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Department of
Agriculture

Forest Service

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Environmental Assessment

Area-Wide Non-Native Invasive Plant Species Eradication Project

Land Between the Lakes, National Recreation Area
Trigg & Lyon Counties, Kentucky and Stewart County, Tennessee

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Chapter I

Purpose and Need for Action

The Non-Native Invasive Plant Species (NNIPS) project area encompasses the entire Land Between the Lakes National Recreation Area (NRA). This includes all land allocation prescription areas described in the Land and Resource Management Plan, 2004 (LRMP). Proposed project activities will be located on the NRA in Kentucky and Tennessee in the following counties: Lyon, Trigg and Stewart.

The NRA will develop an annual operating plan in consultation with Tribes, SHPO, USFWS, implementation partners, and relevant State agencies, which will be published on the NRA website by the last day of the 1st quarter each fiscal year of implementation. The Annual Operating Plan will disclose site specific activities and projects planned for the year, accomplishments from the previous year, and will invite continued public and partner input and participation.

The authority given for this document is intended to streamline efficiency under the Fiscal Responsibility Act of 2023, compliance with recent Executive Order 14154 Unleashing American Energy, and Forest Health and Fuel Reduction supporting USDA Secretary's Memorandum 1078-006 (April 3, 2025) in response to EO 14225 Immediate Expansion of American Timber Production (36 CFR 220.7).

A. Background

The prevention and control of Non-Native Invasive Plant Species (NNIPS) is a critical stewardship responsibility of the Forest Service. The project area contains approximately 170,000 acres over which inventory and monitoring have shown significant presence and a wide variety of NNIPS on the NRA.

Executive Order #13751 signed on December 5, 2016, amends the February 3, 1999 Executive Order #13112 which established the National Invasive Species Council and the Invasive Species Advisory Committee. This order makes it the policy of the United States to prevent the introduction, establishment and spread of invasive species, as well as eradicate and control established populations of invasive species. Invasive species pose threats to prosperity, security, and quality of life. They have negative impacts on the environment and natural resources, agriculture and food production systems, water resources, human, animal and plant health, infrastructure, economy, energy, cultural resources and military readiness. Every year, invasive species cost the United States billions of dollars in economic losses and other damages. In addition, this order establishes the following federal agency duties:

- Prevent the introduction, establishment, and spread of invasive species.
- Detect and respond rapidly to eradicate or control populations of invasive species in a manner which is cost-effective and minimizes human, animal, plant, and environmental health risks.
- Monitor invasive species populations accurately and reliably.
- Provide for the restoration of native species, ecosystems, and other assets which have been impacted by invasive species.
- Conduct research on invasive species and develop and apply technologies to prevent their

introduction and provide for environmentally sound methods of eradication and control of invasive species.

- Promote public education and action on invasive species, their pathways, and ways to address them, with an emphasis on prevention, and early detection and rapid response.
- Assess and strengthen, as appropriate, policy and regulatory frameworks pertaining to the prevention, eradication, and control of invasive species and address regulatory gaps, inconsistencies, and conflicts.
- Coordinate with and complement similar efforts of States, territories, federally recognized American Indian tribes, Alaska Native Corporations, Native Hawaiians, local governments, nongovernmental organizations, and the private sector

In the United States alone, NNIPS are spreading throughout millions of acres per year. Across ownerships and jurisdictions on forests and grasslands, this spread is costing the United States tens of billions of dollars annually. Invasive plants threaten ecosystem function, water availability, economic stability, forest health, and public safety. Second only to direct habitat destruction, invasive species are the greatest threat to native biodiversity and alternative communities, nutrient cycling, hydrology, and natural fire.

The majority of NNIPS occur along roadsides, in recreation areas, along trails, at trailheads, and open areas such as wildlife openings, utility corridors, and planted loblolly pine stands but can occur anywhere across the landscape posing a serious threat to native ecosystems, recreation opportunities, and sustainable forest management. NNIPS species degrade wildlife habitats and ecosystems primarily by displacing native species resulting in a reduction in biodiversity and species richness. Once established on a new site, NNIPS typically build carbohydrate and/or seed reserves very quickly and the rate of spread often increases over time making their control more difficult. These disruptions within an ecosystem can often have many other direct/indirect consequences, including an altered fire regime, decreases in water and nutrient availability, and significant declines in species diversity.

The NRA is at risk for the additional spread and colonization of NNIPS. This risk is increased by management activities (any activity which disturbs the soil) currently being implemented throughout the NRA and natural events such as the 2021 tornados. These types of disturbances encourage the spread of NNIPS. This proposal will give the NRA the ability to address this issue. A partial list of the most common NNIPS known to occur across the NRA include:

- Loblolly Pine
- Tree of heaven
- Kudzu
- sericea lespedeza
- autumn/Russian olive
- privet

B. The Purpose of this Project is to:

The purpose of this project is to remove/control NNIPS so native species can continue playing their natural role in the ecosystem without competition from aggressive and harmful non-native plant species.

This document decision will work concurrently with all other NNIPS treatment decisions on the NRA in order to build upon any proposed treatment options in the future. The intent is to make clear, and provide transparency to all stakeholders, and partner entities as to exactly what is allowed on the NRA, and precisely what activities are underway and/or planned at any point in time. The clarity and transparency will occur during the publication of the annual work plans which will detail specific locations and actions proposed.

C. Need:

Currently, NNIPS species are pervasive and spreading across the NRA. Species of serious concern include, loblolly pine (Pinus taeda), sericea lespedeza (Lespedeza cuneata), autumn/Russian olive (Elaeagnus umbellate/Elaeagnus angustifolia), and kudzu (Pueraria montana), because they are highly aggressive, and are currently overtaking areas which have had disturbances. Once established, NNIPS start becoming less dependent on disturbances and begin overtaking native species through various growth strategies. NNIPS have been documented to have little to no value for native wildlife, forest health, and are threatening the natural environment and heritage of the region.

D. Proposed Action:

This proposal is to remove/control all non-culturally important NNIPS from the NRA. In order to accomplish this goal, we propose to use commercial timber sales, timber cut and leave, mechanical disking, mechanical mastication, prescribed fire, approved pesticide applications, and grazing/browsing with domestic animal herds where feasible. These different treatments may be combined where and when it is effective and efficient to do so. This proposal would include the entire acreage of the NRA; including all land allocation prescription areas and any areas where use is permitted to other agencies, entities, and/or individuals. The NNIPS plant species list found in the Land and Resource Management plan (2004) (and accompanying documents) will serve as the master list for targeted NNIPS plants.

Design Criteria:

- This decision does not, and will not be modified to, apply to native plants, trees, shrubs, vines, or ecotypes. Only incidental impacts to native species, such as those needed to facilitate treatments and/or access are allowed.
- This decision does apply to NNIPS plants which are not currently known to occur on the NRA, but which may be found in the future once identified as NNIPS by the States of Kentucky and/or Tennessee.
- Pesticides/herbicides will be applied at minimum effective rates using minimum effective methodologies such as foliar spray, stump spray, cut stem spray, wick daubing, etc.
- Pesticide application will be in keeping with manufacturers label recommendations only.
- All legal compliance (USFWS, Tribes and SHPO) will be phased.
- All impacts to Threatened and Endangered species will be mitigated prior to treatment to ensure no impacts.
- All impacts to cultural, heritage, and archeological sites will be mitigated prior to treatment to ensure no impacts.
- If NNIPS removal or treatment has potential to cause or worsen erosion in a specific area, project specific plans will be developed to mitigate erosion potential to ensure no impacts.

- If NNIPS removal or treatment has potential to cause negative impacts to cultural uses of a specific area, project specific plans will be developed in consultation with potentially effected individuals or groups to mitigate potential impacts.
- If NNIPS removal or treatment areas require revegetation after treatment, only annual species such as annual rye are allowed for stabilization and only native grass, shrub and tree species are allowed for permanent revegetation.
- Public notice will occur during each annual operating plan phase.
- No new, permanent road construction is allowed.
- No culturally important non-native plants such as daffodils and other legacy, homesite ornamental plants and shrubs, or fruit trees will be removed or treated under this decision.
- No more than five miles of temporary, mechanical fire line (dozer line) will be constructed each year.
- Immediately following the signed decision, the NRA will develop an annual operating plan in consultation with Tribes, SHPO, USFWS, implementation partners, and relevant State agencies, which will be published on the NRA website by the last day of the 1st quarter each fiscal year of implementation. The Annual Operating Plan will disclose specific activities and projects planned for the year, accomplishments from the previous year, and will invite continued public and partner input and participation.
- This decision will be considered relevant until conditions change sufficiently to require a review and assessment of changed conditions.

Chapter II

Alternatives

Alternative 1 (No Action) Is the existing condition and ongoing actions from previous decisions. The result will likely be the continued spread of NNIPS species and displacement of native species.

Alternative 2 (Proposed Action)

The following descriptions and tables display potential activities and treatments in detail.

Non-Native Invasive Plant Species (NNIPS) Control: Selected herbicide(s), mechanical treatment method(s), non-mechanical treatments method(s), and livestock grazing would be used to control identified NNIPS wherever they occur. Potential treatments could also be a combination of multiple methods.

Table 1 Treatment Methods

Method	Treatment Type	Location
Herbicides	Direct foliar, basal spray, stem injection, cut surface	NRA wide as needed on NNIPS
Mechanical	Commercial Harvesting	Loblolly Pine Stands

Mechanical	Mastication	Open lands/loblolly pine stands
Mechanical	Disking	Open-lands, openings
Non-Mechanical	Prescribed Fire	NRA wide as needed on NNIPS
Non-Mechanical	Cut and Leave stand improvement	Loblolly pine stands/ patches of loblolly pine, individual trees
Non-Mechanical	Livestock grazing	Kudzu patches

A) The following types of herbicide treatment methods are proposed but not limited to:

1) **Direct Foliar Spray:** The selected herbicide is generally applied using a portable backpack sprayer or mobile pump sprayer with hand-controlled wand(s). The herbicide is aimed at the target plant's foliage and is sprayed until the plant's foliage is covered to the point of runoff. Direct herbicide application may also be spray and the target infestation forms a monoculture along a roadside, wildlife opening, or similar area and has essentially displaced native plant communities. This type of treatment would also be used along Forest Service and county roads both paved and unpaved to control roadside vegetation. Impacts to non-target vegetation from mounted spray equipment applications would be similar to those of backpack or hand-directed foliar sprays.

2) **Basal Spray:** The selected vegetable oil-based herbicide mixture is sprayed or daubed onto the lower portion of woody stems of trees or shrubs. Herbicides are applied using a backpack sprayer or a wick application and are effective in controlling woody stems up to 6 inches in diameter.
3) **Stem Injection (including hack and squirt):** The selected herbicide is applied into downward incision cuts spaced around woody stems made by an ax, hatchet, machete, brush ax or tree injector. Injection is a selective method of controlling trees and shrubs, which are typically greater than two inches in diameter.
4) **Cut Surface:** The selected herbicide is applied to the outer circumference of freshly cut stumps or the entire top surface of cut stems. Cutting the woody stems is usually accomplished by chainsaw or brush saw but may be accomplished by handsaws or other handheld cutting equipment. Herbicide is applied with a backpack sprayer, spray bottle, wick applicator or paintbrush.

*Herbicide treatments could occur anywhere on the forest where needed.

B) Commercial Harvest

Will occur only in non-native loblolly pine stands or hardwood pine mix stands. Harvest will be of merchantable loblolly pine and very little hardwood species will be harvested.

C) Mastication

Mechanical mastication could occur in commercially harvested loblolly pine stands to help eliminate any loblolly regeneration. The use of mastication may also occur in loblolly stands which have previously been harvested and have regenerated into stands of non-commercial timber. Mastication

may also occur in open lands to control NNIPS.

D) Mechanical Disking

Mechanical disking will occur in existing open-lands and openings created by loblolly pine removal. This treatment method will be used to regenerate areas in native desirable species.

E) Cut and Leave

This treatment will include the cutting and leaving of non-native loblolly pine. It could also be used to treat other NNIPS such as tree of heaven and princess tree

F) Prescribed Fire

Prescribed fire may be used in broader areas known to have NNIPS or disturbed areas which will increase the likelihood of NNIPS presence. Prescribed fire will also be used in loblolly pine stands to help control/eliminate regeneration of seedlings.

G) Livestock Grazing

The use of livestock grazing could be used in areas where the NRA has large patches of Kudzu or other NNIPS.

All of the above-mentioned treatment methods to NNIPS may be used in the same areas and may be used multiple times for the foreseeable future in order to accomplish the control/eradication of NNIPS.

Recommended controls are provided by the following two sources:

Invasive Plant Responses to Silvicultural Practices in the South - Evans, Moorhead Bargeron and Douce; *December 2006*

Invasive Plants in Southern Forests – Miller, Chambliss and Loewenstien; *July 2010*

Note: Treatment of areas of total NNIPS infestation may need to be revegetated, in this case native tree species and native species benefiting pollinators will be used. This may include, but not limited to, disking to expose mineral soil, the use of cover crops to aid in vegetation establishment, and auger planting of hardwood seedlings. In addition, multiple treatments may be needed to control/eliminate NNIPS. These treatments are included as part of the PA for this project.

As new NNIPS are discovered, they will be treated using appropriate methods, following application rates on herbicide labels. Application rates will be in accordance with manufacture's label**.**

The following list shows Pesticides which have had a Risk Assessment completed and could be used to combat NNIPS. This list is subject to change as new risk assessments are completed. https://www.fs.usda.gov/science-technology/forest-health-protection/integrated-pest-management/pesticide-use-risk-assessments-and-worksheets

Alternatives to the Proposed Action Alternative

1: No Action

This alternative would not implement any part of the Proposed Action, and ongoing National Forest permitted and approved activities would continue.

Past, Present, and Reasonably Foreseeable Future Actions

Within the project area there are past, present and reasonably foreseeable treatments which are **NOT** part of the Proposed Action **or** alternatives to the Proposed Action but have occurred or are expected to occur within the foreseeable future.

Due to the project area being located across the entire NRA, each future specific project area may have different past, present and reasonably foreseeable future projects. For the purpose of the analysis, each specialist will disclose what was used to define the past, present and reasonably foreseeable future actions in the "existing conditions" portion during the annual operating plan development.

Protective Measures

In order to protect the environment and lessen possible negative impacts, the measures contained in the LRMP and management area standards for the NRA would be applied to the PA and are incorporated in this EA. Best Management Practices (BMP) Guidelines for Kentucky and Tennessee would also apply as standard protective measures for all proposed actions. All label guidelines will be followed when using herbicides,

Design Features

A project's design features encompass the key elements which define a project's structure, goals, and execution plan. These features include defining the project's scope, setting clear objectives and goals, outlining tasks and timelines, identifying necessary resources, and assessing potential risks.

Monitoring

1) In order to determine how well treatments are achieving the desired future conditions, baseline monitoring would be established prior to or concurrent with treatments to evaluate selected habitat. This would include species likely to benefit from treatments as well as those which may receive impacts. Invasive species would also be monitored in order to evaluate their response to treatments.
2) When herbicides are used, monitoring to ensure label instructions are being followed would be conducted as part of the "on the ground" contract administration.
3) A review of all known occurrences of proposed, endangered, threatened or sensitive species (TES) has been conducted. If any new proposed, threatened or endangered species are discovered, the activity will be halted and the Area Biologist will be contacted to determine what, if any, consultation with the US Fish and Wildlife Service is needed, and what specific measures to implement to avoid any adverse effects.

Chapter III

Environmental Effects

Soil/Water Quality

Affected Environment

The NRA contains very little interior wetland habitat, as most high-quality wetlands were inundated when the rivers were impounded to form Kentucky Lake and Lake Barkley. Wetland habitats are identified on the National Wetlands Inventory (NWI) mapping system, a project of the U.S. Fish and Wildlife Service. Constructed wetlands are managed principally using moist-soil techniques. Existing developed wetlands are at Bear Creek, Long Creek, and Prior Creek. These provide resting and feeding habitat for shorebirds and migrating waterfowl. In addition to constructed wetlands, beaver ponds provide habitat for waterfowl, shorebirds, and other wildlife.

The NRA is divided into numerous watersheds draining east and west into the two lakes. While most watersheds are in good condition, those occurring in or around Turkey Bay/Turner Hollow, Crooked Creek, and Lick Creek are considered at risk, based on the 2003 Roads Analysis and Modeling in the accompanying EIS.

The NRA contains numerous small, rather uniform, stream drainages. There are only 11 perennial streams. Most drainage catchments are too small to retain enough water to maintain year-round flow. Because most are intermittent, they offer little opportunity for recreation and do not support sport fisheries. The channels are down cut from original base elevation, and head cuts are prevalent along the stream profile. Substrates are comprised of gravel and cobbles. Large quantities of bedload move after rainfall events and accumulate behind logs, outside channel bars, and at stream crossings. The NRA has many springs and seeps present; however, most appear to be seasonal. Five constructed interior lakes exist on the NRA: Energy Lake, Bards Lake, Honker Lake, Hematite Lake, and Duncan Lake.

Soils derived from parent materials (limestone or Cretaceous gravels) are low in nutrients over much of the NRA. These soils are not favorable to cultivation or intense cultural activity because of rough topography and low site quality. Bottomland soils, composed of fluvial sediments, are relatively more favorable for cultivation and pasture but subject to flooding. Wind-deposited loess, derived from wide flood plains of the Ohio and

Mississippi rivers covers many of the slopes.

There are differences in soil types between Kentucky and Tennessee counties, in part because loess and coastal plain gravels are generally absent in Stewart County. Limestone outcrops are more common in the southern half of the NRA resulting in thinner, rockier soils. Overall, about half of the soils are classified as erodible.

Watersheds in the United States are divided into progressively smaller units known as hydrologic units, recognized by the U.S. Geological Survey (USGS) as regions, sub-regions, basin, and subbasin units. This hierarchical division of watershed boundaries is useful for assigning address-like codes to drainage basins. This project area falls within the Lower Ohio region (0514) and the Lower Tennessee (0604), and the Lower Cumberland (0513) sub-regions (U.S. Geological Survey, 2003).

The project area and the sub-basin analysis area support streams and rivers which have dendritic drainage patterns. Dendritic drainage patterns are typically underlain by homogeneous geologic layers having similar resistance to weathering. This drainage pattern is effective at draining large areas of land into incrementally larger streams. All streams in the project area eventually drain into either the Tennessee River or Cumberland River.

The project area geology consists of a variety of Quaternary and Tertiary, Tertiary and Cretaceous, Cretaceous and Mississippian age sedimentary rock formations (McFarland, 2004). These are primarily sandstones and limestones which are not particularly good aquifers. Therefore, the base flow contributions necessary to maintain perennial streams are highly variable and associated with seasonal climatic variation.

Within the 6th level watershed analysis area, 100% of the combined watersheds is administered by the Forest Service. Approximately 80% of the analysis area is forested. The balance of the watershed land uses is mainly open lands and developed recreation areas.

The proposed project encompasses all of Land Between the Lakes National Recreation Area occurs within the Level III Interior Plateau ecoregion and Level IV Western Highland Rim ecoregion as identified by the Environmental Protection Agency (EPA) as a revision of work produced by Omernick (1987). These are the same ecoregion divisions recognized by the state for use in defining water quality standards which are regulated by the Kentucky and Tennessee Divisions of Water.

Karst features are known to exist in some areas of the central and southern portions of the project area. No restrictions for the use of chemicals occur within the Land and Resource Management Plan, however, during the detailed analysis of annual work plans, the use of chemicals will be reviewed based on the chemical chosen.

Environmental Effects

Alternative 1: No Action
A possible direct effect currently occurring which would continue from this alternative would be slightly higher sediment load in ditches due to more brush hogging and tractor use in areas adjacent to roads. The current trends and conditions are expected to continue with NNIPS being treated only under location-specific EAs. Roads and right-of-way areas would continue to be mowed for visibility and infrastructure maintenance purposes. Any indirect effects of not treating NNIPS and the use of mowing practices would continue to result from the existing conditions of

the project area.

Alternative 2: Proposed Action (PA)
Herbicide use in this alternative would be applied through multiple methods. Examples include direct injection, cut surface or foliar spray, however other methods may be used. Any herbicide use will follow the manufacturer's label for use. This will include frequency of application, mix rates, and volume applied. Other methods include effects from mechanical removal, timber sales, prescribed fire, or livestock. Forest-wide standards for the above listed control methods would be followed as well as appropriate Best Management Practices (BMPs) designed to limit risk to water quality.

Herbicide applications to control competing vegetation do not disturb the nutrient rich topsoil layer, do not create additional bare soil, and do not adversely affect watershed condition when used responsibly (Neary and Michael, 1996). Maxwell and Neary (1991) concluded in a review, impacts of vegetation management techniques on erosion and sedimentation of water resources increase in this order – herbicides, fire, and then mechanical. They also concluded sediment losses during inter-rotation vegetation management could be sharply reduced by using herbicides and moderate burning instead of mechanical methods and heavy burning.

Herbicide use in forestry is only a fraction of agricultural usage and poses a low pollution risk to groundwater because of its use pattern. The greatest potential hazard to groundwater comes from stored concentrates, not operational application of diluted mixtures (Neary and Michael, 1996). Surface unconfined aquifers in the immediate vicinity of herbicide application zones have the most potential for contamination. It is these aquifers which are directly exposed to leaching residues from the root zone. The only known groundwater contamination incidents of any importance (contamination of bedrock aquifers, persisting more than six months, concentrations in excess of the water quality standard, etc.) in the southeastern United States, where higher amounts of forestry herbicides are used, involved extremely high rates of application, or spills of concentrates. In these situations, herbicide residue was detected in ground water four to five years after the contamination. These situations are definitely not typical of the operational use of forestry herbicides. Proper handling precautions during herbicide transport, storage, mixing/loading, and clean-up are extremely important for preventing groundwater contamination (Neary and Michael, 1996).

The NRA will utilize standards for herbicide application which require buffers between treated vegetation and waterbodies, as well as standards to ensure drift and direct application to waterbodies do not occur. Herbicides specifically produced for use in aquatic applications would be used in streamside management zones which occur near riparian areas. This proposal includes the use of BMP practices to ensure environmental quality is maintained.

The direct and indirect impacts from future project sites are not expected to contribute to the degradation of current water quality. Implementation of the activities associated with this proposal will be determined in site specific analysis which will occur during the development of the annual work plans. It is anticipated the results in some of the above-mentioned effects should be minimal and short lived. With the application of the Kentucky and Tennessee Divisions of Forestry and Water Best Management Practices for Water Quality Protection, current Forest Plan standards, and any other mitigation measures noted in this EA, the activities of this proposal should not result in notable effects on water resources.

Cumulative effects include effects from a combination of the use of herbicides for control of

NNIPS and use on roads, trails, and infrastructure, mechanical, timber sales, or livestock, along with other projects being conducted both within and outside the Forests. Any increase in sediment production is expected to be minimal and temporary. Evaluation of the alternative has resulted in a determination in which they all pose little risk to water resources and their designated uses downstream.

The activities described in this proposal are not expected to affect wetland areas or floodplains.

Recreation/Visual Quality

Affected Environment
The NRA has a wide range of recreation use from both developed and dispersed recreation including many recreational day-use activities. The developed sites throughout the NRA have campsites and facilities the public use daily. It is important these areas are well maintained, and appropriate actions are implemented to provide high-quality experiences for visitors. It is also important all other areas associated with recreation including trails, roadsides, signs, bridges, and other structures in which people travel and/or view daily are well-maintained and properly managed.

Travel corridors, recreation sites and infrastructure within these recreation areas are negatively impacted by NNIPS and is outcompeting, and in some instances replacing the native vegetation. The spread of the NNIPS and other vegetation is a problem and makes maintenance more difficult as it is more costly to manage and shortens the lifespan of infrastructure.

Visitors may notice invasive plant populations when traveling through the NRA. The presence of non-native invasive plants could either present a physical barrier or otherwise limit specific activities. Without control, the proliferation of non- native invasive plants will increasingly detract from the scenic beauty and diversity of recreation areas. The transition of stands to shade tolerant species may affect both the aesthetics of an area, as well as the ecosystem, both of which are related to various recreation activities.

Environmental Effects (Visual Quality)

Alternative 1 (No Action)
Alternative 1 would not include the use of described treatments to help control/eliminate the infestations of NNIPS within the Land Between the Lakes NRA. Treatments would only be allowed to continue in areas already decided on through previous EAs. Under Alternative 1, this would be expected to continue as treatments would not be used to manage problem areas of NNIPS.

Alternative 2 (Proposed Action)
In accordance with *36 CFR 220.6(d)(5)* all recreation sites and facilities are approved for herbicide/pesticide use as needed. This document serves to renew current NEPA related to recreation areas within Land Between the Lakes NRA. It would also include all other areas associated with recreation not part of the CFR reference above. Therefore, all areas within the NRA area could receive treatments as described as needed to control NNIPS and other vegetation accordingly.

The proposed project is consistent with the Scenic Integrity Objectives (SIOs) and no long-term adverse effects should occur. It is important to understand, even though this document analyzes the entire NRA comprised of approximately 170,000 acres, a portion of the total acreage would be treated annually. The public would not see an increase in disturbance in recreation areas as these are already managed with the use of herbicides. All structures such as guardrails, bridges, and highway signs could also be subject to herbicide application as well. This would reduce the number of hours personnel would spend annually mowing along the roadsides and other structures while reducing cost and less exposure to highway vehicles passing by which poses a safety risk to the workers. The public would also benefit from having clearer views of the roadsides as well as better maintained paved highways.

In areas within the NRA where infestations of NNIPS occur, the proposed treatments would help eliminate the occurrence and native vegetation critical to the success of wildlife would be restored. Wildlife viewing and hunting opportunities would improve as the native vegetation would help attract numerous wildlife.

Environmental Effects (Recreation)

Alternative I (No Action)
Under the No Action Alternative, there would be no short-term changes, and current conditions would continue to see an increase in the spread of NNIPS and the indirect effects to recreational opportunities. Hunting and wildlife viewing would be negative as native vegetation would continue to be outcompeted by the NNIPS. No action would certainly facilitate the spread of NNIPS throughout the NRA.

Travel corridors would continue to have less visibility on the shoulder of roads. The visual quality of scenic driving would decrease as time goes on. NNIPS and vegetation along roadsides would only become worse, lessening the views into the Forest.

Dispersed camping and hunting would be affected in the long-term as NNIPS take over areas in which native vegetation once occurred. Game species would be less likely to be seen in these areas as they would depend on the native vegetation to exist. The outcome of the No Action Alternative would not move the management area from its current condition to the desired conditions described in the Land Management Plan. Taking no additional action, (outside of current project decisions), to control non-native invasive plants would increase the amount of manual and mechanical maintenance needed for some trails and other dispersed recreation areas to keep aggressive vegetation from encroaching.

Alternative 2 (Proposed Action)
There should be no direct effects to recreational visitors from any vegetation management strategy activities. Implementation protocol would be in place to deter any direct exposure to herbicides. Visitors might experience a loss of opportunity when they arrive at areas of closure but because the treatments would be in a localized area and only on a minimal percentage of land managed by the NRA, opportunities for a similar recreation experience should exist elsewhere on lands managed by the Land Between the Lakes.

Treatments could indirectly affect the recreation experience of visitors if they encounter treated areas while participating in recreation activities and have to avoid the areas and seek out other locations for their activity. However, these adverse effects would typically be of short duration.

The effort to manage the NRA as a healthy ecosystem may make some areas more desirable for recreation, and improve visual qualities, as a result of them experiencing a more natural landscape with intact native vegetation. The control of plant infestations and the restoration of native forests will lead to more opportunities to recreate on the NRA and a higher quality experience. This positive indirect effect far outweighs the short-term adverse effects of treatment areas.

Cumulative effects to recreation experience, and visuals include positive implications from protecting native species in a strategic way and creating a more natural landscape with intact native vegetation. There would be no contribution to significant cumulative effects from this project on recreation resources, or visual qualities.

Terrestrial Wildlife

Affected Environment

The Recreation Area and surrounding shoreline waterbodies supports over 400 terrestrial wildlife species. Specifically, 278 birds of which 110 birds are either likely present during the nesting season and/or are confirmed nesting species (USFS 2022); 53 mammal species, the Seminole bat has been identified in bat surveys and is added to the number of mammal species listed in the TVA Natural Resources Management Plan Vol. II (TVA 1994); and 28 amphibian and 45 reptile species (APSU 2009).

Habitat management for terrestrial wildlife is designed to provide diversity of cover types and successional stages. In the Recreation Area, forest community diversity is naturally relatively low, with mature oak forests predominating. Open land maintenance, prescribed fire, and timber removal are used to enhance habitat diversity. These management activities include the need to additionally control/eradicate NNIPS in the project area using herbicides.

The National Forest Management Act NFMA states we must "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives". Implementing these regulations require habitat be managed to support viable populations of native and desirable non-native vertebrates within the planning area (36 CFR 219.9). USDA Regulation 9500-004, expanded the NFMA viability regulation by requiring habitats on national forests be managed to support viable populations of native and desired non-native "plants, fish, and wildlife." In consultation with agency biologists, local experts from universities, and partner agencies and organizations, we established a framework to assess the natural diversity of native plant and animal communities which will support the viability of associated species (USFS 2004 LRMP FEIS, pages 83-204).

During the Area-wide planning process we assessed at the landscape-level, habitat mixes and ecological conditions for sustainable whole communities and viability of associated species to be within the constraints of land capability and agency mandates. We identified individual species of viability concern to help ensure the broadscale provisions at the landscape level adequately provide for their needs. We then grouped these species into Habitat Associations. Habitat Associations are defined primarily in terms of combinations of Site Types, Cover Types, Structure Types, Habitat components (e.g. snags), or Rare Communities. In total, twenty-six Habitat Associations are described in the Area Plan FEIS.

In addition to requirements to species viability, NFMA regulations require selection of management indicator species to help indicate the effects of management on fish and wildlife resources (36.CFR 219.19). Selected management indicator species and their affected environment have been analyzed in the LRMP FEIS, and FEIS Appendix F.

National Forest system units are charged with providing for sustained multiple uses to include recreational use of fish and wildlife populations (e.g. fishing, wildlife viewing, and hunting). The recreational use of fish and wildlife resources on the NRA are evaluated in terms of their demand by the public. Land Between the Lakes offers a unique opportunity within the region for publics wanting to participate in fishing, hunting, and wildlife viewing. The Demand species identified in the LRMP FEIS are those most associated with the NRA recreational pursuits.

Breeding bird surveys are completed for 13 routes annually to monitor bird populations across the Recreation Area. These surveys began in 1994 under the TVA and are used to help assess MIS and migratory bird populations.

Bald eagle wintering and nesting populations are monitored in partnership and coordination with the Kentucky Department of Fish and Wildlife Resources, Tennessee Wildlife Resources Agency, U.S. Fish and Wildlife Services, and Friends of Land Between the Lakes. The bald eagle is an MIS and a migratory bird with annual surveys ongoing for over forty years. In August 2007 the bald eagle was federally delisted. Our continued monitoring of this species since its delisting helps us assess their migratory bird populations, their habitat, and protection measures.

Various other terrestrial surveys and monitoring occur through research special use permits, partnership agreements, and contracts. This information will be considered where applicable in assessing the effects of the proposed control/eradication of NNIPS in the project area.

Proposed, Endangered, Threatened and Regional Forester's Sensitive Species
Affected Environment

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service under authority of the Endangered Species Act of 1973, as amended. An endangered species is defined as one which is "in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as one "that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range ... " (FSM 2670.5 [81] and FSM 2670.5 [211], respectively). A proposed species is defined as one in which "information now in possession of the FWS [that] indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threats are not currently available to support proposed rules." (FSM 2670.5).

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) be conducted for all Forest Service planned, funded, executed, or permitted programs and activities.

Environmental Effects

Alternative 1 (No Action)

Without active intervention, invasive plant populations are likely to continue to spread, further displacing native species and degrading habitat. The "No Action" alternative could lead to a worsening of the threats posed by invasive plants to endangered species, potentially causing further population declines.

Alternative 2 (Proposed Action)

A Biological Assessment will be prepared in compliance with Section 7. (Interagency Cooperation) of the Endangered Species Act (ESA) and 50 CFR 402.12, Biological Assessments. A Biological Evaluation will be prepared in compliance with FSM Section 2672.41. Both documents will address the potential effects from implementing the proposed action for all the Proposed, Endangered, Threatened, and Regional Forester's Sensitive (PETS) species listed in Table X1 and X2

Table X 1– Proposed, Endangered, and Threatened Species Evaluated in the Biological Assessment

Common Name	Scientific Name	Listing
Gray bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Northern long-eared bat	*Myotis septentrinonalis*	Endangered
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Whooping crane	*Grus americana*	Endangered (EXPE)
Alligator snapping turtle	*Macrochelys temminckii*	Proposed Threatened
Fat Pocketbook	*Potamilus capax*	Endangered
Longsolid	*Fusconaia subrotunda*	Threatened
Pink Mucket	*Lampsilis abrupta*	Endangered
Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened
Sheepnose	*Plethobasus cyphyus*	Endangered
Monarch butterfly	*Danaus plexippus*	Proposed Threatened
Price's potato bean	*Apios priceana*	Threatened
Experimental population, Essential (EXPE)		

Table X2. LBL NRA Regional Forester's Sensitive Species List 2/24/2022

Common Name	Scientific Name	Potential Federal Listing
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	No
Eastern small-footed bat	*Myotis leibii*	No
Little brown bat	*Myotis lucifigus*	Under USFWS review for federal listing
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Henslow's sparrow	*Ammodramus henslowii*	No

Northern pine snake	*Pituophis melanoleucus*	No
Alligator snapping turtle	Macrochelys temminckii	Proposed Threatened
American bumblebee	*Bombus pensylvanicus*	Under USFWS review for federal listing
Monarch butterfly	*Danaus plexippus*	Proposed Threatened
Appalachian bugbane	*Actaea (Cimicifuga) rubifolia*	No
Butternut	*Juglans cinerea*	No
Fraser's yellow loosestrife	*Lysimachia fraseri*	No
Ocean-blue phacealia	*Phacelia ranunculacea*	No
Rough rattlesnake root	*Prenanthes aspera (Nabulus aspera)*	No
Barbed rattlesnake-root	*Prenanthes barbata*	No
Nodding rattlesnake-root	*Prenanthes crepidinea*	No
Tansy rosinweed	*Silphium pinnatifidum*	No

Fisheries/Aquatics

Affected Environment

Habitat management is designed to provide for a diversity of habitats which also include aquatic habitat. Within the NRA, the variety of aquatic habitat types include open water reservoirs, streams and springs, and swamps.

There are an estimated 1,300 plant species and 355 animal species supported on the NRA's landscape (TVA's 1994 Plan). As of the development of the 2004 Area Plan, 101 species of potential viability concern were identified through cooperation with the US Fish and Wildlife Service (USFWS), Office of Kentucky Nature Preserves, and Tennessee Department of Conservation and Education. Of the known species, twenty-one species of fish inhabit interior lakes, while more than 75 species are found in streams. Invertebrate studies have found eight species of gastropods (Blair, 1985) and numerous populations of macroinvertebrates (Phillipi and Richter, 1990). No recent surveys for fish have been conducted.

Existing species of federally listed freshwater mussels include the fanshell, longsolid, orangefoot pimpleback, pink mucket, ring pink, rough pigtoe, and sheepnose mussel. While these species are not located within the NRA boundaries, they are found immediately adjacent. Therefore, consideration will be given to them when making management decisions.

Demand species are associated with recreational wildlife pursuits such as hunting, fishing, and viewing. Because these activities are generally limited or restricted on private lands, the NRA offers a unique opportunity within the region for those wishing to participate in these activities. Some demand species of interest include the largemouth bass, smallmouth bass, black/white crappie, bluegill, channel/blue/flathead catfish.

Land between the lakes, NRA has a relatively unique situation existing with the majority of streams on the Area. Due to the wide-ranging fluctuations in the bordering Barkley and Kentucky Lake levels, high stresses are put on these channels at their confluence with the reservoirs. The result is head cuts occurring on the majority of channels. These head cuts create significant channel incision which transport large amounts of sediment downstream eventually emptying into the reservoirs. Excess sediment can smother mussel beds, fish habitat, and lead to Eutrophication. Eutrophication is the excessive enrichment of a water body with nutrients, primarily

phosphorus and nitrogen. This enrichment often leads to overgrowth of algae and aquatic plants, which can deplete oxygen in the water as they decompose, potentially harming aquatic life and impacting water quality.

Environmental Effects

Alternative 1 (No Action)
This project is primarily to control terrestrial vegetation; however, it would have an aquatic component to it. The No Action Alternative would allow impacts to the aquatic biota to continue unabated. With the presence of Eurasian milfoil in some waterbodies, no action would allow continued encroachment. Without herbicide application, weeds could continue to increase in density and abundance along streams, displacing native vegetation. Increased weed growth can potentially impact water quality and resources. Dense vegetation along streams, if unmanaged, could increase the chance of fires severe enough to destroy the biotic integrity of soils.

While herbicides typically have low toxicity to fish and invertebrates compared to other pesticides, acute toxicity can occur with direct application or high concentrations.

With no action taken to remove, or even slow, the presence of invasive aquatic plants, the result would be a continued growth of NNIPS to levels which would likely lead to a continued decline in quality to the water body. Continued spread of NNIPS can also affect the diversity and richness of native systems. Other impacts could be removal of the riparian shading which can lead to increased water temperatures. Runoff and leachate from repeated herbicide applications can increase herbicide concentrations in streams.

In summary, a no action alternative for vegetation management on streams generally presents negative consequences, both directly through changes in vegetation and indirectly through impacts on water quality, habitat, and overall stream health and resilience

Alternative 2 (Proposed Action)
Herbicides have the potential to affect water quality and the aquatic biota. The potential risk depends on type of herbicide, the amount used, location of use, the application methods, and environmental conditions in the treatment area. Aquatic labels which do not use POEA (polyethoxylated tallow amine) as a surfactant are considered low risk to aquatic fish and invertebrates, therefore only aquatic formulations would be proposed for use in riparian areas or adjacent to aquatic environments.

Proposed applications of herbicide for forest vegetation management are foliar spray, hack and squirt, cut surface, and basal spray methods. These hand application methods are more controlled and are better for directing the herbicide toward intended target plants. As a result, potential drift and movement off site would decline and have the lowest risk for affecting aquatic biota. The weather such as temperature, humidity, and wind plays a role on potential risks to movement of herbicides.

Other methods of NNIPS eradication proposed include the use of prescribed fire, mastication, TSI/timber sales, and livestock. Threats from the use of the other methods can be tied to the introduction of sediment from bare ground being exposed after the action. This will be mitigated with the use of a variety of best management practices (BMP's) in order to have no negative effects.

While caution is necessary due to potential negative impacts, herbicide use can offer certain cumulative benefits to streams, particularly when part of a larger vegetation management strategy. These benefits often stem from indirect effects related to controlling unwanted vegetation.

Through long-term active management, NNIPS can be reduced, or even eradicated, resulting in overall healthier aquatic systems by restoring and maintaining balanced aquatic plant and animal communities. Without the presence and negative effects of the non-native plants, aquatic ecosystems and riparian buffers would be able to function normally. Herbicides can reduce the need for mechanical tillage, which can lead to significant soil erosion and subsequent stream pollution.

Silviculture/Vegetation

Affected Environment

Land Between the Lakes is primarily an oak hickory forest type with other species mixed within. However, the forest has stands of planted non-native loblolly pine and loblolly pine/hardwood mixed stands. There are also areas which have had human and natural disturbances occur, now seeding in with loblolly pine from nearby seed sources. These areas are being dominated by loblolly pine regeneration and any other species regenerating is being overtopped and suppressed by the loblolly pine. Within the forest boundary there are also numerous other NNIPS present in timber stands, recreation sites, along roads and trails.

The majority of NNIPS start along roadsides and trails, without proper treatment they will expand into the neighboring native vegetation. Mechanical treatments are currently being used to control vegetation but can increase the size of NNIPS populations, through aggressive re-sprouting. The NNIPS are outcompeting native vegetation for sunlight, water, growing space and nutrients. NNIPS are severely limiting the species richness of native vegetation. Currently small amounts of NNIPS are being treated in select small locations across the forest with herbicides under previous NEPA decisions. The PA proposed will allow for the removal of seed sources with commercial harvesting, it will also allow the needed follow-up treatment methods to occur such as the use of prescribed fire, herbicides, mastication. The timing of these treatments and combinations of treatments will allow for the best methods to eliminate/control NNIPS.

Environmental Effects

Alternative 1 (No Action)

Taking no action would let the non-native invasive plants continue their colonization and spread. The native vegetation would continue to be outcompeted by the invasive plants; thus, reducing biodiversity. Current infestations would continue to spread and establish at their current rates over time. This spread would be aided by natural disturbances such as wind throw and ice events.

Ground disturbing activities such as road maintenance and mowing could increase the population and spread of NNIPS by destroying individual stems which would result in prolific sprouting. They would also provide seedbeds for NNIPS germination. Mechanical equipment could also dislodge seeds and transport them to unaffected areas. Implementation of BMPs would reduce the possibility of introducing or spreading NNIPS during project implementation. Without the use of herbicides, populations of NNIPS could continue to increase and spread across the project area.

Alternative 2 (Proposed Action)
Commercial logging timber sales will be used to remove all merchantable loblolly pine stands. The timber sales will target loblolly pine species only, any hardwood species removal will be very limited, such as safety concerns or access to loblolly pine stands. The sales will have virtual sale boundaries using the latest LiDAR technology and mapping to identify boundaries of the loblolly pine stands. The prescriptions for the sales will be written very detailed and specify loblolly pine is the only species to be removed. There will be no timber marking paint used on the ground. LiDAR technology and mapping will be used to identify trees to be cut. Once logging activities have been completed follow-up treatments of herbicide, prescribed fire, and mastication will be used to combat the regeneration of loblolly pine. These follow-up treatments may occur simultaneously or at different times throughout the years. They will also occur for multiple years to achieve the goal of NNIPS removal/ control.

Cut and leave and/or mastication will occur within areas previously disturbed, now regenerating in loblolly pine. Hardwood stands having some loblolly pine regenerating within them will have a cut and leave treatment to remove the existing loblolly pine. These stands may also have herbicide and fire applied to help remove/control the loblolly pine. Stands on the landscape more dominated with loblolly pine regeneration will have mastication occur to remove the existing loblolly pine and will have follow up treatments of herbicide applications and prescribed fire to control the regeneration species. All of the above treatments may occur within the same year and in multiple years to remove/control the NNIPS. Cut and leave will also occur where there are scattered loblolly pines occurring.

Herbicide application methods include direct foliar, basal spray, stem injection, and cut surface. All herbicides to be used will follow the manufacturer's label and state BMP guidelines.

All areas previously treated will follow LRMP guidelines to achieve desirable native vegetation goals. This may be accomplished by natural regeneration or by planting.

Heritage

Affected Environment
Heritage Resources at Land Between the Lakes span at least the last 11,000 years, from Clovis culture (9500 to 8000 BCE) to TVA land acquisition and the construction of the Recreation Area facilities. This time period can be broken up into smaller periods based on human cultural attributes and associated artifacts. Depending on the proposed action, the heritage resources from these different time periods may be impacted, or not impacted, in various ways.

Prehistoric Archaeological Sites
The term Prehistoric, in North America, refers to the time before European settlement and the creation of a written record. Knowledge of this time period is primarily derived from archaeology; the scientific study of the material remains of past human life and activities.

Paleoindian Period – The Paleoindian period (9,500-8,000 BCE) is the initial period of human colonization and habitation of what is now western Kentucky and Tennessee (Maggard and Stackelbeck 2008:131-137). These sites are most often identified by characteristic large lanceolate stone blades. The Early Paleoindian Period (9,500 – 8,800 BCE) is characterized by Clovis blades, which have long flutes down the center of each side.

The Middle Paleoindian period (9,000 – 8,500 BCE) lanceolate blades have greater diversity in shape than Clovis and include Cumberland and Gainey points. Late Paleoindian Period (8,500 – 8,00 BCE) points are generally unfluted, and in the local region, are most commonly Dalton, Beaver Lake, and Quad points. In the Land Between the Lakes area, there are multiple Paleoindian sites. The Henderson Site, in Lyon County on the Cumberland, produced seven points including Clovis, Cumberland, and Dalton points. The Roach Site, in Trigg County on the Tennessee River, produced Paleoindian artifacts. And Site 15Cw241, in Calloway County on Blood River, produced two Clovis and two Dalton points. Additionally, one Clovis base was excavated on Land Between the Lakes, along Kentucky Lake in Stewart County, Tennessee, at Site 40Sw73.

Archaic Period – The Archaic Period (8,000 – 1000 BCE) developed as humans adapted to the changing climate at the end of the Pliestocine (Jefferies 2008:193-226). Diagnostic archaic artifacts include stemmed chert projectile points, socketed antler or bone projectile points, deer ulna awls, tubular shell beads, chert drills and leaf-shaped knives, bone pins, banner stones, and full grooved axes. While Paleoindian sites are generally rare around Land Between the Lakes, with only one or two per county, Archaic sites are much more common, with around 300 known sites along the lower Tennessee and Cumberland rivers to the Ohio River. Archaic sites are known to be disturbed unevenly in the Lakes region; 42 percent are located in the floodplain (which at Land Between the Lakes means they are under water), with 32 percent in the uplands, 16 percent on terraces, and 9 percent on hillsides.

Woodland Period – The Woodland Period (1000 BCE – 1000 CE) was a time of innovation (Applegate 2008:339-383). This time period included the adoption and elaboration of pottery and textile industries, introduction of the bow and arrow, cultivation of native plants, and a move toward larger, more permanent settlements with earthworks and mortuary ritual activities. Much like the Archaic period, much of the Woodland habitation sites are now inundated by the waters of Kentucky Lake and Lake Barkley, but many substantial sites are still accessible on the bluffs overlooking the lakes.

Mississippian Period – The Mississippian Period (1000 CE – 1700 CE) is characterized by the cultivation of maize, squash, and native plants and a hierarchy of habitation sites, from large towns (with mounds, plazas, and palisades), to villages, to farmsteads, and independent cemeteries (Pollack 2008:605-638). The river valleys around Land Between the Lakes were heavily occupies during this time period . Important sites in the immediate region include Birmingham, Jonathan Creek, Root, Goheen, Chambers, all in Marshall County, Tinsley Hill in Lyon County, and Rogers and Canton in Trigg County. The largest towns, like Jonathon Creek are under the lakes but Mississippian farmsteads and cemeteries are located on bluffs and uplands within Land Between the Lakes.

Historic Archaeological Sites

At the time of Euro-American settlement, it is believed no permanent Indian settlements existed in this area. Instead, it is postulated the land between the rivers was a common hunting ground used by a variety of historic Tribes such as the Shawnee, Cherokee, and Chickasaw.

Early historic data for the Land Between the Lakes is just as scant as the prehistoric due to lack of research. Euro-Americans were settling here prior to the American Revolution but most settlement occurred afterwards as

land grants were given for service to the nation during the war. Hunting, land clearing and small farms were the main activities with an increase in intensity over time. A great deal of game was hunted out and subsistence focused on agriculture. The first Euro-American settlers to the area arrived in the late 1700s and early 1800s. By the mid-1800s, communities were large enough to have Post Offices often named for their first postmasters Bass, named for Jethro Bass. It soon became known as Great Western for the iron furnace established by Brien, Newell and Company, and then Model, Tennessee until TVA acquired the land.

One of the more important industries to develop in this agrarian region was the iron industry. Miners obtained the brown hematite ore locally from shallow pits dug into the banks of the hills which surround 8 or 9 furnaces. Wood to feed the furnace was cut from the surrounding hills as well; tons of it. Unfortunately, the Iron industry had fallen on hard times and the furnace only operated for a very short time, which accounts for its current good condition. By the late 1850's, many of the owners were unable to sustain production in the face of market pressures and the end of slavery with the Civil War. Most furnaces in the region closed and never operated again with exception of the Center Furnace, which finally closed permanently in 1912. Many of the iron furnace communities were able to flourish despite these failures.

Model continued as a small farming community until 1963 when Tennessee Valley Authority (TVA) began to consolidate the lands between the lakes which had been created. All the land between the two lakes was bought or condemned and claimed through imminent domain by TVA. Structures were moved, sold or bulldozed to make way for a more "natural" setting. Today the area is predominantly forested and contains the Bison Range and the Homeplace, an upper middle-class 1850's living history museum. The area also contains lake access for boating and fishing as well as typical forest recreation activities: hunting, camping, hiking, scenic driving.

In 1944, TVA impounded the Tennessee River at Gilbertsville, Kentucky, making Kentucky Lake the western boundary of the 'between the rivers" area. In 1959, TVA staff initiated a large-scale national recreation area feasibility study of the land "between the rivers." Lake Barkley was impounded in 1965 by the US Army Corps of Engineers and included a canal connecting the two lakes thereby creating a unique peninsular landmass ultimately becoming LBL. Under TVA's management (1963-1999), the mission was to manage natural resources to provide public outdoor recreation and environmental education opportunities.

In 1998, Congress passed The Protection Act to transfer management of the NRA to the Forest Service in the event TVA did not receive appropriated funding. In 1999, management was transferred to the Forest Service through the Protection Act.

Cemeteries

A unique characteristic of Land Between the Lakes is the presence of over 270 historic cemeteries. The Land Between the Lakes Protection Act requires the government maintain an inventory of these cemeteries and provide access to the cemeteries for visitation, maintenance, and burial for former residents and their descendants. These requirements need to be taken into consideration when considering potential effects of proposed actions.

Environmental Effects

Alternative 1 (No Action)

Currently, some heritage locations are being negatively impacted by the spread of NNIS species due to lack of action. Some historic homesites are being inundated with certain species and pine saplings whose root systems may negatively impact the subsurface archaeological integrity of the site. Other historic homesites and cemeteries are dealing with rapidly encroaching kudzu populations. By not treating these locations with responsible measures reached through consultation and science, certain heritage resources will be negatively affected.

Alternative 2 (Proposed Action)

Herbicides

Herbicide use would be an effective way to remove NNIS species without using ground disturbing activities which could impact above-ground and below-ground heritage resources. Measures would need to be taken to ensure culturally important plant species would not be negatively impacted by the application of herbicides. When designating an area of proposed activity, the protection of plant species considered important to tribal partners historically associated with the Land Between the Lakes area, such as Rivercane and Price's Potato-bean, needs to be taken into consideration and these habitats may potentially need to be excluded from the prescription. Additionally, plant species important to historic descendant populations, such as daffodils and other ornamental species around homesites will need to be taken into consideration.

Commercial Harvest

Commercial harvest of non-native and invasives species for the purposes of eradication may have the most potential for negative impacts on heritage resources of all the proposed activities. As with any commercial harvest, the area of potential effect will need to be surveyed prior to the proposed activity and culturally important areas, such as cemeteries and homesites, will need to be excluded from impacts. Consultation will occur throughout this process to ensure partners (tribal, SHPO, descendant communities) have the opportunity to inform and collaborate with the NRA on the final outcome of the proposed harvest.

Mastication

Mastication should not impact subsurface heritage resources, however, above ground resources such as homesites with surface artifacts, cemeteries, and existing historic structures, could be impacted. Surveys of the area of proposed impact, and consultation, will occur prior to the undertaking and locations with above ground heritage resources should be excluded from mastication activities.

Disking

Disking open lands disturbs subsurface heritage resources. However, open lands on the NRA are historic farm fields which have been plowed for decades, if not centuries. Further disking of these fields may not negatively impact existing archaeological resources any more than they have already been impacted. Surveys of existing agricultural fields have been conducted for decades and can help deduce the archaeological integrity of potentially impacted sites. Should surveys conclude any heritage resources may be negatively impacted by further proposed disking, with the consultation of our partners, some archaeological sites may need to be excluded from proposed actions.

Prescribed Fire

Prescribed Fire has a long tradition as a resource management tool at Land Between the Lakes. In order to prevent subsurface ground disturbance, existing boundaries, such as roads and streams, are used as an alternative to ground-disturbing boundaries such as firebreaks and disking. Surveys are conducted of all existing above-ground cultural resources such as cemeteries, homesites with existing wooden components, fence-lines, and trees with historical significance, and these areas are protected from prescribed burning impacts. This is primarily conducted by crews with leaf-blowers removing fuels from the sensitive area.

Cut and Leave Stand Improvement

Cut and leave undertakings have a much lower potential impact on heritage resources than commercial harvesting because large equipment is not required. Regardless, surveys should be conducted, and some heritage site may need to be excluded from the prescription, in order to prevent unintended negative impacts from falling trees or potential negative impacts to the aesthetic quality of certain heritage locations.

Livestock Grazing

Livestock grazing with animals such as goats is another low impact undertaking which could reduce NNIS species without impacting subsurface heritage resources. Livestock could impact above-ground resources, and some locations may need to be excluded from this activity in order to protect resources like surface artifacts and culturally important plant species from damage.

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USFS, 2022. US Forest Service, Land Between the Lakes National Recreation Area, 100 Van Morgan Drive, Golden Pond, KY 42211. "Birding Checklist".

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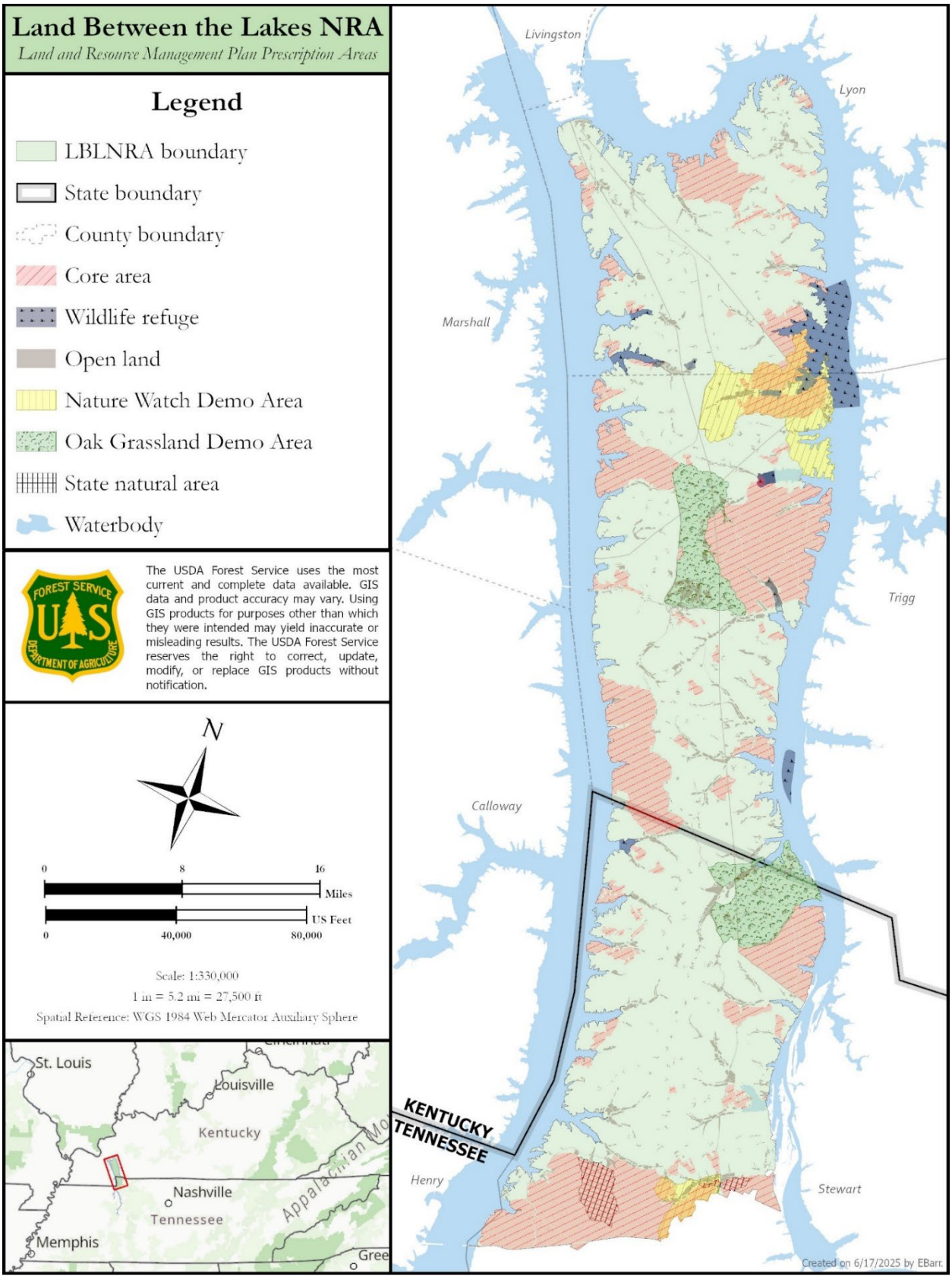
Land Between the Lakes NRA
Land and Resource Management Plan Prescription Areas
Legend
LBLNRA boundary
State boundary
County boundary
Core area
Wildlife refuge
Open land
Nature Watch Demo Area
Oak Grassland Demo Area
State natural area
Waterbody
The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. Using GIS products for purposes other than which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.
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Stewart
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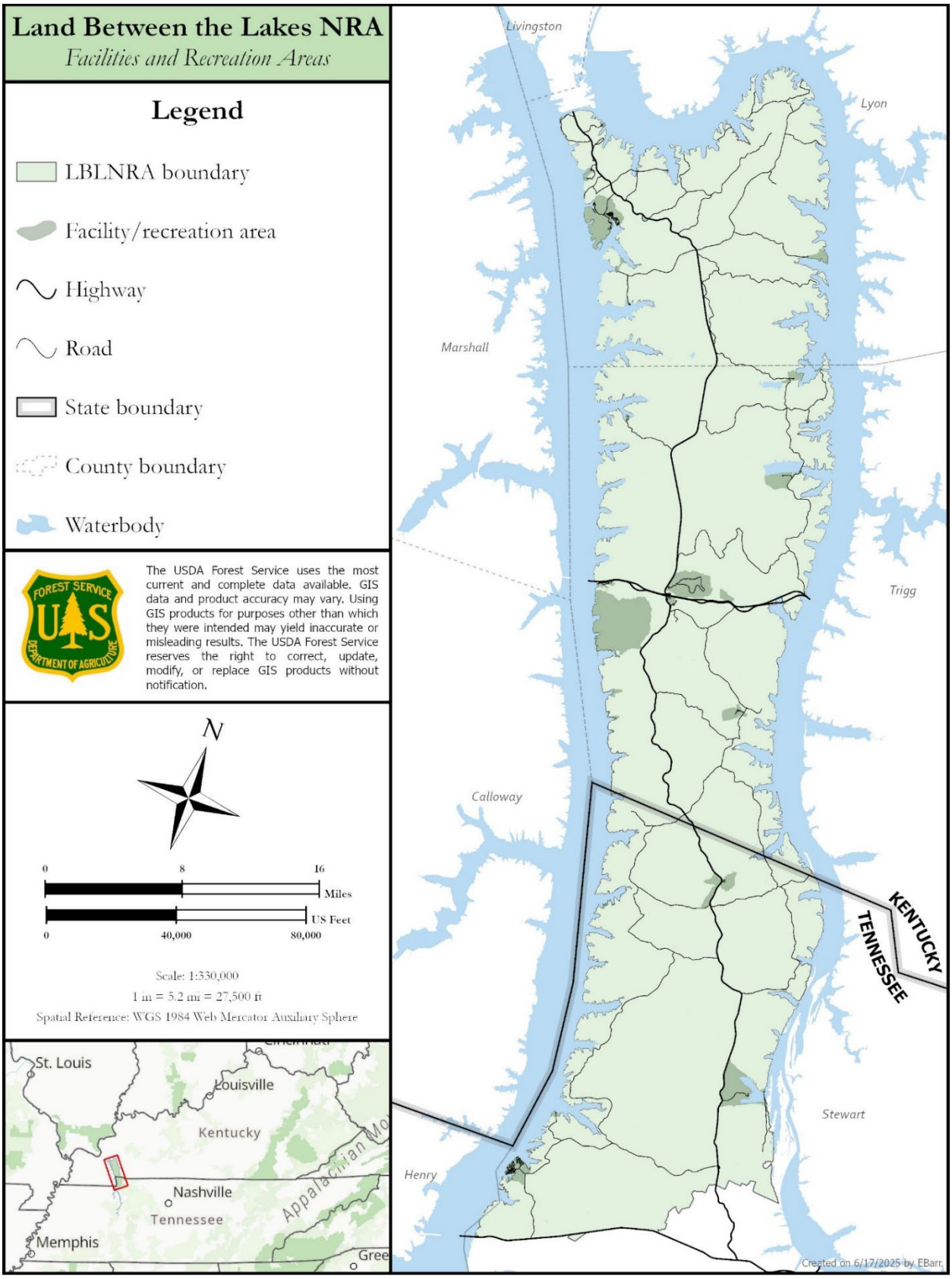
Land Between the Lakes NRA
Facilities and Recreation Areas
Legend
LBLNRA boundary
Facility/recreation area
Highway
Road
State boundary
County boundary
Waterbody
The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. Using GIS products for purposes other than which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.
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