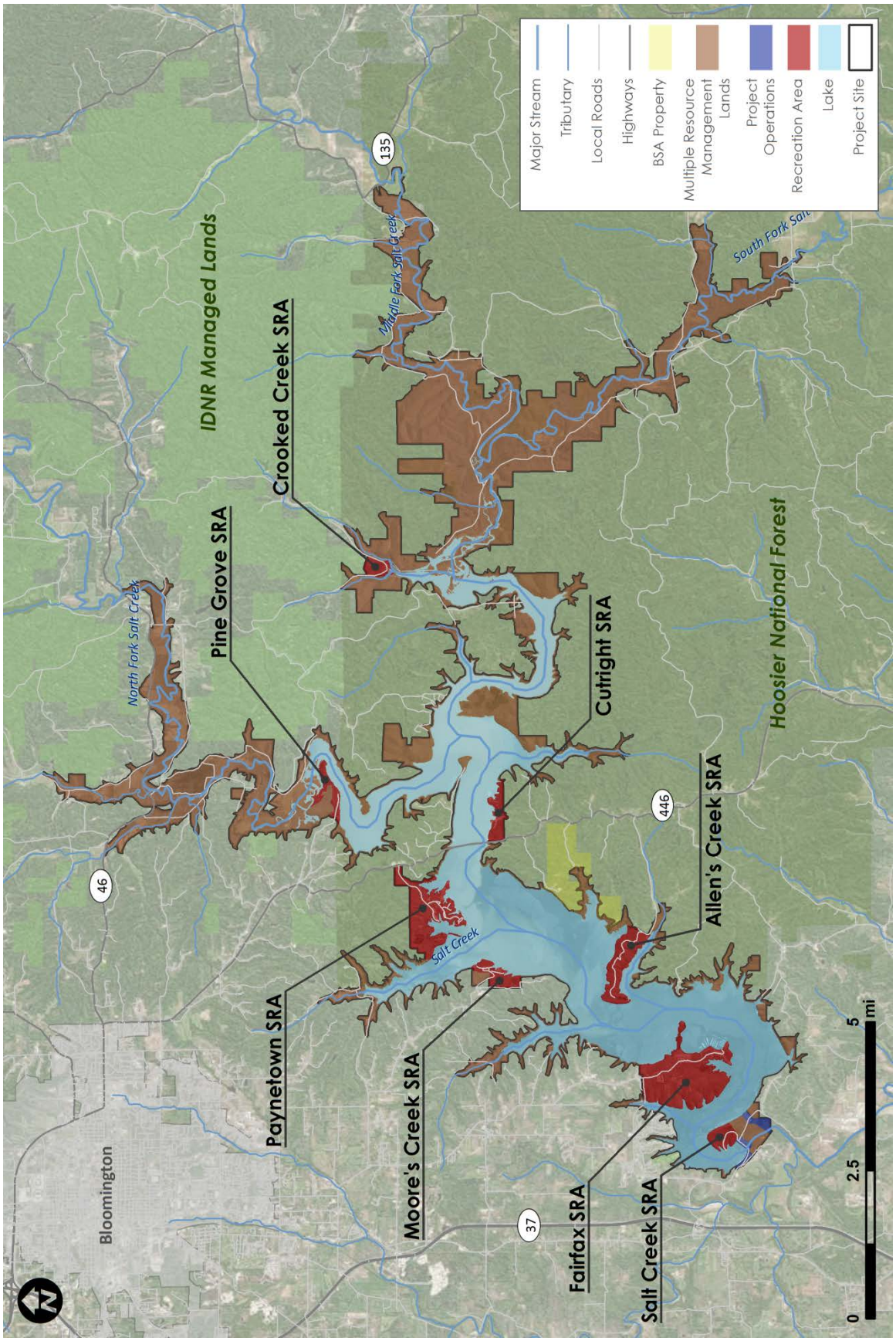


Figure 1-3 *Monroe Lake 1967 Land Allocation and Adjacent Public Entities. Sources: ESRI, USACE, IndianaMAP, IGS, IDNR, IDHS, Monroe County GIS, Indiana*

1.6.6 Project Data/Lake Operations

The Monroe Lake Dam is comprised of an impervious core with a rock shell and mowed turf downstream face, and riprap upstream face, ground stabilization. Table 1-1 describes the project's structure data. The maximum height of the dam is 93 feet and crest length is 1,350 feet. The top elevation of the dam is 574 feet above msl. The Monroe Lake Dam structures include a conduit-type outlet works and a spillway (with a dry tower), a public use road across the top of the dam, and an operations building with a parking area and a gauging station.

Table 1-1: Project Structure Data

Dam	
Type	Impervious Core With Rock Shell
Top Length	1,350
Maximum Height	93 feet
Top Elevation	574 feet above msl
Spillway	
Type	Open Cut Through Left Embankment
Crest Elevation	556 feet above msl
Length of Cut	750 feet
Outlet Works	
Type/Size	12 foot diameter, circular concrete conduit
Control Gates	3 Gates, Each 3.75 foot horizontal by 12 foot vertical
Bypass Gates	2 Gates, Each 30 inch in diameter

Source: 1967 Master Plan, USACE, 1998

The outlet works consist of a dry type tower and a 12-foot diameter, elliptical, concrete conduit. Flow is controlled by three service gates—each with 3.75 feet horizontal by 12-foot vertical dimensions. The conduit inlet invert elevation is 497.00 feet above msl. The dam also has two bypass gates—each 30-inches in diameter.

The spillway is through an open cut of the left abutment around a natural hillside peninsula known as the Salt Creek lake access. The crest elevation is 556 feet above msl. The width of the cut is 600 feet and the length of the cut is 750 feet. The spillway is designed to accommodate a maximum discharge of 73,760 cubic feet per second of flow.

1.6.7 Lake Regulation

The lake has a recreational pool elevation of 538 .00 above msl. At recreational pool elevation, the lake is designed for 182,000 acre feet of storage with 190 miles of shoreline. The lake is designed to provide flood storage from elevation 538.00 msl to 556.00 msl with a 258,000 acre feet capacity. A spillway crest elevation of 556.00 msl, the lake extends 38 miles upstream. Table 1-2 shows the various lake surface water elevations.

Table 1-2: Lake Surface Water Elevations

Lake Level Description	Elevation (Feet Above msl)	Surface Area (Acres)	Area in Acre Feet
Minimum Pool	515.00	3,280	22,300
Recreational (Seasonal) Pool	538.00	10,750	159,900
Flood Pool	556.00	18,450	228,800
Available for Flood Control	515-556	Varies	236,500

Source: 1967 Master Plan, USACE, 1998

1.6.8 Visitation Data

Table 1-3: Visitation Data 2007-2014

IDNR Fiscal Year	IDNR Project Visitation (IDNR Sites Only)	USACE Fiscal Year	USACE Project Visitation (Reservoir-Wide)
FY 2007-2008	949,066	FY 2007	1,022,210
FY 2008-2009	927,745	FY 2008	882,125
FY 2009-2010	946,793	FY 2009	1,060,215
FY 2010-2011	860,039	FY 2010	900,237
FY 2011-2012	1,053,041	FY 2011	972,091
FY 2012-2013	900,168	FY 2012	967,716
FY 2013-2014	950,029	FY 2013	Not available

Sources: http://www.in.gov/dnr/parklake/2441.htm and USACE data from The Operations and Maintenance Business Information Link, 2016

USACE calculates visitation data at Monroe Lake based on data from multiple USACE, IDNR, and USFS sites. IDNR counts visitation only at their managed sites (e.g.; State Recreation Areas). Table 1-3 presents visitation data estimates to the project area from 2007 to 2014. A visit represents the entry of one person into a recreation area. As shown in Table 1-3, visitation data from the USACE's calculations was highest in fiscal year 2009, when there were an estimated 1,060,215 visitors to the project. The highest visitation year to IDNR sites was FY 2011-2012, with 1,053,041 visits. Historic data shows that there were consistently over one million visitations in the 1980s with a high of 1,466,796 visitors in 1988 (USACE, 1998). Original master planning in the 1960s forecasted over one million visitors annually (Project Resource Management Plan, 1973).

2.0
Public Involvement, Coordination and Partnerships

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2.0 Public Involvement, Coordination and Partnerships

Public involvement is important to the overall success of the master planning effort. Stakeholder meetings were held in September 2015, and a public open house was held in December 2015 providing the public, stakeholders and other public agencies opportunities to participate in defining the master plan.

2.1 Stakeholder Public Meetings

Stakeholder meetings were held between 14 September and 17 September 2015 during the scoping phase of the master plan. The scoping process was used to identify issues and concerns and obtain comments. The stakeholder meetings were conducted at the following locations: USACE project office, IDNR Paynetown office, USFS Bedford office and Boy Scouts of America (BSA) Camp Ransburg. Other meetings were conducted with IDNR lessees including Four Winds Resort and Monroe Lake Sailing Club. These meetings helped explain key concerns, which contributed to formulating the objectives presented in Section 5.

2.1.1 Identified Key Areas of Concern

The following summarizes the key areas of concern identified for consideration during the master planning process based on the initial meetings with USACE and on stakeholder meetings.

- Management of land and upkeep of facilities for the enjoyment of future generations
- Invasive species control
- Lack of parking space during high-volume weekends
- Canada geese populations
- Vulture populations and nuisance behavior
- Funds for maintenance, repair and upkeep of existing facilities
- Boater safety

2.2 Consistency with Other Agencies

Goals and objectives of the USACE for recreation align with those of other agencies that provide or plan for recreation in the area based on a review of existing documents, including the following:

- IDNR, Division of Outdoor Recreation. *Indiana Statewide Outdoor Recreation Plan 2011-2015* "Hoosier Planning Play," (Indiana DNR 2012)
- IDNR, Division of Fish and Wildlife, *Indiana State Wildlife Action Plan* (SWAP), (Indiana DNR, 2015)
- USDA, Forest Service, *Land and Resource Management Plan: Hoosier National Forest,* (USFS 2006)
- IDNR, *Annual Wildlife Management Plan,* (DNR, 2015)

Shared goals among the above plans and agencies include the following:

- Good stewardship of the resources
- Provision of recreational opportunities
- Management of land to maintain the resource for future generations
- Maintenance and/or restoration of natural habitats for wildlife conservation

Mutual approaches for achieving the desired goals include the following:

- Coordination among government agencies
- Encouragement of public involvement
- Monitoring and assessing outcomes

Given the commonalities, USACE will continue to work with state and federal agencies as well as other interested parties and stakeholders to support recreational, wildlife management and preservation goals.

Table 2-1 charts the goals listed in the plans developed by other agencies (see above) that are consistent with the project's purpose.

Table 2-2: Shared Recreation and Environmental Conservation Goals

Plan	Goal				
	Recreational Opportunity Enhancement	Stewardship of the Land	Restoration of Ecological Corridors	Restoration of Habitats	Preservation of Natural, Historical and Cultural Resources
Indiana Statewide Outdoor Recreation Plan 2011-2015	●				●
Indiana State Wildlife Action Plan			●	●	
Land and Resource Management Plan: Hoosier National Forest	●	●	●	●	●
IDNR Annual Management Plan		●		●	

2.3 Coordination and Partnerships

The following organizations work in partnership with the USACE at Monroe Lake.

- IDNR-a major lessee and manager of recreational facilities
- USFS-a major adjacent landowner offering recreation and lake access
- BSA-owner of Camp Ransburg managing a scout camp including lake access for campers
- Monroe County-providing planning, and zoning
- City of Bloomington-a nearby city with drinking water withdrawal facilities from the lake
- Indiana Department of Environmental Management - is responsible for monitoring and assessing the water quality of Indiana's surface waters

2.4 Public Open House

A public open house was held on 15 December 2015 at the USACE project office to gather public comments and concerns. Comments received at the open house are included in Appendix C, along with responses.

3.0
Resource Analysis

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3.0 Resource Analysis

The Resource Analysis section of the Master Plan is an assessment of existing natural conditions at Monroe Lake Reservoir. It is intended to facilitate the understanding of development suitability and constraints that will affect future management decisions at the project site.

3.1 Physical Environment

The physical environment surrounding Monroe Lake contains the following resources:

- Surface water
- Wetlands
- Groundwater
- Physiography and topography
- Geology, soils and minerals
- Historic resources
- Scenic elements

Monroe Lake Dam and Tailwater Area

Existing conditions for each of the natural resources are described in the subsections below along with a brief discussion of how each resource may impact development.

3.1.1 Surface Water

Surface water refers to water sources present at the ground surface. This includes Monroe Lake, surrounding tributaries and the tailwater area.

3.1.1.1 Existing Conditions

Streams and Watersheds

Monroe Lake Reservoir is a 24,630.03-acre project fed by the North, Middle and South Forks of Salt Creek. The tailwaters from Monroe Lake drain into Salt Creek, a tributary of the East Fork of the White River (USACE, Fish and Wildlife Plan). Salt Creek flows south from the tailwaters for 26 miles to merge with the East Fork of the White River downstream of Bedford in Lawrence County, Indiana (USACE, 1998). The White River flows into Wabash River which eventually empties into the Ohio River.

The Monroe Lake dam provides flood control for Salt Creek, the East Fork of the White River and the lower portion of the Wabash River, and augments low-flow periods for Salt Creek (USACE, 1998).

Monroe Lake gathers storm water runoff from 432 square miles, covering parts of Monroe, Brown, Jackson, Bartholomew and Lawrence Counties. The sub-basin for the lake, called Lower East Fork White, drains 2,029 square miles (see Figure 3-1). Drainage areas for Salt Creek and its tributaries are presented in Table 3-1.

Table 3-1: Drainage Areas of Salt Creek and Major Tributaries

Watershed (HUC 10)	Tributary/Water Body	Area (Square Miles)
Monroe Lake-Salt Creek	Monroe Lake	89.6
South Fork of Salt Creek	South Fork Salt Creek	102.4
North Fork of Salt Creek	North Fork Salt Creek	167.0
Middle Fork of Salt Creek	Middle Fork Salt Creek	73.0
	Monroe Lake	**432.0**

Source: United States Department of Agriculture, Natural Resources Conservation Service, Indiana Geological Survey, 2009

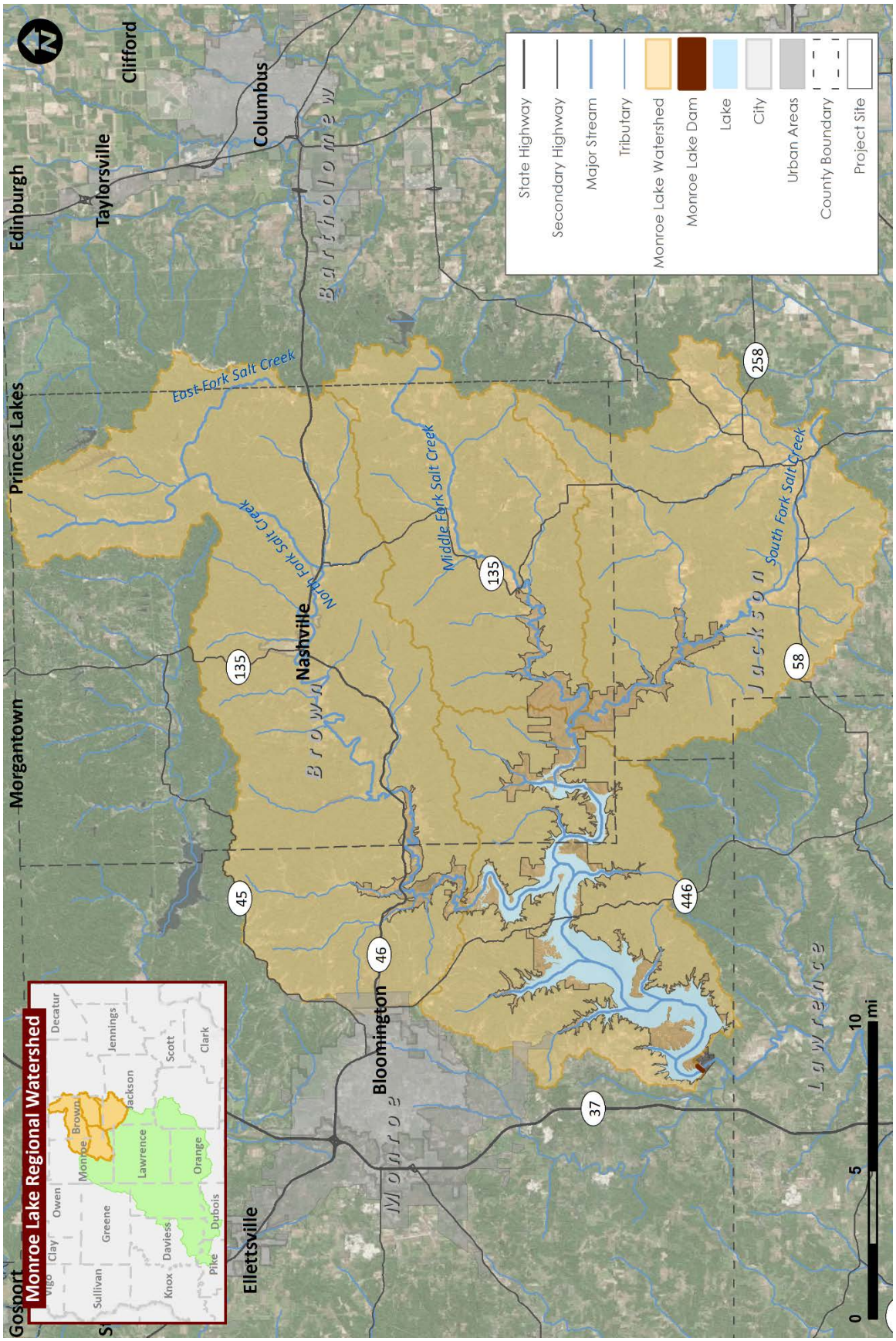


Figure 3-1 *Monroe Lake Drainage Area. Sources: USACE, ESRI, USDA-NCRS, USGS, IndianaMAP*

Monroe Lake

Monroe Lake was formed on Salt Creek by the building of the dam in 1965, making it the State of Indiana's largest inland man-made water body (City of Bloomington, 2015). The dam is located on Salt Creek, 25.9 miles upstream from its confluence with the White River (USACE, 1998). At the permanent pool level (538 msl), the lake has 103 miles of shoreline and 10,750 acres of water (USACE, 1967). The lake is split into three basins—upper, middle and lower—and has an average depth of 17.3 feet, with a maximum depth of 55 feet at 538 msl (Jones, 1997).

Two zones control boat speed on Monroe Lake. Zone 1 limits any area 200 feet or less away from the shoreline or docks (USACE, 2004) as well as all embayments which are less than 1,500 feet wide at the mouth to idling speeds with no wake. Areas of the lake east of SR 446 are also categorized under Zone 1. Zone 2 limits two areas to idling speeds with no wake, which from October 1 to April 15, are closed to watercraft to protect waterfowl habitat (USACE, 1967). The main body of the lake is unrestricted.

The city of Bloomington withdraws an average of 15 million gallons per day through the Monroe Water Treatment Plant from Monroe Lake. This withdrawal can increase to as much as 24 million gallons per day during warmer months (Bengston, Bloomington Utilities). By contract, the maximum daily withdrawal available to the city of Bloomington is 24 million gallons (Jones, 1997). In addition to Bloomington, three other organizations (Eagle Pointe Golf Resort, Indianapolis Power and Light, and Salt Creek Services) account for additional water draws from the reservoir (see section 5.2 for more details). The State of Indiana reserves the right to withdraw more water in the future. See Section 1.4.2 for governing Indiana Codes. Any requests for future additional water withdrawals require entering into an agreement with the State of Indiana.

Tailwater Area

The tailwater area is located downstream of the dam. Water released from the dam is drawn from various depths, allowing for a range of choices to control water temperature. For example, the dam mixes water from various strata to maintain a tailwater temperature within 5 degrees centigrade of the downstream seasonal water temperature to maintain natural stream conditions. Additionally, water release is controlled to maintain a minimum 20 cubic feet per second of flow downstream (USACE, 1998).

Water Quality

The Indiana Department of Environmental Management (IDEM) determines water quality criteria based on the designated use of the water body. Monroe Lake Reservoir is designated for recreation, fishing, drinking and aquatic life. A 2008 assessment of water quality indicators for the reservoir identified impairments from mercury, algal growth, and taste and odor (Bloomington, Water Quality). Ongoing challenges identified in the 1997 diagnostic report include sedimentation, erosion and impacts from heavy recreational use (Jones, 1997). The water quality report for Monroe Lake is currently being updated.

Water quality monitoring is performed by the USACE in coordination with the State of Indiana. Lake project personnel take daily measurements from spring to fall during lake stratification, monitoring the temperature and dissolved oxygen levels at the dam site. Benthic macroinvertebrates and phytoplankton are used as water quality indicators to assess short- and long-term trends. Among the list of water quality concerns are representation of natural conditions and habitat in the tailwaters, eutrophication—especially those resulting in harmful algal blooms (HAB)–and biomagnification due to bioaccumulation. Fish contaminated by lake pollutants are caught by anglers at the lake. USACE is aware of this issue and has recommended to IDNR that IDNR monitor catches and provide information to anglers on the potential contaminated catches (USACE, Water Quality).

USACE began monitoring Monroe Lake for HABs in fiscal year 2012. Since this time, the Corps' Louisville District (LRL) Water Quality Program has coordinated with Indiana state agencies to develop a HAB Response Sampling Plan that protects the public while recognizing the state agencies as the water quality authority per the authority designated to them by the United States Environmental Protection Agency (USEPA), via the Clean Water Act. USACE's primary function in the Indiana HAB Response Plan is to provide support for Indiana state agencies through data collection at the lakes managed by USACE.

The current coordination with Indiana state agencies states that USACE will await the results of the IDEM HAB sampling efforts to determine which LRL reservoirs in Indiana will be sampled prior to Memorial Day weekend. Beyond Memorial Day, Indiana reservoirs will be sampled in response to a reported incident or observation and

HAB response sampling will occur monthly when cyanobacteria cell counts remain higher than 20,000 cells/mL. Sampling will be suspended when results are below 20,000 cells/mL for two consecutive sampling events. HAB response sampling is limited to the May to September recreational season. Table 3-2 summarizes Indiana advisory and caution levels for cyanobacteria.

Table 3-2: Indiana Cyanobacteria Caution and Advisory Levels

Alert Level	Cell Count/msl	Toxin Level	Color	Precautions
Low Risk	< 100,000	< 6 ppb	Blue	Don't drink the water. Shower after you swim.
Advisory	> 100,000	< 6 ppb	Yellow	Swimming and boating permitted. Avoid contact with algae. Don't drink the water. Shower after you swim. Keep pets out of the water or, at minimum, bathe them after swimming and prevent them from licking algae/water from fur.
Caution	> 100,000	> 6 ppb but < 20 ppb	Orange	All ADVISORY precautions plus children and immune-compromised individuals should avoid the water.
Closed	> 100,000	> 20 ppb	Red	Unsafe to swim for humans or pets.

Source: USACE Monroe Lake HAB Results 2012-2015

There are 10 established HAB sampling sites at Monroe Lake. Samples at each site are collected by the lake staff and shipped overnight to an analytical laboratory that has been secured by the LRL Water Quality Program. Based on the sampling results, IDEM issues cautions or advisories. HAB advisories have been issued every year since sampling began in 2011, generally throughout August. Although sampling has occurred in various years as late as December, August is the last month for the state to issue recreational advisories. IDNR and USFS personnel are responsible for ensuring that signs are installed at Monroe Lake recreational areas.

3.1.1.2 Implications of Surface Water on Development

Although the lake level varies throughout the year, on average, the permanent pool elevation is 538 msl. This is conducive to many forms of recreation. Flooding above the permanent pool is possible and has occurred during the summer months as recently as the summer of 2015. Until flooding reaches 548 to 550 msl, it has relatively minor effects on the recreational operation of the lake (see Table 3-3).

The size and depth of the reservoir allows for a variety of recreational activities. Boats found on the lake can be anything from kayaks and canoes to house boats and sailboats. Large boats predominantly traverse the main basins, while the smaller boats, canoes and kayaks are capable of travelling the forks of the lake. These make use of the multiple group docks, marinas, and boats ramps located along the lake.

Swimming and fishing are also popular forms of recreation at Monroe Lake. There are four beaches on Monroe Lake: one at Fairfax Recreation Area, one at Paynetown Recreation Area, one at Hardin Ridge in the Hoosier National Forest and the last at Camp Ransburg. The lake and tailwaters provide an array of fish species and aquatic life. The forks and fingers of the lake are especially popular places for anglers. It is important to note that water quality can affect the availability of recreational activities, especially during the month of August due to eutrophication.

The primary purpose of the Monroe Lake project is flood control. The reservoir was designed to store floodwaters and control release downstream, reducing flood risk in the Salt Creek valley and ultimately along the Ohio River. Figure 3-2 shows inundation areas between the permanent pool level of 538 msl and the maximum flood control elevation of 556 msl. The top of the dam is at 574 msl. Based on the inundation areas displayed in Figure 3-2, the north and south forks will experience the most significant flooding. Table 3-3 presents effects of various lake elevations on adjacent areas.

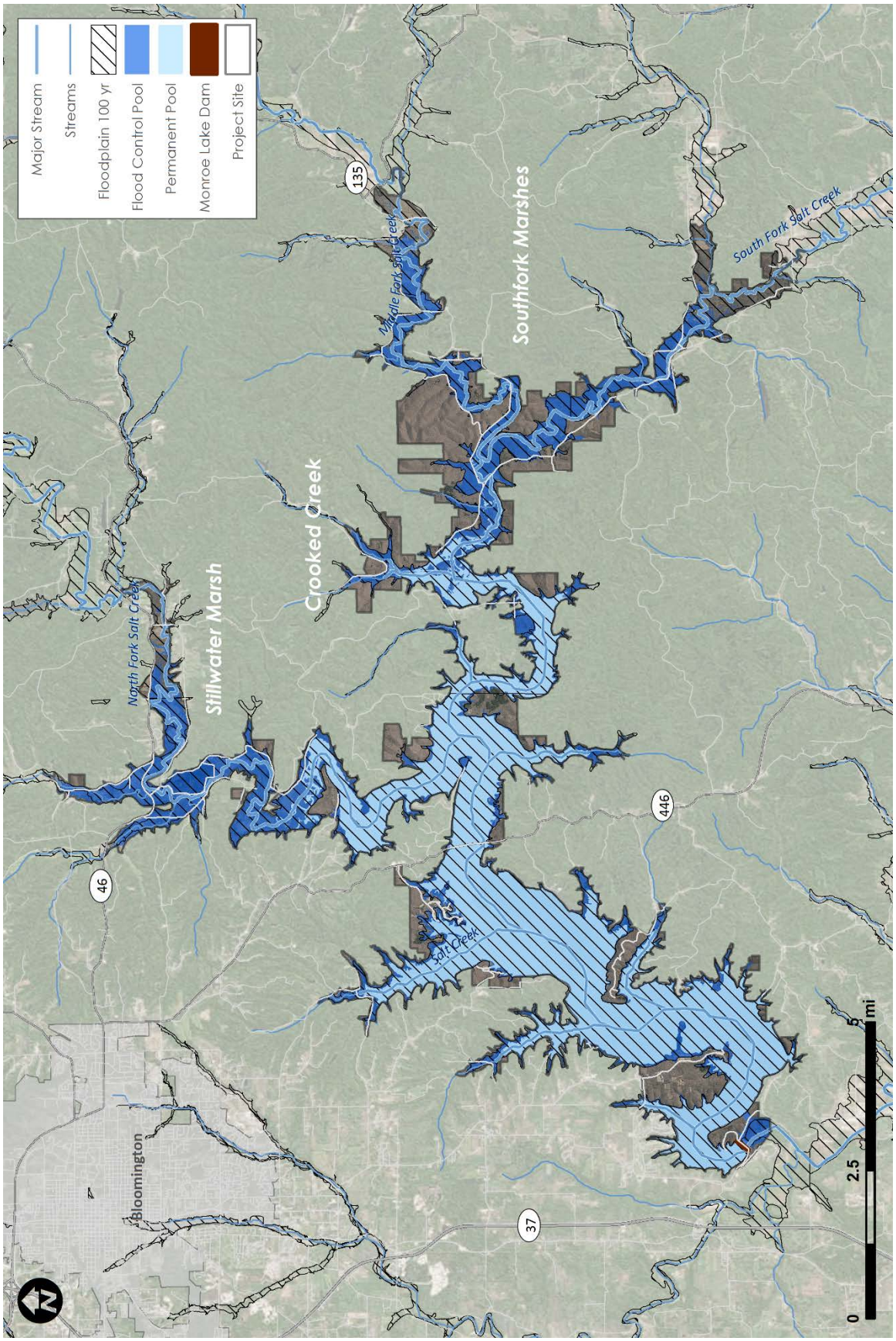


Figure 3-2 *Inundation Areas at Flood Control Level. Sources: USACE, ESRI, USDA-NCRS, IDNR, FEMA, IndianaMAP*

Table 3-3: Impact of Lake Elevation	
Elevation (Feet Above msl)	**Project Impact(s)**
515	**Minimum pool elevation.**
534	Allen's Creek, Pine Grove boat ramps are closed. Launching boats is impossible or difficult at Paynetown courtesy dock and Lake Monroe Sailing Association. Beach at Paynetown SRA becomes mud.
536	Crooked Creek boat ramp closed.
538	**Permanent pool elevation.**
541	Drainage for marshes is stopped and several leased fields are flooded.
543	Paynetown SRA beach flooded. McGowan Road flooded. Water covers back platform of control tower including emergency gate and bypass bulkhead slots.
544	Friendship, Stipp and upper end of Moore's Creek Roads flooded.
545	Fairfax beach and Hardin Ridge beach closed
546	Fairfax, Paynetown, Cutright boat ramps and Allen's Creek Road flooded.
547	Emergency bypass bulkhead under water.
548	Approach to Paynetown docks flooded.
549	North fork of Cleve Butcher Road flooded.
550	Approach to Hardin Ridge beach closed. Storage buildings at Crooked Creek and Lake Monroe Sailing Association flooded. Pine Grove ramp access road flooded and Crooked Creek boat ramp flooded.
551	Lower end of Moore's Creek Road flooded.
552	Paynetown SRA campsite closures begin due to flooding. Brummett Creek Road flooded.
556	Flood Control Pool Elevation and Spillway Crest. Boy Scouts of America Camp Ransburg beach closed. Valley Mission Road, Kent Road and South Dam access road closed. Stillwater Marsh, Southfork Marshes and Crooked Creek flooded.
574	**Top of Dam**

Sources: USACE 2015, USACE, 1998

USACE Engineering Manual (EM) 1110-1-400 Section 2.2.1 recommends developing lakeside facilities outside the five-year flood frequency levels when possible (USACE, 2004). This may limit project development in some areas, but there are several locations, mostly near current recreational areas, which are not impacted by the five-year flood level (see Figure 3-2).

3.1.2 Wetlands

The Clean Water Act defines wetlands as those "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils." Wetlands include swamps, marshes and other similar areas. To be characterized as a wetland, sites must have hydric soils and predominantly hydrophytic vegetation species. Wetlands are critical landscape features. As they hold and slowly release water, wetlands filter and clean, remove impurities and allow sediment to settle out, facilitating the recycling of nutrients. Due to the nature of the habitat, wetlands tend to be rich in flora and fauna.

3.1.2.1 Existing Conditions

According to the National Wetlands Inventory (NWI), Monroe Lake contains 238 potential jurisdictional wetlands within the project area (see Figure 3-3). The NWI map shows that wetlands comprise the majority of Crooked Creek, Stillwater Marsh and Southfork Marshes located in the north and south forks of the lake with an average wetland size of 12.8 acres. The wetlands in the forks compromise 2,902 acres out of 3,052 acres of wetlands found within the project boundary. Table 3-4 provides information on different wetland types found in the northern and southern forks.

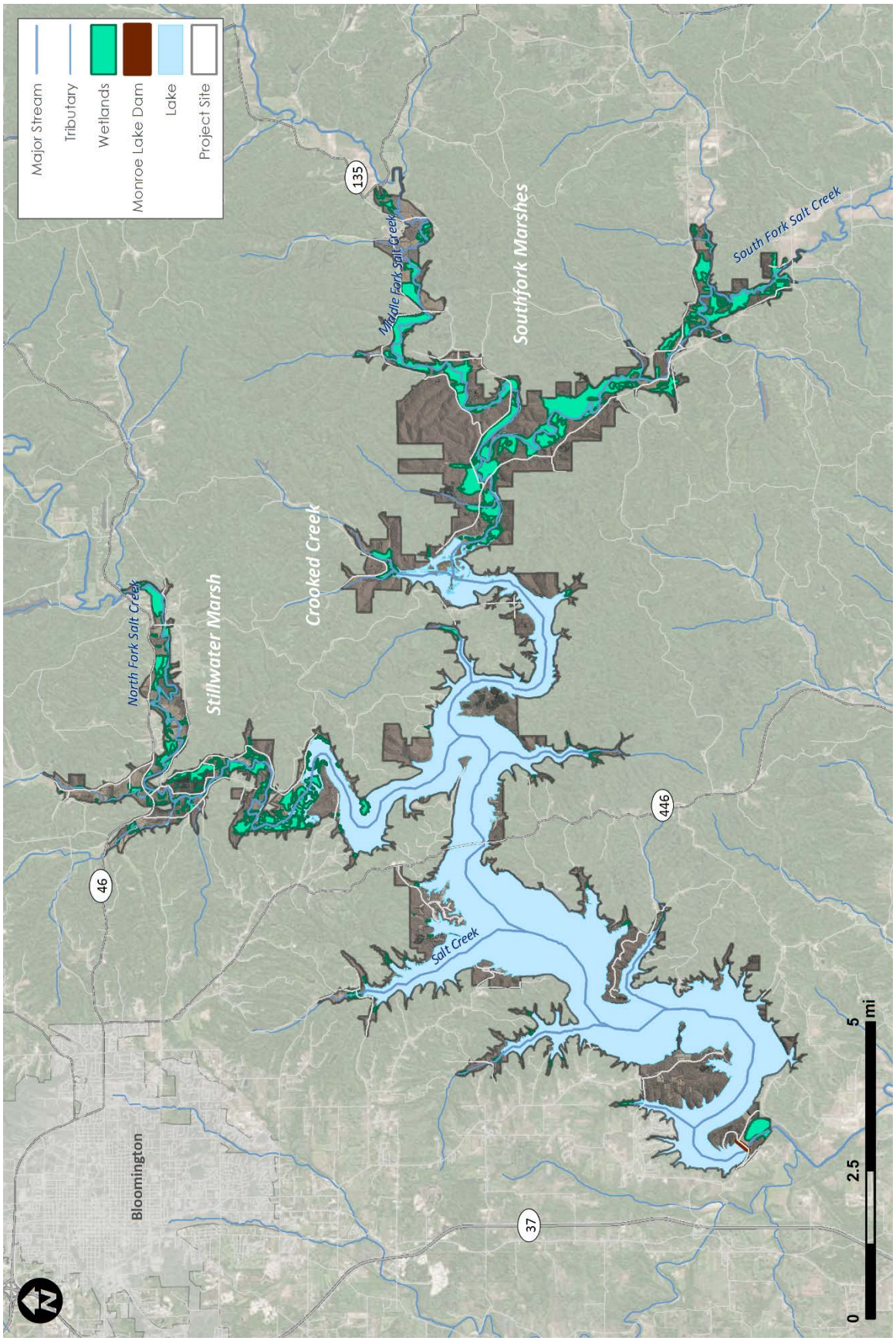


Figure 3-3 *Wetlands. Sources: USACE, ESRI, USDA-NCRS, NWI*

Table 3-4: Wetlands Present in Project Area			
Wetland Type	Abbreviation	Number of Sites	Total Acreage
Palustrine emergent, temporary, seasonally or semi-permanently flooded wetland	PEM	75	497.4
Palustrine forested, temporary, seasonally or semi-permanently flooded or intermittently exposed wetland	PFO	143	2331.7
Palustrine scrub-shrub, temporary or seasonally flooded wetland	PSS	20	223.4

Source: National Wetlands Inventory, US Fish & Wildlife Service, 2015

3.1.2.2 Implications of Wetlands on Development

EO 11990 requires federal agencies, including USACE to minimize destruction or degradation of wetlands and to enhance wetland resources. Wetlands are considered environmentally sensitive resources and therefore, constrain high-intensity development and recreational opportunities. Development opportunities at Monroe Lake will be very limited in Stillwater Marsh, Crooked Creek and the Southfork Marshes along with a few scattered areas in the fingers of the lake.

Potential recreational activities provided by wetland habitats include wildlife viewing, hunting, fishing, trapping and conservation. The wetlands at Monroe Lake provide a specialized habitat for a variety of flora and fauna. Three conservation areas are designated for waterfowl from fall to spring, providing ample opportunities for bird-watching and hunting. Prior to implementation of proposed project development, wetland delineations would need to be conducted, and potential wetland impacts along with mitigation of impacts would need to be identified and evaluated.

3.1.3 Groundwater

Groundwater refers to subsurface waters generally contained in aquifers. Aquifers are permeable geologic units that store water until released via natural streams, springs or water wells. Groundwater provides water for domestic and industrial use when no accessible surface water supply exists.

3.1.3.1 Existing Conditions

Monroe Lake lies within the Dissected Till and Residuum Unglaciated Southern Hills and Lowlands unconsolidated aquifer as well as the Mississippian Borden Group bedrock aquifer system. The most viable aquifers are located in areas of valley train and glacial outwash deposits along streams (USACE, 1998). Despite this, neither system provides sufficient quantities of drinking water for the populace (IGS, Groundwater). Average flow from the bedrock aquifers is typically less than 5 gallons per minute, but in certain rare locations a rate of up to 15 gallons per minute may be produced (IDNR, Aquifer). A successful well is unlikely in this location. As a result, the areas around the project tend to draw from the lake in lieu of wells, although there may be a few individuals on well water.

3.1.3.2 Implications of Groundwater Resources on Development

Due to the likelihood of unsuccessful wells, groundwater is not a viable water supply. Any development will require a connection to a water distribution system.

3.1.4 Physiography and Topography

Physiography and topography are used to describe landforms and the land surface, including geologic formations and elevation.

3.1.4.1 Existing Conditions

Monroe Lake Reservoir is located in the Mitchell Karst Plain and Norman Upland of the Southern Hills and Lowlands region. The area surrounding the lake is characterized by steep ravines and rolling hills. Elevations within the project site range from 490 to 830 msl.

Monroe Lake Reservoir

Locations along the south fork have limited development potential due to slopes greater than 15 percent. USACE EM-1110-1-400, under Chapter 2, recommends avoiding

development on slopes greater than 15 percent unless there is no other acceptable alternative. Approximately 46 percent of the project consists of slopes greater than 15 percent.

3.1.4.2 Implications of Physiography and Topography on Development

The topography of the project is generally hilly with deep flat bottomed valleys. Steep slopes are characteristic of the eastern areas along the fingers of the lake.

Slopes of less than 15 percent have the highest development potential. Slopes between 15 and 30 percent have more limited potential, but are enjoyable for activities such as hiking and wildlife viewing. Areas with slopes greater than 30 percent have very limited development potential, but contribute to the scenic quality of the lake.

Based on information displayed in Figure 3-4, areas with the highest potential for development are limited to the lake edges and peninsulas, mainly along the northwestern shoreline. This area has existing well developed recreational areas. The eastern portion of the site, in particular around Crooked Creek and Southfork Marshes, has the least development potential due to slope limitations. Flooding or wet soils are potential constraints for areas with minimal slope. See Section 3.1.5 Geology, Soils and Minerals for more details.

Erosion Potential Due to Steep Slopes

Erosion potential is minimal where slopes are gradual but increases on moderate to steep slopes. In the past, ruggedness of terrain upstream of the project prevented the mostly rural communities from conducting large-scale farming operations – a potential erosion source (USACE, 1998). The Monroe Lake watershed is urbanizing (see Section 4.2.2), resulting in more construction. Construction activities have potential to increase erosion which in turn will increase downstream sedimentation of the lake. Although the majority of this area is not within the jurisdiction of USACE, management practices are being implemented by the COE through their OMP and Shoreline Management Plan.-Future development within the watershed of the Lake will need to continue to be regulated by Federal, State, and local agencies having jurisdiction.

3.1.5 Geology, Soils and Minerals

This section describes the geology, soil characteristics and minerals found at the project.

3.1.5.1 Existing Geology and Soil Conditions

Monroe Lake Reservoir is underlain with limestone, siltstone and shale (Jones, 1997) dating to the Mississippian age, about 330 million years ago (Hill, 2015). The Mississippian rock around the lake is split into two regions: the Norman Upland to the east and Mitchell Karst Plain to the west. The Norman Upland contains the majority of the project as well as the watersheds, which drain into the lake. The rocks surrounding the project site create steep hills and valleys around eastern edges of the lake. On the western side, the Mississippian rock under the broad rolling hills has undergone acid dissolution, creating karst features.

Karst

The Mitchell Karst Plain on the western lake edges is characterized by karst features. According to the United States Geological Survey (USGS), karst is a terrain type with a distinctive landform and hydrology system. Acid dissolution of limestone and dolomite creates a network of interconnected fissures, fractures and conduits allowing groundwater flow and storage. Visible surface features of karst terrains include caves, vanishing streams, sinkholes and springs (USGS, 2015). Often karst features can be used as a water source; however, the features surrounding Monroe Lake are not viable water sources. According to a 2011 inventory completed by the Indiana Geological Survey (IGS), the project site contains several sinkholes with the potential to develop more (see Figure 3-5).

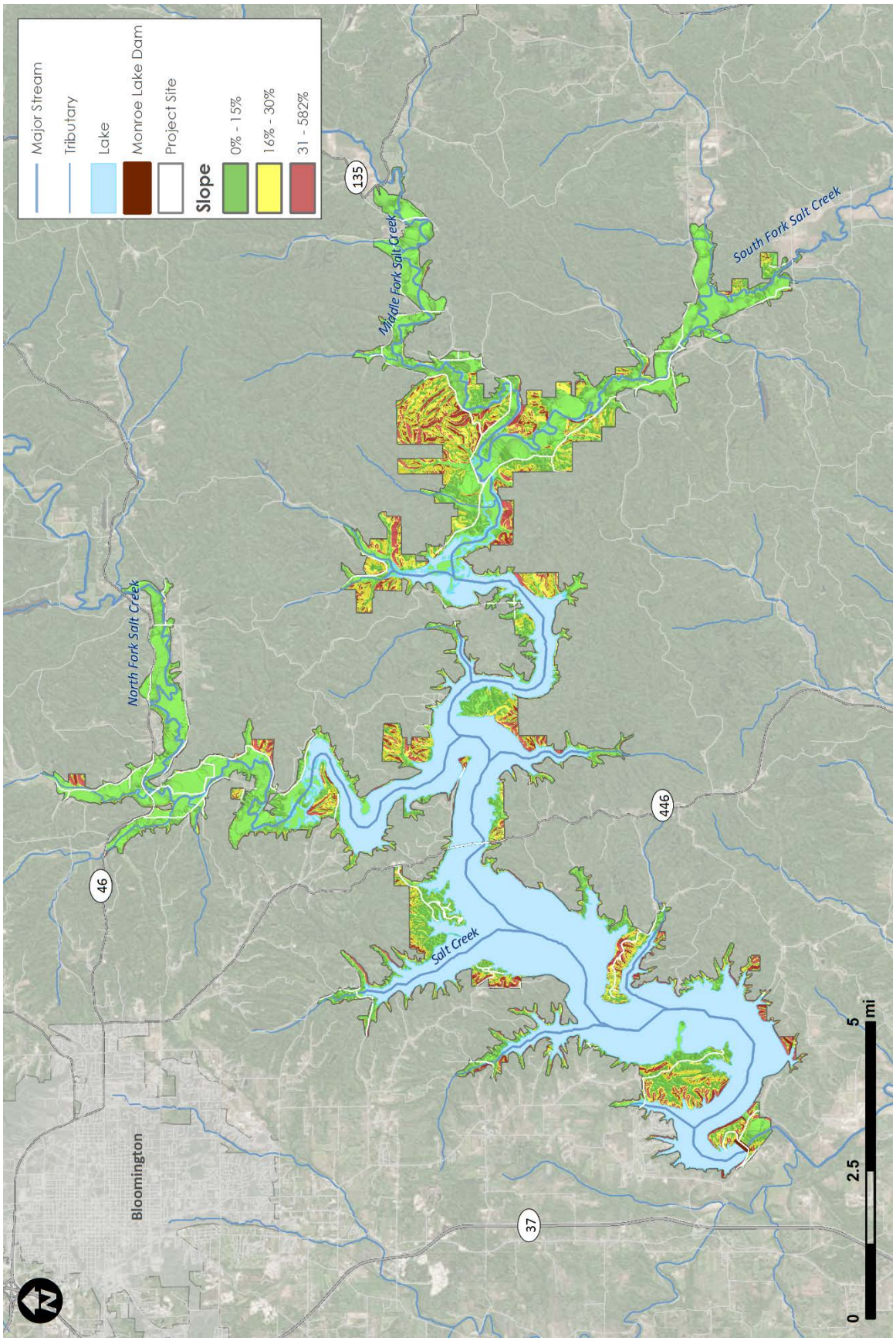


Figure 3-4 *Influence of Slope on Development Potential. Sources: USACE, ESRI, USDA-NCRS, USGS*

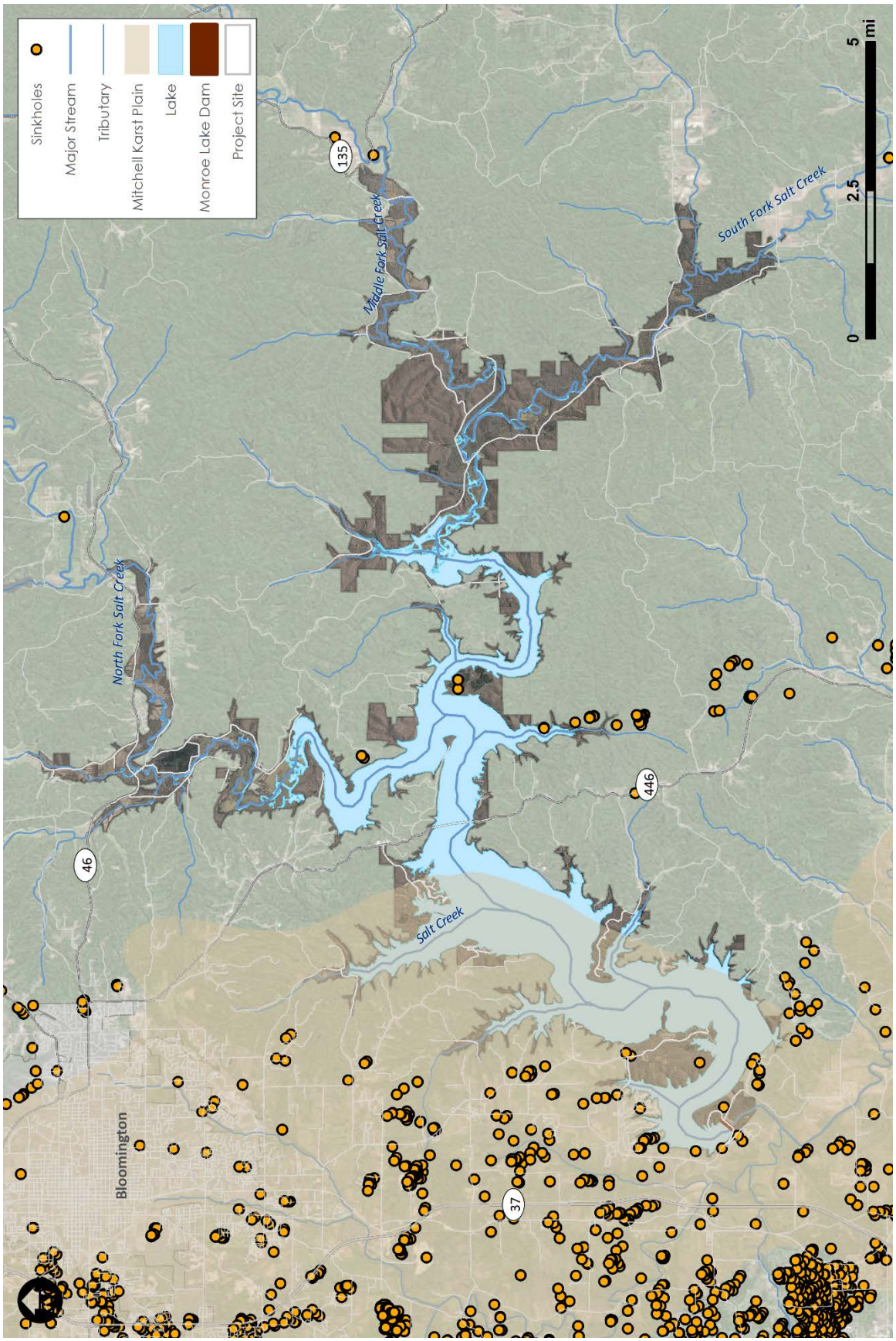


Figure 3-5 *Karst Potential. Sources: USACE, ESRI, USDA-NCRS, IndianaMAP, IGS, Indiana Natural Heritage Data Center, IDNR*

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (USDA NCRS), four soil associations occur at the project site. These soil associations are listed in Table 3-5. Figure 3-6 divides the soils identified in Table 3-5 into three development suitability categories:

1. Most suitable for development
2. Limited development
3. Least suitable for development

Table 3-5: Soil Associations in Order of Predominance

Soil Association	Typical Slope	Suitability Based on Slope and Soil Type
Wellston-Weikert-Gilpin-Berks	Moderately—Very Steep	*Limited Suitability.* Well-drained soil found on gentle to steep slopes
Stendal-Bonnie	Flat	*Least Suitable.* Somewhat poorly drained, often characterized by floodplains or wetlands, may flood frequently
Wakeland-Haymond	Flat	*Least Suitable.* Somewhat poorly drained, often characterized by floodplains or wetlands, may flood frequently
Crider-Bedford-Baxter	Flat—Moderately Steep	*Most Suitable.* Moderately to well-drained soil found on gentle to steep slopes

Source: USDA NRCS, Digital General Soil Map of U.S. 2006

Based on information presented in Table 3-5, the Wellston-Weikert-Gilpin-Berks and Crider-Bedford-Baxter provide the best development opportunities because they are classified as having "limited" and "most" suitability. These soils are found on rolling hills, ridge tops and other steep slopes. NCRS classifies Stendal-Bonnie and Wakeland-Haymond as hydric soils; therefore, they are least suitable for development.

3.1.5.2 Existing Mineral Resources

Historically, the project contained wells to extract salt from the salt springs that the creek is named after (Hall, undated). In more recent years, surveys conducted by the USGS have indicated potential sand and gravel deposits along the lake within the project boundary. IGS has assigned a potential economic value to each location. Three high-potential locations are estimated within the project. The project site also contains several dry wells. Abandoned oil and gas wells, abandoned quarries, active oil and gas wells and active industrial mineral operations are all found in the vicinity of the project. Figure 3-7 shows both active and abandoned mineral activities located in the project vicinity.

3.1.5.3 Implications of Geology, Soils and Minerals for Development

Geology and Soils

The land form of the majority of the project area, especially the eastern portion, is steep and hilly with narrow flat-bottomed valleys unsuitable for development. The hills and ridgetops are dry, while the valley floors are generally floodplains. These areas are unsuitable for development due to ponding and slope. There are small tracts of developable land throughout the project located on rolling hills, valleys not prone to flooding and along ridges. Soil associations identified for development are Wellston-Weikert-Gilpin-Berks and Crider-Bedford-Baxter. Should project areas be developed, a more in-depth soil series study covering inundation frequency, steepness of slope and access may be necessary.

Minerals

Potential sand and gravel resources are located within the project boundary. These resources are minimal and, in the past, development and extraction has been given a low priority due to limited ability for public use (USACE, 1998). Since the main objective of the project is to manage current resources to prevent degradation of potential future use, no development is anticipated.

3.1.6 Historic Resources

A historic property is defined by the National Historic Preservation Act (NHPA) as "any historic or prehistoric district, site, building, structure, or object included on, or eligible for inclusion on, the National Register, including artifacts, records, and material remains" relating to the property (NHPA).

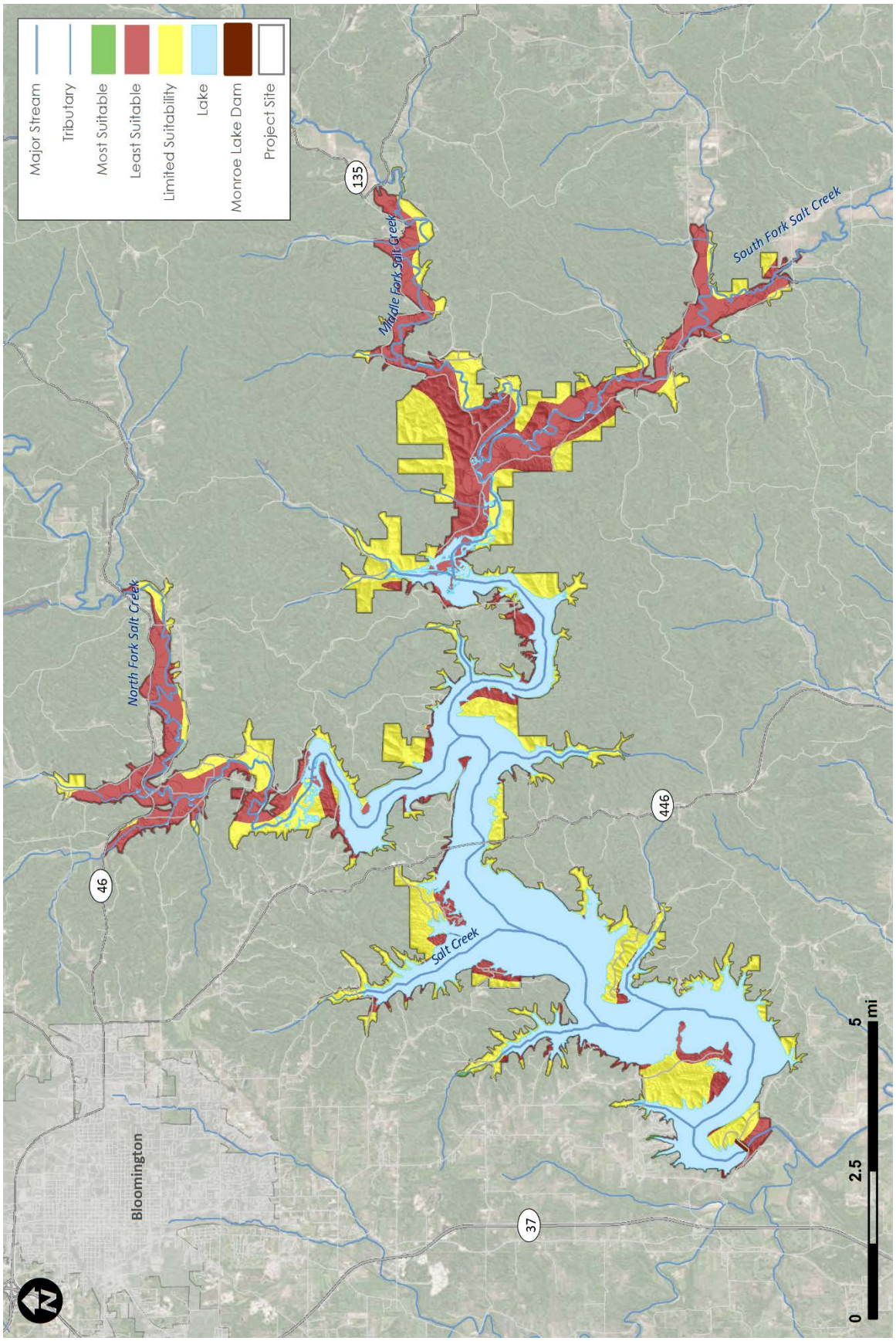


Figure 3-6 *Influence of Soil on Development Potential. Sources: USACE, ESRI, USDA-NCRS*

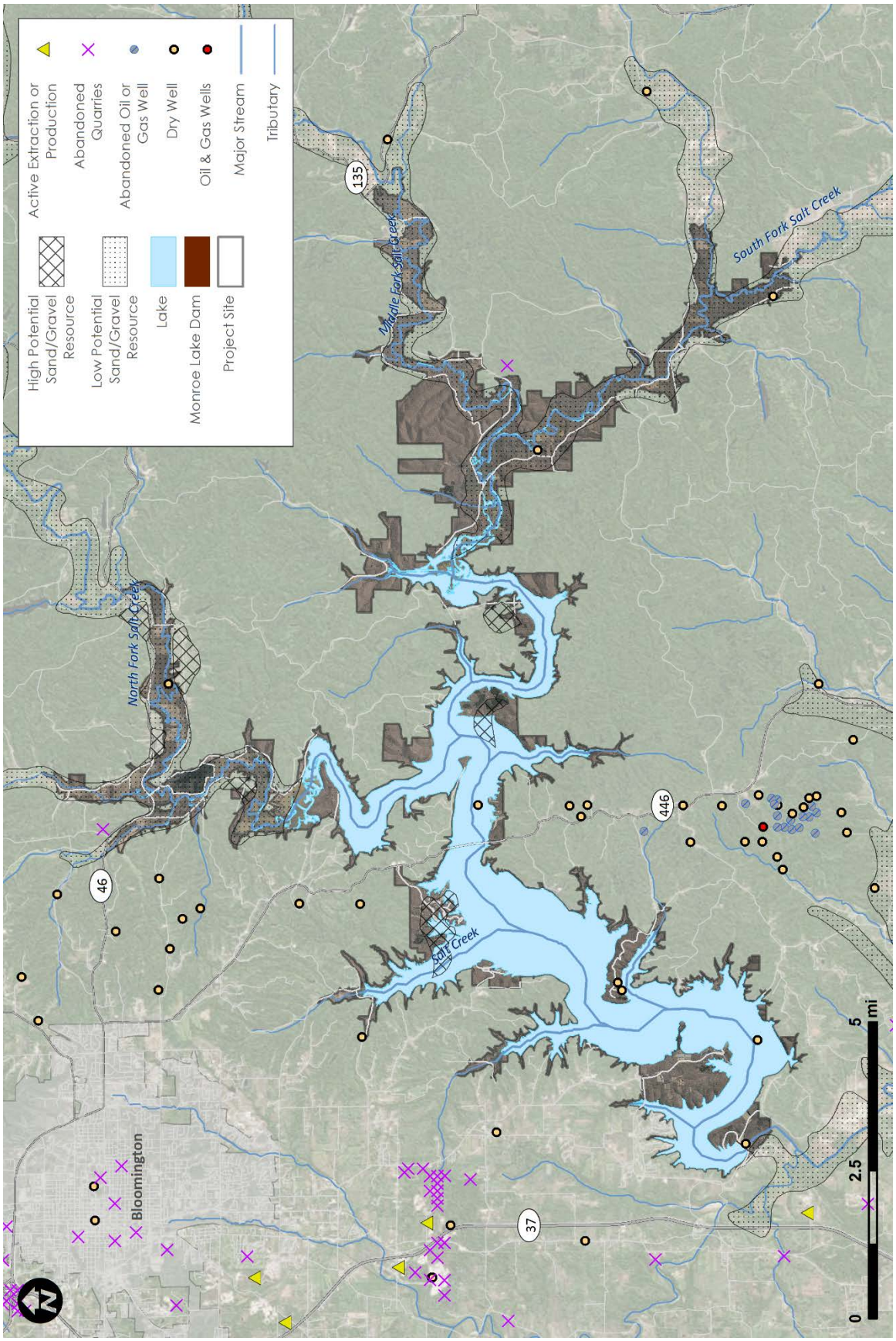


Figure 3-7 *Mineral Resources in the Vicinity of Monroe Lake. Sources: USACE, ESRI, USDA-NCRS, IGS, IndianaMAP*

3.1.6.1 Existing Conditions

According to the National Register of Historic Places (NRHP), there are two possible archeological sites (Kappa V 12MO301 and Epsilon II 12MO133) at the project. TC Steele House and Studio, an NRHP site, is located in the vicinity of the project. SHAARD, the State Historic Architectural and Archaeological Research Database, shows several cemeteries and historic bridges within or in the vicinity of the project. The exact address for the sites is restricted except for photos and general information about the structures found on the SHAARD website.

3.1.6.2 Implications of Prehistoric and Historic Resources for Development

Proposed development actions are required to comply with the NHPA. Prior to implementation of any ground disturbing activity, field surveys and Section 106 NHPA coordination with the Indiana State Historic Preservation Office (SHPO) will be conducted by the USACE. Federal and state laws require federal agencies to minimize or mitigate adverse impacts to historic properties (36 CFR Part 800.13). Should unanticipated historic or prehistoric resources be discovered during ground disturbing activities, work must cease immediately and the USACE will contact the Indiana SHPO.

3.1.7 Scenic Quality

Scenic quality refers to the environment as perceived through the senses.

3.1.7.1 Existing Conditions

The terrain, as described in Section 3.1.4, in combination with the lake and forested hills, creates a scenic environment with opportunities for scenic view sheds. Views range from glimpses of the lake and floodplains along park roads to panoramic overlooks at the dam and Hardin Ridge. Limited access points and overlooks along the lake give the effect of an isolated pristine environment.

Monroe Lake

The forested surroundings of the lake provide several opportunities to enjoy scenic qualities. Hiking trails, picnic areas and boating opportunities are located throughout the project. Wildlife pedestals and waterfowl conservation areas are maintained to facilitate wildlife viewing. Fall foliage also attracts a large number of visitors to the lake each year for sightseeing.

3.1.7.2 Implications of Scenic Qualities for Development

The project area provides unique scenic qualities; however, improvements in accessibility and the number of overlooks would create more opportunities for scenic enjoyment. Currently, the main areas for scenic views are along the dam and at the various recreation areas. Creating greater accessibility along the lakeshore at additional places aside from those mentioned above may also reduce the isolated environment of the lake.

3.2 Biological Environment

The biological environment surrounding Monroe Lake includes:

- Habitats
- Invasive species
- Game species
- Sensitive species and critical habitat
- Environmentally sensitive areas
- Wildlife management lands and measures

Existing conditions for each of the biological resources are described in the subsections below along with a brief discussion of how each resource may impact development.

3.2.1 Habitats

Habitat is defined by the U.S. Fish and Wildlife Service (USFWS) as a location where a particular species lives along with its surroundings, both living and non-living. This includes the following environmental conditions: water, soil moisture and topography. Monroe Lake contains eight habitats described below (see Figure 3-8).

3.2.1.1 Existing Conditions

Of the eight habitats, four consist of regularly disturbed areas including agricultural fields, developed lands, clear-cut and successional woods, and managed tree areas. These regularly disturbed areas are home to edge and urban adaptive species. Typical animal species found in these habitats may include songbirds, coyotes, foxes, deer, raptors, mice, squirrels, raccoons, etc.

Open Water

The majority of the project consists of open water. Fish living in the open water environment include sunfish, catfish, northern pike, walleye, bass and crappie. A 2015 survey by the IDNR Division of Fish and Wildlife found 29 species of fish and two hybrid species at the lake. The primary game species found were largemouth bass, white and black crappie, channel catfish, and bluegill. The most abundant species found was gizzard shad. IDNR annually stocks the lake with hybrid striped bass and walleye (Kittaka, 2016).

Wetlands

Monroe Lake wetlands are located in floodplains surrounding the lake and the headwater streams. Typical wetland flora include cattail, spikerush, smartweed, knotweed, arrowhead, pickerelweed, pondweed, naid, watermilfoil, bladderwort, duckweed and waterlily. Trees also may be found in Monroe Lake wetlands including willow, sycamore, maple, river birch, oak and elm. Wetlands provide habitat for many animals including red-winged blackbird, muskrats, mink, beaver, reptiles and amphibians, and a wide range of waterfowl.

South-Central Interior Mesophytic Forest

A mixed-mesophytic community found south of the glacial boundary, the South-Central Interior Mesophytic Forest, is typically found on lower slopes, in coves and in other protected landscape areas. Small streams often bisect this community. This habitat contains a rich herb layer often comprised of abundant spring ephemerals such as spring beauty and Dutchman's breeches. Other herbs include white trillium, black baneberry and great Indian plantain. Dominant canopy species are sugar maple and American beech with maples, black walnut and sassafras among others as subdominants (NatureServe, 2007).

Southern Interior Low Plateau Dry-Mesic Oak Forest

Typically found on mid-slopes to broad ridges, the Southern Interior Low Plateau Dry-Mesic Oak Forest is an upland hardwood-dominated forest. Dominant species vary greatly depending on soil moisture and slope aspect. In general, oaks and hickories comprise the canopy while flowering dogwood dominates the sub-canopy (NatureServe, 2008).

Common animals to both forest habitats include white-tailed deer, gray squirrels, fox squirrels, raccoons, songbirds, woodpeckers, owls and foxes.

3.2.1.2 Implications of Habitats for Development

Habitat variety enhances recreation and scenic opportunities. A rich diversity of wildlife is found within the project site, including several species of concern (see Section 3.2.4). Each habitat provides its own unique benefits to the project.

Vegetation in the wetlands and forests slow and filter storm water. The roots of trees, bushes and grasses hold soil and prevent erosion. This prevents additional siltation of the lake from surrounding slopes, improving water quality. The large contiguous forest provides habitat for migratory birds, game species, and threatened and endangered species. Managing the forest to maintain the ecological services and encourage a rich diversity of wildlife is recommended. By encouraging wildlife diversity through forest management, recreational activities such as wildlife watching can benefit. Details of forest management are handled through agreements with USACOE and its lessors.

The large open water and stream habitats supports ample opportunity for recreational fishing. If desired, fishing activities could be expanded; however, the fish need to be monitored by IDNR or IDEM for contamination.

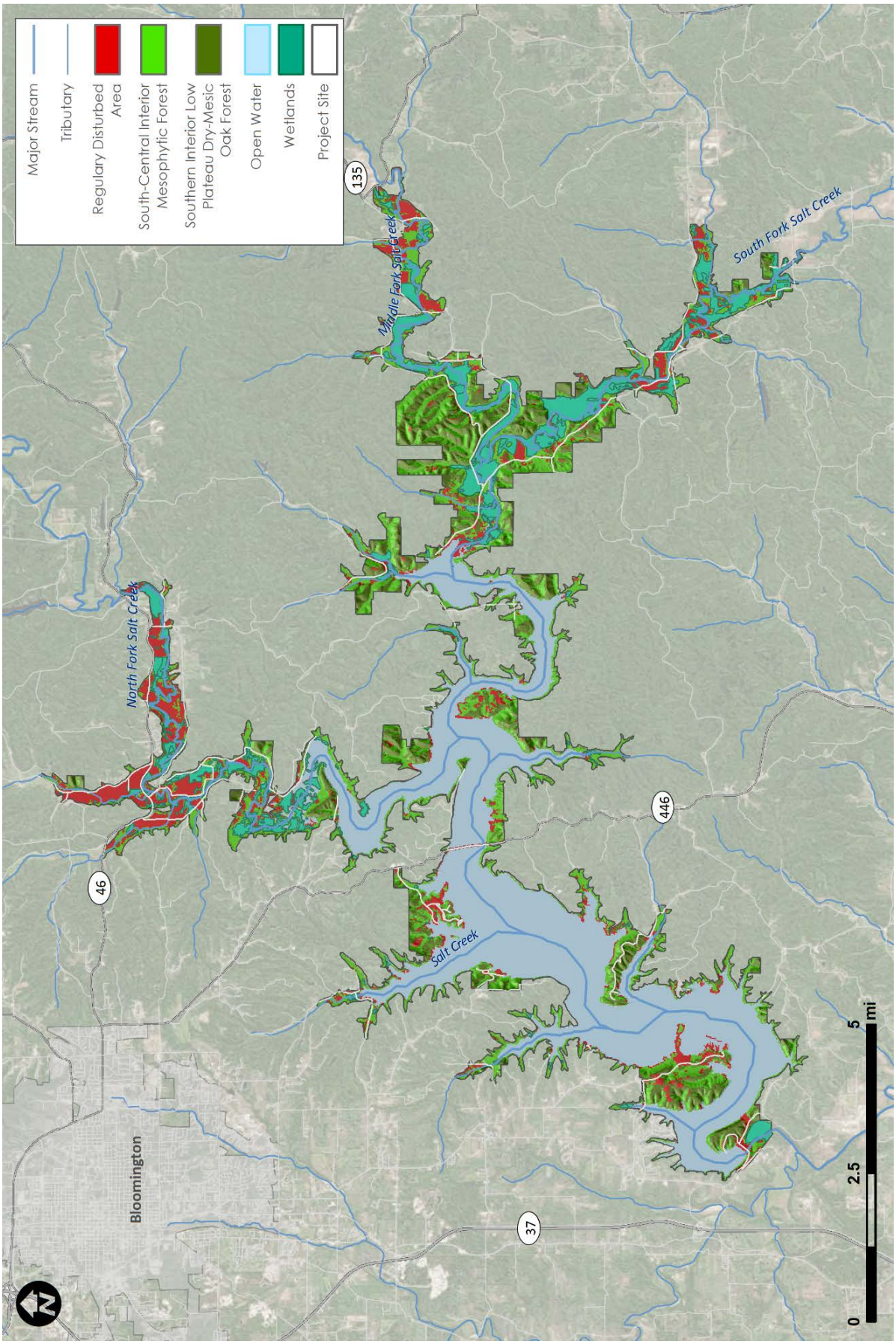


Figure 3-8 *Vegetative Habitats. Sources: USACE, ESRI, NWI, USGS, NatureServe*

3.2.2 Invasive Species

USFWS defines invasive species as one that is "not native to an ecosystem and which causes or is likely to cause economic or environmental harm or harm to human health." Invasive species out-compete native plants and wildlife, degrading, changing or replacing native habitat (USFWS, 2012).

3.2.2.1 Existing Conditions

Many invasive species are found in Indiana. Table 3-6 contains a list of the invasive species that are either high-priority species or have a high-potential impact to the project. This list does not include all invasive species present at Monroe Lake. See Appendix D: Environmental Assessment for more detailed information.

3.2.2.2 Implications of Invasive Species for Development

Invasive species are commonly introduced or spread through the periodic disturbance of an area. Awareness of current and local emerging invasive species potential for impact can help address and limit their spread. Future development and maintenance projects should be aware of and attempt to limit the spread of invasive species in the project site. In addition, visitors can be made aware of invasive species and the threat they pose through interpretive signs. This may especially be helpful to prevent further spread of aggressive invasive species. USACE already practices this at the tailwater recreation area.

Invasive Species Signage at Monroe Lake

An emerging high priority species of concern is the Asian longhorned beetle (*Anoplophora glabripennis*), which has been found in Ohio, New Jersey, New York, Massachusetts and Illinois. Preferred targets for the Asian longhorned beetle include maple species, birches, elms, horsechesnut, Ohio buckeye and willows (USFS, Forest Health and Economics, 2015). The beetle grows and reproduces in hardwoods, eventually killing the tree. USDA Animal and Plant Health Inspection Service (APHIS) is conducting an eradication program for the Asian longhorned beetle in an attempt to limit its spread. This beetle has the potential to devastate Monroe Lake forests and influence future management decisions (USDA APHIS, Asian longhorned beetle, 2015).

3.2.3 Game Species

Game species provide a form of recreation during the fall and winter months. Hunting, trapping and fishing have taken on an additional aspect of nuisance control. Nuisance wildlife are animals which destroy property.

3.2.3.1 Existing Conditions

Hunting, fishing and trapping at Monroe Lake is managed by IDNR. IDNR maintains a website that is updated each hunting season with the current regulations for hunting at the park.

Hunting and trapping are allowed within designated areas during the hunting season. Monroe Lake maintains approximately 21,817 acres for hunting and fishing and four sites for trapping (USACE, 1998). Hunts are allowed in Waterfowl Resting Areas based on a draw. Trapping is available through a sealed bid process. Night hunting for specific species is permitted (IDNR, Monroe Lake Hunting and Trapping, 2015).

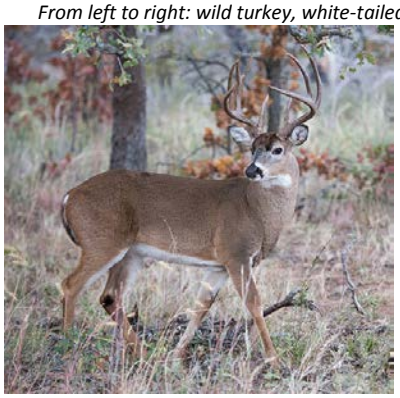
Aside from the recreational opportunity it provides, IDNR uses hunting to manage the populations of animals. Hunting minimizes ecological damage done by animals like white-tailed deer when over populated. Currently, IDNR allows the taking of "bonus antlerless deer," i.e.; additional does, to control the white-tailed deer populations (IDNR, Hunting and Trapping Guide, 2015).

Common game species at Monroe Lake include turkeys, white-tailed deer, squirrels, mourning doves, rabbits, woodcocks, raccoons, foxes, muskrat, and waterfowl. The lake was originally stocked with warm water game fish such as walleye, stripers, largemouth bass, northern pike, black crappie, catfish, redear, bluegill and sunfish. Hybrid striped bass and walleye are still being stocked at Monroe Lake.

Table 3-6: High Priority Invasive Species Found in the Vicinity of Monroe Lake				
Taxonomy	**Common Name**	**Scientific Name**	**Effect**	**Presence**
Animals	Silver Carp	*Hypophthalmichthys molitrix*	Reduces food available for native species	Tailwater area
	Bighead Carp	*Hypophthalmichthys nobilis*	Reduces food available for native species	Tailwater area
	Emerald Ash Borer	*Agrilus planipennis*	Causes 100 percent mortality of all species of ash	Throughout Indiana
	Gypsy Moth	*Lymantria dispar*	Tree defoliation which may result in eventual mortality	Monroe Lake project
	Pine Bark Beetle	*Ips* spp. & *Dendroctonus* spp.	Causes decline in tree health and eventual mortality	Monroe Lake project
Plants	Bush Honeysuckle	*Lonicera maackii*	Strangulation of trees and invasion of habitat	Throughout Southern Indiana
	Potato Vine	*Dioscorea oppositifolia*	Forms dense vines, which smother plants and trees	Hoosier National Forest
	White Sweet Clover	*Melilotus alba*	Negatively impacts species diversity and richness, may restrict woody plant establishment	Hoosier National Forest
	Yellow Sweet Clover	*Melilotus officinalis*	Negatively impacts species diversity and richness, may restrict woody plant establishment	Hoosier National Forest
	Garlic Mustard	*Alliaria petiolata*	Displaces native species, invades forests	Throughout Indiana
	Crown Vetch	*Coronilla varia*	Out-competes native grassland and prairie vegetation	Throughout Indiana
	Autumn Olive	*Elaeagnus umbellata*	Increases nitrogen levels in soils	Spreading throughout Indiana
	Japanese Honeysuckle	*Lonicrea japonica*	Engulfs woodlands and strangles trees, out-competes native flora	Throughout Southern Indiana
	Japanese Stiltgrass	*Microstegium vimineum*	Invades and out-competes shaded understories	Brown and Jackson counties
	Tree of Heaven	*Ailanthus altissima*	Roots contain toxins which kill surrounding plants	Throughout Indiana
	Kudzu	*Pueraria montana*	Covers and strangles entire forests, quick growing	Throughout Southern Indiana
	Multiflora Rose	*Rosa multiflora*	Invades pastures and crowds out native species	Throughout Indiana
	Curly pondweed	*Potamogeton crispus*	Crowds out native species	Throughout Indiana
	Eurasian Watermilfoil	*Myriophyllum spicatum*	Crowds out native species	Throughout Indiana wetlands

Sources: USFS Non-Native Invasive Species: Alien Threats to Southern Indiana's Forests, USDA National Invasive Species Information Center Species Profiles, USDA Forest Pest Range Maps, UGA EDDMapS, USACE Tailwater sign

From left to right: wild turkey, white-tailed deer, red fox; photos provided courtesy of USFWS


3.2.3.2 Implications of Game Species for Development

Wildlife management operations collect valuable information from hunts and fishing concerning the health and numbers of animal populations. The information collected from consumptive recreation activities is invaluable to developing wildlife management plans and prescriptions. Continued maintenance of hunting and fishing policies would provide recreation needs while meeting a USACE-authorized project purpose.

3.2.4 Sensitive Species and Critical Habitat

Lists of threatened, endangered and species of special concern are maintained by the USFWS and the State of Indiana. Under the Federal Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531-1544), endangered species are defined as any species in danger of extinction throughout all or portions of its range. A threatened species is any species likely to become endangered in the foreseeable future. The Endangered Species Act defines a critical habitat of the above species as a geographic area that contains the physical or biological features that are essential to the conservation of a particular species and that may need special management or protection. This section also covers birds listed under the Migratory Bird Treaty Act of 1918 (16 U.S.C §§ 703-712) as birds of conservation concern.

3.2.4.1 Existing Conditions

The USFWS maintains lists of rare plants and wildlife that occur in each county of the United States. The State of Indiana maintains a separate inventory of state-ranked endangered and threatened species and species of special concern. This list can be obtained from the Indiana Natural Heritage Data Center by county or by vicinity to the project site. Threatened and endangered species at both the federal and state level are listed in the Environmental Assessment in Appendix D.

In 1985, efforts to reintroduce bald eagles began at Monroe Lake. The first successful eagle nests occurred in 1991 and since then bald eagles have been sighted on several occasions within the project area. There are currently 15 active bald eagle nests at Monroe Lake. Although no longer federally-listed under ESA, they are protected by the Golden and Bald Eagle Protection Act of 1940 (16 U.S.C. §§ 668-668d) and the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712). These laws prohibit harming the eagles, their nests and the eggs. Bald eagles prefer bodies of open water with nearby large trees, making Monroe Lake excellent eagle habitat.

From left to right: Indiana bat, bald eagle, northern long-eared bat; photos courtesy of USFWS



Ruffed grouse is considered a high priority for management at Monroe Lake by IDNR. Successional areas created by natural disturbance found in large continuous forests and transitional zones between grasslands and forests provide ruffed grouse habitat. If artificial methods were to be used to create these habitats, they would be addressed in the OMP. In 1983, ruffed grouse distribution in south-central Indiana reached a high of 41 counties after having experienced decline for several decades. Today, its distribution has likely been reduced to between 16 and 26 counties (IDNR, Ruffed Grouse, 2015). Ruffed grouse are protected under the MBTA. Additional MBTA birds include the cerulean warbler, Canada goose, Red-tailed hawk, great blue heron, and Henslow's sparrow.

3.2.4.2 Implications of Sensitive Species and Critical Habitat for Development

Section 7 of the Endangered Species Act requires all federal agencies to conserve threatened and endangered species and to further the purpose of the act. The Environmental Assessment in Appendix D provides more information on the implications for development from the presence of threatened and endangered species.

Development near bald eagle active and inactive nests is limited by the Bald and Golden Eagle Act. Under the act, steps must be followed to prevent the "non-purposeful take" of an eagle. The Midwest Region of the USFWS maintains a guidance document that helps project developers to determine if their project will result in the "take" of a bald eagle. In general, the USFWS recommends that no trees are cleared within 660 feet of active or inactive nests, and that work within line of sight of the nests be restricted during the egg-laying period (January 15-July 31). The USFWS should be consulted for guidance on impacts to threatened, endangered species, migratory birds and high-quality habitats if any new development will be planned.

In addition, the Indiana Natural Heritage Data Center has identified areas of high-quality habitat and important geologic features within the vicinity of Monroe Lake. The Mesic Upland Forest is considered an uncommon high-quality natural community by the State of Indiana and occurs within the boundary of Monroe Lake. The state recommends that these high-quality natural communities and features be preserved. Plant and animal locations in Figure 3-9 represent relative areas where species of concern were reported. The bald eagle points in the figure represent both active and inactive areas.

3.2.5 Environmentally Sensitive Areas

Environmentally sensitive areas are locations designated as having a special status by federal or state legislation. Rare and unique features also may be listed as environmentally sensitive. Additional areas included as sensitive are locations that may pose a risk for development like sinkhole areas and the normal flood pool.

3.2.5.1 Existing Conditions

Examples of environmentally sensitive areas at Monroe Lake include wetlands, threatened and endangered species, special status species, high-quality natural communities, flood control pool and sinkhole areas. Figure 3-9 identifies the environmentally sensitive areas identified in this chapter. Plant and animal locations in Figure 3-9 are relative locations based on observations and field surveys submitted to the Indiana Natural Heritage Data Center.

The north, middle and south forks of Salt Creek contain the largest tracts of environmentally sensitive areas. Environmentally sensitive areas in these locations are comprised of wetlands, steep slopes, bald eagle sightings, and floodplains. The forested habitat is the predominant habitat at Monroe Lake excluding the water. Although it is not listed as a sensitive area, it should be noted that the mature forest provides habitat for several species of concern. Loss of mature forest could indirectly harm these species while benefiting others. The precise location and habitat needs of the species of concern should be identified and considered environmentally sensitive.

3.2.5.2 Implications of Environmentally Sensitive Areas on Development

Development restrictions exist to protect the environmentally sensitive resources; however, these resources provide other opportunities. Environmentally sensitive locations can provide interpretive, educational, eco-tourism and other low-intensity recreational opportunities.

3.2.6 Wildlife Management Lands and Measures

Other than small areas managed by the Corps, the U.S. Forest Service and the BSA, IDNR manages the natural resources and wildlife resources on its leased land that surrounds the lake.

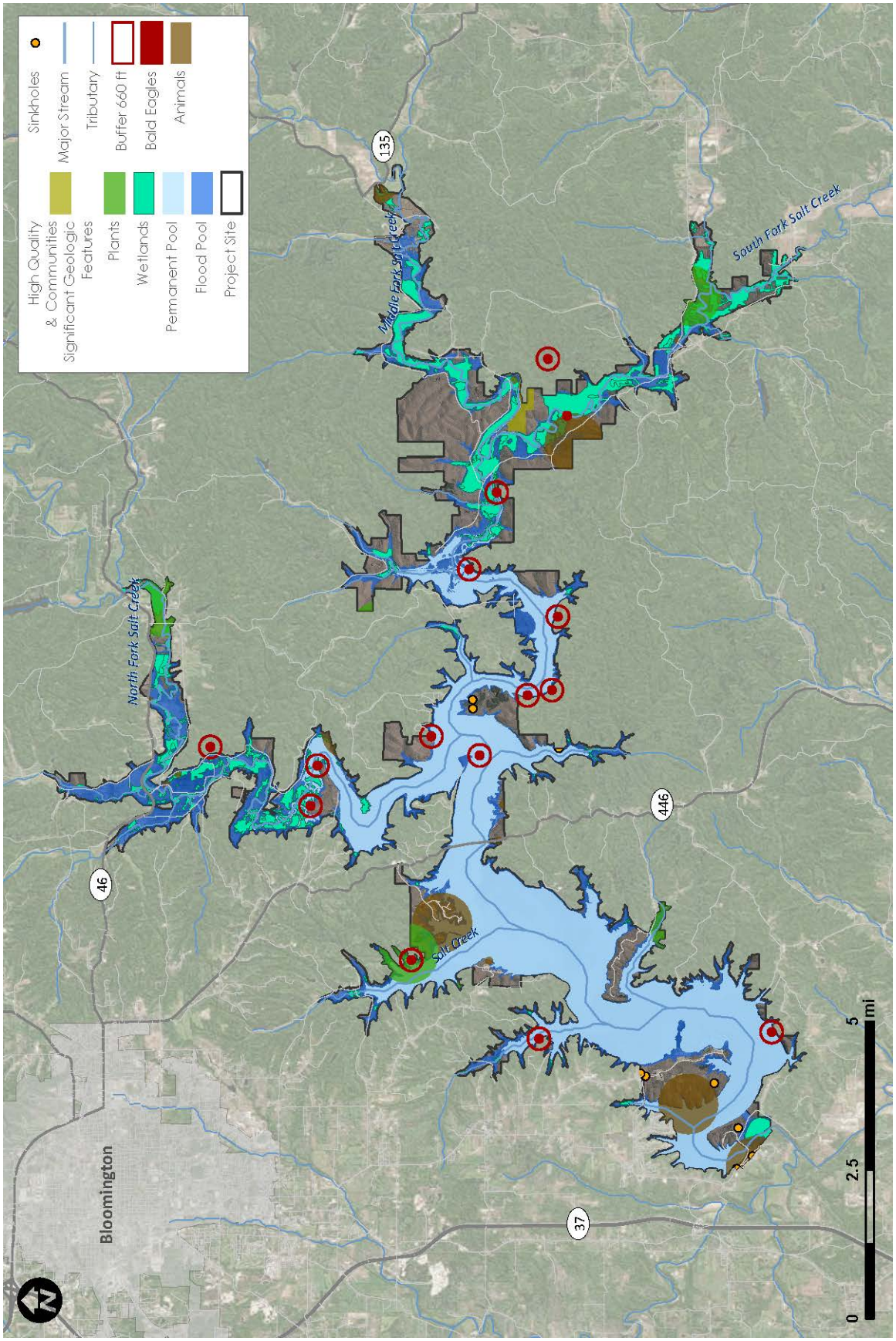


Figure 3-9 *Environmentally Sensitive Areas. Sources: USACE, ESRI, IndianaMAP, IGS, NWI, Indiana Natural Heritage Data Center*

3.2.6.1 Existing Conditions

Approximately 1,325 acres of farmland within the leased area are sub-leased to farmers for crop cultivation. Crops that are planted include corn, soybeans, sorghum and hay. Farmers are required to leave 10 percent of their grain crops and hay standing in the field at the end of the season as food and cover for wildlife. In addition to these farm field food and cover areas, IDNR personnel maintain 352 acres of food plots to benefit wildlife and migrating waterfowl. The average size of each plot is 10 acres. Wildlife food plots benefit both game and non-game species. IDNR specifically monitors woodland openings for grouse, woodcock and turkey use. A grant has been received by IDNR for the repair of wetland marsh levees. In addition, IDNR has a timber management Memorandum of Understanding (MOU) with the USACE for timber harvesting to provide early successional woodland habitat diversity. These areas and the food plots provide wildlife benefits for grouse, quail, mourning doves, songbirds, rabbits and other upland species (IDNR Annual Management Plan, 2015).

In addition to the land management measures, IDNR manages multiple facilities for wildlife management and visitor use. These facilities include nine boat launches, 23 hunter parking areas, one marsh observation platform, 17 waterfowl blinds, seven disabled accessible waterfowl blinds, 22 standard waterfowl blind sites, 24 goose nesting mounds, 87 wood duck nesting boxes, 120 bluebird boxes, 85 tree swallow boxes, 40 prothonotary warbler boxes, 19 hunter check stations, and numerous information signs (IDNR Annual Management Plan, 2015).

3.2.6.2 Implications of Wildlife Management Units for Development

In 2015, IDNR proposed the following projects for wildlife management objectives:

- Planting crops for wildlife including using fertilizer and lime
- Bush hogging and prescribed burning of 230 acres to reduce forest succession
- Woodland opening improvement and creation
- Field access lane maintenance and improvements
- Levee repair and improvement, field drainage and control structures maintenance, wetland creation
- Construction/installation of nesting mounds, nesting boxes and hunting blinds
- Installation of beaver exclusion structures
- Replacement of property signs and gates to communicate the rules and boundaries of the wildlife habitat areas

New development at the IDNR lease area should be coordinated with the IDNR wildlife management staff to ensure that the development footprint, new facility lighting or long-term noise from the new development will not conflict with the objectives of the wildlife management areas. Conversely, new development may offer additional or enhanced access points or program opportunities for wildlife visitation. Signage at the development should describe the rules and closures (for example during hunting seasons) for visitors in coordination with the IDNR wildlife management staff.

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4.0
Recreation
Program Analysis

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4.0 Recreation Program Analysis

Public recreation lands at Monroe Lake are operated and managed by three different entities. Operational responsibilities for the designated recreation areas are divided among the USACE, USFS and IDNR. Eight of the recreation areas are managed by IDNR through a lease granted by USACE. Hardin Ridge Recreation Area (identified below) is owned and operated by the USFS through a MOU with USACE, as stated in the Monroe Reservoir Master Plan of 1967:

> *"[This plan] reflects consideration of the provisions of the 'Memorandum of Agreement by the Secretaries of the Army and Agriculture relative to Management of Land and Water Resources at Water Development Projects of the Corps of Engineers Located Within or Partly Within the National Forest System' approved 13 August 1964."*

The following chapter is an analysis of the recreational amenities and areas offered at Monroe Lake by these three different entities.

4.1 Introduction

This chapter contains the results of an analysis of the recreational opportunities offered at Monroe Lake. The intent of the analysis is to identify current and future recreational demands that may affect the resources at Monroe Lake and its recreation areas. Specifically, Chapter 4 will provide an overview of each existing recreation area, describe the recreational assets contained in each area, identify and describe the users of Monroe Lake as a whole, summarize existing trends and documents from the state and provide an in-depth explanation of what the findings from the analysis mean for Monroe Lake's recreational future.

Section 4.2 describes the physical layout and administrative structure of each recreation area. Section 4.3 provides a list of the activities enjoyed by Monroe Lake users and presents visitation data for each activity. Section 4.4 includes a socioeconomic profile of the area of influence surrounding Monroe Lake. Section 4.5 summarizes comparable facilities from around the region. As a final piece to the existing conditions portion of the analysis, Section 4.6 examines the Indiana State Comprehensive Outdoor Recreation Plan (SCORP) for trends in recreation throughout the state and in the areas surrounding Monroe Lake. The remainder of Chapter 4 contains the results of the analysis. Specifically, Section 4.7 provides and describes a list of potential recreational activities at Monroe Lake, Section 4.8 defines the potential demand for recreation at Monroe Lake and Section 4.9 identifies the possible implications of the projected demand for recreation on the project.

4.2 Recreation Area Overview

Monroe Lake encompasses several recreation areas that are managed by public and private entities. These areas are scattered along the perimeter of the lake and are diverse in uses provided. This section describes the overall purpose, layout and administrative structure of each recreation area. The areas described are listed in Table 4-1 along with their managing entity.

Table 4-1: Recreational Areas of Monroe Lake

Recreation Area	Approximate Size	Managing Entity
Allen's Creek SRA	380 acres	IDNR
Crooked Creek Ramp	70 acres	IDNR
Cutright SRA	126 acres	IDNR (marina and concessions managed by private entity)
Dam Site and Operations Area	171.71 acres	USACE
Fairfax SRA	700 acres	IDNR (resort and marina managed by Fourwinds)
Hardin Ridge	1,200 acres	USFS
Moore's Creek SRA	140 acres	IDNR
Paynetown SRA	280 acres	IDNR
Pinegrove	40 acres	IDNR
Salt Creek SRA	90 acres	IDNR

4.2.1 Allen's Creek State Recreation Area

Allen's Creek State Recreation Area (SRA) is located on an east-facing peninsula in the southern portion of Monroe Lake. It is accessible by Allen's Creek Road, which is west off of SR 446. Facilities located on Allen's Creek include a restroom and a two-lane boat launch. Hiking is also offered at Allen's Creek on the Turkey Trot Trail,

which contains 1.75 miles of easy-to-moderate hiking and can be used as a handicap hunting location. Parking at Allen's Creek provides 35 spaces, 15 of which are trailer-accessible. Hunting and trapping with an acceptable license is permitted on all Allen's Creek lands. All of these amenities, as well as the grounds, are managed by IDNR.

4.2.2 Crooked Creek State Recreation Area

Crooked Creek SRA is located on the northern bank of the lake in the eastern portion within the Crooked Creek marshes. It is accessible by Crooked Creek Road or T.C. Steele Road, which loop to the south off of SR 46. Facilities at Crooked Creek SRA include restrooms and a two-lane boat launch. The recreation area is managed by IDNR.

Crooked Creek Ramp

4.2.3 Cutright State Recreation Area

Cutright SRA is located on the southern bank of the lake, immediately east of the causeway. It is directly accessed by turning east off of SR 446. Cutright SRA offers amenities such as a 10-lane boat launch, boat rental, a marina with fuel, a picnic area with a shelter, restrooms and a handicap-accessible fishing dock. Most Cutright SRA amenities are managed by IDNR, but the marina is operated by a private vendor, which also operates concessions, a deli and boat rental service. The marina is leased by the vendor through IDNR, an agreement through which IDNR receives a percentage of gross revenue coming mainly from concession sales.

Parking can reach full capacity on weekends, specifically holiday weekends when some visitors will park on the grass, which indicates both a high demand for the area and a possible need for increased capacity. There are 90 parking spaces at the marina, 30 spaces southwest of the concessions area, 56 trailer-accessible spaces at the east central area, 132 trailer-accessible spaces at the main central area and 84 trailer-accessible spots at the main west parking area. The marina has four docks for a total of 116 slips, 68 of which are covered. There are 10 party boats that can be rented through the boat rental service.

Cutright SRA

A private campground called B & D Causeway Camp is located immediately south of Cutright SRA off of SR 446. The campground contains 55 sites and is on land that is outside of USACE and IDNR purview and is managed by a private entity.

4.2.4 Dam Site and Operations Area

The Dam Site and Operations Area is located at the southern end of Monroe Lake. This is the area where the lake is released into Salt Creek. The dam site is the only recreation area managed by USACE, which provides tail water fishing, a rentable picnic area, visitor information at the project office and an overlook. The USACE maintenance yard is located at the project office.

Dam Site Overlook

4.2.5 Fairfax State Recreation Area

Fairfax SRA is located on a peninsula that protrudes from the northern bank of the lake in its western portion. It is accessible by Fairfax Road or Mt. Ebal Road, east of SR 37. Fairfax SRA offers a beach with a shower house and an adjoining structure used for storage, two four-lane boat launches, boat rental, lodging, two restaurants, a marina

with fuel, picnic areas with four shelters, a playground, restrooms, a grocery and boat supply store, and drinking water. Many Fairfax SRA amenities are managed by IDNR, but the marina, restaurants, lodging and boat rental are run by Fourwinds Lakeside Inn and Marina, which operates under a lease agreement with IDNR.

The IDNR portion of Fairfax has four major areas that offer amenities. In the southwestern portion of the peninsula, 76 trailer-accessible parking spaces, a four-lane boat launch, and one restroom are available. Near Fourwinds Marina's P dock, IDNR provides 64 car parking spaces, 32 trailer-accessible parking spaces, another boat launch, and one picnic shelter. North of the parking area and boat launch are 29 additional trailer-accessible parking spaces abutted on both sides by two identical picnic areas with 20 car parking spaces each. Overflow parking is provided; however during holiday weekends and on occasional non-holiday weekends, some visitors have to park vehicles on the grass.

Ramp in Fourwinds Beach Area

North of the ramps and Fourwinds is the beach area. The beach area provides 720 total car parking spaces, a playground, a picnic shelter, a shower house, a vacant concession area (used for storage) and a concrete walkway onto a small, east-oriented peninsula.

A wildlife management area is located to the west of Fairfax Road. This area provides opportunities for hiking and picnicking and is also available for hunting and trapping during appropriate seasons.

The rest of the amenities offered in the Fairfax SRA are offered by Fourwinds. Fourwinds provides its customers with 931 marina slips, over half of which are covered. The marina is the largest "gas island" on Monroe Lake with seven fueling stations and mobile pump-out service. Fourwinds also has two major storage areas for dry storage, one south of the facility and one across the street, for a total of 265 dry storage spaces, in addition to a warehouse available for winter storage of 30-40 boats. Fourwinds also rents pontoons, runabouts, deck and double-deck party boats, and wave runners. In the resort, there is lodging with 118 rooms, which hosts approximately 21,000 guests annually, and two restaurants. The resort includes 10,000 square feet of indoor/outdoor space for conferences and other events, and also offers an indoor/outdoor heated swimming pool, a gazebo, a fitness center, a private beach, tennis and basketball courts, volleyball and mini golf. In 2014, the resort renovated their rooms, and exterior, and added a new swimming pool and an elevator.

Fourwinds Resort

4.2.6 Hardin Ridge Recreation Area

Hardin Ridge Recreation Area (Hardin Ridge) is located just south of Allen's Creek SRA in the southwestern portion of the lake. Hardin Ridge is located in Hoosier National Forest and is accessible by Hardin Ridge Road via Chapel Hill Road west of SR 446. Hardin Ridge offers users a range of amenities such as 300 linear feet of beach front with adjoining bathhouse, a four-lane boat launch, multiple campgrounds, concessions, hiking trails, picnic areas, a playground, restrooms, cabins, showers, and a visitor center. Amenities at Hardin Ridge, including the campgrounds and concessions, are managed by the USFS.

Entrance to Hardin Ridge Recreation Area

The campgrounds and concession areas make Hardin Ridge the only area of revenue for the USFS in the Monroe Lake area. The campgrounds include 204 trailer and tent campsites, some with electricity, two cabins and shower houses. The sites are divided among the six scenic campgrounds at Hardin Ridge, connected by the trail system. The Hardin Ridge trail system has a total of 3.2 miles split between two routes; 1.2 of these miles are interpretive. Hardin Ridge also offers its users a large waterfront area that is served by 189 parking spaces, 72 of which are trailer-accessible. Finally, there are 60 picnic tables scattered throughout Hardin Ridge's lake front with three total shelters and an amphitheater.

4.2.7 Moore's Creek State Recreation Area

Moore's Creek SRA is located on the western bank of the lake in its northwestern portion. It is accessible by Shields Creek Road (Handy Road) off of Moffet Lane east of SR 37. Moore's Creek SRA offers boat launch; a picnic area that includes six tables and a shelter; restrooms; and drinking water. Hunting and trapping (with licenses) are available in the area to the east of the marina. Moore's Creek SRA amenities are managed by IDNR.

Boat Launch located in the Moore's Creek SRA

There is also a marina located just southwest of Moore's Creek SRA. The marina is operated by the Lake Monroe Sailing Association (LMSA), which has a license from IDNR for concessions and operations. The marina offers 100 slips and 57 buoy moorings for wet storage, with dry storage available for the winter months, two hoists for launching small boats, courtesy docks, a playground and a shower house. LMSA offers sailing classes and various other events to its members.

4.2.8 Paynetown State Recreation Area

Paynetown SRA is located on the northern bank in the northern portion of the lake, across an inlet from Moore's Creek SRA. It is directly accessed by turning west off of SR 446. Paynetown SRA offers an abundance of amenities for many different users. Offered amenities include a beach with a bathhouse; a 10-lane boat launch; boat rental; a campground; hiking trails; interpretive naturalist service; a marina with fuel and picnic areas with shelters; a handicap accessible fishing pier; a playground; restrooms; showers; a general store; a visitor center; and drinking water. Hunting and trapping are available (with licenses) in the area northwest of the campground and IDNR operational compound. Paynetown is managed by IDNR, and an entrance fee or state park pass is required.

General Store located in the Paynetown SRA

The campground offers campers a choice of 221 electric campsites, three of which are handicap accessible, and 94 more non-electric campsites. Within the electric campground are four comfort stations with running water and showers in addition to one pit toilet. The non-electric campground contains one comfort station with running water and showers, several pit toilets, a fish cleaning station, and a shelter house and playground with restrooms nearby. There is a pump out station for recreational vehicle (RV) campers and boaters as well as a camp store for all users.

The Paynetown Marina, which is managed by IDNR, provides three uncovered docks for a total of 120 slips in addition to 80 mooring spaces. There are three picnic shelters with 12 total tables at the activity center and 32 tables with six grills on the peninsula.

4.2.9 Pinegrove State Recreation Area

Pinegrove SRA is located on the northern arm of the lake off of the western bank. It is accessible by Pinegrove Road east of SR 446. Facilities at Pinegrove are a two-lane boat launch and restrooms. The area has extensive access to shallow water and is used primarily by fishermen and non-motorized boat users. Pinegrove is managed by IDNR.

4.2.10 Salt Creek State Recreation Area

Salt Creek SRA is located across the lake from Fairfax SRA in the southwest portion of the lake and on the north and east sides of the dam site and operational area. It is accessible by Monroe Dam Road from the west or Mission Valley Road from the south and is situated east of SR 37. Facilities at Salt Creek include a four-lane boat launch with a courtesy dock and restrooms. Hunting with the necessary permit is also available at the portions of Salt Creek that are not operational dam areas, fishing areas or boat-launching areas. While the dam site is maintained by USACE, Salt Creek is managed by IDNR.

Handicap Fishing Pier at Paynetown SRA

4.2.11 Group Boat Docks

There are 11 private group docks located on the shores of Monroe Lake. These docks, while not public, provide a significant number of boat slips with access to the project for many stakeholders. The group docks are permitted by COE and are usually member-owned.

4.2.12 Handicap Accessible Areas

Both USACE and IDNR provide some facilities that are handicap accessible. Restrooms and walkways are handicap accessible in most cases. Cutright SRA and Paynetown SRA have handicap-accessible fishing piers located on its premises, but this is not the case with all docks. The USACE and IDNR encourage community boat dock license holders to provide handicap accessible docks.

4.3 Current Recreational Activities and Visitation

This section provides a detailed list of recreational activities that are available at Monroe Lake and some key statistics related to recreational participation at the lake.

4.3.1 Outdoor Recreational Activities

Monroe Lake affords its visitors many choices for outdoor recreation. To present these choices, Table 4-2 on the next page lists all activities available to Monroe Lake visitors, the location where these activities are available and a short description of the activity.

4.3.2 Hunting and Trapping

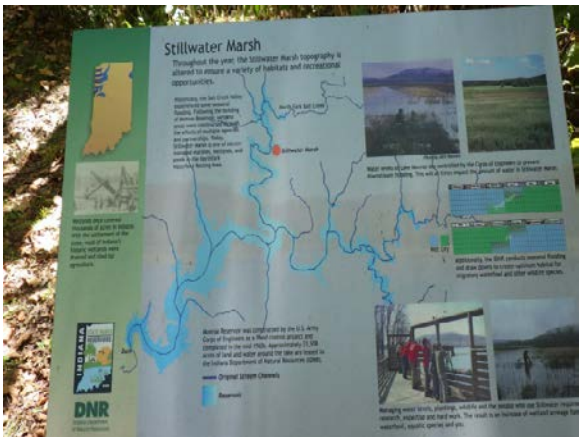
Hunting is allowed on most of the project lands outside of high-density recreation areas. IDNR staff has stated that conflict between hunters and other visitors to Monroe Lake are kept to a minimum. Current policy requires that hunters maintain a distance of at least 300 yards from the demarked safety zones and that hunting areas are clearly marked, which helps mitigate safety issues. This is an increasingly popular form of recreation. IDNR has seen the number of women hunters increase significantly in the last decade and is expecting it to continue to climb for the foreseeable future (IDNR, Hunting and Trapping Guide). According to IDNR staff, there are approximately 10-12,000 hunters per year at Monroe Lake.

4.3.3 Interpretive Programs

There is currently a full-time interpretive naturalist position with IDNR located in the nature center at Paynetown SRA. The center is open on weekends during the spring and fall and five days a week (Thursday through Monday) in the summer. The facility has an exhibit area, a small program area, an office and storage space. The nature center shares space at the large bathhouse complex.

Table 4-2: Recreational Activities at Monroe Lake		
Activity	**Location**	**Description**
Boating	Allen's Creek SRA	Two-lane boat launch
	Crooked Creek SRA	Two-lane boat launch
	Cutright SRA	10-lane boat and car top launch, boat rental, marina with 116 slips at the Lake Monroe Marina
	Fairfax SRA	Two four to six-lane boat launches, boat rental, marina with 931 slips
	Hardin Ridge	Four-lane boat launch
	Moore's Creek SRA	Four-lane boat launch, marina with 100 slips and 57 buoys (for LMSA members)
	Paynetown SRA	10-lane boat launch, boat rental, marina with 120 slips and, 80 buoys are provided by the LMSA
	Pinegrove	Two-lane boat launch
	Salt Creek SRA	Four-lane boat launch
Camping	Hardin Ridge	200 tent and trailer sites, 2 cabins
	Paynetown SRA	221 electric and 94 non-electric campsites, 3 handicap accessible
Fishing	Allen's Creek SRA	Access at boat launch
	Crooked Creek SRA	Access at boat launch
	Cutright SRA	Access at boat launch
	Dam Site	Tailwater access
	Fairfax SRA	Access at boat launch
	Hardin Ridge	Access at boat launch
	Moore's Creek SRA	Access at boat launch
	Paynetown SRA	Access at boat launch
	Pinegrove	Access at boat launch
	Salt Creek SRA	Access at boat launch
Hunting and Trapping	Allen's Creek SRA	Hunting available with registration
	Cutright SRA	Hunting available with registration
	Fairfax SRA	Hunting available with registration
	Moore's Creek SRA	Hunting available with registration
	Paynetown SRA	Hunting available with registration
	Salt Creek SRA	Hunting available with registration
Picnicking	Cutright SRA	1 shelter
	Fairfax SRA	4 shelters
	Hardin Ridge	60 tables with 2 shelters
	Moore's Creek SRA	6 tables sites with a shelter
	Paynetown SRA	44 tables with 3 shelters
Swimming	Fairfax SRA	Beach with bathhouse
	Hardin Ridge	300-foot Beach with bathhouse
	Paynetown SRA	Beach with bathhouse
Hiking	Allen's Creek	1.75 miles of moderate hiking
	Fairfax SRA	1.75 miles of moderate hiking
	Hardin Ridge	3.2 miles of moderate hiking
	Paynetown SRA	2.25 miles of moderate hiking, .5 miles of easy hiking
	Dam Site	2.0 miles of moderate hiking trails

There are interpretive programs and events offered at Monroe Lake throughout the year, including an annual trail run and walk on New Year's Day in Fairfax SRA; an annual Yule log celebration at Paynetown SRA; and other special events. These special events include, but are not limited to, wildflower forays, cycling and walking history tours, pet-oriented events, crafts workshops, meteor shower viewings, and holiday-themed events. The overall goal of these programs is to increase the visitors' knowledge and appreciation of Indiana's and Monroe Lake's natural and cultural resources and promote volunteer services throughout the community. By bringing together natural resource specialists and visitors of all ages, the public gains knowledge of wildlife, geology, geography and history in the Monroe Lake area.



Interpretive Signage at Monroe Lake

According to the Monroe Lake Interpretive Master Plan of 2011, participation can be low for certain scheduled events and although boaters are one of the major user groups at Monroe Lake, they do not regularly attend interpretive programs. Other groups potentially in the interpretive programs' audiences are day users, resource users, students and staff of Indiana University, scouting programs, and spring, summer and fall campers. Hikes and campfire programs, on the other hand, are successful with the spring, summer and fall campers.

Activity Center at Monroe Lake

Successful programs in recent years have included recreation-based programs, craft activities, night hikes, live animal programs, traditional programs in the spring and fall (due to increased numbers of campers), beach parties with interpretive messages, pet programs, fishing contests, campfire programs, pre-school programs and special events.

Interpretive programming leads to numerous benefits with little capital investment. Leveraging volunteer labor with full- and part-time staff can provide the services necessary to increase public awareness and appreciation of the project and all of its amenities.

4.3.4 Bloomington Area Visitation

Before this analysis looks specifically at Monroe Lake recreation statistics, it is important to understand the entire region's tourism and recreational information. This provides us with context of Monroe Lake's own position as a recreational hub in the Bloomington area. The Bloomington area is home to many more tourist destinations beside Monroe Lake, and the area receives an influx of tourism revenue on a year round basis. Much of the annual influx of visitors can be attributed to Indiana University, which is located in Bloomington. Some facilities throughout the area are comparable to Monroe Lake, which are all outlined in Section 4.4.

The Bloomington area welcomes approximately 1.84 million visitors each year. Visitors come for the region's arts and culture, recreation, food, and collegiate events and conventions and spend an average of $146.15 per person during their stay. The average duration of stay is 2.5 days and over 60 percent of tourists are repeat visitors. The impact of tourism on employment is also significant. In 2013, the tourism industry in the area employed 4,163 people, which amounted to $97 million in total wages.

4.3.5 Recent Recreation Trends

There are national and regional variables that affect the way people spend their leisure time. From year to year the overall number of visitors to Monroe Lake can change due to these variables. Table 4-3 presents the number of visitors that have visited any or multiple of Monroe Lake's eight SRAs since 2007.

Table 4-3: Visitation Data 2007-2015

IDNR Fiscal Year	IDNR Project Visitation (IDNR Sites Only)	USACE Fiscal Year	USACE Project Visitation (Reservoir-Wide)
FY 2007-2008	949,066	FY 2007	1,022,210
FY 2008-2009	927,745	FY 2008	882,125
FY 2009-2010	946,793	FY 2009-	1,060,215
FY 2010-2011	860,039	FY 2010-	900,237
FY 2011-2012	1,053,041	FY 2011	972,091
FY 2012-2013	900,168	FY 2012	967,716
FY 2013-2014	950,029	FY 2013	Not available

Sources: http://www.in.gov/dnr/parklake/2441.htm and USACE data from The Operations and Maintenance Business Information Link, 2016

4.3.6 Visitation by Recreation Area

To provide specific recreation statistics about Monroe Lake and each of its recreation areas, this analysis will use the Visitation Estimation and Reporting System (VERS). All USACE recreation programs report visitation data via VERS, and VERS is the only authorized reporting procedure that is used to compute visitation rates for Natural Resource Management System (NRMS) projects. During the period of time when this report was being produced, VERS data was not available. When more recent data is available, it will be inserted into this section and provide more detail for visitor projections.

4.4 Area of Influence

The following section provides an overview of the area of influence of Monroe Lake. The area of influence is defined as the area where the majority of people who visit Monroe Lake live. Determining the area of influence and evaluating the demographic characteristics of the area are important aspects of the planning process and necessary to project possible future trends in Monroe Lake's demand.

4.4.1 Identifying the Area of Influence

Due to Monroe Lake's size, scope, and its lodging and camping capacity, it is possible that many of the lake's users travel more than one hour to enjoy the recreational activities of Monroe Lake. The lake is, however, in close proximity to the metropolitan area of Bloomington, which indicates that there is also a high volume of local visitors. For these two reasons, we have identified two sub-areas of influence based on drive time—the population within one hour's drive, referred to as the primary area of influence, and the population between one hour's drive and a 90-minute drive, referred to as the secondary area of influence. Figure 4-1 on the following page shows the Monroe Lake area of influence.

4.4.2 Demographic Characteristics of the Area of Influence

Demographic data was compiled using the internet census database Social Explorer to find U.S. Census and American Community Survey data from the U.S. Census Bureau. Projections were extracted from STATS Indiana. These data were analyzed for multiple years from multiple jurisdictions to create a framework of understanding around the demographic makeup of each area of influence. This analysis can be used to help Monroe Lake area officials and decision makers understand possible future demand for recreational activities.

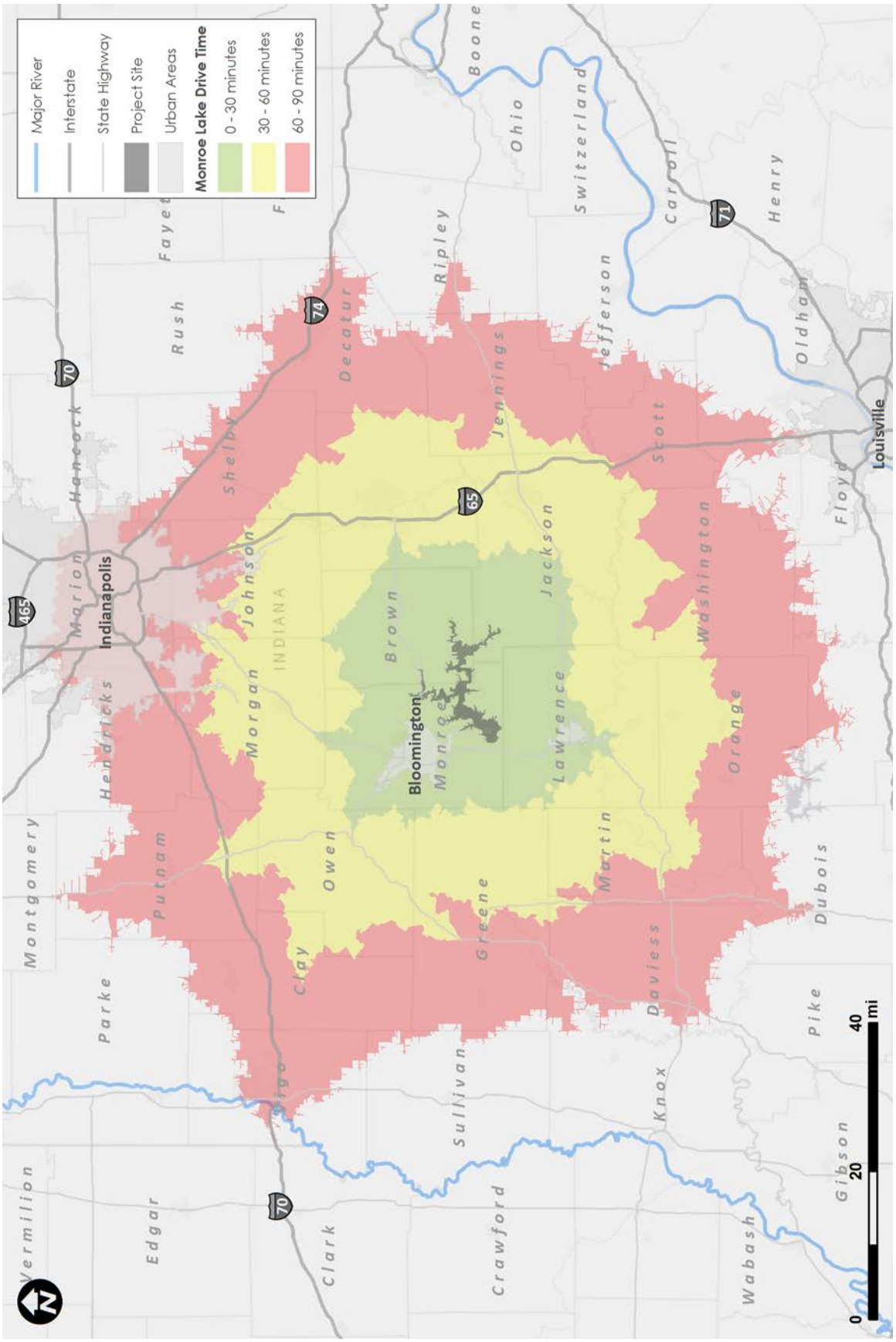


Figure 4-1 *Area of Influence. Sources: USACE, ESRI, U.S. Census Bureau, USDA-NCRS*

The Monroe Lake area of influence is comprised of 22 counties in southern and central Indiana, eight of which are in the primary area of influence. Fourteen of the counties are in the secondary area of influence. Table 4-4 shows historic populations and future population projections for each area of influence as well as the projected growth rate for each study area from 2010 to 2030.

Table 4-4: Population in Area of Influence

Area of Influence	2000 Population	2010 Population	2020 Population	2030 Population	Projected Growth. 2010-2030
Primary	497,896	548,643	590,511	623,796	13.7%
Secondary	1,371,359	1,467,673	1,563,618	1,643,575	12.0%
Total	**1,869,255**	**2,016,316**	**2,154,129**	**2,267,371**	**12.5%**

Source: US Census Bureau, ACS, STATS Indiana

The highest projected growth rate occurs in the primary area of influence. If the table were to show the growth rate by county, one might deduce that this high growth rate is largely due to the high growth rate of Monroe

County, home to Bloomington. According to the United States Census and the American Community Survey (ACS, 2010), Monroe County's population increased 16 percent from 2000 to 2013. The projections show a continued increase in the population of the primary area of influence through 2030; albeit at a somewhat slower rate of increase. The secondary area of influence is also expected to experience a moderate growth rate of 12 percent. With a total growth rate of 12.5 percent, the total area of influence is projected to see an average annual growth rate of 0.63 percent, which is relatively high compared to the State of Indiana's projected annual growth rate over the same time period of 0.33 percent. These data suggest that the population for the overall area of influence for Monroe Lake will continue to grow, which may require increased capacity at the project.

Table 4-5 shows the age distribution of each area of influence in 2010 as well as the projected change in age distribution between 2010 and 2030.

Table 4-5: Age Distribution, 2010-2030

	Primary Area of Influence			Secondary Area of Influence		
Age Group	2010	2030	Change 2010-2030	2010	2030	Change 2010-2030
Less than 5	6.1%	5.8%	-0.3%	7.1%	6.9%	-0.2%
5 to 19	21.1%	19.1%	-2.0%	20.9%	20.2%	-0.7%
20 to 24	9.1%	8.6%	-0.5%	7.1%	6.5%	-0.6%
25 to 44	25.9%	24.4%	-1.5%	28.4%	26.9%	-1.5%
45 to 64	25.3%	22.1%	-3.2%	25.0%	21.9%	-3.1%
65 and up	12.5%	20.0%	7.5%	11.5%	17.6%	6.1%

Source: US Census Bureau, ACS, STATS Indiana

These data clearly indicate that southern and central Indiana's population is projected to age in the next 15 years. Historical data would also show that this trend has been occurring for some time nationwide. With senior citizens increasing their share of the population, preferences for recreational opportunities are likely to shift. Further research regarding recreational activities participated in by each age group should be undergone and considered, and a summary of the findings in the Indiana SCORP, found in Section 4.5 of this chapter, sheds some light on these changing preferences.

Table 4-6 shows the median household incomes in each area of influence, the State of Indiana, and the United States.

Both areas of influence as well as the State of Indiana have lower median household incomes than the national estimate in 2013. The primary area of influence has a significantly higher median household income than the secondary area of influence.

Table 4-6: Median Household Income

Area of Influence	2013 Income
Primary	$50,004
Secondary	$45,309
State of Indiana	$48,248
United States	$53,046

Source: US Census Bureau, ACS

Two important socioeconomic variables to consider in a demographic analysis are employers and employees. Specifically, Tables 4-7 and 4-8 show the area's top employers and the share of employment in each industry, respectively. For this section, the study has been further specified to Monroe Lake's immediate tri-county region: Monroe, Jackson and Brown. These counties were chosen because

they all encompass a piece of Monroe Lake. Later in this chapter, we will analyze each county's comprehensive plan and zoning ordinance and summarize each document's possible effects on Monroe Lake.

Table 4-7: Top Employers, 2015

Brown County	Jackson County	Monroe County
Brown County Health and Living	Aisin USA Manufacturing	Indiana University Medical Center
Jehovah's Witnesses	Valeo Sylvania	Indiana University-Bloomington
Brown County High School	Walmart Distribution Center	Indiana University Health Bloomington Hospital
Abe Martin Lodge	Cummins Engine Co	Cook Group Inc.
Brown County State Park	Walmart Supercenter	GE Appliances

Source: Hoosier Data

Table 4-8: Industry by Occupation Distribution, 2013

Industry Class	Brown County	Jackson County	Monroe County	All Counties	Indiana
Manufacturing	15.0%	32.0%	10.0%	14.9%	18.4%
Retail Trade	10.7%	13.5%	10.5%	11.2%	11.5%
Professional/Management	8.8%	4.2%	6.9%	6.5%	7.7%
Educational Services	23.8%	17.8%	36.0%	31.3%	23.2%
Arts, Entertainment, Recreation	12.0%	6.4%	13.1%	11.6%	8.9%
All Other Industries	29.7%	26.1%	23.5%	24.5%	30.3%

Source: US Census Bureau, ACS

The impact of Indiana University on Monroe County is evident by looking at its top employers, which are ordered in this list from most employees to fifth most employees. Each of the top five employers in Monroe County are located in the City of Bloomington, the top three of which are associated with Indiana University. There's a similar anchor effect evident in both of the other two counties. All five of the top employers in Brown County are located in the City of Nashville, and all five of the top employers in Jackson County are located in the City of Seymour.

Compared to the state average, the tri-county area of influence has a high share of its employment in educational services, likely due to the prominence of Indiana University, and a high proportion of arts, entertainment and recreational services. While the share of employment in manufacturing is lower than the state share at a regional level, when broken down by county, Jackson County has a much higher share of its employed population in manufacturing than the state at 32.0 percent compared to 18.4 percent. Jackson County's top employer is Aisin USA Manufacturing, Inc.

4.5 Outdoor Recreational Opportunities at Comparable Facilities

Comparable outdoor recreational facilities within a 90-minute drive of Monroe Lake were identified and analyzed to understand the area's other options for outdoor recreation. Identifying the status of comparable facilities in the primary and secondary area of influence allows for an understanding of potential effects these nearby facilities may have on Monroe Lake visitation. Table 4-9 provides a list of these areas identified along with their location in relation to Monroe Lake, their overall visitation data (if available), their size and their managing agency. Table 4-10 provides a basic overview of the recreational activities afforded to these facilities' visitors. Following the tables are descriptions of the facilities and a summary of the potential effects each facility may have on Monroe Lake visitation.

Table 4-10: Recreation Activities Offered at Monroe Lake and Comparable Entities

Recreational Entity \ Activity Offered	Mtn. Biking	Camping	Boating	Hiking	Fishing	Disc Golfing	Golfing	Horseback Riding	Hunting	Nature Preserve	Historic Site	Picnicking	Playground	Pool Swimming	Swimming	Target Shooting	Winter Activities	Lodging/Cabins	Boat Rentals	Boat Tours	Zipline	Marina	Arboretum	Amphitheatre
Monroe Lake		✓	✓	✓	✓				✓			✓	✓	✓	✓		✓	✓	✓			✓		
Hoosier National Forest		✓		✓	✓			✓	✓			✓			✓			✓						
T.C. Steele State Historic Site				✓							✓													
Griffy Lake Nature Preserve				✓	✓					✓														
Spring Mill State Park		✓		✓						✓	✓	✓		✓				✓		✓				
Yellowwood State Forest	✓	✓		✓	✓			✓	✓			✓												
Martin State Forest	✓	✓		✓	✓				✓			✓												
Lake Lemon			✓	✓	✓							✓			✓									
McCormick's Creek State Park		✓		✓								✓		✓										✓
Brown County State park	✓	✓		✓	✓			✓				✓	✓	✓			✓	✓						
Morgan-Monroe State Forest		✓		✓	✓			✓	✓			✓						✓						
Lieber SRA at Cagles Mill Lake		✓	✓	✓	✓				✓			✓	✓	✓	✓					✓			✓	
Jackson-Washington State Forest	✓	✓	✓	✓	✓			✓	✓			✓			✓	✓								
Patoka Lake		✓	✓	✓	✓	✓			✓			✓	✓		✓		✓		✓			✓		
Shakamak State Park		✓	✓	✓	✓							✓		✓	✓				✓					
Hardy Lake State Park		✓	✓	✓	✓				✓			✓	✓		✓	✓			✓			✓		
Eagle Creek Park			✓	✓	✓		✓					✓	✓		✓	✓					✓			

Table 4-9: Comparable Recreational Facilities				
Name	Area of Influence	Operating Agency	Approximate Size (Acres)	2014 Visitation
Monroe Lake	**N/A**	**Various (IDNR/USACE)**	**24,000**	**950,029**
Hoosier National Forest	Primary	USFS	202,000	N/A
T.C. Steele State Historic Site	Primary	IDNR	211	N/A
Griffy Lake Nature Preserve	Primary	City of Bloomington	1,200	N/A
Spring Mill State Park	Primary	IDNR	1,358	595,522
Yellowwood State Forest	Primary	IDNR	2,000	N/A
Martin State Forest	Primary	IDNR	7,863	N/A
Lake Lemon	Primary	Lake Lemon Conservancy District	1,650	N/A
McCormick's Creek State Park	Primary	IDNR	1,924	588,555
Brown County State Park	Primary	IDNR	16,000	1,386,317
Morgan-Monroe Sate Forest	Primary	IDNR	24,000	N/A
Lieber SRA at Cagles Mill Lake	Secondary	IDNR (USACE Lake)	948	464,126
Jackson-Washington State Forest	Secondary	IDNR	18,000	N/A
Patoka Lake	Secondary	Various (IDNR/USACE)	25,800	638,617
Shakamak State Park	Secondary	IDNR	1,766	207,032
Hardy Lake State Park	Secondary	IDNR	2,178	226,443
Eagle Creek Park	Secondary	City of Indianapolis	3,900	N/A

There are 16 other notable recreation areas in Monroe Lake's area of influence, nine are within the primary area of influence and six are within the secondary area of influence. The following section provides a summary of each of these locations and touches on possible affects these areas may have on Monroe Lake visitation. Figure 4-2 on the following page shows each recreation area's location in relation to Monroe Lake.

4.5.1 Recreation Areas within Primary Area of Influence

4.5.1.1 Hoosier National Forest

Hoosier National Forest encompasses 202,000 acres of Southern Indiana, a small portion of which is located in the Hardin Ridge Recreation area at Monroe Lake. This vast USFS managed forest provides hiking, camping, fishing, hunting, and more. Hoosier National Forest is unlike the other 15 comparable recreational entities on this list due to its sheer size and management, and it's unlikely that Monroe Lake and Hoosier National Forest are competing for recreational visitors. In fact, Hoosier National Forest likely draws visitors to Monroe Lake and other surrounding recreation areas in Southern Indiana.

4.5.1.2 T.C. Steele State Historic Site

The T.C. Steele State Historic Site is located three miles north of Crooked Creek SRA on 211 acres of forested land. The site was once the home to iconic Hoosier artist Theodore Clement Steele, who established the famous Art Colony of the Midwest. T.C. Steele State Historic Site offers visitors a large studio in the House of the Singing Winds (Steele's home) with more than 50 of Steele's paintings on display. Outside of the historic structure, visitors can walk through the historic gardens and explore the grounds on one of the site's five hiking trails. With the site's proximity to Monroe Lake, the site's effect on Monroe Lake visitation is likely positive. The proximity of the historic site would likely encourage visitors to explore some of Monroe Lake's recreation areas.

4.5.1.3 Griffy Lake

Griffy Lake is located in the northern portion of the City of Bloomington, totally encompassed by the Griffy Lake Nature Preserve (GLNP). Perhaps the most significant difference between the two lakes is that Griffy Lake is much smaller than Monroe Lake.

Recreational opportunities available at GLNP include fishing, hiking and picnicking. Due to its urban setting and prohibition of many other activities, hiking is the most popular outdoor activity at GLNP. Prohibited activities include horseback riding, mountain biking, off-road vehicles, campfires, overnight parking and swimming. Due to this extensive list of banned activities, GLNP is probably not a major competitor to Monroe Lake, although some Bloomington residents might forego driving to Monroe Lake for an afternoon hike at GLNP.

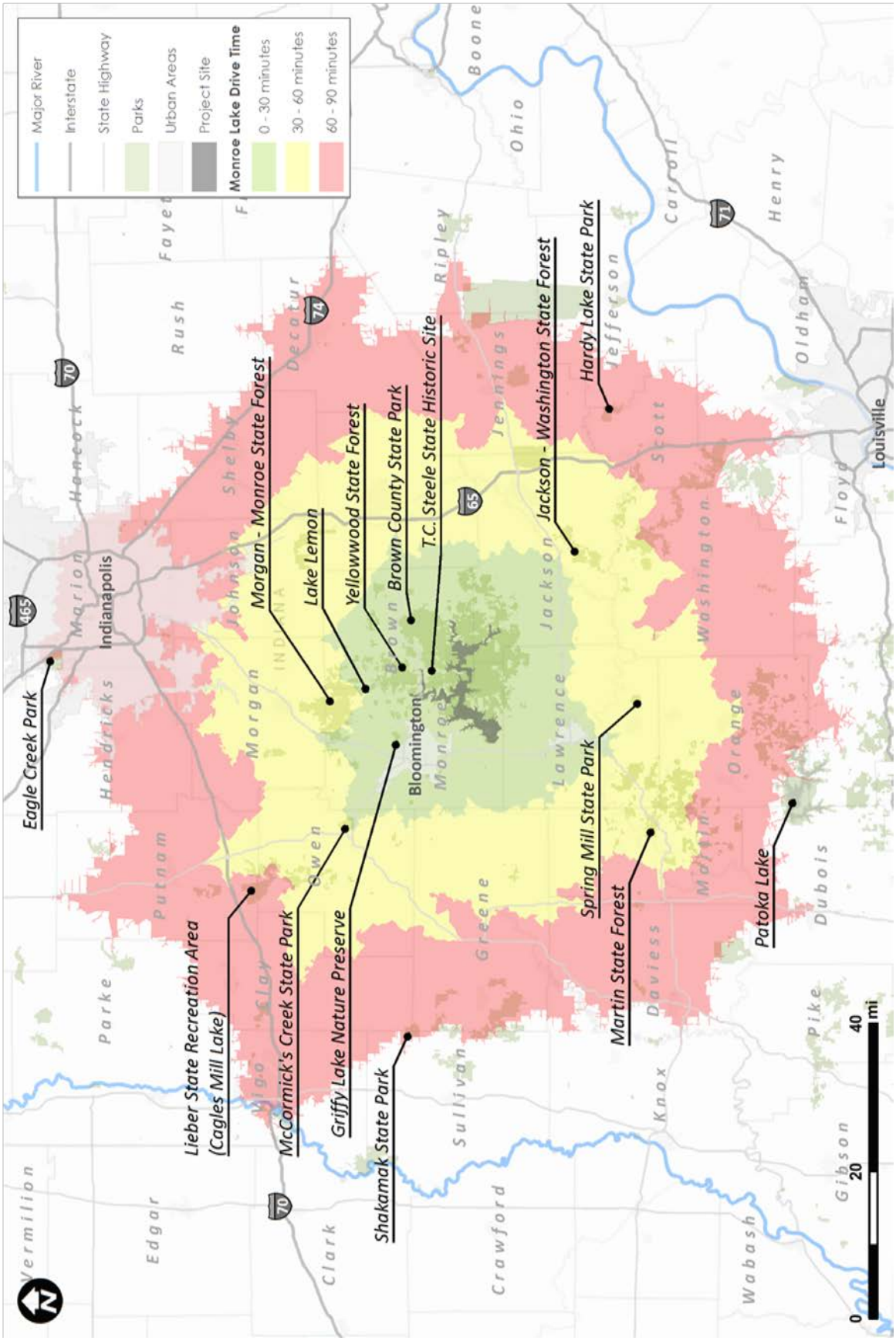


Figure 4-2 *Comparable Recreation Areas within Area of Influence. Sources: USACE, ESRI, U.S. Census Bureau, USDA-NCRS, Google Earth*

4.5.1.4 Spring Mill State Park

Located just 27 miles south of the Monroe Lake Dam, Spring Mill State Park displays historic industrial sites from the 19th century. There are 20 historic buildings in the restored Pioneer Village; caves, with an option for a boat tour; hiking; biking; camping; a nature center; and an inn for lodging. Spring Mill State Park hosted 595,522 visitors in 2014. Despite its proximity to Monroe Lake, it is unlikely to draw away Monroe Lake users due to its small size and difference in amenities.

4.5.1.5 Yellowwood State Forest

Yellowwood State Forest (YSF) is home to Yellowwood Lake and is approximately 10 miles due east of Bloomington and is situated between Lemon Lake (see below) and Monroe Lake. Slightly larger than Griffy Lake, Yellowwood Lake is approximately 133 acres, making it much smaller than Monroe Lake. YSF makes Yellowwood Lake slightly more secluded than Monroe Lake, which offers a different visitor experience than Monroe Lake.

Recreational activities offered at YSF include hiking, horseback riding, overnight camping, hunting and fishing. Boating is also offered in multiple forms on Yellowwood Lake, with boat and rowboat rentals and a boat launch. There are fewer prohibitions on Yellowwood Lake than Griffy Lake, which makes it more of a competitor with Monroe Lake. However, acreage is limited on and around Yellowwood Lake, and the area does not have the capacity to compete with Monroe Lake on a large scale.

4.5.1.6 Martin State Forest

Martin State Forest is located approximately 34 miles southwest of the Monroe Lake Dam in Martin County. The property spans 7,863 acres and contains multiple man-made fishing ponds that are 3-4 acres. This property has been public land since 1932 and is now managed carefully by the IDNR.

Activities on Martin State Forest include hiking, mountain biking, fishing, hunting, picnicking, camping and/or enjoying the Hoosier Woodland Arboretum. There are 26 designated campsites, three fishing ponds, miles of hiking and biking trails, and multiple picnic areas with four shelters. With the exception of Martin State Forest's extensive mountain biking trail network, Monroe Lake offers all of Martin State Forest's amenities at a higher capacity. There are more miles of hiking trails, more fishing locations, many more campsites and more picnic areas at Monroe Lake than Martin State Forest. For that reason, and the fact that Monroe Lake offers boating, swimming and lodging, Martin State Forest likely has little effect on Monroe Lake visitation.

4.5.1.7 Lake Lemon

Lake Lemon is approximately 10 miles northeast of Bloomington and due north of Monroe Lake. Lake Lemon is much smaller than Monroe Lake, but is still of significant size with its 1,650 acres and 24 miles of shoreline. Originally constructed in 1953 to be the main water source for the City of Bloomington, this reservoir now serves as Bloomington's backup water supply.

There are plenty of recreational opportunities on and around Lake Lemon that liken the lake to Monroe Lake. Visitors can enjoy boating on the lake using numerous launches, hike the Tulip Trace Nature Trail, or enjoy a day at the beach at Riddle Point Park. However, Lake Lemon's size hinders its capacity for a diversified set of recreational opportunities; for example, there are no boat rental service organizations or campgrounds along Lake Lemon's shores, and boating is difficult due to the lake's shallow and weedy bed.

4.5.1.8 McCormick's Creek State Park

McCormick's Creek State Park is located approximately 30 miles northwest of the Monroe Lake Dam. Although McCormick's Creek does not encompass a lake or reservoir, there are numerous natural features that attract hikers, campers, bird watchers, and park visitors of all sorts. With limestone canyons, waterfalls, trails, a historic rock quarry, an inn with lodging and a restaurant, a nature center with an amphitheater, and a cave, McCormick's Creek offers visitors opportunities not available at Monroe Lake. On the other hand, there also are opportunities at Monroe Lake not available at McCormick's Creek, most notably boating and lake swimming. McCormick's Creek State Park hosted 588,555 visitors in 2014. It is likely that Monroe Lake and McCormick's Creek compete for local recreation users due to the proximity, but McCormick's Creek also attracts visitors to the area, which increases Monroe Lake's visitation as well.

4.5.1.9 Brown County State Park

Brown County State Park (BCSP) is located just east of YSF, northeast of Monroe Lake, and is home to two small lakes used primarily for fishing. As Indiana's largest state park, BCSP offers camping, horseback riding, mountain biking, hiking, naturalist services, picnicking, fishing and swimming at the water park.

Like YSF, BCSP is slightly more secluded than Monroe Lake and gives visitors a better opportunity for more rigorous hiking and nature-related activities. While there are overlaps in the activities offered by BCSP and Monroe Lake, there are also many opportunities at Monroe Lake not offered at BCSP. For example, the lakes located in BCSP are small and do not offer the opportunity for private boating. BCSP hosted 1,386,317 visitors in 2014.

4.5.1.10 Morgan-Monroe State Forest

Morgan-Monroe State Forest is located approximately 30 miles northeast of the Monroe Lake Dam and approximately 15 miles northeast of downtown Bloomington. With more than 24,000 acres of forest land in Morgan and Monroe Counties, the property has been managed by the State of Indiana since 1929. Although the main entry point for visitors and the forest office is located in north Monroe County, it is spread across various areas with a boundary of the state forest contiguous with Monroe Lake property in the north fork area of the lake.

Activities available at Morgan-Monroe State Forest include camping, lodging, hiking, limited boating, fishing, hunting, gold panning and picnicking. Boating on one of the three small lakes is permitted, but is limited to trolling motors for motor boats. For overnight excursions, there are 19 campsites and two cabins. Morgan-Monroe State Forest lacks the beachfront and boating availability of Monroe Lake and has an overall less developed landscape. The area offers a different recreation experience and surrounding than Monroe Lake, but its proximity to Bloomington may have a slight negative effect on Monroe Lake visitation.

4.5.2 Recreation Areas within Secondary Area of Influence

4.5.2.1 Lieber SRA at Cagles Mill Lake

Lieber SRA is located approximately 50 miles northwest of the Monroe Lake Dam and approximately 35 miles east of Terra Haute, Indiana. Lieber SRA, a 948 acre park, is located north of Cagles Mill Lake, a 1,500 acre reservoir owned by USACE. This SRA, which is managed by IDNR, is one of the more scenic state parks in Indiana. The natural amenities are complemented by built infrastructure, with an aquatic center, nature center, basketball court, two boat ramps, a fishing pier and picnic shelters.

Visitors have the opportunity to participate in fishing, hiking, hunting, swimming, naturalist services, boating with rentals available, and a water safari boat tour. For campers, there are 120 electric sites and 96 non-electric sites at Lieber SRA, which hosted 464,126 visitors in 2014. With the range of activities and scenic amenities along with the overnight option, Lieber SRA may have the capability to adversely affect Monroe Lake visitation.

4.5.2.2 Jackson-Washington State Forest/Starve-Hallow SRA

Jackson-Washington State Forest is located approximately 40 miles southeast of the Monroe Lake Dam in Jackson and Washington Counties. The property is approximately 18,000 acres and encompasses Starve-Hallow SRA. Starve-Hallow SRA contains the 145-acre Starve-Hallow Lake with boating and beach availability.

Activities available on Jackson-Washington State Forest and Starve-Hallow SRA include hiking, camping, lodging, fishing, swimming, boating, hunting, archery and picnicking. There is also an education center with a full-time interpretive naturalist located at Starve-Hallow SRA. Many of the same activities offered at Monroe Lake can be found at these two entities, albeit at a smaller scale. There is likely a small adverse effect on Monroe Lake visitation from Jackson-Washington State Forest and Starve-Hallow SRA.

4.5.2.3 Patoka Lake

Patoka Lake is the second largest lake in Indiana behind Monroe Lake. Located just under 90 minutes south of the Monroe Lake Dam, Patoka Lake also has a significant portion of its shoreline surrounded by Hoosier National Forest. Patoka Lake is approximately 8,800 acres, with 25,800 acres of USACE-owned, state-leased recreation lands surrounding its shores.

Offered at its seven SRAs are numerous diverse outdoor recreation activities. These opportunities include an archery range; 10 boat launches for private boating; 455 Class A campsites, 45 Class C sites and seven backcountry sites; cross-country skiing in the winter; fishing; a disc golf course; numerous hiking and biking trails; woodland game areas for hunting with registration required; interpretive naturalist programs; picnic areas with shelters; public beaches for swimming; and a visitor center. This extensive list of activities could mean that Patoka Lake also attracts users from 90 minutes or more away, which would overlap with the Monroe Lake area of influence. Patoka Lake provided recreation for 638,117 visitors in fiscal year 2014, compared with Monroe Lake's 950,029 during the same year.

4.5.2.4 Shakamak State Park

Shakamak State Park is located approximately 55 miles northwest of the Monroe Lake Dam. With three man-made lakes totaling 400 acres of water, Shakamak State Park offers visitors camping for both RV and tent campers, boating and a family aquatic center. The park hosted 207,032 visitors in 2014. Shakamak State Park can offer visitors similar opportunities to Monroe Lake, albeit at a much smaller scale, which may sway park visitors from the western edge of the secondary area of influence to opt for the closer of the two.

4.5.2.5 Hardy Lake State Park

Hardy Lake State Park (Hardy Lake) is located southeast of Monroe Lake, just within a 90-minute drive. It is Indiana's only reservoir not used for flood control, which means that the lake levels are relatively stable year-round. This is the only large reservoir in Indiana that is not on USACE property.

Although it is significantly smaller than Monroe Lake, with 741 acres of water surrounded by 2,178.16 acres of state park land, Hardy Lake offers many of the same recreation opportunities as Monroe Lake, including hiking, hunting, swimming, boating, skiing and camping. Hardy Lake hosted 226,443 visitors in 2014. Since it is right on the edge of a 90-minute drive, and only one hour's drive from Louisville, Kentucky, it is unlikely that Hardy Lake visitors come from the same population centers as Monroe Lake visitors.

4.5.2.6 Eagle Creek Park

Eagle Creek Park is located in, and maintained by, the City of Indianapolis. As one of the largest municipal parks in the country, the park spans 3,900 acres around the northern half of the Eagle Creek Reservoir. The park is located in the northwestern quadrant of Indianapolis, just under a 90-minute drive north of the Monroe Lake Dam.

Eagle Creek Park offers visitors a swimming area, a marina, picnic shelters, multiple outbuildings available for event hosting, a pistol range, a dog park, multiple nature centers, a zip-line course, a golf course, 3.8 miles of trails and a restaurant. Eagle Creek Park has a natural, forested landscape, which could be a factor that attracts Indianapolis residents similar to what attracts many Bloomington residents to Monroe Lake. There is no option for camping, however, and the park closes in the evenings.

With its natural features, recreational opportunities and location within the 90-minute drive-shed of Monroe Lake, it is possible that residents in the Indianapolis metropolitan area would choose Eagle Creek Park over Monroe Lake. However, folks seeking extended stays do not have that option at Eagle Creek Park.

4.6 Regional and Statewide Trends

People around the country do not participate in the same activities they used to, or at least not at the same rate. Recreational demand is always evolving. It is important that Monroe Lake is sensitive to recreation shifts and can continue to provide relevant infrastructure to provide for this ever-changing demand.

The following section provides an insight to changing trends in recreational demand in the State of Indiana, which can be used to identify what activities will be popular into the future around Monroe Lake. We can further use this information to anticipate popular activities for future visitors, which will help Monroe Lake decision-makers provide the necessary infrastructure to meet future demand.

4.6.1 Indiana State Comprehensive Outdoor Recreation Plan

The Indiana SCORP is a five-year plan created in 2011 to provide local jurisdictions with information that quantifies the benefits of outdoor recreation, identifies potential users of recreational facilities, and qualifies the state for National Park Service Land and Water Conservation Fund grants.

The following section provides a brief overview of the Indiana SCORP and examines the trends presented in the document. Many of these trends are statewide, but these data can be reasonably applied to the Monroe Lake area to understand the effects future recreational demand changes may have on Monroe Lake's recreational future.

One important trend mentioned in the SCORP is that more state residents are traveling shorter distances for recreation, possibly due to high fuel costs and an increase in walking as a mode of transportation. However, one survey conducted by IDNR for the SCORP found that 21 percent of respondents were willing to travel over 100 miles to participate in their favorite outdoor activity, which was narrowly the most popular response. The second most popular answer was 36-50 miles. A strong majority of respondents, 62.8 percent, said that their top method of travel to reach their favorite outdoor recreation activity was by automobile. These responses confirm that the population of Bloomington and in some cases Indianapolis is willing to travel to Monroe Lake to participate in outdoor recreation activities.

It is also useful to understand what it is visitors are doing once they arrive at their recreation destinations. Surveys conducted in the SCORP found that the top five "favorite" outdoor recreation activities in Indiana were, in order of popularity, walking/hiking/jogging/running, camping, picnicking, fishing and swimming. All five activities can be supported at Monroe Lake.

Demographic information can also lead us to important assumptions about future recreational demands. Demographic data collected in the SCORP and in Section 4.3.2 of this document suggests that Indiana as a whole is aging, more people are retiring, and people are retired for a longer period of time. This trend is expected to continue in both areas of influence as seniors (65 and older) are projected to increase their population share from 2010 to 2030 while all other age groups are projected to have a declining population share in the same time period. These data may suggest that more people are engaging in recreational activities that are popular with seniors. For example, older people prefer RV camping to tent camping and walking to jogging or cycling. While more specific research should be used to assess the exact capacity, Monroe Lake has a fairly high capacity for electric, trailer camping.

The SCORP also presents a general guideline that can be applied locally to assess how well each county is meeting recreational demand. In the SCORP's supply analysis of parks and outdoor recreation acreage, it is recommended that 55 acres of local, state, and federal parkland be provided per 1,000 people. For example, Jackson County, with a population of 42,376 should have 2,330.68 acres of outdoor recreation land. According to the analysis, 50 of 92 counties in Indiana meet this threshold. Jackson, Brown and Monroe Counties, partially due to the presence of Monroe Lake, all have outdoor recreation acreages that far surpass this quota. This threshold of 55 acres per 1,000 people is not an absolute number, but rather a flexible guideline and the recreational needs of one jurisdiction may differ from another. Specifically, Monroe Lake is an inter-county recreation asset, and visitors using the lake's various recreation areas are often traveling from outside Brown, Monroe and Jackson Counties.

Another important piece of information is an understanding of the monetary value people are putting on recreation. Since many of Monroe Lake's recreation areas are free or cost a nominal fee, it is difficult to assess the financial value of these areas. The SCORP uses its widespread survey to receive stated preference responses. A 2010 Outdoor Recreation Participation Survey found that 21 percent of respondents, the largest single percentage of respondents, were only willing to spend less than $100 per year on their favorite activity, which was the lowest possible answer.

Finally, the SCORP presented a time-series result that displays how demand for recreation changes over time. In 1989, the number one outdoor activity was picnicking, which has been replaced by walking/hiking/jogging/running. The second most popular outdoor recreation activity has changed from pleasure driving in 1989 to camping in 2010.

Some of these trends were predicted in the IDNR Comprehensive Outdoor Recreation Plan (ORP) of 1984. In fact, as summarized by the Monroe Lake OMP of 1988, the 1984 ORP predicted the following trends: 1) There would be a shift of interest toward more "primitive" outdoor activities such as hiking, canoeing, rock climbing, etc.; 2) an increase in the number of elderly visitors would occur in the ensuing years due to increased retirement lengths and a more healthy, active senior citizen cohort; and 3) there would be an increase of young families visiting Indiana's parks as the baby boomers began having families. Furthermore, the 1988 plan associates increased elderly use with a noticeable schedule—the elderly visit during the off-season (spring and fall) and

midweek to enjoy the serenity of nature without the crowd. The ORP called for a more diverse gamut of activities to support a wide age range.

4.6.2 Outdoor Recreation Participation Report

The Outdoor Foundation, a non-profit organization focused on increasing outdoor recreation participation, produces its Outdoor Recreation Participation Report (ORPR) in which a nationwide survey is produced to further understand national recreation trends. The survey is produced every year and the 2015 report is available for review.

The 2015 ORPR has identified that 48.4 percent of all Americans participated in outdoor recreation in 2014, which is a 0.8 percent decrease from 2013. In fact, the percentage of Americans that participate in outdoor activities has remained relatively constant since 2006, but significant changes have occurred to what specific activities are popular among Americans.

Recreational activities that many Americans participate in are always changing. This is also the case in Indiana as presented by the Indiana SCORP. The 2015 ORPR has shown that many activities have seen stark increases in participation from just a few years ago. Since 2012, adventure racing, kayak fishing and stand-up paddling have seen participation rates increase by over 20 percent. Adventure racing and kayak fishing have both increased by over 30 percent. Other significant increases were seen in overnight backpacking, windsailing, BMX biking, climbing, kayaking, trail running and triathlon participation.

Since overall participation has remained constant and many activities have increased their share of participation, some recreational activities in response have seen a decline in participation since 2012. According to the 2015 ORPR survey, activities that have had a 3 percent or higher decline in participation from 2012 to 2014 are RV camping, tent camping, downhill skiing, snowboarding and snowshoeing.

This survey report also focuses on activity participation by age group. The survey was split among youth and young adult (aged 6-24) and adult (aged 25 and over). For youth and young adults, the top five outdoor recreation activities of 2014 were running, jogging and trail running; BMX, road and mountain bicycling; car, RV and tent camping; fishing; and hiking. Adults had the same activities in the top five, but in different order: running, jogging and trail running; fishing; BMX, road and mountain bicycling; hiking; and car, RV and tent camping.

The ORPR also looks at the demographics of outdoor activity participants. In the 2014 survey, males and females participate in outdoor activities an equal amount among youth and young adults, and 30 percent of youth and young-adult outdoor recreation participants are minorities, which is a 7 percent increase from 2007.

Change in recreation demand drives change in recreational supply. This is why it is important to fully understand the results of the SCORP and ORPR surveys as well as past documents and apply the findings to Monroe Lake. Understanding the trends and outcomes of studies like this can help Monroe Lake anticipate future demand and adequately supply future visitors to the area.

4.7 Potential Recreational Opportunities

Using the findings and trends uncovered by the analysis, it is now possible to look critically at what activities are offered at Monroe Lake, what activities will be demanded in the future, and where viable projects and programs could be implemented to provide for this future demand. The following section lists and explains what activities are currently available on the grounds of Monroe Lake, what activities are not currently offered at Monroe Lake but have the potential to be offered, and what activities are not offered at Monroe Lake that are inconsistent with plan goals and objectives.

When identifying activities that can be implemented at Monroe Lake, it is important to look at both the participation rate and the intrinsic value people place on an activity. For example, camping has a low participation rate, but this is not because camping is not highly valued, but because camping takes a lot of time and energy for the camper, and thus, the camper can only participate in camping a few times a year. Hiking has a very high participation rate, but that does not necessarily mean that hiking has a high value for the hiker. It simply may mean that it is easier to participate in hiking, and therefore the hiker participates in hiking more often than camping. This is one item for the decision-makers at Monroe Lake to consider when planning for increased capacity and new activities for Monroe Lake.

Another item to consider is the inconsistency of activities. Activities that are deemed “inconsistent” (see "Not Allowed” in Table 4-11) are not currently available at Monroe Lake and are also in conflict with Monroe Lake and USACE policy, planning and environmental conservation goals.

Table 4-11 lists several activities that were both identified by the Indiana SCORP and present at Monroe Lake’s surrounding comparable facilities. The first 10 have been identified as the top 10 favorite outdoor activities for Indiana residents. The table denotes that the activity is either currently available at Monroe Lake, not currently available but consistent (labeled “potential”), or not currently available and inconsistent.

Table 4-11: Potential Recreation Activities at the Project

Activity/Opportunity	Provided	Potential	Currently Not Allowed
Hiking/Walking/Jogging	✓		
Camping	✓		
Picnicking	✓		
Fishing	✓		
Swimming	✓		
Boating/Waterskiing/etc.	✓		
Golfing		✓	✓
Biking/Mountain Biking		✓	✓
Hunting	✓		
Horseback Riding (at USFS only)		✓	✓
Disc Golfing		✓	
Historic Site Seeing		✓	
Nature Preserve		✓	
Playground	✓		
Rock Climbing		✓	✓
Pool Swimming	✓		
Target Shooting (Archery or firearm)		✓	
Winter Activities	✓		
Internet availability (limited)	✓	✓	
Lodging/Cabins	✓		
Boat Tours	✓		
Zip Line		✓	
Marina	✓		
Arboretum		✓	
Amphitheatre		✓	
Off Road Vehicles (ORV)			✓

Monroe Lake currently provides all of the top 10 outdoor recreation activities. The remaining activities and opportunities provided in the table have been identified as available in at least one of the comparable facilities in Monroe Lake’s area of influence. These opportunities indicate that there is a demand in southern Indiana for such an activity.

4.8 Recreational Demand Analysis

There are three major factors that have the potential to significantly impact visitation rates at Monroe Lake.

- **Change in Demographics:** With a change in the local population, there will likely be a change in both visitation rates as well as preference. Indiana, like the rest of the country, is aging and so are the areas of influence. This can significantly affect how many people come to Monroe Lake and what they do when they get there.
- **Change in Preference:** As mentioned above, a changing population will mean a change in outdoor recreation preference. According to the Indiana SCORP, an aging population means more RV camping and less tent camping, more passive hiking and active, difficult hiking on the trails, etc.
- **Change in Opportunity:** Currently, Monroe Lake is a unique place in terms of recreational opportunities offered within one hour’s drive. However, new recreation infrastructure in the area can be provided at any

time, which will have a lasting influence on the visitation rates at Monroe Lake. Jackson County has expressed an interest in expanding its park system, it is important that decision-makers from Monroe Lake and beyond collaborate to efficiently serve all park visitors efficiently

4.8.1 Impact of Comparable Facilities

As mentioned above, Monroe Lake is a one-of-a-kind recreational asset in terms of size and capacity within an hour's drive of many population centers. However, Patoka Lake, just under 90-minutes to the south of Monroe Lake, offers as many, if not more, recreational opportunities as Monroe Lake. More research should be done regarding the area of influence of both Monroe Lake and Patoka Lake as well as any opportunities for collaboration that could occur between entities from the two lakes. Both lakes are USACE owned lakes with much of their surrounding land acreage leased to the IDNR. Other than Patoka Lake, none of the closer recreational lakes around Monroe Lake are expected to significantly adversely affect Monroe Lake visitation in the future, although these other recreational facilities should not be ignored.

4.8.2 Impact of Demographic Changes

Both the primary and secondary areas of influence are projected to moderately increase in population from 2010 to 2030. STATS Indiana and our analysis have the entire area of influence, both primary and secondary, increasing by over a quarter-million people in that time period. As shown in Table 4-5, the only age group that may increase its share of the population over this time period is the cohort aged 65 and older. The demographic shifts have shown us the following trends:

- The secondary area of influence has a population much higher than that of the primary area of influence due to its larger physical size and the presence of the Indianapolis metropolitan area. However, from 2010 to 2030, the primary area of influence is expected to grow at a higher rate than the secondary area of influence; 13.7 percent compared to 12.0 percent.
- Both areas of influence are getting older and, according to the Indiana SCORP, this likely means that RV camping will be more preferred to tent camping. Furthermore, this may mean a shift of demand from camping to lodging altogether.
- Finally, this age shift could also mean an increased demand for trails that are easier to traverse. Monroe Lake has 9.45 miles of hiking available at four different locations surrounding the lake. Only 0.5 miles of hiking is considered "easy" and it is located at just one SRA. The intensity of each trail should be considered closely and increasing the capacity for easy trails may be necessary.

4.9 Implications of Projected Future Demand on Recreational Activities

Based on previously discussed trends and changing demographics, demand for recreational activities are expected to change in the future at Monroe Lake. The following section describes the implications of the trend and demand analysis on recreational activities at Monroe Lake.

4.9.1 Boating

Monroe Lake is a unique asset in the Bloomington area and has little competition for boating visitation within the primary area of influence. This fact, along with the large capacity and lake access at the project makes boating one of the most popular activities available at Monroe Lake. Surface water availability and access to that surface water are both significant factors for boating convenience. With 10,750 water acres, nine boat launches with a total of 40 lanes, 1,267 marina slips and 137 mooring buoys, boating is well provided for.

According to both the Indiana SCORP of 2011 and the ORPR of 2015, motor boating has remained a popular activity in Indiana and the country as a whole, but participation has not necessarily increased significantly in the past few years. This type of boating requires the considerable infrastructure investment by the land managing entity, but Monroe Lake has the aforementioned capacity for motor boating.

According to the 2014 ORPR survey, alternative uses of the surface water have significantly increased in recent years. Paddle boarding, kayaking and kayak fishing participation have all increased by at least 20 percent since 2012. Furthermore, windsurfing and board sailing participation has increased by over 13 percent in the same time period.

Although motor boating participation is not growing at the rate of alternative surface water recreation uses, it is and will continue to be a popular choice for Monroe Lake users. The current motor boating infrastructure should be maintained and improved where necessary. The aforementioned alternative surface water uses are increasing at a significant rate, and although this does not require the investment and upkeep as motor boating, this trend should not be ignored. The visitors that use kayaks, canoes, stand up paddle boards, etc. require surface area, just as motor boaters do. Regulations and access management may have to change to adapt to this change in demand.

4.9.2 Camping

There are currently 515 campsites around Monroe Lake; 200 at Hardin Ridge and 315 at Paynetown SRA. Of the 315 sites at Paynetown SRA, 221 are electric, 30 have pull thru access, and three are handicap accessible.

Camping has always been a popular activity throughout Indiana and the United States. The Indiana SCORP identifies camping as the second most "favorite" outdoor recreation activity among Hoosiers and the ORPR states camping of all types as the third most popular activity among youth and young adults and the fifth most popular activity among adults 25. Despite this, the ORPR survey finds that both RV and tent camping have decreased by over 4 percent since 2012 in the United States.

Despite the fact that conventional camping experiences are seeing drops in participation, RV and tent camping are still one of the most popular forms of outdoor recreation. The Monroe Lake Interpretive Master Plan states that campers are the most active Monroe Lake visitors in interpretive programs throughout the project area. Campground areas and lodging locations should continue to be well maintained and equipped to handle an influx of seasonal campers each year. Also, with the Bloomington area expected to see an increase in the senior population, RV camping is likely to be more popular than it once was, and this should be taken into account when planning for the future configuration of campgrounds.

While conventional camping participation rates decreased, backpacking participation has significantly grown. The ORPR defines backpacking as overnight camping at least one-quarter mile away from the nearest vehicle. This type of camping has increased by 12.8 percent since 2012, according to the ORPR survey. This could mean that providing more primitive and isolated campsites with more trails would be an important land use decision around Monroe Lake.

4.9.3 Fishing

Fishing at Monroe Lake occurs both from shore and by boat. Shoreline fishing is available at all SRA boat ramps, the tailwater fishing area of the Monroe Lake dam and at the Hardin Ridge boat launch.

At a national level, fly fishing, saltwater fishing and freshwater fishing have remained relatively constant since 2012. But much like camping and motor boating, Monroe Lake offers unique amenities for fishing that makes it a popular destination for anglers. Fishing is still among the top five most "favorite" outdoor recreation activities according to the Indiana SCORP and in the top five most popular outdoor recreation activities according to the ORPR. Furthermore, kayak fishing participation has increased in the ORPR survey by 20.1 percent since 2012, the importance of which is mentioned in Section 4.8.1.

With numerous inlets and bays, Monroe Lake is naturally ideal for fishing. Indeed, anglers made an estimated 38,019 fishing trips with an estimated economic value of $2.4 million in 2007 according to IDNR (Kittaka, 2008). These intrinsic fishing amenities have garnered a healthy amount of fishing demand, and ensuring that this demand is met now and into the future is an important goal for Monroe Lake. To do this, strong shoreline management practices and healthy land use techniques should be employed on and around the lake. Due to prior historical contamination of the lake bed and IDEM results, it is recommended that IDNR monitor the quality and number of fish taken by anglers.

4.9.4 Hunting

Given the nature of hunting, this activity is permitted only in selected areas throughout Monroe Lake during designated hunting seasons. Hunting is available with valid registration at Allen's Creek, Cutright, Fairfax, Moore's Creek, Paynetown and Salt Creek SRAs, as well as many additional acres of land surrounding the lake. Targeted species include deer, squirrel, rabbit, waterfowl and other upland game.

Nationally, hunting participation has remained relatively stagnant, possibly with a slight drop according to the ORPR. Specifically, bow hunting and rifle hunting have both seen three-year participation drops of 1 percent or higher, but handgun hunting, which has a much lower number of participants, has seen a 6.6 percent increase in participation over that time period.

In the State of Indiana, there has been a considerable increase in hunting participation among women. In fact, the number of hunting licenses sold to female hunters increased by 93 percent from 2006 to 2014. Nationally, hunting participation for women went up 85 percent from 2001 to 2013. This substantial increase in women hunters, specifically in the State of Indiana, is significant and underscores the fact that hunting will continue to be a popular form of outdoor recreation in Indiana for years to come.

With the number of hunters staying about the same nationwide, and an increase of women hunters in Indiana, there is a need to conserve lands. Hunting requires open land with little to no developed land use, and particularly restricts the proximity of residential structures. There is plenty of rural land around the east side of Monroe Lake, but residential growth on the land bordering the project to the west will affect the total amount of land available for hunting.

4.9.5 Picnicking

Picnicking is available throughout Monroe Lake at the Overlook and Tailwater areas at the Dam Site, Paynetown SRA, Cutright SRA, Fairfax SRA, Moore's Creek SRA and Hardin Ridge. There are shelters available at all of these sites.

Picnicking is number three on the list of top five "favorite" recreational activities list in the Indiana SCORP, but this is down two spots from the 1989 SCORP when picnicking was the most favorite outdoor activity in Indiana. However, with an aging population, passive outdoor recreation such as walking, picnicking and RV camping are expected to increase in southern Indiana. The ORPR does not mention picnicking.

Maintenance and upkeep of picnic shelters and tables is highly recommended, since there is no evidence to suggest that picnicking will decrease in popularity in the future. Identifying where popular picnic destinations around the project are located will help allocate picnic resources in the future.

4.9.6 Hiking

Hiking is the most popular activity in Indiana according to the SCORP and Monroe Lake is a destination spot for hikers from around the area. With over nine miles of identified trails ranging from moderate to easy difficulty, as well as additional unofficial trails, there is ample hiking available.

While hiking is almost universally popular among outdoor recreation participants, the types of hiking can differ from one person to another. For example, young adults might prefer a more strenuous hike while the empty-nester or senior-aged population may prefer an easier hike. Hiking was the fifth most popular outdoor recreation activity among youth and young adult outdoor recreation participants in the 2014 ORPR survey and fourth most popular among adults.

With the popularity of hiking among all age groups, it is important that Monroe Lake provides a range of hiking options to satisfy all abilities. Currently, Monroe Lake offers 9.45 miles of hiking trails to its users and only 0.5 miles is considered "easy" while the rest is considered "moderate." There are more miles of unidentified trails that are in use. Further study of the difficulty of these trails and reclassification is necessary to fully determine how many more miles of easy and difficult hiking should be provided.

4.9.7 Other Activities

4.9.7.1 Sightseeing

Views of Monroe Lake are available at all recreation areas throughout the project. Hardin Ridge, located in the Hoosier National Forest, is the most popular sightseeing destination around Monroe Lake, but with the hilly topography of southern Indiana, there's no shortage of aesthetic views.

Sightseeing can be considered a complementary activity, in that it is involved with other activities such as hiking or picnicking. Specific view shed locations should be identified and accounted for to protect these sightseeing areas from unwanted encroachment.

4.9.7.2 Swimming

Swimming is available by beach access in Fairfax SRA, Paynetown SRA and Hardin Ridge. With the size and availability of the lake and the lack of similar swimming opportunities in the area, swimming is a very popular outdoor activity at Monroe Lake.

With multiple outlets available to participate in recreational swimming, including swimming from private boats and dead end roads that provide water access, it is difficult to measure its visitation. However, swimming has been identified as the fifth most "favorite" in the SCORP and its connection to Monroe Lake is undeniable. Further study should be conducted to discover swimming participation at Monroe Lake in order to test the beach carrying capacity at the project.

5.0
Resource Use
Objectives

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5.0 Resource Use Objectives

Resource considerations at Monroe Lake exist primarily to fulfill the USACE mission of flood control and low-flow augmentation within the Ohio River Basin. The natural resources under the control of the USACE for this purpose require resource stewardship and allow for recreational use. Recreational uses reflect user demands and funding. Multiple user types have interests in the project lands, recreational facilities and waters including water supply for the city of Bloomington. Such demands regularly create conflicts. The Corps is obligated to manage these resources for the overall interest of the public and not for a select group of individuals. It is the responsibility of the project and the agency to attempt to provide an environmentally sound balance of these demands. Impacts on the environment will be assessed during the decision-making process prior to any management plans or strategies. The following objectives are the priorities for consideration when determining management goals and development activities.

5.1 Resource Objective 1: Flood Control

5.1.1 Measures to Achieve Objective

- Retain all fee land flood rights for the Corps for operation and maintenance of the dam and appurtenant facilities
- Retain flowage rights for the Corps

5.1.2 Justification

- To provide flood control for downstream communities and agricultural interests

5.2 Resource Objective 2: Water Supply

5.2.1 Measures to Achieve Objective

- Supply water to the Bloomington Water Treatment Plant to provide a clean and abundant water supply for the city of Bloomington. The city of Bloomington currently draws 16-23 million gallons per day from Monroe Lake through an agreement between USACE and the State of Indiana
- Supply water to Eagle Pointe Golf Resort for recreation enhancement. Currently, Eagle Pointe may withdraw up to 85 million gallons annually.
- Supply water to Indianapolis Power & Light for cooling water at the downstream Petersburg generating plant at 325.9 million gallons per year. That amount is the limit and it has only occurred once in the past 25 years through a contract with the State of Indiana. This only occurs during droughts, if their water source is too low.
- Supply water to Salt Creek Services for rural distribution. Salt Creek Services may withdraw up to 9.125 million gallons annually.
- Although unlikely, the State of Indiana (under 312 IAC 6.3) can make a request to the Corps for additional water draws from Monroe Lake to anywhere else in the State to supplement municipalities that are deficient in their ability to provide reliable water supply. The Corps would have to agree to the request, making sure that it is in keeping with all of its resource use objectives, including consideration of its current agreements with various municipalities.

5.2.2 Justification

- Monroe Lake is the largest body of water in the State of Indiana.
- Monroe Lake is capable of providing water up to 130 million gallons per day to the State of Indiana or 47,450 million gallons annually.

5.3 Resource Objective 3: Provide Low Water Augmentation to Salt Creek Drainage Area

5.3.1 Measures to Achieve Objective

- Release water from the dam as necessary at a minimum of 50 cubic feet per second to the Salt Creek drainage area

5.3.2 Justification

- The Salt Creek drainage area provides habitat for plant and animal life and aids in flood control
- It helps to regulate floods in below-dam receiving waters
- Provides water for the cooling of Indianapolis Power & Light's Petersburg generating plant. Indianapolis Power & Light maintains a contract for an annual reservation of 1,000 acre feet to augment low flow in the White River.

5.4 Resource Objective 4: Provide Opportunities for Recreational Use of Land and Water

5.4.1 Measures to Achieve Objective

- Provide recreational facilities
- Provide for future recreational demands
- Lease areas to IDNR for the development, management and maintenance of recreational use areas
- Provide periodic studies to determine recreational demands and trends
- Identify safety hazards or unsafe conditions, correct infractions and implement safety standards in accordance with EM 385-1-1

5.4.2 Justification

- The original agreements and master plan called for selection of land required specifically for recreation
- The USACE and IDNR entered into an agreement before construction of the Monroe Lake dam and reservoir whereby IDNR provided partial funding for construction of the dam and was given the responsibility of developing and administering recreational facilities at Monroe Lake
- Under federal law, the land and water for reservoirs are public property and allow the opportunity for recreation

5.5 Resource Objective 5: Protect and Preserve Natural Resources and Habitats

5.5.1 Measures to Achieve Objective

- Comply with all pertinent environmental laws, regulations and policies
- Use best management practices to protect, preserve and enhance wildlife habitat
- Protect and preserve the existing shoreline from erosion and overuse through natural resource management and cooperation with adjacent landowners
- Integrate fish and wildlife management practices with other natural resource management practices, while working closely with the state, federal and local natural resource agencies
- Encourage non-consumptive use of project lands, including regulation of timber cutting
- Inform the public through programs and personal contacts about the project and resource management purposes and objectives
- Provide programs for environmental education

5.5.2 Justification

- Ensure quality natural resources are preserved for future generations
- Increase the value of all project lands and waters for recreation, fisheries and wildlife
- Continually provide habitat for viewing, fishing, and hunting
- Preserve bio-diversity and complete ecosystems

6.0
Land Allocation and Classification

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6.0 Land Allocation and Classification

The information presented in this chapter pertains to the current land allocation and land classification at the Monroe Lake project. This chapter will present the project's current land allocation, identify land classification throughout the project and current USACE easement lands located in and around the project area. Identifying the allocations of these lands as well as easement lands help project officials and decision-makers understand the current use, development and management of project lands. The land classification categories are established for all USACE projects based on Engineering Pamphlet (EP) 1130-2-550, Recreation Operations and Maintenance Policies and help guide decisions for future development.

6.1 Land Allocation

Land allocation is defined as the congressionally authorized purpose for which the lands were acquired (EP 1130-2-550). There are four land allocation categories applicable to USACE projects, including the following:

1. Operations
2. Recreation
3. Fish and wildlife
4. Mitigation

Monroe Lake lands are currently allocated for operations, recreation, and fish and wildlife purposes. The current location of recreation and wildlife management lands throughout the project were deemed compatible with the project purposes, and recreation and wildlife management uses do not interfere with project operations.

6.2 Land Classification

The land is further categorized into classifications to identify use and management of all project lands (see Figures 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8 and 6-9). Land classification categories as defined by EP 1130-2-550 are as follows:

1. Project operations
2. High density recreation
3. Multiple resource management
    a. Recreation–low-density
    b. Wildlife management
    c. Vegetative management
    d. Future high density recreation areas
    e. Future low density recreation areas
4. Environmental sensitive areas

6.2.1 Project Operations

Project operations (PO) are used to classify lands that are related to the dam, spillway, maintenance facilities, administrative facilities and any other land associated with project maintenance and operation. Project operations are the focus of these areas; however a limited amount of low density recreation could be accommodated. Picnicking, limited sightseeing and permitted special events would be allowed at a designated shelter and overlook. These limited recreational functions would result in the need for smaller capacity parking lots and restrooms. Boat ramps are acceptable functions, and would require vehicle and trailer parking, and rest rooms.

Lands classified as PO at Monroe Lake are located at the dam site, Fairfax SRA and Paynetown SRA. At the dam site, PO includes the area immediately surrounding the dam, the spillway and USACE administrative offices. These areas include an overlook, picnic shelter, playground, and flush toilets. Project Operations land in Fairfax SRA includes a maintenance compound with a water tower in the northern portion of the recreation area on both sides of Fairfax Road. Project Operations land at Paynetown SRA includes a maintenance compound west of the campground and the IDNR administrative offices northwest of the campground. No license, easements, permits or outgrants would be issued for uses that conflicts with project operational requirements. Mountain biking trails and off-highway vehicle use is prohibited. Project Operations accounts for 96 acres.

6.2.2 High-Density Recreation

High-density recreation (HDR) land includes areas that are developed for intensive recreational use for visitors to the project. This land use classification allows the greatest amount of land disturbance of all land use categories for this project. Examples of high-density recreation lands include day use areas, amphitheaters, campgrounds, beaches, cabins, quasi-public development, and commercial concessions such as marinas, restaurants, lodges, etc. High activity areas such as the Four Winds Resort include recreation activities complementary to a resort function, which includes a swimming pool, tennis courts, a marina, a restaurant and tennis courts. All recreational development would be planned and designed to accommodate large numbers of visitors. This would include boat ramps and large capacity vehicle parking lots for individual vehicles, large vehicles, and vehicles with trailers. Boat ramps in high-density recreation areas would accommodate multiple boat launches/recoveries simultaneously. Rest room facilities would be provided in proximity to the boat ramps and parking areas.

No uses that would negatively affect the ability of visitors to enjoy active recreational experiences at the lake should be permitted. Agricultural activities would not be permitted unless part of an interpretive program or to maintain viewsheds. Low-density recreational activities such as picnicking and hiking would be allowed and require rest rooms. Permits, leases or easements for man-made intrusions or facilities would be consistent with the expectations of visitors and the needs of concessionaire operators would be allowed. Mountain biking trails and off-highway vehicle use is prohibited.

HDR lands on Monroe Lake are located at Fairfax SRA, Moore's Creek SRA, Paynetown SRA and Cutright SRA. The southeast portion of the Fairfax peninsula, which is leased to Fourwinds Resort, is designated as HDR. The HDR at Moore's Creek SRA is the LMSA marina and the public boat launch. The campground at Paynetown SRA and the entirety of Cutright SRA are both designated as HDR. HDR lands account for 452 acres of the project, most of which is managed by IDNR.

6.2.3 Multiple Resource Management Lands

Multiple resource management lands allow for the designation of predominant use as described with the understanding that other compatible uses may also occur on these lands without impacting the predominant use. The compatible uses that may occur on multiple resource management lands are described below, but all sub-categories prohibit mountain biking and off-highway vehicles.

Low-Density Recreation (LDR). LDR are lands designated for passive public recreational use that require minimal development and infrastructure. Low density recreation is located at multiple locations throughout the project.

Agricultural and vegetative management activities would be permitted if they could be incorporated into interpretive programs, maintain viewsheds, and be used in management of wildlife. Low-density recreational activities such as boat ramps and docks, picnicking, primitive camping, fishing, wildlife viewing and hiking would be allowed. These low-density recreation areas would require rest rooms and parking lots with the capacity for vehicles with trailers.

Hunting and fishing are allowed when compatible with the stated wildlife management goals; adherence to Federal and State regulations and with strict control of visitors during hunting seasons. This is particularly important for LDR lands in proximity to HDR lands. Mountain biking trails and off-highway vehicle use is prohibited.

Most LDR lands at Monroe Lake are the relatively undeveloped lands in proximity to HDR lands that contain more intensive recreation activities and development. This interface between LDR and HDR occurs at Fairfax SRA, Moore's Creek SRA and Paynetown SRA. LDR is also located at Allen's Creek SRA and on much of the shore in the west end of the lake including the limited development lands surrounding the private group docks. Permits, leases or easements for man-made intrusions such as pipelines, powerlines and roads could be allowed as long as the affect to natural resources and visitor experience were mitigated. LDR accounts for 2,913 acres of project lands.

Wildlife Management. Wildlife management lands are designated for stewardship of fish and wildlife. These lands are characterized by valuable wildlife habitat that are managed to benefit certain game and non-game species or the natural community as a whole. Agricultural activities are permitted under strict oversight of the IDNR to improve habitat. Other management recommendations for wildlife management lands include: tree repression (to provide woodlands with a diversity of tree successions), food plot planting, parking area

construction, creation of new marshes, erecting waterfowl and songbird boxes, maintaining levees and water levels, monitoring eagle nests, constructing osprey platforms, allowing crop leases, and managing woodlands. Boat ramps are an acceptable improvement in the wildlife management areas (IDNR, 2010).

Similar to LDR lands, wildlife management allows for passive recreation activities including hiking on established trails, wildlife viewing, and the study of the natural world. Hunting and trapping are allowed when compatible with the stated wildlife management goals for that particular area and adhere to Federal and State regulations. Mountain biking trails and off-highway vehicle use is prohibited. Wildlife management accounts for 9,090 acres of project lands and is considered the second to least accessible of the Multiple Resource Management Lands- with only the vegetative management lands being more restrictive.

Vegetative Management. Vegetative management lands are designated for stewardship of forest, prairie and other native vegetative cover. Vegetation management areas are widely distributed at Monroe Lake. These areas are managed to promote the biodiversity of vegetative habitats and include a variety of habitat types. Active management of invasive plant species is also conducted at these areas. These areas also stabilize soils, minimizing erosion along the shoreline of the lake.

Vegetative Management lands include the North Fork of Salt Creek and in the southern inlet west of the Charles C. Deam Wilderness area. Vegetative management lands are also designated along the shoreline north of the dam to mitigate residential growth along the west side of the lake. This classification is designated around much of the shoreline to the flood pool elevation of 560.

The upper reaches of flooded lands in the vicinity of SR 46, Kent Road, and Belmont are also designated as vegetation management lands. These areas are farmland, which is a permitted activity that occasionally floods and contains food plots that are left standing at the end of the harvest to provide cover and food for wildlife. Each farmer is required under the terms of the lease agreement to leave ten percent of the grain crops and hay crops standing in the field as food and cover for wildlife. These scattered remnant crops can total as much as 100 acres for wildlife benefit. The types of crops include corn, soybeans, hay, and small grains. Other crops include buckwheat, sorghum, millet, sunflower, clover, alfalfa, oats, and rye. Crop fields that are not leased will be mowed and kept in open field vegetation. Woodlands are also managed in the vegetative management area for game and non-game animals in cooperative agreement with the USACE (IDNR, 2015).

Public access would be prohibited unless warranted by public interest. Mountain biking trails and off-highway vehicle use is prohibited. Vegetative management accounts for 1,793 acres of land. Vegetative management lands are the least accessible of the Multiple Resource Management Lands to protect the integrity of the resource.

Future Recreation Areas. These areas have site characteristics compatible with potential future recreational development. Future Recreation Areas (FRA) are divided into Future Low-Density Recreation and Future High-Density Recreation areas, based on resource analysis and are identified on the accompanying maps. These areas provide opportunities for future recreation pursuits when demand and funding can accommodate. Identifying these areas as Future LDR or Future HDR areas also allows for flexibility in determining the most appropriate activities as trends in recreation have changed over the years. Future recreation areas are located at Fairfax HDR, Allen's Creek, and Pine Grove.

Although future recreation at Fairfax HDR could include activities such as ropes courses, zip lines or other outdoor activities that could be constructed and operated with only minor effects to vegetation or wildlife. Mountain biking trails and off-highway vehicle use is prohibited.

Current recreation facilities at Allen's Creek include vehicle parking and a boat ramp. Future recreation at Allen's Creek could include wildlife management and LDR functions such as primitive camping, hiking and ongoing opportunities for hunting and fishing. Hunting and fishing are allowed when compatible with the stated wildlife management goals; adherence to Federal and State regulations and with strict control of visitors during hunting seasons. This is particularly important for LDR lands in proximity to HDR lands. Mountain biking trails and off-highway vehicle use is prohibited. Future recreation would add an additional 391 acres of outdoor activities to the project.

Much of the Pine Grove area has been identified as Future LDR. This area allows for picnicking and primitive camping. There is currently a boat ramp at the southern edge of the Pine Grove area.

6.2.4 Mitigation

Mitigation lands are those lands used to offset losses associated with development at the project. No mitigation lands exist on the project.

6.2.5 Environmentally Sensitive Areas

Environmentally sensitive areas (ESA) are lands in which aesthetic, ecological, cultural or scientific features have been identified and deemed sensitive to development and intense land use. Project management must ensure that the sensitive features in the ESAs are not adversely impacted. Typically, allowing no or limited use on ESAs is a standard procedure for protecting these lands. Preservation of these areas would be accomplished by strictly, or completely limiting public access and prohibiting agricultural activities. Buffering of ESAs may be necessary, the size of which depends on the ecology of the area. No licenses, leases, permits or easements for man-made intrusions in these areas would be permitted. Mountain biking trails and off-highway vehicle use is prohibited.

There are several different environmentally sensitive variables that make up ESAs around the project. Locations of significant animals, plants, and high quality natural communities have been identified and digitized by the Indiana Natural Heritage Data Center to set appropriate protection priorities in these areas, which include bald eagle nesting locations. There have been sightings of bald eagles throughout the project and the estimated location of their active and inactive nesting areas have been identified. Around each of these locations is a 660 foot buffer of undevelopable land. There are 15 such buffer zones located throughout the project, 12 of which are east of the SR 446 causeway. Other significant animal and plant sightings have been identified around the project, and these areas are presented in Figures 3-9 and 3-10. ESA lands account for 213 acres located intermittently throughout the project.

6.3 Easement Lands

Easement lands include all lands for which USACE holds an easement, but not fee title. Easements are acquired for specific purposes and do not hold the same rights or ownership to USACE as other lands. Planned use and management of easement lands will be in strict accordance with the terms and conditions of the easement acquired for the project. Easement lands are divided into three sub-categories; operations easement, flowage easement and conservation easement.

At the time of purchase, USACE obtained 11.85 acres of land through flowage easement and 1,014.00 acres of use permit in addition to the land obtained through fee. Flowage rights are maintained on land held by USFS, the State of Indiana, and several private owners and allow the Corps to flood when necessary.

There are no conservation or operational easements at Monroe Lake.

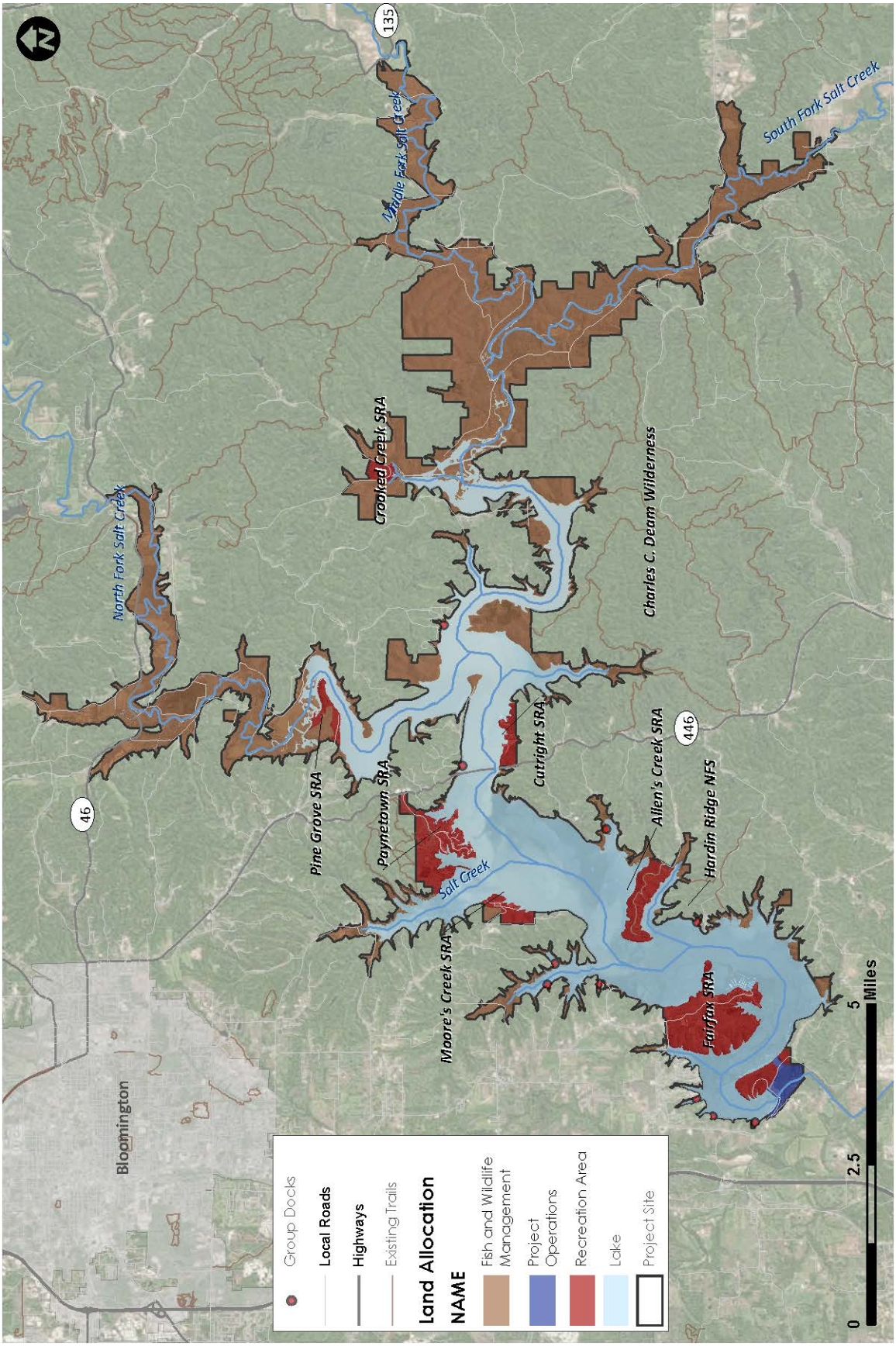

Figure 6-1 *Land Allocation. Sources: USACE, ESRI, IndianaMAP, IDNR, IGS, Indiana Natural Heritage Data Center*

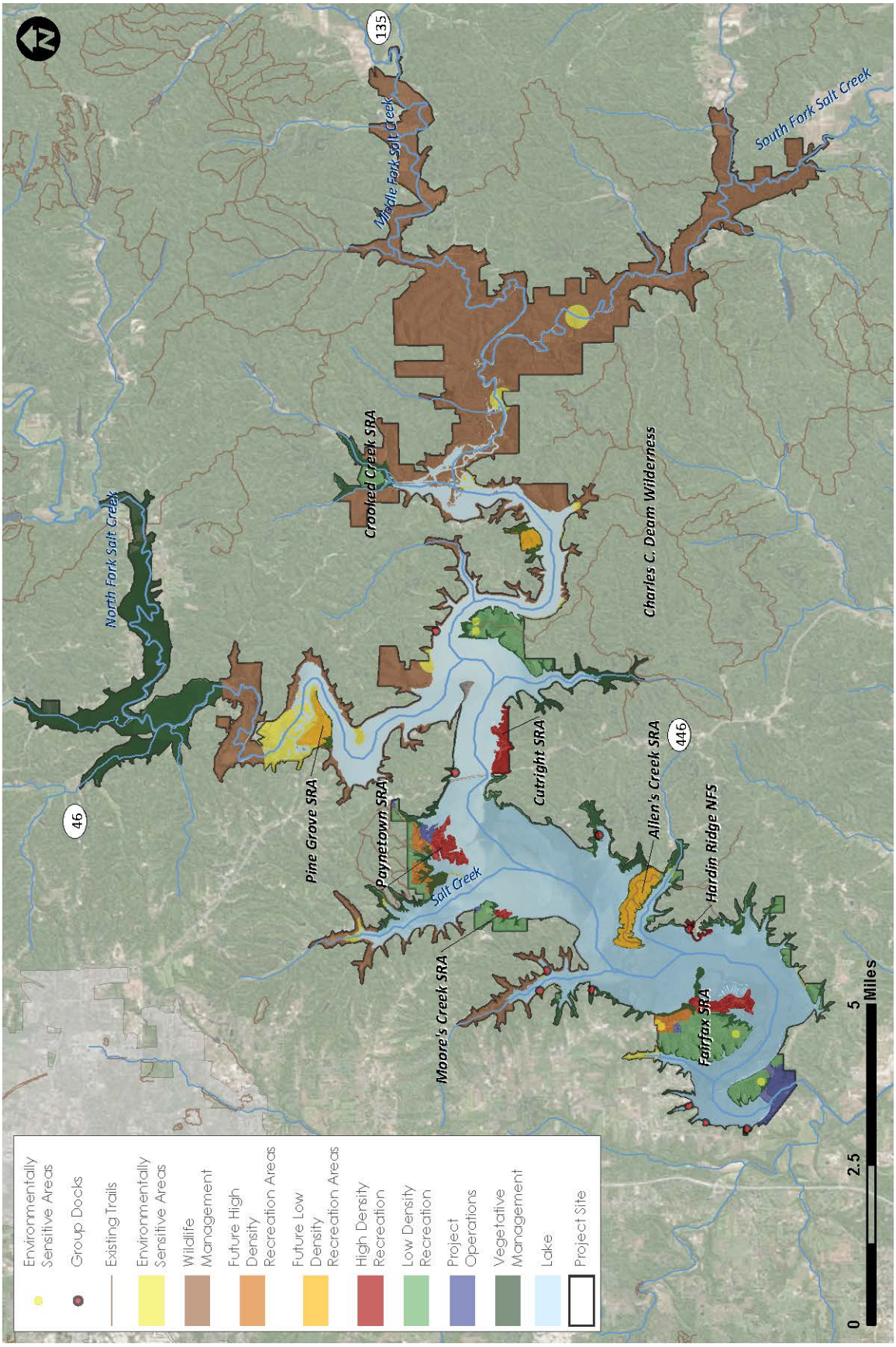

Figure 6-2 *Future Land Classification. Sources: USACE, ESRI, IndianaMAP, IDNR, IGS, Indiana Natural Heritage Data Center*

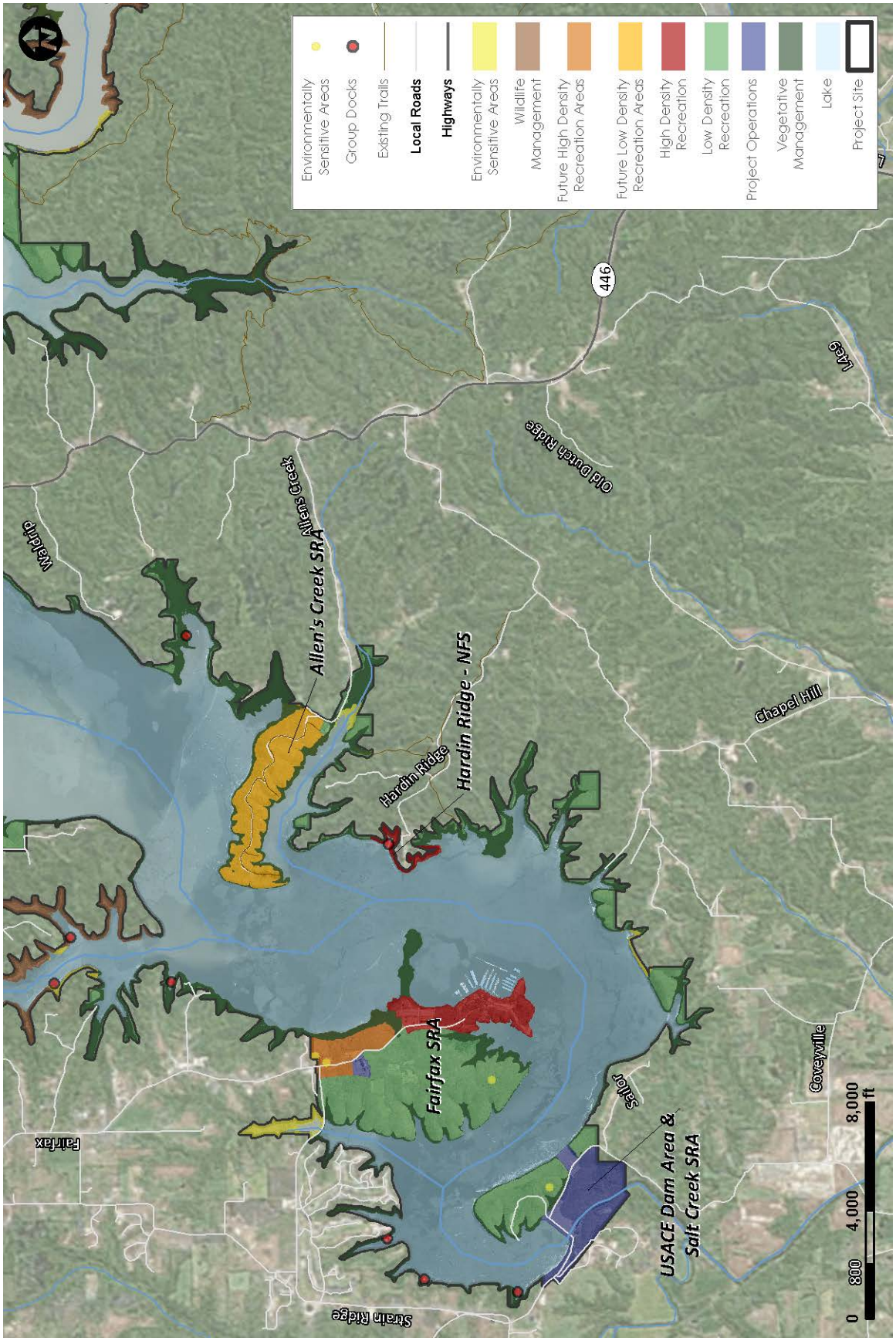

Figure 6-3 *Fairfax/Allen's Creek. Sources: USACE, ESRI, IndianaMAP, IDNR, IGS, Indiana Natural Heritage Data Center*

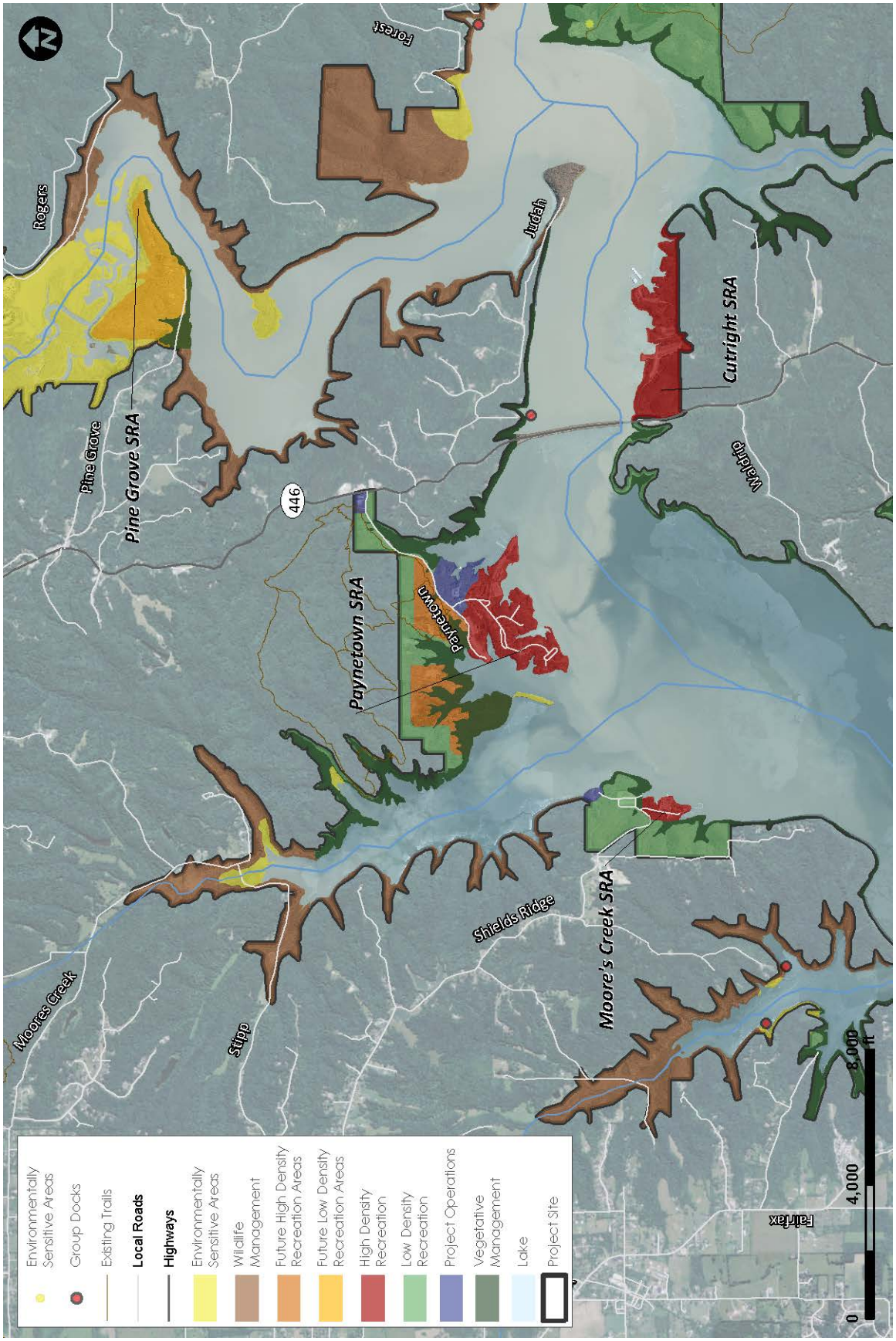

Figure 6-4 *Moore's Creek/Paynetown/Cutright. Sources: USACE, ESRI, IndianaMAP, IDNR, IGS, Indiana Natural Heritage Data Center*

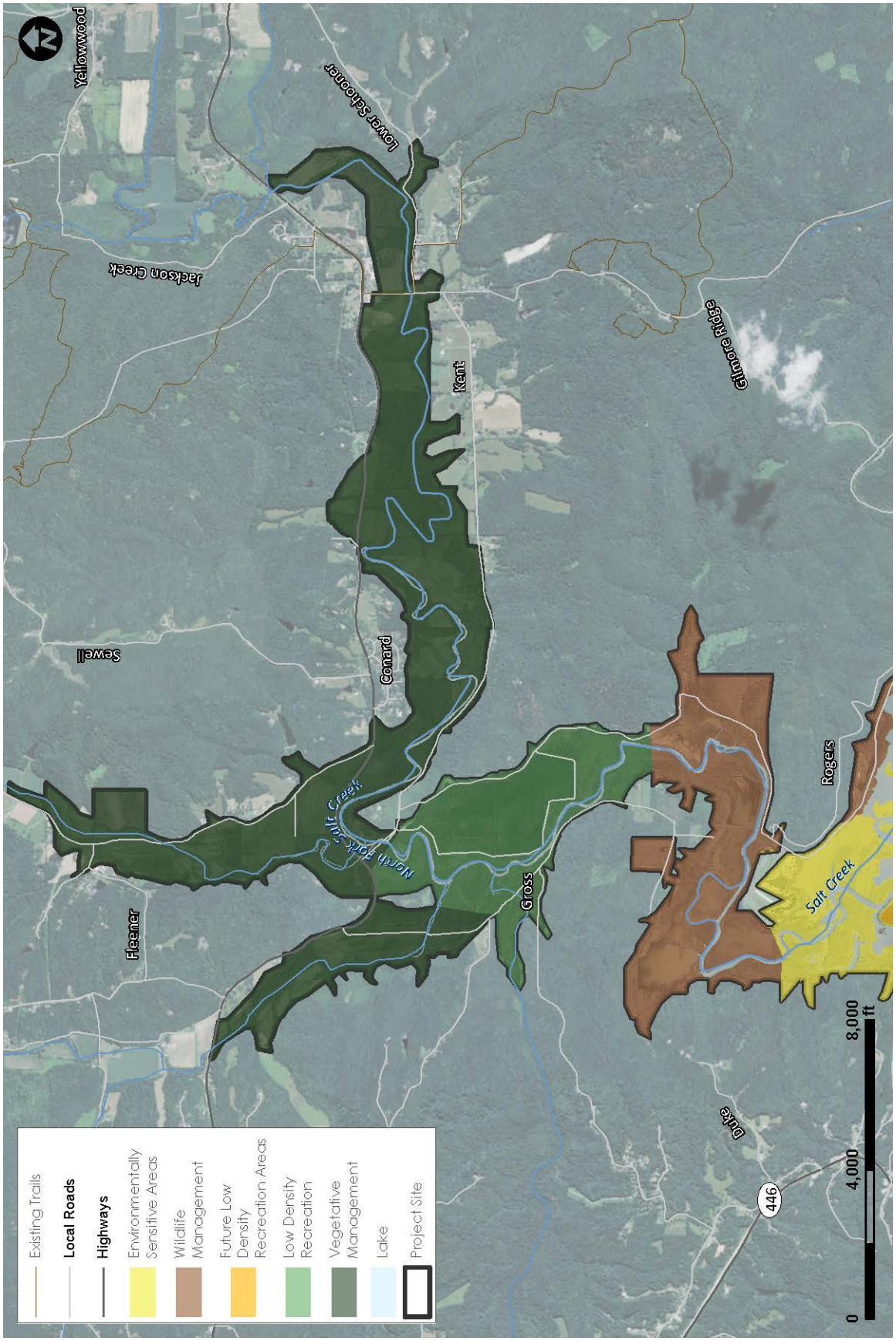

Figure 6-5 *North Fork of Salt Creek. Sources: USACE, ESRI, IndianaMAP, IDNR*

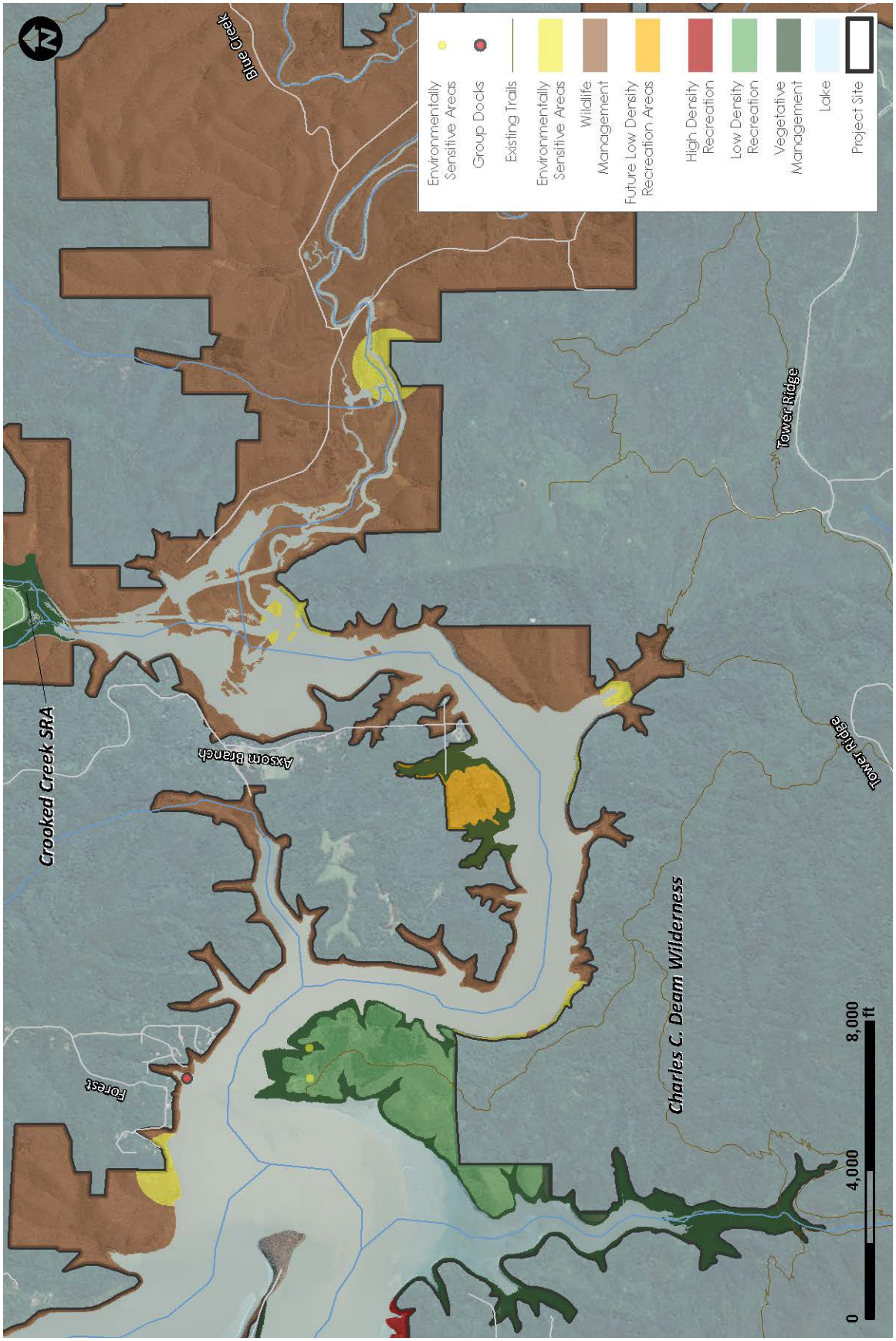

Figure 6-6 *Deam Wilderness Waterfowl Area. Sources: USACE, ESRI, IndianaMAP, IDNR, IGS, Indiana Natural Heritage Data Center*

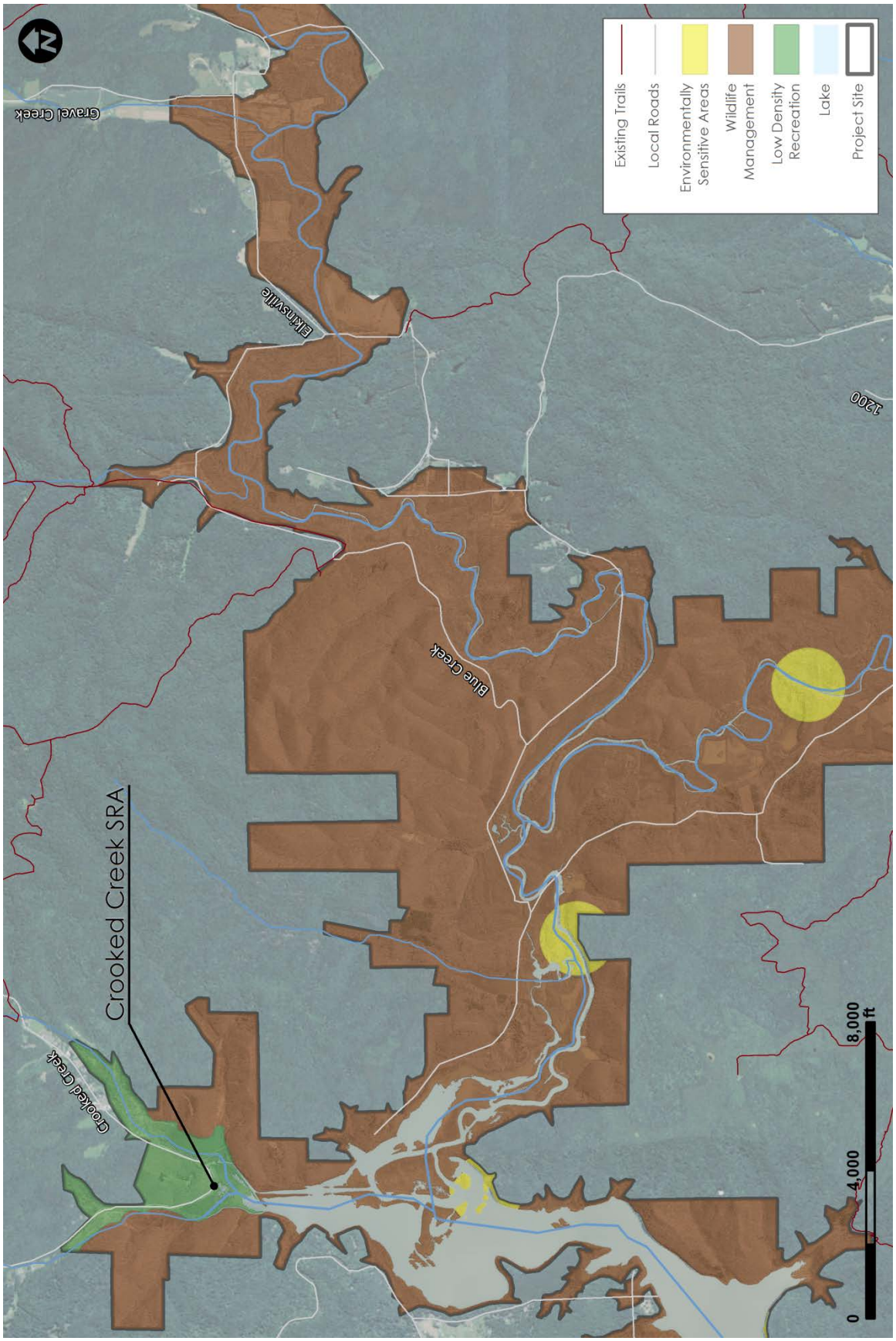

Figure 6-7 *South Fork of Salt Creek. Sources: USACE, ESRI, IndianaMAP, IDNR, Indiana Natural Heritage Data Center*

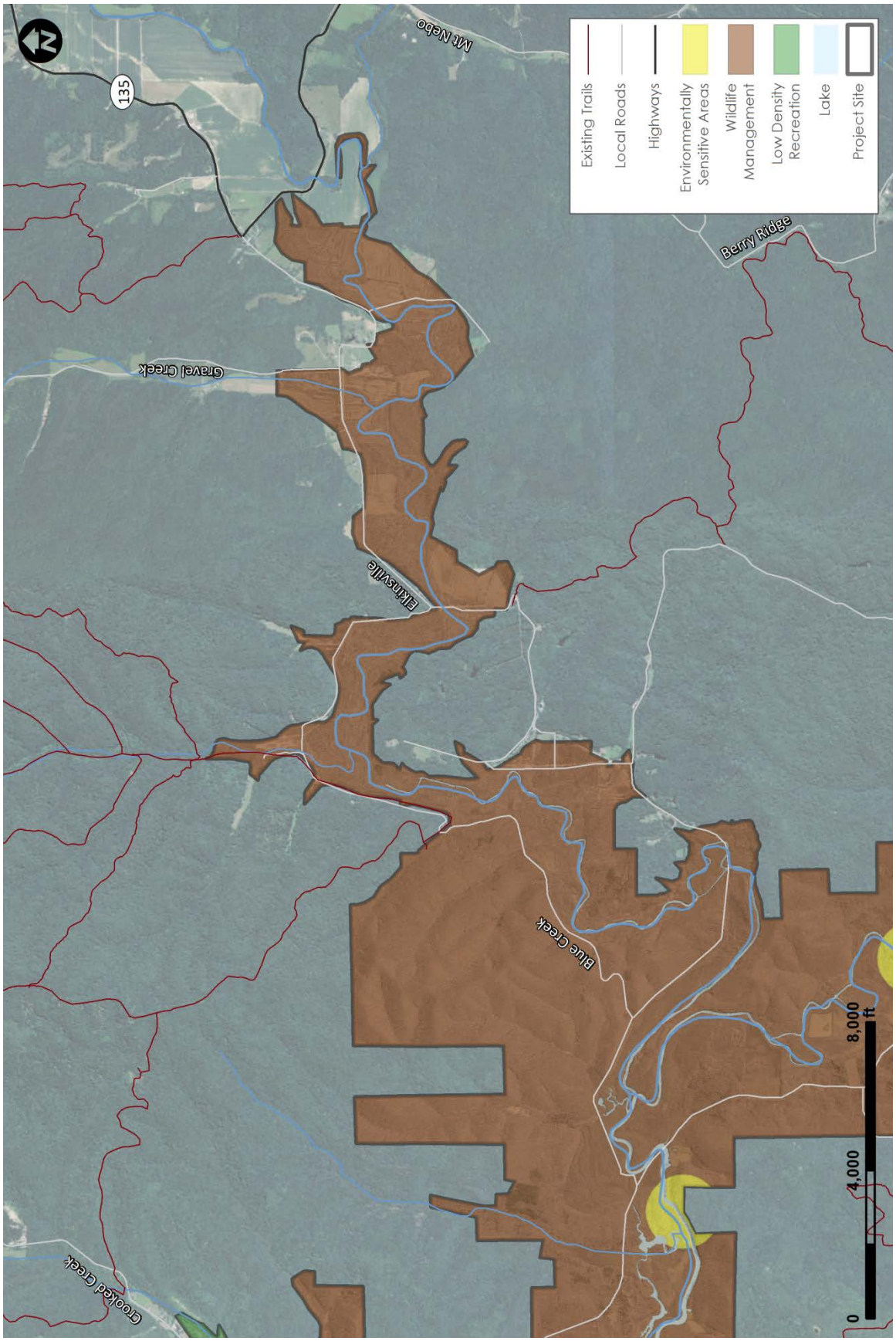

Figure 6-8 *Middle Fork of Salt Creek. Sources: USACE, ESRI, IndianaMAP, IDNR, Indiana Natural Heritage Data Center*

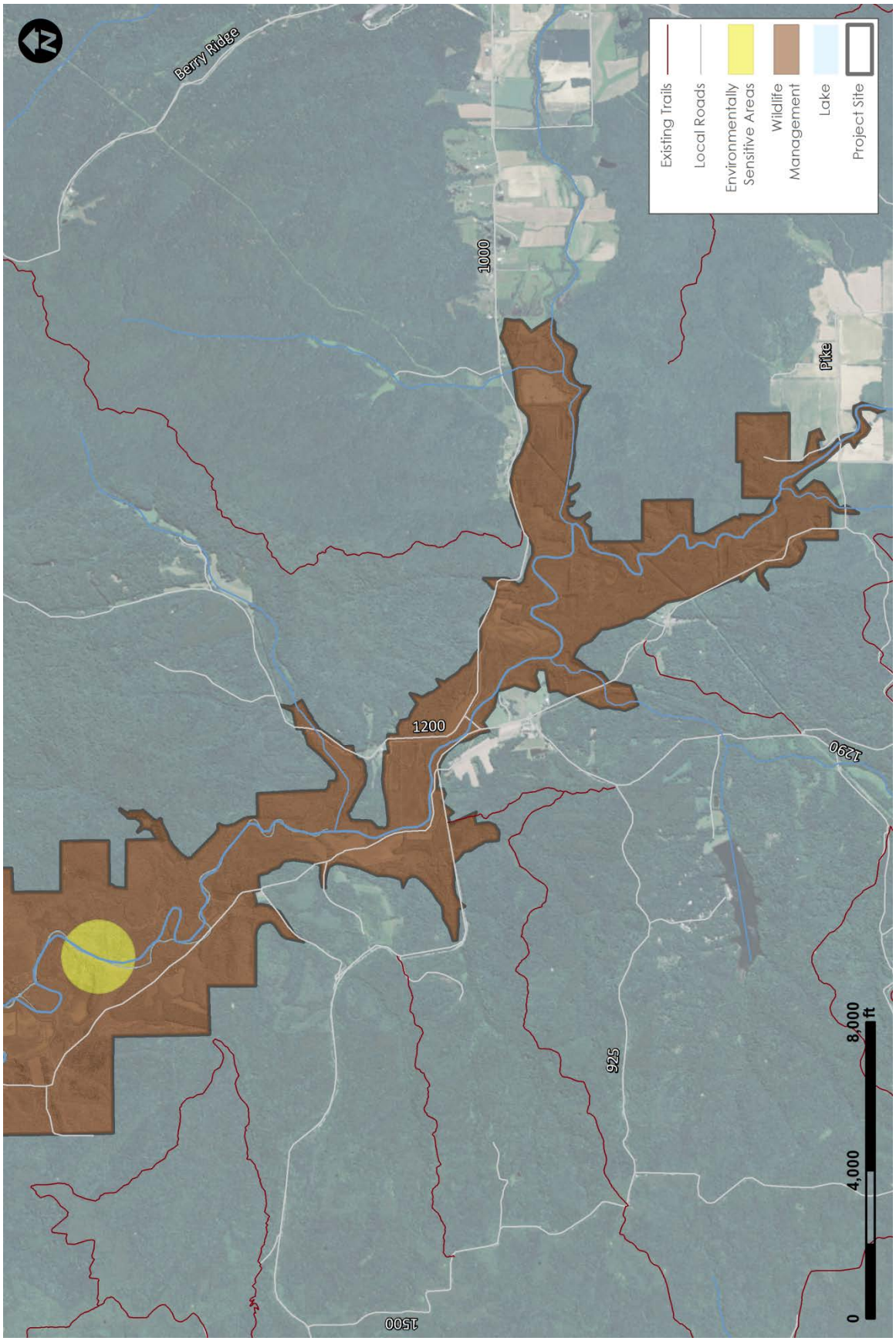

Figure 6-9 *South Fork of Salt Creek. Sources: USACE, ESRI, IndianaMAP, IDNR, Indiana Natural Heritage Data Center*

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7.0
Special Considerations

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7.0 Special Considerations

There are several important items to consider in this Master Plan update that make Monroe Lake a unique project. Stakeholders and decision-makers at the project should carefully consider these aspects when making land use and operational decisions. A major special consideration at Monroe Lake is the assortment of land management entities that own or lease land around the project. Another consideration will be the wide range of utility easements and leases necessary for uses on lands on and surrounding the project. Finally, this section will investigate the relevant aspects of planning and zoning documents from the project's three surrounding counties; Brown, Jackson and Monroe. While zoning regulations do not apply to Corps owned property, they do apply to privately owned property that has an impact on the project.

7.1 Land Management Entities

There are multiple managing entities located throughout the Monroe Lake project that have differing scopes and resource use. USACE has leased land out to IDNR, who has subsequently leased out land to four private concessionaires. There are two other land managing entities that are adjacent to Monroe Lake: The BSA and USFS.

7.1.1 Indiana Department of Natural Resources

As stated in Chapter 1, the USACE provides outgrants for numerous purposes. One of these outgrants is a lease of land from USACE to IDNR. This lease was issued in 1967 granting IDNR use and occupancy of 22,663 acres of land and water areas for recreational and fish and wildlife management uses. The lease was set to last 40 years, but has been amended and will extend to 2032. IDNR manages and operates Salt Creek SRA, Fairfax SRA, Allen's Creek SRA, Moore's Creek SRA, Paynetown SRA, Cutright SRA, Pinegrove SRA and Crooked Creek SRA.

The USACE and IDNR signed an MOU in 1990 on management of forest resources in the project that IDNR leases from the USACE. The intent of the MOU is for IDNR to manage forest resources in a manner that is integrated with overall natural resource management of lands leased to the State of Indiana and in accordance with the terms of the lease agreement. Planning efforts for forest resource management will be evaluated through the NEPA process.

The USACE and IDNR also signed an MOA in 1990 in order to provide guidance to the LRL COE and IDNR in performance of their respective obligations in managing COE properties outgranted to IDNR.

7.1.2 U.S. Forest Service

The USFS and USACE agreed to a MOU for the transfer of land ownership and management responsibility from USACE to USFS. This MOU, effective 1969, transferred 2,075 acres of land on the eastern shoreline of Monroe Lake to USFS with the understanding that USACE maintains the right to flood when necessary. The area, Hardin Ridge Recreation Area, is part of the Hoosier National Forest. The USFS manages land east of the SR 446 as wilderness. The Charles M. Deam Wilderness Area extends to the lake and USFS limits visitation to horse trails and camps, hiking trails, primitive camping and visitor contact at the Brooks Cabin. With the exception of Tower Ridge Road and certain USFS operational functions, motorized vehicles are prohibited. The USFS coordinates with IDNR/USACE on occasional projects including hiking trails.

7.1.3 Boy Scouts of America

The Crossroads of America Council of the Boy Scouts of America owns and manages 624 acres directly to the north of Allen's Creek SRA on the eastern shoreline of the lake. The Ransburg Scout Reservation includes 38 campsites, a dining hall, indoor swimming pool, and many opportunities for recreation and merit badge achievement. These opportunities include boating, shooting, archery and swimming. They have a license from the Corps to operate and maintain two beaches, a boat ramp, and swimming area within the project.

7.2 Infrastructure Considerations

There are several different land uses on and around the project area. The wide range of uses in the area require different types of infrastructure, not the least of which is transportation. Utilities are also necessary for many operations on and around the project. The following section outlines the transportation network and summarizes the leasing and easement information for utilities.

7.2.1 Transportation

There are several roadways present throughout the Monroe Lake project that allow community members and recreational visitors to travel through the project or travel between the recreation areas. The roadways range from major state highways to unpaved service roads.

The primary road through the project is SR 446. SR 446 is a north-south road through the project, bisecting the lake with a land bridge. Cutright SRA is at the south end of the bridge and Paynetown SRA is at the north end of the bridge. The bridge is grounded as a peninsula for most of its length, but there is a section that allows boats to travel under the bridge at idle speed. SR 446 continues north past Paynetown SRA and on to the eastern edge of Bloomington, before ending at its intersection with SR 46. This section of SR 446 is narrow and winding.

Two other major roadways providing access to the project are SR 37 and SR 46. SR 37 travels north-south along the western edge of Bloomington and down to the western edge of the Monroe Lake area. It provides access to numerous feeder roads which lead to several recreation areas including Fairfax SRA and the dam. SR 46 veers off from SR 37 in Bloomington and heads east through the northern edge of the Stillwater Marsh area and onward towards Nashville and Columbus, Indiana.

Other roadways in or around the project areas are low-level feeder streets used to connect the three major corridors to recreation areas, housing developments and other land uses. To the east of SR 446 are lands that are much less developed and includes the Deam Wilderness of Hoosier National Forest. Roads are relatively scarce in the upper and lower forks of the project. On the north side of the lake is Crooked Creek Road, which veers south off of SR 46 and meanders down to Crooked Creek SRA. T.C. Steele Road extends south from SR 46 at Belmont, provding access to the T.C. Steele State Historic Area and Crooked Creek SRA.

To the west of SR 446, roads are present at a higher density. This portion of the project is closer to the Bloomington metropolitan area and moderate residential growth. Most roads connect SR 37 and SR 446 with project recreation areas and other land uses around Monroe Lake. One important roadway, which the 2012 Monroe County Comprehensive Plan considers a major collector, is Fairfax Road. Fairfax Road travels north from the southern tip of Fairfax SRA until it reaches Walnut Street just south of the City of Bloomington.

SR 37 has been identified by the State of Indiana as a potential future corridor for the Interstate 69 extension. Although there are no planned interchanges in the Monroe Lake area, the Interstate 69 extension using SR 37 would likely increase traffic around the west side of Monroe Lake. Furthermore, the Bloomington/Monroe County Metropolitan Planning Commission's 2035 Long Range Transportation Plan recommends major upgrades to SR 46, including the portion of SR 46 that travels through the Monroe Lake area. While neither of these potential roadway improvements are going to affect the physical nature of the Monroe Lake area, both may have an effect on nearby vehicular traffic, which could affect visitation in the project area. There is no road that circumferences the lake, making travel between SRAs difficult.

7.2.2 Utility Corridors

Easements and licenses are issued for roads and driveways, pipelines, electric power lines, communication lines, water lines and sewer lines on project land. According to the USACE LRL Real Estate office, there are 102 total outgrants around Monroe Lake, including the recreation lease for IDNR's eight recreation areas and11 recreation licenses for private group docks scattered throughout the lake. The remaining outgrants are divided among licenses and easements for utilities of water, sewer, communication, electric, pipeline and roads.

As of January 2016, there are 83 utility easements and licenses. . Thirty-three easements are for roads or driveways, 16 for electric lines, eight for pipelines, nine for water lines, 15 communication lines, and two for sewer line.

7.3 Regional Plans and Zoning Ordinances

To further understand potential trends regarding land use and development around Monroe Lake, it is useful to analyze existing land use and planning documents from surrounding jurisdictions. The following section will summarize the comprehensive plans and zoning ordinances of Monroe Lake's three surrounding counties: Brown, Jackson and Monroe. The comprehensive plans identify the goals and vision of the counties while the zoning ordinance provides a glimpse of how each jurisdiction is implementing these goals, which can be informative for the master plan for the project. While these land use policies affect the watershed, they do not have regulatory authority over USACE land in the reservoir.

7.3.1 Regional Plans

7.3.1.1 Monroe County

The Monroe County Comprehensive Plan is a guiding document that establishes principles of sustainable land use policy for the future of the county and its jurisdictions. The plan was approved in 2012.

The plan deems environmental resources, and specifically water resources, to be important assets that must be considered when drafting and enforcing land use policy. Furthermore, the plan mentions the intrinsic value of Monroe Lake, both for its potable water (there are ten water suppliers in the county, nine of which draw from Monroe Lake) and as a recreational asset. The plan also mentions the importance to protect this resource by carefully considering how future development may affect the reservoir. The following quote exemplifies the county's sensitivity:

> *"With only 1.4 percent of the watershed containing development related property uses, the potential impact of future development in the area and the effect it could have on the health of the watershed is indefinite."*

The plan refers to the county Zoning Ordinance's environmental protection language in regard to Monroe Lake and other environmental assets. With recent development pressure on land surrounding the reservoir, the county developed an Environmental Constraints Overlay (ECO) in its zoning ordinance to ensure that development in Monroe Lake's watershed is environmentally conscious, especially in regard to erosion control. The ECO is summarized later in this section.

Furthermore, there are policy assumptions, policy statements, goals and objectives that recognize the environmental and economic development value of environmental protection and encourage the adoption of ordinance language that would achieve the basic goals of sustainable development.

Finally, the plan identifies three major land-use categories to be considered when planning for land use on vulnerable lands; undisturbed land, open space and private holdings. Monroe Lake and its surroundings are mainly classified as open space, which allows for limited development, but there are areas surrounding the reservoir that are unmanaged, private holdings. A summary of zoning around Monroe Lake is provided later in this section.

7.3.1.2 Jackson County

The Jackson County Comprehensive Plan was adopted in 2006 and aims to guide land-use policy decisions by Jackson County and its jurisdictions into the future. As the county's first comprehensive plan since 1968, this document lays out existing conditions; the county's vision, goals and objectives; and future land-use scenarios.

Protecting and enhancing water quality is mentioned numerous times throughout the document and flood damage management is a prominent goal. Objectives under this goal are related to site design regulation, but preserving natural lands is also mentioned as both a flood mitigating and water quality preserving tool. With much of the Monroe Lake area being forest land and within a flood plain, it can be deduced that protecting the area from unnecessary development is beneficial to the entire region.

Preserving natural resources is understood to be an economic development tool as well. The plan's first economic development related goal is to limit development that is distracting from natural features.
As a final goal related to Monroe Lake, Jackson County has stated its interest in increasing collaboration with non-profits and other parks and recreation entities with its Parks and Recreation Goal II: Objective A: "Work with local non-profits to establish a grant program for expansion and development of recreation facilities." This expresses the county's desire to expand its own park programs, which may affect Monroe Lake visitation demand in the future.

In Chapter 4: Land Use and Transportation, the county expresses concern about its rapidly aging population. To avoid high costs of elderly care, the plan states that it is important that the county encourages healthy lifestyles and provides opportunities for outdoor recreation, which may include increased access to Monroe Lake and Jackson County parks.

7.3.1.3 Brown County

To date, Brown County, Indiana, does not have a comprehensive plan.

7.3.2 Zoning Ordinances

7.3.2.1 Monroe County Zoning Ordinance

The Monroe County Zoning Ordinance was adopted in 2004 and is the development regulation document for all lands under the county's jurisdiction. Included in the ordinance are definitions and explanations for 18 land-use districts and five overlay zones. The following summary highlights the districts applicable to Monroe Lake and explains each pertinent zone's purpose, eventually relating the overall ordinance to Monroe Lake.

Zoning districts found in the Monroe Lake area are: Agriculture/Rural Reserve (AG/RR), Conservation Residential (CR), Estate Residential (ER), Suburban Residential (SR), Pre-Existing Business (PB), Institutional/Public (IP), and Planned Unit Development (PUD). AG/RR districts are lands that are primarily intended for agricultural uses and rural non-farm-related, single family uses. CR is specific to the Lake Griffy and Monroe Reservoir watersheds and provides for cluster and planned unit development in environmentally sound locations within these watersheds. ER districts provide for low-density, single-family uses located on relatively flat land with some public services. SR districts provide for low-density, single-family uses located in areas where public sewers are available or planned in the near future. PB is primarily intended to accommodate commercial and business services that were in operation prior to the adoption of the zoning ordinance. Finally, IP districts are areas owned and operated by local, state or federal governments. PUD also is an option around Monroe Lake and is used in one location around the lake.

There are numerous **overlay districts** in Monroe County's Zoning Ordinance, two of which have special pertinence to Monroe Lake. They are Special Flood Hazard Area overlay (SFHA) and ECO. SFHA are areas that are within the county's jurisdiction and subject to regulatory flood. Monroe Lake has an extensive flood plain, and many of its surrounding lands could be encompassed in this zone. ECO lands are specifically lands that are within the Monroe Reservoir and Lake Griffy watershed boundaries. ECO regulates development within this overlay and requires that all construction projects pay special attention to their environmental effect, specifically storm water runoff.

The Monroe County Zoning Ordinance recognizes the importance of forest and wetland preservation, specifically with regard to Monroe Lake. The CR District is a strong example of the efforts of the county to balance residential development and ecological conservation. By providing the option for cluster development or planned unit development, it is possible that this development could occur in an environmentally sensitive fashion. CR is located in a few areas in the northwest portion of the Monroe Lake area, but the most prevalent land uses are zoned AG/RR preserve on the southeast area and IP in the remaining southern lands. IP districts encompass all SRAs and U.S. Forest Service lands located along Monroe Lake.

There is a smattering of SR zoning on the west side of the lake and a few parcels on the east side located in Hoosier National Forest. ER areas are located just west of the dam, north of the dam, and northwest of Fairfax SRA. There are a few pockets of PB districts; one northwest of the dam for a boat storage establishment, one larger pocket for various businesses directly north of Fairfax SRA, and a few isolated parcels around Indiana Road 446 in the southeast portion of the project. Finally, PUD was used for the Eagle Point Golf Resort and the surrounding residential uses directly west of Fairfax SRA.

7.3.2.2 Jackson County Zoning Ordinance

The Jackson County Zoning Ordinance has 13 zoning districts, all developed with an overall goal similar to the Monroe County Zoning Ordinance: Preserve the county's natural and cultural assets while providing room for economic development and overall sustainable growth. In the northwest portion of the county, the portion of the county closest to Monroe Lake, there are three major zones, all related to open space and/or agriculture.

The applicable zones to Monroe Lake in Jackson County are Agricultural (A2), Floodplain (FP), and Forest Recreation (FR). A2 refers to lands that contain both agriculture uses and rolling and rugged terrain where little development is liable to occur in the near future. FP zones include areas that are within the floodplain of rivers and creeks and thus subject to inundation. FR is established to include land that is for the most part rough terrain and where there is extensive public ownership of lands.

The Jackson County Zoning Ordinance recognizes environmentally sensitive areas throughout its borders with the various floodplain districts as well as the Forest Recreation District. Although just a small portion of Monroe Lake extends into Jackson County, a significant amount of Hoosier National Forest is located within Jackson County,

which is an important recreational and ecological asset for the county, as recognized by the Forest Recreation District.

7.3.2.3 Brown County Zoning Ordinance

The Brown County Zoning Ordinance contains explanations and definitions for 10 zoning districts throughout the county. While not delineated on their zoning map, three different flood zones have been outlined in the ordinance. Given Monroe Lake's flood mitigating purpose, the flood zones have been listed with other zoning districts below.

The flood zones and applicable Monroe Lake districts are FP, Floodway (FW), Floodway Fringe (FF), Forest Reserve (FR), Lake Residence (LR), and Accommodation Business (AB). The three flood plain districts are designed to guide development that may occur in 100-year flood boundaries, FW and FF as delineated by the appropriate Federal Insurance Administration maps. The FR districts contain forest land that has "rough" terrain and extensive public ownership. LR delineates those lands around Monroe Lake and other lakes in Brown County that allow for low-density, single-family residential. AB districts are lands that provide for commercial uses to serve LR populations.

The Brown County zoning map is a visual representation of Brown County's commitment to preserving forestland—a vast majority of the county's acreage is zoned FR. The area immediately surrounding Brown County's portion of Monroe Lake, however, is zoned LR. While there is currently very little development around Monroe Lake in Brown County, it is implied that the county is willing to allow light development in the area. Similar to the Monroe County Zoning Ordinance, there are isolated pockets of business-oriented zoning around the lake. These zones are defined as AB. AB zoning is slightly different from Monroe County's Pre-existing Business district in that this zone was created specifically to cater to lakeside residents. It is clear that while recognizing the importance of the reservoir, Brown County sees the area surrounding it as buildable, despite much of its area situated in the floodplain zone.

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Monroe Lake, Ohio River Basin
Salt Creek, Indiana

US Army Corps of Engineers
Louisville District

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