

# Appendix C. Draft Hunting Compatibility Determination for Green River National Wildlife Refuge

## Draft Compatibility Determination for Hunting

### Waterfowl, Other Migratory Birds, and Big Game at

### Green River National Wildlife Refuge

#### Refuge Use Category

Hunting

#### Refuge Use Types

Hunting (Waterfowl). Recreational firearms (non-toxic ammunition in accordance with Federal and state regulations) hunting of waterfowl species:

- Duck (See State Regulations)
- Teal (*Anas discors*, *Anas crecca carolinensis*, *A. cyanoptera*)
- Wood duck (*Aix sponsa*)
- Merganser (*Mergus serrator*, *Lophodytes cucullatus*, *Mergus merganser*)
- Coot (*Fulica americana*)
- Goose – Canada (*Branta canadensis*), Cackling (*B. Hutchinsii*), Greater White-Fronted (*Anser albifrons*), Lesser White-Fronted (*A. erythropus*), Snow (*A. caerulescens*), Greater Snow (*A. c. atlantica*), and Ross's (*A. rossii*)
- Dove (*Zenaida macroura*, *Z. asiatica*, *Streptopelia decaocto*, *S. risoria*)

Hunting (Big Game). Recreational archery and crossbow hunting of big game:

- White-Tailed Deer (*Odocoileus virginianus*)
- Turkey (*Meleagris gallopavo silvestris*)
- Incidental Take of Feral Hog (*Sus scrofa*) (not considered game species)

Associated facilities: Multiple public roadways provide access to each Green River NWR hunt unit. Primary access to the refuge would likely be along county roads, unless flooding conditions occur. Hunters wishing to access hunting areas would find legal parking along the refuge's boundary to access the area by foot.

Associated (supporting) uses: Supporting uses would include boating (human-powered or motorized [electric trolling motors only]), hiking and backpacking, and bicycling (including e-bikes).

## Refuge

Green River National Wildlife Refuge, established November 19, 2019

### Refuge Purposes and Establishing and Acquisition Authorities

Managed by the U.S. Fish and Wildlife Service (Service, USFWS), Green River National Wildlife Refuge (NWR, refuge) was established pursuant to the NWR System Administration Act (NWRSA) of 1966, as amended by the NWRS Improvement Act (NWRRIA) of 1997 [16 United States Code (USC) §668dd(a)(2)].

The refuge has an ongoing, active land acquisition program. Acquisition of additional properties can occur through various legislative and administrative authorities, creating related secondary purposes for Green River NWR; likely authorities to be used are listed.

- 16 USC §1534 (Endangered Species Act of 1973)
- 16 USC §3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)
- 16 USC §715d (Migratory Bird Conservation Act)
- 16 USC §742f(a)(4) (Fish and Wildlife Act of 1956)
- 16 USC §460k-1, 16 USC §460k-2 (Refuge Recreation Act of 1962)

The primary purpose of the refuge is the:

- "... conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans..." 16 U.S.C. §668dd(a)(2) (NWRSA of 1966, as amended by the NWRRIA of 1997).

Acquisition of refuge lands can occur through various legislative and administrative authorities, creating related secondary purposes for Green River NWR. As properties are acquired over time, additional secondary purposes may apply, depending on the acquisition authorities used and any special conditions associated with a specific

acquisition. As outlined in the refuge's Land Protection Plan (LPP) and Conceptual Management Plan (CMP) (USFWS 2019), potential secondary purposes for the refuge are listed.

- "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants..." 16 USC §1534 (Endangered Species Act of 1973)
- "...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 USC §3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)
- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 USC §715d (Migratory Bird Conservation Act)
- "...to conserve and protect migratory birds..., including species that are listed...as endangered species or threatened species, and to restore or develop adequate wildlife habitat." 16 USC §715i (Migratory Bird Conservation Act)
- "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 USC §742f(b)(1) "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 USC §742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)
- "...suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 USC §460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 USC §460k-2 (Refuge Recreation Act of 1962)

### **National Wildlife Refuge System Mission**

The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (Pub. L. 105-57; 111 Stat. 1252).

## Description of Use

Is this an existing use?

No. The proposed hunting of migratory game birds and big game on Green River NWR is a priority public use of the NWRS and would be a new use of the refuge.

What is the use?

The proposed use is public hunting of migratory game birds and big game, with the potential future addition of incidental take of feral hog as outlined in the draft Hunting Plan (Section A, USFWS 2024) and draft refuge-specific regulations (as published in the Federal Register for the 2024-25 Hunting and Sport Fishing Rule), and as analyzed in the companion Environmental Assessment (EA, Section B, USFWS 2024). The refuge's hunt program includes migratory waterfowl hunting (duck, goose, coot, and merganser) in accordance with Federal and state regulations, recreational archery and crossbow hunting of white-tailed deer and turkey. As additional lands are acquired as part of Green River NWR, the Service would evaluate and potentially open to hunting activities on up to 24,000 acres as outlined and analyzed in the draft 2024 migratory bird and big game hunt plan (Section A) and in the EA (Section B), as well as in 2019 LPP and CMP (USFWS 2019a), in accordance with procedures outlined by hunting and sport fishing rulemaking process and Service Policy.

This compatibility determination builds on the findings and recommendations of Green River NWR's LPP and CMP and replaces the interim Recreational Hunting Compatibility Determination for the refuge (USFWS 2019). In the 2024-2025 hunt season, Green River NWR proposes to open approximately 793 acres to limited hunting opportunities to include: migratory waterfowl hunting in December, January, and February for youth, seniors, disabled hunters, and veterans; big game hunting to include archery and crossbow hunting of white-tailed deer and fall turkey in September and October for youth, seniors, and disabled hunters; and archery and crossbow hunting of eastern wild turkey during April and May for youth. The Service proposes to initiate quota hunt(s) in the 2025-2026 hunting season. Based on acreage, staffing, habitat restoration, infrastructure, and visitor amenities, the Service will work at the refuge to refine existing opportunities and/or develop additional migratory game bird hunting (e.g., quota hunts, early teal and wood duck hunts, and dove hunts) and additional big game hunting (e.g. quota hunts). The Service will strive to provide safe, compatible, quality, wildlife-dependent hunting programs including expanding hunting opportunities on the refuge to a broader populace, especially underserved groups.

Feral hogs will not be regarded as a game species on Green River NWR and control measures will be implemented to eradicate this non-native, invasive species, which may include a hunting option in the future. The Service will continue to coordinate with the Kentucky Department of Fish and Wildlife Resources (KDFWR) on feral hog control efforts. The state of Kentucky does not consider the feral hog to be a game species and discourages public hunting of feral hogs in favor of more effective control methods (Commonwealth of Kentucky 2022).

Is the use a priority public use?

Yes

Where would the use be conducted?

Providing the Service flexibility to meet the target acreage and serve outlined purposes and goals, the 2019 LPP for Green River NWR outlined an approximately 53,000-acre Conservation Partnership Area (CPA) along the Ohio and Green rivers within which the Service is authorized to acquire up to 24,000 acres for Green River NWR (USFWS 2019). The CPA also provides the ability to diversify habitats, increase connectivity of lands, provide resources for wildlife during major flood events, and support public uses. As previously stated, the Service is actively acquiring property for the refuge. The 2024 Hunting Plan and EA evaluated all properties within the nearly 53,000-acre CPA (which has a 24,000-acre acquisition cap) for potential future inclusion in the refuge's hunt program. The hunting use could occur on up to 24,000 acres within the 53,000-acre CPA following future applicable planning, environmental analysis, and rulemaking. As outlined in Table 1 and with the majority of lands located on the south side of the Ohio River, the 24,000-acre Green River NWR could exist across five units: Scuffletown Unit, Horseshoe Bend Unit, Race Track Unit, Bluff Unit, and Green River Unit.

As outlined in the LPP/EA/FONSI (USFWS 2019), all refuge properties would be in Henderson County, Kentucky. The Scuffletown Unit (29,627 acres) and the Horseshoe Bend Unit (5,443 acres) are located along the south bank of the Ohio River and are separated by U.S. Highway 41. The Race Track Unit (1,994 acres) is located both east and west of Highway 41 and along the north bank of the Ohio River. The Bluff Unit (5,365 acres) is bordered by the John J. Audubon State Park on the west, the Green River on the north and east, and a CSX railway on the south. The Green River Unit (10,202 acres) is located south and east of Spottsville, Kentucky and is bordered by the Green River on the north and east.

**Table 1. Conservation Partnership Area Acres, Acres to be Opened and Closed to Hunting in 2024-25, and Potential Future Acquisition Acres are Divided by Management Unit**

Units	Total CPA Acres	Approximate Total Acres Owned or Managed by FWS (as of December 31, 2023)	Approximate Acres to be Evaluated for Inclusion in Hunting Program for the 2024-25 Hunt Season*	Approximate Acres for Potential Future Acquisition
Scuffletown Unit	29,627	0	0	Up to 21,803.48
Horseshoe Bend Unit	5,443	589.13	589.13	Up to 4,853.50
Race Track Unit	1,994	0	0	Up to 1,994.00
Bluff Unit	5,365	1,607.39	204.00	Up to 3,757.61
Green River Unit	10,202	0	0	Up to 10,202.00
Total Acres	52,631	2,196.52	793.13	Up to 21,803.48

\*Approximately 1,403.39 acres would currently be closed to hunting.

Note: As additional lands are acquired as part of Green River NWR, the Service would evaluate and potentially open to hunting activities on up to 24,000 acres as outlined in this plan, the 2019 LPP, and CMP (USFWS 2019a) and as analyzed in the EA (Section B), in accordance with procedures outlined by hunting and sport fishing rulemaking process and Service Policy.

As of the end of calendar year 2023, Green River NWR comprised approximately 2,197 acres, of which approximately 793.13 would be open to hunting in 2024-25 (589.13 acres in the Horseshoe Bend Unit and 204 acres in the Bluff Unit). Over time, as the Service acquires additional properties for the refuge, each newly acquired parcel and existing closed properties would be evaluated to be opened to hunting as outlined in the draft Hunting Plan (Section A, USFWS 2024) and in the 2019 LPP and CMP / EA/FONSI (USFWS 2019) and as analyzed in the EA (Section B, USFWS 2024). Any future hunt openings would meet all applicable planning, public engagement, environmental analysis, and rulemaking requirements. Table 1 outlines the CPA acreage total by management unit, the total acreage owned or managed (as of

December 31, 2023), the acres to be opened and closed to hunting for 2024-25 and 2025-26, and the estimated acres for potential future acquisitions. Based on acreage, staffing, habitat restoration, infrastructure, and visitor amenities, the Service will work at the refuge to refine existing opportunities and/or develop additional migratory game bird hunting (e.g., quota hunts, early teal and wood duck hunts, and dove hunts) and additional big game hunting (e.g. quota hunts), specifically on 1,355 acres in the Tscharner East section of the Bluff Unit and newly acquired properties, through procedures outlined by hunting and sport fishing rulemaking process and Service Policy.

As infrastructure, such as levees, water control structures, and impoundments, is created on this site, the Service will set aside waterfowl units for sanctuary and units for quota migratory game bird and big game hunts. Opening hunting in this section of the Bluff Unit and newly acquired properties will be analyzed through procedures outlined by hunting and sport fishing rulemaking process and Service Policy.

Green River NWR has an active land acquisition program. Upon acquisition of a property within the Green River NWR CPA, the property would be evaluated for opening to public use activities, including hunting opportunities. Criteria used to evaluate compatibility of hunting on future properties include the acreage and size of the property; configuration of the property; juxtaposition in the landscape and to other refuge properties; adjacent property uses; wildlife habitat type, availability, and condition; potential management of the property to meet refuge purposes and goals (e.g., sanctuary for migratory waterfowl, closed areas, and visitor use and facilities); and public safety concerns. After evaluation, each property determined to be compatible with hunting will follow procedures outlined by hunting and sport fishing rulemaking process and Service Policy to be opened to this recreational use. Refuge properties expanding or restricting hunting would be identified through various outlets, including, but not limited to, the refuge's hunt brochure, the refuge's website (<https://www.fws.gov/refuge/green-river>), the refuge's Facebook site (<https://www.facebook.com/GreenRiverNWR/>), and the Service's Find Your Hunt website (<https://www.fws.gov/refuges/hunting/map/>).

#### When would the use be conducted?

Hunting would be conducted seasonally and daily within the framework of state hunting seasons, bag limits, and other state restrictions, as established by the KDFWR within applicable Federal frameworks. Hunting activities on the refuge would occur from early September through early May during the day. Hunting access to open areas of the refuge would be from 2 hours before legal sunrise to 2 hours after legal

sunset. Waterfowl hunting on the refuge would begin at the legal state shooting time (30 minutes before legal sunrise in 2024); waterfowl hunting would end and hunters would be required to leave the hunting area by 12:00 pm (noon). Except for waterfowl hunting, all other hunting would be from 30 minutes before legal sunrise to 30 minutes after legal sunset in accordance with state regulations. Certain areas on the refuge could be designated as waterfowl sanctuaries and closed seasonally to all public entry and use, including hunting. Other types of closures could occur in certain areas of the refuge due to public safety issues or other management concerns. Hunt season dates, hunting hours, seasonal zone closures, and other regulations pertaining to timing of hunting would be provided in an annual hunt brochure and on the refuge's website. Although subject to change, based on 2023-24 state regulations (which can be reviewed at <https://fw.ky.gov/Hunt/Pages/Guides.aspx>) and based on proposed 2024-25 refuge-specific regulations, hunting would be allowed according to all state regulations within the state zones and seasons (i.e., state shooting hours, methods of take, and bag limits) within the refuge open to public hunting with the exception of Federal regulations, including refuge-specific regulations.

#### How would the use be conducted?

To determine the appropriate frameworks for migratory game bird species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of state and Federal governments. After Service establishment of final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for NWRs open to hunting are never longer or larger than the state regulations. The KDFWR is responsible for the management of resident wildlife throughout the state and is a key partner to the refuge, especially in terms of ensuring biological soundness with respect to resident wildlife populations. The KDFWR sets hunting seasons and bag limits for resident wildlife that are allowed to be hunted as part of the Green River NWR big game hunt program. Green River NWR may be more restrictive regarding resident wildlife than the state. Green River NWR would consider the use of quotas, permits, period limitations, and other measures on some areas to facilitate a quality,



safe hunting experience while meeting other refuge management goals and objectives.

Migratory bird hunting seasons and species (including waterfowl) would be consistent with Federal and state season frameworks and regulations subject to the special conditions as published annually in the Code of Federal Regulations (CFR) and outlined in annual refuge-specific hunt brochures, which are available to the general public. All other species open for take on the refuge would be allowable under state regulations, subject to the special conditions as published annually in the Code of Federal Regulations (CFR) and outlined in annual refuge-specific hunt brochures, which are available to the general public. Specific hunting seasons, days, and times on the refuge may vary in some instances from state frameworks such as waterfowl hunting limited from legal sunrise to noon. The Green River NWR hunt brochures and CFR would be updated, as needed, to reflect more specific information and restrictions, including seasons, days, times, bag limits, access, licenses and permits, allowable hunting devices and ammunition, other equipment, quota application process, and other refuge-specific regulations. Refuge-specific hunting regulations allow for proper management of public properties and their resources; they also provide increased safety to refuge visitors and adjacent landowners.

The hunting use would be in accordance with the refuge's draft Hunting Plan (Section A, USFWS 2024). To achieve the objectives set forth by the draft Hunting Plan (Section A, USFWS 2024) and meet compatibility requirements, it may be necessary, on occasion, to deviate from state season structures, adjust bag limits, or implement other restrictions. Determinations would be based on evaluations of multiple factors including, but not limited to, public use levels and conflicts, wildlife population levels, habitat conditions, and time and space zoning. Adjustments would be made in coordination with the KDFWR to ensure achievement of the primary goals of the NWRS and the mutual regional conservation goals of both partners.

Under the proposal, the Service would open the listed hunts for the 2024-25 hunt season.

- In 2024-25, the Service proposes to open the 589.13 acres of the Horseshoe Bend Unit of Green River NWR to the listed hunts.
  - Migratory waterfowl hunting (duck, goose, coot, and merganser) for youth, seniors, and disabled hunters as defined by the state during the months of December and January of the statewide season and in for youth and veterans for the February for the state-wide Veterans and youth dates

- Deer and turkey archery and crossbow only hunting for youth, seniors, and disabled hunters, as defined by the state, during the months of September and October of the statewide season
- Turkey archery and crossbow only hunting for youth only, as defined by the state, during the months of April and May of the statewide season
- Also in 2024-25, the Service proposes to open the 204 acres of the Tscharner West section of the Bluff Unit of Green River NWR to the listed hunts.
  - Deer and turkey archery and crossbow only hunting for youth, seniors, and disabled hunters, as defined by the state, during the months of September and October of the statewide season
  - Turkey archery and crossbow only hunting for youth only, as defined by the state, during the months of April and May of the statewide season
- Beginning in the 2025-26 hunt season, given the logistical timing of approval for hunt plans, as well as the time needed for applications, awards, and permit issuance, the Service proposes to open approximately 793.13 acres (i.e., 589.13 acres in Horseshoe Bend and 204 acres of the Tscharner West section of Bluff Unit) to the listed hunts.
  - Quota archery and crossbow deer/turkey in November of the statewide season

Based on acreage, staffing, habitat restoration, infrastructure, and visitor amenities, the Service will work at the refuge to refine existing opportunities and/or develop additional migratory game bird hunting (e.g., quota hunts, early teal and wood duck hunts, and dove hunts) and additional big game hunting (e.g. quota hunts).

Refuge units designated as hunting units would be open to hunting unless otherwise posted with signage, as outlined in the refuge's hunt brochure and website (<https://www.fws.gov/refuge/green-river>) and the Service's Find Your Hunt database/map interface (<https://www.fws.gov/refuges/hunting/map/>). Specific hunting seasons, days, and times could vary in some instances from state frameworks and could be more restrictive than state frameworks; however, these differences would be coordinated with KDFWR. The Green River NWR hunt brochure would be updated annually to reflect more specific information on all refuge regulations, hunting units, species, and restrictions, including seasons, days, times, bag limits, access, licenses and permits, allowable hunting devices and ammunition, other equipment, any quota application process, and other refuge-specific regulations. To ensure compatibility with refuge purposes and the mission of the Refuge System,

hunting must be conducted in accordance with state and Federal regulations, as supplemented by refuge-specific regulations, and information sheets and brochures.

Beginning in the 2024-25 hunting season, hunters would not be required to submit refuge-specific applications to hunt on Green River NWR. Hunters would be required to possess and carry all appropriate state licenses and stamps, Federal stamps, and the Refuge's Annual Hunt Brochure. In the future, a refuge hunt permit and a recreational use fee could also be required, and the Service could consider additional hunting opportunities like quota hunt options. Hunters would be expected to review the refuge's hunt brochure and website (<https://www.fws.gov/refuge/green-river>), the Service's Find Your Hunt (<https://www.fws.gov/refuges/hunting/map/>) database and map interface, and all applicable regulations. As additional properties are acquired, evaluated for public use opportunities, and potentially included in the hunt program, hunting use on the refuge may increase over time. Waterfowl quota hunts could be initiated once waterfowl impoundments are purchased and/or developed on properties, including Tscharner East section of the Bluff Unit. Green River NWR could then consider administering quota hunts for waterfowl, big game, or other species similar to Clarks River NWR, since the two units are managed under the same refuge complex.

The proposed refuge-specific hunting regulations are listed in the Stipulations section below and were published in the 2024-25 Hunting and Sport Fishing Rule in the Federal Register (since regulations are updated over time, see [50 CFR Part 32 Subpart B](#) for the current regulations for Green River NWR). Enforcement of refuge violations normally associated with management of an NWR is the responsibility of commissioned Federal Wildlife Law Enforcement Officers. Dependent on jurisdictions and inter-/intra-agency agreements, other officers, special agents, state game wardens, and local Sheriff's Departments assist the NWRS Federal Wildlife Officer.

The listed methods are used to control and enforce hunting regulations.

- Refuge and hunt area boundaries would be clearly posted with signage.
- The refuge would provide a brochure that shows hunting areas.
- Service law enforcement staff would conduct routine compliance checks on refuge users, including hunters.
- The refuge would monitor user conflicts and strive to alleviate issues through management practices that consider opportunity, time, space and other elements associated with any specific issue.

Since Green River NWR has an active land acquisition program, as the Service acquires additional properties, staff, and funding for the refuge, each newly acquired parcel and existing properties currently closed to hunting would be evaluated to determine if opening hunting opportunities on the tract meets refuge management objectives and could be included in the refuge hunting program (see Section III.A in the draft Hunting Plan [Section A, USFWS 2024], Compatibility Determination [Appendix C], and Environmental Assessment [Section B] for the evaluation criteria). Increases or decreases to hunting opportunities may occur based on harvest data, wildlife population data, habitat conditions, quality of hunt opportunities, wildlife disease, refuge management priorities, public use demands, other refuge programs, and public safety needs. Adjusting the number of hunters; adjusting the types of equipment allowed; and/or implementing other actions, such as the use of spatial and temporal sanctuaries, quota hunts, or special hunts, may be necessary to meet refuge management objectives. All or part of the refuge may be closed to hunting by the Refuge Manager at any time, if necessary, for public safety, to provide wildlife sanctuary for trust species, or for other refuge management actions to ensure that the use continues to meet compatibility requirements. Evaluation of any other hunt opportunities for existing or newly acquired properties would be obligated to meet all applicable planning, public engagement, environmental analysis, and hunting and sport fishing rulemaking requirements.

The 50 CFR Part 32 outlines refuge-specific regulations, 50 CFR Part 20 outlines migratory bird hunting, 50 CFR Part 26 outlines Public Entry and Use, and 50 CFR Part 27 outlines prohibited acts. Refuge-specific regulations were published in the Federal Register Refuge-specific Hunting and Sport Fishing Rule; initial proposed regulations are included under the Stipulations section of this CD. (Regulations may be updated over time; consult [50 CFR Part 32 Subpart B](#) for current regulations for Green River NWR.) The refuge hunt brochure would provide important information and requirements for hunting on the refuge. Seasons would be set annually and would be published in the refuge hunt brochure. Refuge-specific regulations and other CFR outline key requirements and prohibitions, including those listed.

#### Prohibitions

- Hunting in designated closed areas
- Hunting within 100 yards (91 meters) of a residence, graveled roads, and hiking trails managed by the Service as part of Green River NWR
- Marking or flagging any tree or other refuge feature with non-biodegradable reflectors, paint, flagging, or other substance
- Trapping

- Reserving hunting areas by leaving boat, decoys, portable blinds, tree stands, or other materials or items
- Using all-terrain vehicles (ATVs, including off-highway vehicles and utility task vehicles) without a Special Use Permit (FWS Form 3-1383-G)
- Using internal combustion motors, personal watercraft (*e.g.*, jet skis), airboats, and hovercraft
- Blocking gates or roadways
- Discharging a weapon outside of hunting season, including target practice
- Using motor vehicle, bikes, or e-bikes on other than designated routes
- Unauthorized taking, disturbing, injuring and damaging of wildlife and plants (including cutting trees or brush)
- Introducing plants and animals or their parts taken elsewhere
- Searching for, or removing, any object of antiquity or other valued objects
- Using artificial light to locate wildlife
- Interfering with any private person or employee of a state or Federal government agency engaged in an authorized activity
- Littering
- Cleaning of harvested game and/or discarding of carcasses in public use areas
- Installing or using permanent structures, including stands or blinds
- Using fires
- Camping
- Having pets not on a leash, except for legal use of hunting dogs
- Participating in a commercial activity without appropriate permit
- Driving a nail, spike, or other metal object in tree or hunting from tree with such an object in it
- Hunting without securing and possessing appropriate licenses, stamps, and permits, including a state hunting license
- Using arrows to which any drug, chemical, or toxic substance has been added
- Using or possessing alcoholic beverages or controlled substances
- Hunting of any wildlife by the aid of or distributing any feed, salt, minerals, or other ingestible attractants
- Installing or using trail cameras

The refuge is closed at night, except during designated hunting access hours. As outlined above, hunters may enter the refuge two hours prior to legal sunrise and must leave within two hours after legal sunset. Hunting hours vary by species; proposed regulations are posted in the Stipulations section and were published in the Federal Register for Refuge-specific Hunting and Sport Fishing Rulemaking. Since regulations are updated over time, consult [50 CFR Part 32 Subpart B](#) for current

regulations for Green River NWR. Special closures are in effect during waterfowl season. Consult the Green River NWR hunt brochure for specific information and a map.

Hunting periods and access points (e.g., parking areas and, if applicable, boat ramps) would be outlined in the annual hunt brochure and identified on the associated map. We would allow hunters to use boats (manual power or electric trolling motors only) and bikes (including e-bikes) along designated routes only (graveled, paved roads, and established trails) managed by the Service as part of Green River NWR for access the refuge. In special cases to support mobility-impaired users, the use of off-road or all-terrain vehicles would be authorized. A formal request must be filed with the refuge including a verified physician's statement attesting to the nature of the disability and specific area to be accessed. If approved, the individual is issued a special use permit (SUP) permitting off-road or all-terrain vehicles use for access purposes only in designated areas of the refuge if a reasonable accommodation is required to participate in refuge programs. Approved mobility impaired hunters are issued a valid General Activities Special Use Permit (OMB Control Number 1018-0102; FWS Form 3-1383-G), which must be possessed and carried while hunting on the refuge. Hunters may park along open roadways, in parking lots, or at gates/pull-offs when on the refuge. Hunters may not block access to refuge roads.

### Why is this use being proposed or reevaluated?

The Service is proposing opening Green River NWR to hunting in accordance with the primary purpose of the refuge and as previously outlined in the refuge's LPP and CMP (USFWS 2019). The LPP and CMP included 4 overarching goals for Green River NWR; refuge goals 1, 3, and 4 outlined in the LPP and CMP would be supported by the draft 2024 Hunting Plan.

**Green River NWR LPP/CMP Goal 1.** Protect, Restore, and Manage Habitats for Fish and Wildlife. The Green River NWR would restore, manage, and conserve bottomland hardwoods, adjacent upland habitats, and plant and animal species associated with these communities. The refuge would contribute to the habitat goals presented in the North American Waterfowl Management Plan (NAWMP), various threatened and endangered recovery plans, and Kentucky's State Wildlife Action Plan.

**Green River NWR LPP/CMP Goal 3.** Connect People with Nature. Visitors would have access to the Green River NWR in order to enjoy and take advantage of opportunities for compatible hunting, sport fishing, wildlife observation, photography, and environmental education and interpretation.

**Green River NWR LPP/CMP Goal 4.** Promote Conservation Partnerships. The Green River NWR would increase opportunities for collaboration and partnerships in science, education, and research with conservation organizations, private landowners, government agencies, and others. These collaborative efforts will help inform land management decisions on the refuge/landscape and encourage continued responsible stewardship of the refuge and its natural resources.

The need is to meet the requirements of the NWRSA; evaluate compatibility of the proposed use; and protect biological integrity, diversity, and environmental health. The need is also to align as much as possible with state hunting regulations when and where compatible with refuge purpose(s) and to manage through effective coordination with KDFWR, Native American Tribes, adjacent landowners, and the general public.

This compatibility determination evaluates compatibility of the proposed hunting use (as outlined in Section A and analyzed in Section B, USFWS 2024) and implements the 2019 LPP and CMP (USFWS 2019). The Service's priorities and mandates are outlined by the NWRSA to:

“recognize compatible wildlife-dependent recreational uses as the priority general public uses of the NWRS through which the American public can develop an appreciation for fish and wildlife; provide for the conservation of fish, wildlife, and plants, and their habitats within the NWRS; ensure that the biological integrity, diversity, and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans; and ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the states in which the units of the NWRS are located” [16 USC §§668dd(a)(4)].

Hunting is one of the priority public uses outlined in the NWRSA. The Service supports and encourages priority uses when they are appropriate and compatible on national wildlife refuge lands. Hunting is a healthy, traditional, recreational use of renewable natural resources that is deeply rooted in America's heritage. Hunting is also an important wildlife management tool to maintain wildlife populations at healthy levels. The Service also looks to implement the Service's Secretarial Order (S.O.) 3347 Conservation Stewardship and Outdoor Recreation and S.O. 3356 Hunting, Fishing, Recreational Shooting, and Wildlife Conservation Opportunities and Coordination with states, Tribes, and Territories, aligning as much as possible with state hunting regulations where compatible with refuge purposes. The proposed hunting use would help further align the refuge with the Department of the Interior's Secretarial Order 3356, which directs the Service to enhance and expand public

access to lands and waters on national wildlife refuges for hunting, fishing, recreational shooting, and other forms of outdoor recreation.

### **Availability of Resources**

The analysis of cost for administering and managing each use will only include the incremental increase above general operational costs that we can show as being directly caused by the proposed use. Currently, the administration of Green River NWR is through the Clarks River NWR located 2 hours southwest in Benton, Kentucky. Green River NWR currently has no full-time equivalent positions on-site. Future programs, services, facilities, and amenities supporting visitor use would be dependent on on-site staffing and station-specific funding. Development of infrastructure to support refuge programs and habitat management objectives would also be dependent on on-site staffing and refuge-specific funding. Annual administration costs, including staff salary, equipment, law enforcement, brochures, collection of data, and analysis of biological information, would total approximately \$32,850 for the hunting program at Green River NWR. It is anticipated that funding would be provided to support and enhance the hunting program at Green River NWR as lands are acquired and user opportunities increase. See Table 2.

**Table 2. Annual Funding and Staffing Requirements to Support the Hunting Use**

<b>Identifier</b>	<b>Cost</b>
Staff (maintenance workers, biologist, and refuge managers)	\$12,000
Maintain roads, parking lots, and trails*	\$6,750
News releases, fact sheets, and reports	\$1,350
Post and maintain signage	\$6,750
Law Enforcement**	\$6,000
<b>Total Annual Cost</b>	<b>\$32,850</b>

*\* Development and maintenance of refuge parking lots, trails, and roads would be shared across multiple uses. Due to no on-site staff, initial development and maintenance activities would need to be contracted. One-time development costs are not included in this annual cost estimate.*

*\*\* Detailed Federal wildlife officers would be needed to support this use.*



## Offsetting Revenue

Currently, no offsetting revenues exist. Hunters would be required to have all applicable licenses, permits, and stamps, including state hunting licenses and refuge hunt brochure. The Service is exploring the implementation of a refuge-specific permit and fee structure for the 2025-26 hunting season. Implementation of a fee program will not only allow the Refuge to better track visitor numbers, harvest data, and visitor usage of the refuge, but fees garnered through this program will be used to offset expenses for road and parking lot maintenance, boundary maintenance, brochures, public education programs, law enforcement salaries, and expansion/improvements of visitor amenities. Fees would also support habitat management and enforcement activities by Federal Wildlife Officers, and other staff support. The offsetting revenues would increase as additional properties are acquired and opened to hunting with anticipated increases in annual hunting visits. The offsetting revenues within the 2024-25 hunting season are estimated to be approximately \$2,000 however, revenues would increase in the future with estimates up to \$37,500. With the development of any facilities, maintenance costs would be expected to increase from the estimates in Table 2.

## Anticipated Impacts of the Use

### Potential impacts of a proposed use on the refuge's purposes and the Refuge System mission

The EA (Section B, USFWS 2024) for the proposed 2023 Draft Hunting Plan (Section A, USFWS 2024) for Green River NWR analyzed the proposed hunting use and the associated impacts. A summary discussion of the impacts is provided here; consult the EA for more detailed information. The hunt program for the refuge was designed to be sustainable. No significant adverse or beneficial short-term, long-term, or cumulative impacts would be anticipated. The proposed hunting program was designed to be sustainable, minimizing any associated adverse impacts. The Service would regularly evaluate the use and any associated impacts, making changes or eliminating the use as necessary to minimize adverse impacts and to meet compatibility requirements.

The proposed hunting use would be a priority public use of the NWRS, would promote stewardship of natural resources, would increase the public's appreciation and support for the refuge, and would be designed and implemented in accordance with the purposes of the refuge. Game species would be managed at or near carrying capacity to minimize any intra- and inter-species competition for habitat. The

proposed hunting use would support LPP and CMP goals (USFWS 2019), including refuge management efforts to restore fish, wildlife, and plant resources through maintaining sustainable wildlife populations at levels compatible with refuge habitats and preserving the natural diversity by reducing populations of invasive and nuisance animals to minimize adverse wildlife and habitat impacts (LPP and CMP Goal 1); would help connect people with nature through opportunities for this wildlife-dependent, outdoor recreational activity (LPP and CMP Goal 3); and would help promote conservation partnerships through the coordination of hunting activities with Native American Tribes, adjacent landowners, the general public, other conservation organizations, and state fish and wildlife agencies and the alignment with state hunting regulations, as much as possible, while serving refuge purposes (LPP and CMP Goal 4).

Hunting and its associated activities can result in beneficial or adverse impacts to wildlife and other refuge resources. In its highly regulated form, the proposed hunting might have minor adverse impacts, including damage to vegetation, littering, conflicts among refuge visitors and between user groups, and disturbance to wildlife. Minor beneficial impacts of the proposed refuge hunting program would include the provision of additional high-quality, wildlife-dependent recreational opportunities, increased appreciation and understanding of the wildlife and habitats associated with the refuge, and support for maintenance of healthy wildlife populations, as well as minor benefits to local economies from increased visitation to the area. These beneficial effects can translate into more widespread and stronger support for the refuge, the NWRS, and the Service.

Green River NWR was established to provide for the needs of migratory birds and other wildlife. Regulated hunting would not adversely affect the ability of the refuge to fulfill its purposes and role in the landscape. Refuges are managed, first and foremost, for wildlife. The focus of refuge management is to benefit wildlife populations and not necessarily individual animals. While hunting does cause mortality and wounding of individual animals, it is regulated so as not to threaten the future of wildlife populations. In fact, hunting is a tool to help maintain a balance between certain wildlife populations and the habitats on which multiple wildlife species depend. The effects of hunting on wildlife populations are monitored within the state and across the nation and are considered when establishing hunting regulations and annual bag limits. Migratory birds are managed on a flyway basis and hunting regulations are established in each state based on flyway data. Migratory bird regulations are established at the Federal level each year following a series of meetings involving both state and Federal biologists. To determine the appropriate frameworks for each species, the Service considers factors such as population size

and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. Migratory bird hunting frameworks are inherently designed to support sustainable populations. The Service, working with partners, annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of migratory birds that may be taken and possessed. These frameworks are necessary to allow state selections of season and limits for recreation and sustenance; aid Federal, state, and Tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. The KDFWR regulates hunting on statewide, regional, and local scales to ensure that hunting remains sustainable and does not cause a negative impact to game populations. Hunting is a priority public use of the NWRS and allowing hunting on the refuge would help facilitate the fulfillment of refuge purposes and the NWRS mission.

### Short-term impacts

While the proposed hunt program was designed to be sustainable and to minimize adverse impacts, some short-term, minor, discrete adverse impacts are associated with any public use activity and could occur from the Proposed Action. However, no significant short-term adverse or beneficial impacts would be anticipated from implementation of the proposed hunt program on the refuge.

Human presence, including hunters, boaters, and bicyclists, can negatively affect wildlife by causing animals to alter behaviors necessary for survival. Birds exhibit various behavioral and physiological responses to human disturbance and may avoid areas with high levels of human activity (Burger 1981). Physiological responses include the release of stress hormones (Müllner et al. 2004, Thiel et al. 2008) and increased heart rate (Weimerskirch et al. 2002). Behavioral responses include increased vigilance (Frid and Dill 2002), altered singing behavior (Gutzwiller et al. 1994), and flushing (Spahr 1990, Ikuta and Blumstein 2003, Beale and Monaghan 2004, Pease et al. 2005, McLeod et al. 2013, Livezey et al. 2016). Human disturbance can also cause birds to discontinue or avoid foraging (Burger and Gochfield 1998, Thomas et al. 2003, Yasue 2005, Martín et al. 2015) and instead spend more time displaying avoidance behaviors. Further, McNeil et al. (1992) suggested that some waterfowl and shorebird species may forage at night instead of during the day to avoid humans. These physiological and behavioral responses to human activity cause birds to expend energy (Bélanger and Bédard 1990, Weimerskirch et al. 2002) that would otherwise be used for survival, migration, and reproduction. Mammals also exhibit avoidance behaviors in response to human activity (Hammitt and Cole 1998), including bicyclists

(Taylor and Knight 2003). Bats expend more energy when disturbed by humans (Speakman et al. 1991), and mammalian species across the globe have become nocturnal to avoid people (Gaynor et al. 2018). Mammals likely to experience adverse impacts from human disturbance are those with limited available habitat; these animals are forced to remain in the disturbed habitat due to a lack of suitable alternatives and suffer the consequences of human disturbance.

Proposed hunting could have temporary, localized impacts to populations of game and non-game species. Hunting can alter behavior (e.g., foraging time), population structure, general health (e.g., weight loss), and distribution patterns of all wildlife within the hunt area (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, Cole and Knight 1990). While highly localized, the level of disturbance associated with hunting can be high due to the loud noises produced by guns and the rapid movement of both hunters and hunting dogs within the hunt area. Disturbance to wildlife can cause shifts in habitat use, abandonment of habitat, increased energy demands on affected wildlife, changes in nesting and reproductive success, and changes in singing behavior (Knight and Cole 1991, Miller et al. 1998, Schultz and Stock 1993, Gill et al. 1996, Arrese 1987, Gill et al. 2001). Target and non-target species could be disturbed by hunting (De Long 2002), but such disturbance is considered temporary, short term, and not pervasive enough to result in adverse impacts to populations. Disturbed wildlife will relocate to avoid hunters or flush and expend more energy than if they had remained at rest. Most displacement of wildlife is considered minor, and animals typically will remain within their normal home ranges. Additionally, the majority of hunting generally occurs during times of the year when most wildlife are not nesting, birthing, or raising offspring. Many outdoor recreational activities, such as wildlife viewing, photography, and hiking, can have temporary, localized, short-term impacts such as flushing to populations of game and non-game species. Marzano and Dandy (2012) cite several studies on birds, deer, and red squirrels that suggest recreational activity does not have a significant long-term impact on animal behavior. Additionally, disturbance to vegetation, water, or soils could occur while hunters are accessing sites or scouting on vehicles, boat, bike, or by foot. Potential impacts include trampling, damage, and killing of vegetation from walking off trail (Kuss 1986, Roovers et al. 2004, Hammitt and Cole 1998) and accidental introduction or spread of invasive plants, pathogens, or exotic invertebrates, especially along forest roads which can facilitate the spread of invasive plants (Mortensen et al. 2009) and could result in habitat alterations causing short and long-term changes in wildlife communities (deMaynadier and Hunter 1995).

Minor short-term impacts may be associated with bicycling, including temporary wildlife disturbance and littering. However, bicycling would only be permitted on

designated roads and trails, limiting disturbance to areas already subject to recreational activities. The impacts of e-bikes on wildlife compared to non-motorized bicycles is not well understood, with little research available in the literature. E-bikes may cause greater disturbance to wildlife than non-motorized bikes because they are louder, possibly resulting in shorter flight initiation distances than non-motorized bikes. In addition, e-bikes can cover greater distances in a given period than non-motorized bikes and thus may disturb more wildlife per unit of time. However, some studies suggest that e-bikes cause less disturbance because they exit the area more quickly than non-motorized bikes (Nielson et al. 2019).

Boating, including associated noise, perception of threat, and mere presence, can disturb wildlife, especially birds. Boating can disrupt feeding, loafing, resting, and nesting activities. Boating can disrupt aggregation and communication. Physiological and behavioral changes can occur in wildlife in response to boating activities. Disturbance by boating is similar disturbance by hunting and can result in increased energy expenditures from avoidance of the disturbance and decreased energy intake due to interference with feeding activities. Wildlife responds differently to boats based on their size, speed, the amount of noise they make, and how close the crafts get to wildlife. Boats increase the access of visitors to areas not open to most other visitors, thus having a greater potential to cause wildlife disturbance if not managed properly. The speed and manner in which a boat approaches wildlife can influence wildlife responses. Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995). Possible short-term adverse impacts include wildlife disturbance, littering, vandalism, and vegetation disturbance, with motorized boats more likely to cause wildlife disturbance than non-motorized boats. Boating has been shown to alter distribution, reduce use of particular habitats by waterfowl and other birds, alter feeding behavior, and cause premature departure from areas. Impacts of boating can occur even at low densities, given the ability of powerboats to cover extensive areas in a short amount of time, the noise they produce, and their speed (Sterling and Dzubin 1967; Bergman 1973; Speight 1973; Skagen 1980; Korschgen et al. 1985; Kahl 1991; Bauer et al. 1992; Dahlgren and Korschgen 1992; Korschgen and Dahlgren 1992). However, some of these impacts would be minimized due to the refuge only allowing boats operated by manual power and/or electric trolling motors.

Motorized vehicles, including off-road or all-terrain vehicles, would have similar impacts as motorized boats. However, these vehicles would only be permitted on designated roads and trails, limiting disturbance to areas already subject to recreational activities.

Several management strategies may be used by the refuge to minimize wildlife disturbance. The Service may consider establishing no hunting zones and areas that are closed to all public entry, and well as temporal zones or areas where hunting is restricted during certain times of the day/night. Restricting waterfowl hunting to noon daily reduces noise impacts from gun for resident wildlife as well as reduces minimizing user conflicts. While not part of the currently proposed hunting use, intermittent hunting can also be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). The Service would also consider the use of quota hunts to help to manage wildlife disturbance. The hunting program on existing and future properties of the refuge would be managed such that the effects of disturbance to wildlife would be minimal and within the tolerance level of known wildlife species and populations. All hunting activities would be conducted within the constraints of sound biological principles and refuge-specific regulations established to restrict illegal or questionable activities. Monitoring activities through wildlife inventories and assessments of public use levels and activities would be used, and public use programs would be adjusted as needed to limit disturbance.

The short-term adverse or beneficial impacts of hunting on migratory game bird and big game populations at the refuge would not be anticipated to be significant. The proportion of the refuge's harvest of these species would be negligible when compared to local, regional, and statewide populations and harvest. Because of the regulatory process for harvest management in place within the Service, the setting of hunting seasons largely outside of the breeding seasons of resident and migratory wildlife, and the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, we would anticipate no significant adverse short-term impacts from the proposed hunting use on migratory game birds, resident and non-resident animals, non-target animals, aquatic species, threatened and endangered species and other special status species, habitat and vegetation, and visitor use and experiences; specific impacts are summarized below.

#### Migratory Game Birds: Duck, Teal, Wood Duck, Goose, Coot, Merganser and Dove

Migratory birds are managed on a flyway basis, and hunting regulations are established in each state based on flyway data. Migratory bird regulations are established at the Federal level each year following a series of meetings involving both state and Federal biologists. While hunting waterfowl on the refuge would be expected to reduce the total numbers of birds in the flyway since individual migratory game birds would be expected to be harvested, populations of migratory game birds would not be expected to be adversely impacted since the take would be within the

established state and Federal frameworks. Hunting waterfowl on the refuge would likely make the birds more skittish and prone to disturbance, reduce the amount of time they spend foraging and resting, cause direct mortality to target species, and alter their habitat usage patterns (Bartelt 1987, Madsen and Fox 1995). Disturbance to non-target birds and resident wildlife would likely occur from hunting and associated hunter activity, but this would be short-term and temporary. Disturbance could include, but would not be limited to, firearm noise, hunter movements, motorized equipment, and the movement of displaced wildlife. While localized, the level of disturbance associated with hunting can be high due to the loud noises produced by guns and the rapid movement of both hunters and hunting dogs within the hunt area. This disturbance, especially when repeated over a period of time, can compel waterfowl and other species to change foraging habits (e.g., foraging at night) or abandon areas of disturbance (Madsen 1995, Wolder 1993). In fact, studies indicate that prolonged and extensive disturbances can cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995, Paulus 1984). Various studies indicate an inverse relationship between the numbers of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintail on Sacramento NWR non-hunt areas increased after the first week of hunting and remained high until the hunting season was over (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area on a refuge, but use of this area was lower than before the hunting season began.

Impacts to waterfowl and other species can be reduced by providing adjacent sanctuary areas where hunting does not occur and where birds can feed and rest relatively undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992). Thus, non-hunt areas are very important to waterfowl populations subject to hunting as they ensure the continued presence of the affected species within the general vicinity of the hunt area. The Service would develop sanctuary that would be closed to all public use from November to March to provide a disturbance-free zone for migrating game birds and resident wildlife. Available open water habitat conducive for waterfowl in the form of sloughs and oxbows is likely to be acquired for the refuge, providing habitat to both migratory and resident waterfowl species. As the size of the refuge increases over time, the Service would consider additional time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users such as quota hunts) to reduce adverse impacts

to all wildlife species. Overall, while individual birds would be killed, the impacts to migratory bird populations would be expected to be minimal.

As analyzed in the EA (Section B, USFWS 2024), short-term adverse impacts of the proposed hunting use to migratory game bird species would not be anticipated to be significant because the Service would follow or be more restrictive than state seasons.

#### Big Game (white-tailed deer and eastern wild turkey)

The KDFWR annually reviews hunting seasons and bag limits and modifies them to avoid any long-term population declines. Thus, hunting would not be expected to adversely impact deer or turkey populations. Deer harvest is essential to maintain the herd at or below habitat carrying capacity. Deer, when overpopulated, have the capability of changing vegetation structure and composition, impacting a variety of wildlife and habitat (Hester et al. 2000; Hobbs 1996; Schmitz and Sinclair 1997). Overpopulation can also lead to outbreaks of devastating diseases, such as chronic wasting disease, epizootic hemorrhagic disease, bluetongue, and avian pox which can have population-level effects in localized areas. Overpopulation also leads to starvation, increased car-deer collisions, and poor overall health.

Wild turkeys were restored to Kentucky during the 1970s to 2000 and now occur and are hunted in all 120 counties. A crude statewide population estimate is 250,000–400,000 turkeys. KDFWR (2022) reports the population appears stable based on spring harvest and reproductive data. Caused by a virus, avian pox is a major disease of wild turkeys and may have important population-level effects in localized areas, including in Kentucky. It causes visible nodules and lesions (warts) on unfeathered parts of birds (such as the head and legs). It can occur in many different species of birds. The disease is spread by mosquitoes (and possibly other biting flies), through direct contact with infected birds, and through environmental contamination (such as infection of food or stagnant water sources). It is more common in warm, humid parts of the country (KDFWR 2023). Avian pox is a major disease of wild turkeys and may have important population-level effects in localized areas (KDFWR 2023). Avian influenza can also impact wild turkeys. Disease and long-term reproductive decline raise concerns about the sustainability of turkey harvest, even under the state's relatively conservative regulations.

Hunting big game on the refuge would reduce the total numbers of individuals in the local populations, but harvest would be within allowable limits as determined by the KDFWR annually. Disturbance likely to occur from hunting and associated hunter activity would be similar to those discussed for migratory game birds and would be short-term and temporary. Big game populations are monitored by the KDFWR, and



hunters are required to check their harvests of all big game species through the KDFWR telecheck process. The KDFWR sets statewide season structures and bag limits, in which Green River NWR would adopt the same as or would be more restrictive than Kentucky, thereby supporting management on a more regional basis.

As analyzed in the EA (Section B, USFWS 2024), short-term adverse impacts of the proposed hunting use to big game species would not be anticipated to be significant because the Service would follow or be more restrictive than state seasons.

#### Incidental Species (Feral Hog)

The EA (Section B, USFWS 2024) also evaluates the impacts of incidental take of feral hogs, which are also listed in the draft Hunting Plan (Section A, USFWS 2024) in Section III.B as a proactive measure. Feral hogs are not currently established on the refuge, however, with the potential for the spread of this invasive species onto refuge properties and with the potential for the future acquisition of properties with feral hogs, the Service proactively included this species in this analysis to enable the Service to respond quickly in the future to the presence of this species with a variety of control measures. It is neither the goal nor the intent of the Service to manage feral hogs as a huntable game species. Hogs are an invasive, exotic species that damage native habitats and prey on native wildlife. The objective of a feral hog control program would be to reduce numbers to levels that minimize impacts to acceptable levels, and where possible, completely eradicate them. Because the ultimate goal is to eliminate feral hogs, the Service sees no management value in promoting recreational hunting of feral hogs on any public lands. The Service does believe that hunter effort can remove a portion of feral hogs from its refuges, but it does not fully support the overall goal that hunting alone can control feral hog populations.

History, observations, and research across many states suggest that allowing take of feral hogs creates a value and commodity among users and that reducing or eliminating the opportunity to take feral hogs reduces the releasing of feral pigs on public and private lands. Historically, unscrupulous hunters have been caught and prosecuted for illegally releasing live hogs onto public lands. Kentucky currently has five known breeding populations and five areas of concern, each covering 13 counties. According to the Midwest Association of Fish and Wildlife Agencies (MAFWA), joint efforts between the U.S. Department of Agriculture Wildlife Services and KDFWR resulted in the removal of 171 wild pigs in 2018 (MAFWA 2019). Most breeding populations have been reduced significantly. The largest wild pig population in north central Kentucky (Henry, Owen, and Franklin counties) has been drastically reduced (MAFWA 2019). Currently, feral hogs do not occur on the refuge's existing or future

properties; however, it is acknowledged that they could become established in the future but would not be considered a game species.

While hunter effort can remove a portion of feral hogs from refuges, hunting has been found to not fully accomplish the goal of elimination of feral hogs. Hunting has been shown to reduce hog populations by as little as 8% to as much as 50%, and studies show that at least 66 to 75% of a hog population must be removed each year to impact or offset reproduction (USFWS 2020). Additionally, hunters often selectively harvest hogs, bypassing females or small piglets. Public hunting also is often density-dependent, thus, when control measures successfully remove a significant percentage of the feral hog population, hunters are often unwilling to put forth the time and effort required to harvest remaining hogs. Public hunting pressure then is reduced, and feral hog populations rebound to previous levels.

The Service's feral hog management strategies include a multifaceted approach using various removal methods, including on both small and large scales by staff and partners. This approach ensures that each strategy supports the same goal. Allowing hunters to remove hogs can be variable and may often times not share the same goal as land managers. The Service's intent would be to eliminate this species from the refuge; hence, it would not be managed as a game species. Any public hunting of feral hogs on the refuge would be to support management efforts to remove this species from the refuge. As data and literature become available, the Service is constantly adapting its strategy to make the most effective impact on the feral hog population on its refuges. We would continue to support KDFWR's feral hog strategy and continue to work with partners in a unified approach to control and eliminate feral hogs.

#### Non-Target Animals and Aquatic Species

Human disturbance can alter wildlife behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. Hunter disturbance, especially when repeated over a period of time, can compel waterfowl and other species to change foraging habits (e.g., foraging at night) or abandon areas of disturbance (Madsen 1995, Wolder 1993). The level of disturbance associated with hunting can be high due to the loud noises produced by guns and the rapid movement of both hunters and hunting dogs within the hunt area. Disturbance to wildlife can cause shifts in habitat use, abandonment of habitat, increased energy demands on affected wildlife, changes in nesting and reproductive success, and changes in singing behavior (Knight and Cole 1991, Miller et al. 1998, Schultz and Stock 1993, Gill et al. 1996, Arrese 1987, Gill et al. 2001). It is probable that hunting would cause some or all of these effects to some degree on refuge wildlife. Hunting can have temporary, localized impacts to populations of game and non-game species. Disturbed wildlife will relocate to avoid

hunters or flush and expend more energy than if they had remained at rest. Outdoor recreational activities, including hunting, can have temporary, localized, short-term impacts to populations of game and non-game species. Marzano and Dandy (2012) cite several studies on birds, deer, and red squirrels that suggest recreational activity does not have a significant long-term impact on animal behavior. Most animals will be able to readily replace those energy reserves used to escape from hunters. In addition, most hunting seasons largely occur outside the times when most wildlife species are raising offspring and are most sensitive to disturbance. Studies have been conducted to determine the effects of direct hunting on the population dynamics of small game. Results have consistently shown that small game populations, such as gray and fox squirrels and eastern cottontails and swamp rabbits, are not affected by direct hunting or disturbance from hunting, but rather are limited by food resources (USFWS 2014). Mosby (1969) found that 38% of the population of gray squirrels could be removed from the population by hunting and not adversely affect recruitment in the exploited population, with no significant influence on the average annual mortality rate. Efforts throughout history, to eradicate coyote populations because of damage to livestock, property, and other commodities has failed. It has been deemed nearly impossible to permanently reduce coyote populations (Crabtree and Sheldon 1999). Disturbance likely to occur from hunting and associated hunter activity to non-target resident species would be similar to those discussed for migratory game birds and would be short-term and temporary. Other small mammals, including bats, are inactive during winter when hunting season occurs. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by ectothermic reptiles and amphibians limits their activity during the hunting season when temperatures are low; therefore, hunters would rarely encounter reptiles and amphibians during most of the hunting season. Some species of bats, butterflies, and moths are migratory. Negative effects to these species at the flyway level should be negligible. These species are in torpor or have completely passed through western Kentucky by peak hunting season, which occurs from October to January. Fish would not be expected to be adversely impacted by the proposed hunting opportunities.

Intermittent hunting could also be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). Green River NWR would consider the use of quota hunts and other measures to help manage wildlife disturbance.

Additionally, disturbance to vegetation, water, and soils could occur while hunters are accessing sites or scouting on vehicles, boats, bikes, or by foot. Potential impacts include trampling, damage, and killing of vegetation from walking off trail (Kuss 1986,

Roovers et al. 2004, Hammitt and Cole 1998) and accidental introduction or spread of invasive plants, pathogens, or exotic invertebrates, especially along forest roads (Mortensen et al. 2009) and could result in habitat alterations that may cause short- and long-term changes in wildlife communities (deMaynadier and Hunter 1995).

As analyzed in the EA (Section B, USFWS 2024), short-term adverse impacts of the proposed hunting use to non-target animals and aquatic species would not be anticipated to be significant.

### Threatened and Endangered Species and Other Special Status Species

The Service's Information for Planning and Consultation database includes 15 species in the CPA as threatened or endangered. However, an additional 2 species are listed as potential threatened or endangered, 1 species listed as a candidate species, and 1 species listed as a non-essential experimental population could be supported or potentially supported within the CPA.

It is the policy of the Service to protect and preserve all native species of fish, amphibians, reptiles, birds, mammals, invertebrates, and plants that are designated threatened or endangered, including their habitats. With the establishment of Green River NWR and an active land acquisition program as outlined in the LPP (USFWS 2019), impacts to threatened and endangered species and other special status species would be expected to be beneficial as properties are acquired and managed under the refuge, thus protecting them from being developed or converted into agriculture. Habitat restoration efforts by the Service will also restore hydrology and convert some lands back into natural communities of concern listed by the state of Kentucky.

Since many of the properties that are included in the refuge were hunted under the previous landowner and since many properties to be acquired in the future for the refuge could also likewise have been historically hunted, we expect the impacts of the proposed hunting program to be minimal. The proposed hunting program is designed to be sustainable and to minimize adverse impacts. With refuge hunting being more restrictive than state seasons, the proposed hunting use would not likely affect or not likely jeopardize any threatened, endangered, or other special status species.

Disturbance factors resulting from public use are always considered for all listed species. Environmental trends, life history, and occurrence records of each threatened and endangered species are covered in the EA (Section B). The proposed hunting program was designed to minimize impacts to threatened, endangered, and other special status species.

No knowns wintering hibernacula exist within the CPA for the threatened and endangered bats analyzed. As a result, these bats would not be present in the CPA

during migratory game bird hunting seasons (September through March). Additionally, migratory game bird hunting will not result in impacts to winter habitat or suitable summer roosting, foraging, or commuting habitat for this species in the CPA. Therefore, effects to bats from migratory game bird hunting is considered discountable. Bats would also not be present in the CPA during fall deer and turkey archery and crossbow hunting seasons (September through January). Although the potential for overlap between bats and hunters exists in the CPA during turkey archery and crossbow hunting in April and May, any potential disturbance to bats due to hiking or biking through forested habitat from hunting activity is expected to have discountable or insignificant effects.

Indiana, Northern long-eared, and tricolor bats all roost in trees and therefore have the potential to be disturbed by hunters use of tree stands. Trees that bats select for roosting typically are dead or dying, with large, thick slabs of peeling bark. These trees are typically not the same trees that hunters select for tree stands for safety reasons or due to lack of coverage for camouflage. However, Northern long-eared bats will use trees with less dead or damaged areas than Indiana bats, and it's possible that hunters could install a tree stand in a tree that contains a roosting individual. Therefore, it is possible that the use of portable, removable tree stands and climbing on trees could disturb and flush individuals of this species utilizing the same tree as hunters. However, the likelihood of bats and hunters using the same trees would be very low given most hunters will only use tree stands during fall deer and turkey hunting. Even if a hunter used a tree for a tree stand that a bat happened to be roosting in, the bats would likely not leave the roost tree during daylight hours. If a bat was flushed from a tree, the individual could likely move to other suitable roosting habitat nearby and would not experience mortality or harassment reaching the level of take. The individual bat would also be able to return to the roost later in the day or the following day when the hunter was no longer present. Use of tree stands is also not anticipated to impact suitable roost trees. As previously discussed, hunters do not typically use trees or the portions of trees that provide suitable roosting habitat for bats. Any use of suitable roost trees by hunters would result in minimal damage, if any, to a small portion of the tree's exterior and is unlikely to affect the suitability of the tree for bats.

Noise from hunters moving to and from hunting locations is expected to be minimal and not rise above typical ambient noise levels in the hunting areas. Some noise may be generated during installation of tree stands but is expected to be localized to the immediate area and will be short-term in nature. As previously discussed, hunters are unlikely to be using the same trees as bats; therefore, noise from tree stand installation is not anticipated to affect roosting bats. Additionally, a roosting bat that

is flushed would be able to find other suitable roosting habitat nearby. Arrows being discharged from bows or crossbows will produce little to no noise and are not anticipated to affect roosting bats. The refuge allows ATV/UTV use for mobility-impaired hunters only. Access via these vehicles will only be permitted on established trails. While some noise disturbance could be caused by motorized vehicles, they would only be permitted on designated roads and trails, limiting disturbance to areas already subject to recreational activities. As a result, effects to bats from noise during spring turkey archery and crossbow hunting in April and May are considered insignificant. No effects to bats are expected during September through January archery and crossbow hunting of deer and turkey due to the absence of bats in the CPA during that time. Based on these factors, effects to bats roosting in trees during deer and turkey archery and crossbow hunting are considered insignificant. No effects are anticipated to bats from archery and crossbow hunting in the winter because the species will not be present in the CPA during that time. Effects to tree-roosting individuals from hunting techniques that do not require use of a tree (i.e., spring turkey hunting) are considered discountable.

No wintering hibernacula for the gray bat are known to occur within the CPA; therefore, no individuals will be present during migratory game bird hunting from September through January. Additionally, this type of hunting will not result in impacts to potential hibernacula. As a result, effects to gray bats and their hibernacula and roosting habitat from migratory game bird hunting are considered discountable.

Potential disturbance to trees and noise from hunters moving through the CPA, using tree stands, and shooting arrows during turkey archery and crossbow hunting in April and May and deer and turkey archery and crossbow hunting in September through January would not affect gray bats because the species does not roost in trees. These activities would also be limited to daylight hours and would not occur when bats may be foraging and commuting in the CPA. Based on these factors, effects to the gray bat from deer and turkey archery and crossbow hunting are expected to be discountable.

To maintain the integrity of streams, slough, and other waterbodies, the refuge limits the use of motorized vehicles. Only boats operated by manual power or electric trolling motors are allowed to access the refuge. Hunters using bikes or approved mobility impaired hunters using all-terrain vehicles will be allowed access along designated routes only (graveled and paved roads, and established trails) managed by the Service as part of Green River NWR. The refuge prohibits the use of internal combustion motors, personal watercraft (e.g., jet skis), airboats, and hovercraft on lands owned and managed by Green River NWR. The refuge does not allow blinds or

tree stand to be left overnight. Additionally, the refuge prohibits the removal of plants including the cutting of trees or brush which helps to reduce habitat modification. Therefore, impacts to bat foraging habitat from hunting are considered discountable.

The proposed activities would be limited to daylight hours and would not occur when bats may be foraging and commuting in the CPA. Based on anticipated discountable effects from migratory game bird hunting and insignificant effects from archery and crossbow big game hunting, the Proposed Action is not likely to adversely affect these species of bats.

The whooping crane has not been documented in the CPA or in the refuge, and no nesting habitat for this species is present within the CPA. However, given the vicinity of Patoka River refuge, whooping cranes could stop over on Green River NWR to forage during their fall or spring migration, which may coincide with the proposed hunting periods. Green River NWR is not opening hunting of this species or the similar sandhill crane. Therefore, take of this species is not anticipated from hunting. Disturbance from hunters and noise caused by hunters could cause whooping cranes to flush; however, disturbance is anticipated to be short-term, temporary, and discrete. Given that limited number of whooping cranes in the eastern population, limited interactions with hunters are anticipated. An administrative closure may be warranted if whooping cranes are found to occur on the refuge in areas open to hunting, pursuant to 50 CFR §25.21(e), to reduce any impacts from disturbance due to these activities. As a result, effects to the whooping crane from hunting is considered insignificant, and the Proposed Action is not likely to adversely affect this species.

Suitable habitat for these mussel species exists in the Ohio River, which is adjacent to portions of the CPA. Hunters could disturb sediment while moving through streams, sloughs, wetlands, and other tributaries of the river during migratory game bird hunting which could be transported downstream into the Ohio River. However, sediment disturbance from hunter movements is expected to be minimal and would likely be transported only a short distance before resettling due to the slow-flowing, lentic nature of these waterbodies. As a result, effects from migratory game bird hunting to mussels potentially located in the Ohio River are considered discountable. No effects to these mussel species are anticipated from deer and turkey archery and crossbow hunting due to the lack of hunter activity in tributaries of the Ohio River. While potentially suitable habitat for all mussel species exists in the project area within the Ohio River and Green River, the CPA does not include these rivers. As a result, there is no suitable habitat within the CPA for these species. Therefore, the

Proposed Action is not likely to adversely affect these species or jeopardize the continued existence of the pyramid pigtoe.

Monarchs are present throughout Kentucky. Monarchs begin migrating to their wintering grounds in October and begin returning to Kentucky in March and April. The monarchs would not be present in the CPA during the majority of migratory game bird hunting seasons (September through March) or deer and turkey archery and crossbow hunting (September through January). Although the potential for overlap between monarch butterflies and hunters exists in the CPA during turkey archery and crossbow hunting in April and May, any potential disturbance to monarchs due to hiking or biking through forested habitat or use of tree stands from hunting activity is expected to have discountable or insignificant effects. Given the limited temporal overlap when hunters could be in the proposed hunt area while monarch butterflies and caterpillars could potentially be there, encounters with monarch butterflies or caterpillars would be infrequent; even so, the presence of humans would likely not disturb the monarchs, given they are fairly tolerant of human presence. Hunting will not result in impacts to winter habitat, given the nectar plants or milkweed required by monarchs and their caterpillars would be dormant. Suitable summer habitat for monarch butterflies exists on the CPA. Potential damage to nectar plants from off-trail foot traffic to access hunting areas during the spring could occur. Milkweed, being grown from rhizomes, are very hardy plants. Therefore, injury from trampling by hunters is expected to be insignificant. Additionally, the Service prohibits the take of plants or removal of vegetation, including nectar sources or milkweed, on the refuge. The refuge also prohibits the cutting of trees or brush which helps to reduce habitat modification. Thus, impacts to monarch foraging habitat from hunting are considered discountable. Therefore, the Proposed Action is not likely to jeopardize the continued existence of the species.

No significant adverse impacts from the Proposed Action would be expected to any of the above listed threatened, endangered, and other special status species. With the refuge providing both temporal and spatial protections and being more restrictive than state hunting regulations in many cases, disturbance from the Proposed Action would be not likely to adversely affect or jeopardize any threatened species, endangered species, or species of concern. The proposed hunting program was designed to be sustainable and minimize impacts, including to threatened and endangered species and other special status species. Further, refuge staff would actively coordinate with the Kentucky Ecological Services Field Office in order to ensure that potential adverse effects on those species would be adequately addressed. It is the policy of the Service to protect and preserve all native species of



fish, amphibians, reptiles, birds, mammals, invertebrates, and plants, which are designated threatened or endangered, including their habitats.

### Habitat and Vegetation

Refuge visitors can trample vegetation on- and off-trail. A plant's response to trampling is heavily influenced by its morphological characteristics (Pescott and Stewart 2014, Marion et al. 2016). The brittle woody stems of shrubs and small trees and rigid stems of tall forbs are susceptible to trampling, which damages buds and flowers and reduces seed production (Cole 1995, Cole and Monz 2002, Marion et al. 2016). Grasses, sedges, and low-growing herbs are more resistant due to flexible stems and underground perennating buds (Hill and Pickering 2009, Striker et al. 2011, Marion et al. 2016). Once trampling occurs, vegetation is slow to recover; however, studies have consistently shown that the most impact occurs with initial or low use, with a diminishing increase in impact associated with increasing traffic levels (Bostrom et al. 2021). The proposed hunting use would not be expected to adversely affect refuge habitat and vegetation. Hiking or walking can alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. For each mile of trail, approximately 0.6 acres of soil is affected (Liddle 1975). Soil compaction makes root penetration more difficult, making it harder for seedlings to become established. In moderate cases of soil compaction, plant cover and biomass are decreased. In highly compacted soils, plant species abundance and diversity are reduced in the long-term as only the most resistant species survive (Liddle 1975). Hiking may impact vegetation succession as disturbance of vegetation not only results in an alteration of vegetation but also a change in light, moisture, and topographical characteristics that can reduce ground- and shrub-nesting avian species. Nesting success of ground-nesting birds is also influenced by vegetation cover and disturbance (Blakesly and Reese 1988). Similar impacts could occur from accessing hunting areas by bicycle, motor vehicle, and boats. Bicycle wheels can cause physical impacts on soil surfaces. Cessford (1995) reported that the shearing action of wheels damages trails, with damage increasing during wet conditions and when bicyclists travel up steep slopes. Once vegetation and organic litter are lost, exposed soils are subject to compaction, leading to increased erosion and wetland sedimentation (Cooke and Xia 2020). The consequences of compacted soil include increased soil temperatures, reduced moisture (Marion et al. 2016), reduced soil biota (Liddle 1997), and resistance to seed germination and penetration by plant roots (Alessa and Earnhart 2000). However, soil erosion is largely avoidable with good trail design and maintenance. Properly designed drainage features divert water from a trail, where vegetation and organic litter can filter out sediments (Bostrom et al. 2021). Similar impacts would be expected from the limited use of all-terrain vehicles. The Service would avoid

additional soil compaction by restricting bicyclists and motor vehicles including off-road and/or all-terrain vehicles to designated trails and roads. Recreational boat traffic and mooring infrastructure can have long-term impacts on submerged aquatic vegetation abundance in freshwater and coastal systems (Sagerman et al. 2020). Boating can reduce vegetation cover and height and alter its composition (Hansen et al. 2019). The loss, fragmentation, and alteration of aquatic vegetation can affect its beneficial ecological functions. For example, several studies have shown that submerged vegetation's ability to reduce turbidity is related to its abundance and extent (Orth et al. 1999, Moore 2004, Austin et al. 2017).

Visitors can introduce invasive plants, animals, and pathogens (Marion et al. 2006, Davies and Sheley 2007, Anderson et al. 2015) regardless of the type of visitation. Once present, invasive species can out-compete native plants and animals, thereby altering habitats (Marion et al. 2006, Anderson et al. 2015). Invasive species can alter animal and plant composition, diversity, and abundance (Eiswerth et al. 2005, Davies and Sheley 2007). These changes may reduce native forage, cover, and water sources (Eiswerth et al. 2005). Certain invasive species may even impede access to other recreational activities, such as hydrilla, which blocks waterways.

Repeated visitation to any location on the refuge could cause damage to vegetation and, therefore, wildlife habitat. Substantial, widespread habitat degradation could, through time, result in negative effects to wildlife by reducing available cover, food, and nesting habitat along heavily used access routes. For hunters, impacts to wildlife habitat would be expected to be minimal as most plant species will have already undergone senescence or become dormant. Repeated use of an area by boats can damage emergent and submergent vegetation beds. Portions of, or whole plants, can be torn, sometimes by roots, and boat wakes contribute to erosion. Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to boats or trailers is another potential source of direct, adverse impacts. People and boats can be vectors for invasive plants when seeds or other propagules are moved from one area to another. Once established, invasives can outcompete native plants, thereby altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment will be an issue requiring annual monitoring and, when necessary, treatment. In the event new undesirable invasive species are found on the refuge, staff would work to eradicate the weeds and educate the visiting public about the problem.

Negative ecological effects associated with an overpopulated deer herd include lack of oak and other hardwood regeneration, a notable lack of shrub component, and an herbaceous layer lacking in species variety. High deer densities denude the forest of

shrubs and saplings, jeopardizing future regeneration and natural successional processes; as trees mature and die, there are no young trees to fill the gaps. Management and control of the deer herd is imperative to accomplish refuge objectives. If left uncontrolled, deer herds can become so numerous that they adversely affect associated plant and animal communities by reducing ecological diversity and negatively impacting healthy ecosystem functions. When habitat carrying capacity is exceeded, competition for limited food resources results in over browsing by deer. Severe over browsing alters plant species composition, distribution, and abundance, and reduces understory structural diversity. These changes may have a deleterious impact on local animal communities that depend on healthy vegetative systems for food and cover (Ellingwood and Caturano 1988). Additionally, feral hogs can have an impact on abundance and richness of plant species and cause crop damage (Massei et. al. 2011).

As analyzed in the EA (Section B, USFWS 2024), short-term adverse impacts of the proposed hunting use to habitat and vegetation would not be anticipated to be significant.

#### Visitor Use and Experiences

Over time, the Service anticipates opening the refuge to all six priority wildlife-dependent public uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Opening the refuge to proposed hunting activities would provide additional opportunities for this popular use with minor beneficial impacts expected for visitor use and experiences. As public use levels on the refuge expand across time, unanticipated conflicts between users and user groups may occur. The refuge's Visitor Services programs would be regularly evaluated and adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities that include promoting public safety.

In an effort to minimize conflicts with priority non-hunting recreational uses outlined in the NWRSA and for public safety, the refuge would designate areas open to hunting and enforce refuge-specific regulations. Areas administratively closed to hunting would be clearly marked with signs stating, "No Hunting Zone" or "Area Beyond This Sign Closed" and illustrated in the refuge hunt brochure map. Overall, hunting impacts to visitor services and recreation opportunities would be considered short-term, minor, and localized. Past conflicts on other refuges have been minimal, and we anticipate future conflicts on Green River NWR to be about the same. As property is acquired and visitor amenities developed, specific measures would be taken to avoid conflict with non-hunting refuge visitors, potentially including

establishing no hunting zones around any offices and visitor center/visitor contact sites and posting signs at key refuge entry points to notify the public that hunts are in progress.

### Summary

In summary, we would anticipate no direct or indirect beneficial or adverse short-term impacts from the Proposed Action to migratory game birds, big game, non-target wildlife and aquatic species, threatened and endangered species and other special status species, habitat and vegetation (including vegetation of special management concern), visitor use and experience, land use, socioeconomics, environmental justice communities, geology and soils, air quality, water quality, floodplains, or cultural resources.

### Long-term impacts

The proposed hunt program for the refuge was designed to be sustainable. Long-term impacts from the proposed hunting use would not be anticipated; however, the use and its effects on refuge resources would be monitored by refuge staff to ensure that no significant impacts were associated with the use and that the use continued to meet compatibility requirements. Regulations on migratory bird hunting are determined through the assessment of annual surveys, waterfowl banding data, and hunter harvest data. Survey data is obtained through aerial surveys that count birds, ponds, and nests of the North American flyways and provide information for analyzing population and habitat conditions. Recommendations from the Flyway Council are considered when original rules are created. Rules are presented to the public through the Federal Register and followed by a series of public meetings for any recommendations. The final regulations are assessed based on a collective analysis of all information, as well as council and public recommendations. The state of Kentucky annually reviews hunting seasons and bag limits for all game species and modifies them to avoid any long-term population declines. Since it would exist within the established state and Federal frameworks and regulations, the proposed refuge hunting would not be expected to adversely impact game or non-game species populations.

Over time, global climate change is likely to produce significant effects on the natural system of the refuge; however, many of these potential effects are unknown or not predictable with any specificity. The Service recognizes that the refuge is already in a period of accelerated change; some of this change may be associated with global climate change, but other factors, such as human population growth and associated development, are also causal in system changes. The primary roles of the refuge in

light of future change associated with global climate change and other anthropogenic factors are maintaining a functioning ecosystem for native wildlife and fisheries and monitoring to contribute to an understanding of the ongoing changes and potential for mitigation through active management. Monitoring of range expansions of invasive or exotic species and monitoring of composition, distribution and health of forests by the refuge are also potentially valuable efforts, particularly if in coordination with regional efforts.

In summary, we would anticipate no direct or indirect beneficial or adverse long-term impacts from the Proposed Action to migratory game birds, big game, non-target wildlife and aquatic species, threatened and endangered species and other special status species, habitat and vegetation (including vegetation of special management concern), visitor use and experience, land use, socioeconomics, environmental justice communities, geology and soils, air quality, water quality, floodplains, or cultural resources.

### Cumulative Impacts

Cumulative impacts on the environment result from incremental impacts of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative impacts may result from individually minor actions, they may, viewed as a whole, become substantial over time. The proposed refuge hunt program was designed to be sustainable through time, given relatively stable conditions and in accordance with Federal frameworks and state regulations and bag limits, particularly because of close coordination with KDFWR.

Because of the regulatory process for harvest management in place within the Service, the setting of hunting seasons largely outside of the breeding seasons of resident and migratory wildlife, the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, and the wide geographic separation of individual refuges, we would anticipate no direct or indirect beneficial or adverse cumulative impacts from the Proposed Action to migratory game birds, big game, non-target wildlife and aquatic species, threatened and endangered species and other special status species, habitat and vegetation (including vegetation of special management concern), visitor use and experience, land use, socioeconomics, environmental justice communities, geology and soils, air quality, water quality, floodplains, or cultural resources.

In summary, the cumulative impacts of hunting on migratory game bird and big game, and the potential future hunting of feral hogs at the refuge would be negligible. The proportion of the refuge's harvest of these species would be negligible when

compared to local, regional, and statewide populations and harvest. Any negative cumulative impacts that could potentially be realized in the future to refuge resources would be further reduced by appropriate modifications to the use.

The Service acknowledges potential impacts associated with the proposed hunting use in an effort to continually meet the needs of the public while maintaining the biological integrity, diversity, and environmental health of the refuge. The refuge staff would monitor both harvest trends and wildlife health to ensure that target species can be hunted at the refuge without appreciably adversely affecting these populations. As analyzed in the EA (Section B, USFWS 2024), no significant adverse or beneficial cumulative impacts would be expected from the proposed hunting use.

### **Public Review and Comment**

The Service sent scoping letters to KDFWR and nine potentially interested Native American Tribes (i.e., Cherokee Nation, Chickasaw Nation, Delaware Nation of Oklahoma, Eastern Band of Cherokees, Miami Tribe of Oklahoma, Osage Nation, Peoria Tribe of Indians of Oklahoma, Quapaw Tribal Business Committee, and United Keetoowah Band of Cherokee Indians) on March 31, 2021 with follow up letters on January 4, 2024, to engage them early in the planning process for the proposed hunting program at Green River NWR. The EA, draft Hunt Plan, draft Hunting Compatibility Determination, and draft refuge-specific regulations were made available for public review and comment in 2024 nationally through the Federal Register and locally through notice to local media and notice on the refuge's website (<https://www.fws.gov/refuge/green-river>) and Facebook page (<https://www.facebook.com/GreenRiverNWR/>). Separate notice was also provided to KDFWR and the nine above-mentioned Native American Tribes.

All comments received will be reviewed in the development of final documents. All comments received become part of the official public record. We will handle all requests for such comments in accordance with the Freedom of Information Act and National Environmental Policy Act regulations in 40 CFR §1506.6(f).

The refuge maintains a contact list, for public information bulletin purposes, to local newspapers, radio, and television news stations. Special announcements and articles may be released in conjunction with hunting seasons. In addition, information about proposed hunting and sport would be available on the Green River NWR website (<https://www.fws.gov/refuge/green-river>), social media pages (<https://www.facebook.com/GreenRiverNWR/>), and the Service's Find Your Hunt website (<https://www.fws.gov/refuges/hunting/map/>).

## Determination

Is the use compatible?

Yes

### Stipulations Necessary to Ensure Compatibility

To ensure compatibility with refuge purposes and the Refuge System mission, hunting would occur at Green River NWR in accordance with state and Federal regulations and special refuge-specific restrictions to ensure that wildlife and habitat management goals are achieved and that the program is providing a safe, high-quality hunting experience for participants. This hunting program would be monitored and potentially modified or eliminated to ensure that the use meets compatibility requirements. The listed stipulations are necessary to ensure compatibility and reflect proposed CFR refuge-specific regulations; these stipulations and the CFR refuge-specific regulations may be modified over time to meet refuge management goals and objectives, to ensure continued compatibility of the use, to address changing conditions, and/or to meet public safety needs.

- This use must be conducted in accordance with state and Federal regulations, and special refuge regulations published in the annual refuge hunt brochure and outlined in 50 CFR Part 32. Season dates, hunt methods, species hunted, quota hunt application procedures, and other hunt related information is located on the refuge website and in the hunt brochure.
- This use is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in a determination that hunting is causing unanticipated adverse impacts to natural communities, wildlife species, wildlife habitat, or other refuge management goals and objectives.
- Hunting on the refuge may be more restrictive than state seasons and regulations to ensure compliance and to provide for public safety, reduce wildlife and habitat disturbance, facilitate opportunities for high-quality hunting, and to meet other refuge management goals and objectives.
- Federal wildlife law enforcement officers will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Law enforcement personnel will monitor all areas and enforce all applicable state and Federal regulations.
- The Refuge Manager may, upon review of the hunting program and in coordination with the KDFWR, impose further restrictions on hunting on the

refuge, recommend that the refuge be closed to hunting, or further liberalize hunting regulations within the limits of state seasons and regulations or as otherwise coordinated with KDFWR (e.g., to address chronic wasting disease). Hunting restrictions may be implemented to meet other refuge management goals and objectives, ensure continued compatibility of the use, and/or meet public safety needs.

- Refuge-specific regulations and other regulations in CFR outline prohibited activities relative to the refuge hunt program, including those listed.
  - Prohibitions
    - Hunting in designated closed areas
    - Hunting within 100 yards (91 meters) of a residence, graveled roads, and hiking trails managed by the Service as part of Green River NWR
    - Marking or flagging any tree or other refuge feature with non-biodegradable reflectors, paint, flagging, or other substance
    - Trapping
    - Reserving hunting areas by leaving boat, decoys, portable blinds, tree stands, or other materials or items
    - Using all-terrain vehicles (ATVs, including off-highway vehicles and utility task vehicles) without a Special Use Permit (FWS Form 3-1383-G)
    - Using internal combustion motors, personal watercraft (*e.g.*, jet skis), airboats, and hovercraft
    - Blocking gates or roadways
    - Discharging a weapon outside of hunting season, including target practice
    - Using motor vehicle, bikes, or e-bikes on other than designated routes
    - Unauthorized taking, disturbing, injuring and damaging of wildlife and plants (including cutting trees or brush)
    - Introducing plants and animals or their parts taken elsewhere
    - Searching for, or removing, any object of antiquity or other valued objects
    - Using artificial light to locate wildlife
    - Interfering with any private person or employee of a state or Federal government agency engaged in an authorized activity
    - Littering
    - Cleaning of harvested game and/or discarding of carcasses in public use areas



- Installing or using permanent structures, including stands or blinds
- Using fires
- Camping
- Having pets not on a leash, except for legal use of hunting dogs
- Participating in a commercial activity without appropriate permit
- Driving a nail, spike, or other metal object in tree or hunting from tree with such an object in it
- Hunting without securing and possessing appropriate licenses, stamps, and permits, including a state hunting license
- Using arrows to which any drug, chemical, or toxic substance has been added
- Using or possessing alcoholic beverages or controlled substances
- Hunting of any wildlife by the aid of or distributing any feed, salt, minerals, or other ingestible attractants
- Installing or using trail cameras

The refuge is closed at night, except during designated hunting access hours. As outlined above, hunters may enter the refuge two hours prior to legal sunrise and must leave within two hours after legal sunset. Special closures are in effect during waterfowl season. Consult the Green River NWR hunt brochure for specific information and a map.

#### Key Requirements:

The 2019 LPP for Green River NWR outlined a 53,000-acre Conservation Partnership Area (CPA) within which the Service is authorized to acquire up to 24,000 acres for Green River NWR (USFWS 2019). As of December 31, 2023, the Service (Figure 1) currently owns and manages approximately 2,197 acres for the refuge. Under the proposal, and as previously analyzed (USFWS 2019), the Service would open the listed hunts. As lands are acquired by the Service for management within Green River NWR they will be assessed for inclusion into the hunt program and included within the appropriate hunt unit.

- In 2024-25, Green River NWR proposes to open the 589.13 acres of the Horseshoe Bend Unit to the following hunts:
  - Migratory waterfowl hunting (duck, goose, coot, and merganser) for youth, seniors, and disabled hunters, as defined by the state, during the months of December and January of the statewide season and in for youth and veterans for the February for the state-wide Veterans and youth dates.
  - Deer and turkey archery and crossbow only hunting for youth, seniors, and disabled hunters, as defined by the state, during the months of September and October of the statewide season

- Turkey archery and crossbow only hunting for youth only, as defined by the state, during the months of April and May of the statewide season
- In 2024-25, Green River NWR proposes to open the 204 acres of the Tscharner West section of the Bluff Unit to the listed hunts.
  - Deer and turkey archery and crossbow only hunting for youth, seniors, and disabled hunters, as defined by the state, during the months of September and October of the statewide season
  - Turkey archery and crossbow only hunting for youth only, as defined by the state, during the months of April and May of the statewide season
- Beginning in the 2025-26 hunt season, given the logistical timing of approval for hunt plans, as well as the time needed for applications, awards, and permit issuance, the Service proposes to open approximately 793.13 acres (i.e., 589.13 acres in Horseshoe Bend and 204 acres of the Tscharner West section of Bluff Unit) to the listed hunts.
  - Quota archery and crossbow deer/turkey in November of the statewide season

The proposed refuge-specific hunting regulations for Green River NWR were published in the 2024-25 Hunting and Sport Fishing Rule in the Federal Register (see [50 CFR Part 32 Subpart B](#) for current regulations); they are incorporated herein by reference.

## **Justification**

As outlined in the NWRSA, hunting is a priority wildlife-dependent use for the NWRS through which the public can develop an appreciation for fish and wildlife. The Service's policy is to provide opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

While hunting serves a recreational need, hunting on national wildlife refuges is also an important, proactive management action that can prevent overpopulation of certain wildlife species and the deterioration of habitat. Disturbance to other species would be expected to occur, but this disturbance would generally be short-term, minor, and localized in effect. Suitable habitat exists on current and potential future refuge properties to support hunting as proposed. Further, hunting as outlined in this draft compatibility determination, detailed in the draft Hunting Plan (Section A, USFWS 2024), and analyzed in the EA (Section B, USFWS 2024) would support the primary purpose of the refuge and the LPP and CMP (USFWS 2019) for Green River NWR. The proposed hunting use would also further align the refuge with the

Department of the Interior's Secretarial Orders 3356 and 3347, which direct the Service to expand hunting opportunities and align as much as possible with state hunting regulations.

The Service's policy is to provide opportunities for wildlife-dependent recreation where appropriate, compatible, and consistent with refuge purposes and the Refuge System mission. The stipulations outlined above would help ensure that the use continues to be compatible on the refuge. This activity would not conflict with any of the other priority public uses on the refuge or adversely impact biological resources. Hunting, as outlined above, would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. Based on available science and best professional judgement, the Service has determined that the hunting on Green River NWR, in accordance with the stipulations provided here, would not materially interfere with, or detract from, the fulfillment of the refuge System mission or the purposes of the refuge.

### **Signature of Determination**

Refuge Manager Signature and Date

### **Signature of Concurrence**

Assistant Regional Director Signature and Date

### **Mandatory Reevaluation Date**

2039

## Literature Cited/References

- Alessa, L. and C. G. Earnhart. 2000. Effects of soil compaction on root and root hair morphology: Implications for campsite rehabilitation. In: Cole, D. N., S. F. McCool, W. T. Borrie, J. O Loughlin (comps.). 2000. Wilderness science in a time of change conference-Volume 5: Wilderness ecosystems, threats, and management; 1999 May 23 27; Missoula, MT. Proceedings RMRS-P-15-VOL-5. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. pp. 99-104.
- Anderson, L. G., S. Roccliffe, N. R. Haddaway, and A. M. Dunn. 2015. The role of tourism and recreation in the spread of non-native species: A systematic review and meta-analysis. *PLoS ONE* 10:p.e0140833.
- Arrese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male Song Sparrows. *Animal Behavior*, 35:773-784.
- Austin, Å. N., J. P. Hansen, S. Donadi, and J. S. Eklöf. 2017. Relationships between aquatic vegetation and water turbidity: A field survey across seasons and spatial scales. *PLoS ONE* 12:e0181419.
- Bartelt, G.A 1987. Effects of disturbance and hunting on the behavior of Canada goose family groups in east central Wisconsin. *Journal of Wildlife Management*, 51:517-522.
- Beale, C. M. and P. Monaghan. 2004. Behavioural responses to human disturbance: A matter of choice? *Animal Behavior* 68:1065-1069.  
<https://doi.org/10.1016/j.anbehav.2004.07.002>
- Bélanger, L. and J. Bédard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management* 54:36-41.
- Bergman, R. D. 1973. Use of southern boreal lakes by post-breeding canvasbacks and redheads. *Journal of Wildlife Management* 37: 160-170.
- Blakesley, J. A. and K. P. Reese. 1988. Avian use of campground and non-campground sites in riparian zones. *Journal Wildlife Management*, 52(3):399-402.
- Bostrom, H., C. Crachiola, A. Kosnett, and B. Rasmussen. 2021. Bicycling impacts on National Wildlife Refuges. U.S. Department of Transportation. John A. Volpe National Transportation Systems Center. DOT-VNTSC-FWS-21-03.  
<https://rosap.ntl.bts.gov/view/dot/59266>
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation* 21:231-241.

- Burger, J. and M. Gochfeld. 1998. Effects of ecotourists on bird behavior at Loxahatchee National Wildlife Refuge, FL. *Environmental Conservation* 25:13–21.
- Cessford, G. R. 1995. *Off-road mountain biking: A profile of participants and their recreation setting and experience preferences*. Department of Conservation, Wellington, New Zealand. <https://www.doc.govt.nz/Documents/science-and-technical/sr93.pdf>
- Cole, D. N., and R. L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. *Natural Resources and Environmental Issues*, (0), Article 6. Utah State University <https://digitalcommons.usu.edu/nrei/vol0/iss1/6>.
- Cole, D. 1995. Experimental trampling of vegetation. II. Predictors of resistance and resilience. *Journal of Applied Ecology* 32:215–224.
- Cole, D. and C. Monz. 2002. Trampling disturbance of high-elevation vegetation, Wind River Mountains, Wyoming, USA. *Arctic, Antarctic, and Alpine Research* 34:365–376.
- Commonwealth of Kentucky. 2022. Wild Pig Home. Kentucky Department of Fish and Wildlife Resources. Frankfort, KY. <https://fw.ky.gov/InvasiveSpecies/Pages/Wild-Pig-Home.aspx>
- Cooke, M. T. and L. Xia. 2020. Impacts of land-based recreation on water quality. *Natural Areas Journal* 40:179–188.
- Crabtree, R.L., and J.W. Sheldon. 1999. The Ecological Role of Coyotes on Yellowstone’s Northern Range. *Yellowstone Science*, Spring 1999, pp. 15-23.
- Cronan, J.M. Jr., 1957. Food and Feeding Habits of the Scaups in Connecticut Waters. *The Auk* , Oct., 1957, Vol. 74, No. 4 (October 1957), pp. 459-468.
- Davies, K. W. and R. L. Sheley. 2007. A conceptual framework for preventing the spatial dispersal of invasive plants. *Weed Science* 55:178–184.
- DeLong. A. K. 2002. Managing visitor use and disturbance of waterbirds – a literature review of impacts and mitigation measures – prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) in Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Department of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR.
- deMaynadier, P.G., and M.L. Hunter, Jr. 1995. The relationship between forest management and amphibian ecology: a review of the North American literature. *Environmental Reviews*, 3(3-4):230-261. <https://doi.org/10.1139/a95-012>.

- Ellingwood, M.R., and S.L. Caturano. 1988. An evaluation of deer management options. New England Chapter of The Wildlife Society and Northeast Deer Technical Committee.
- Eiswerth, M. E., T. D. Darden, W. S. Johnson, J. Agapoff, and T. R. Harris. 2005. Input-output modeling, outdoor recreation, and the economic impacts of weeds. *Weed Science* 53:130–137.
- Fox, A. D., and J. Madsen. 1997. Behavioral and distributional effects of hunting disturbance on waterbirds in Europe: implications for refuge design. *Journal of Applied Ecology*, 34:1-13.
- Frid, A. and L. M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology* 6.
- Gaynor, K. M., C. E. Hohnowski, N. H. Carter, and J. S. Brashares. 2018. The influence of human disturbance on wildlife nocturnality. *Science* 360:1232–1235.
- Gill, J. A., W. J. Sutherland, and A. R. Watkinson. 1996. A method to quantify the effects of human disturbance on animal populations. *Journal of Applied Ecology*, 33:786-792.
- Gill, J.A., K. Norris, and W.J. Sutherland. 2001. The effects of disturbance on habitat use by black-tailed godwits *Limosa limosa*. *Journal of Applied Ecology*. Vol. 38 pp.846-856.
- Gutzwiller, K. J., R. T. Wiedenmann, K. L. Clements, and S. H. Anderson. 1994. Effects of human intrusion on song occurrence and singing consistency in subalpine birds. *The Auk* 111:28–37.
- Hammitt, W. E., and D. N. Cole. 1998. *Wildlife Recreation: Ecology and Management* (2nd edition). New York: John Wiley & Sons. 361 pp.
- Hansen, J. P., G. Sundblad, U. Bergstrom, A. N. Austin, S. Donadi, B. K. Eriksson, and J. S. Eklof. 2019. Recreational boating degrades vegetation important for fish recruitment. *Ambio* 48:539–551.
- Havera, S. P., L. R. Boens, M. M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*, 20:290-298.
- Heitmeyer, M. E., and D. G. Raveling. 1988. Winter resource use by three species of dabbling ducks in California. Final report to Delta Waterfowl and Wetlands Research Center.

- Hester, A.J., L. Edenius, R.M. Buttenschøn, and A.T. Kuiters. 2000. Interactions between forests and herbivores: the role of controlled grazing experiments. *Forestry: An International Journal of Forest Research*, Volume 73, Issue 4, 2000, Pages 381–391. <https://doi.org/10.1093/forestry/73.4.381>.
- Hill, W. and C. M. Pickering. 2009. Differences in the resistance of three subtropical vegetation types to experimental trampling. *Journal of Environmental Management* 90:1305–1312.
- Hobbs, N. T. 1996. Modification of ecosystems by ungulates. *Journal of Wildlife Management*, 60:695–713.
- Ikuta, L. A. and D. T. Blumstein. 2003. Do fences protect birds from human disturbance? *Biological Conservation* 112:447–452. [https://doi.org/10.1016/S0006-3207\(02\)00324-5](https://doi.org/10.1016/S0006-3207(02)00324-5)
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin* 19: 242–248.
- Kentucky Department of Fish and Wildlife Resources. 2023. Avian Pox. Commonwealth of Kentucky. Frankfort, KY. <https://fw.ky.gov/Wildlife/Pages/Avian-Pox.aspx>.
- Knight, R. L., and D. N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. *Transactions of the North American Wildlife and Natural Resources Conference* 56:238–247.
- Knight, R.L. and D.N. Cole. 1995. Wildlife response to recreationists. Pages 71–79 in R.L. Knight and K.J. Gutzwiller, eds., *Wildlife and Recreationists: Coexistence thorough Management and Research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, C.E. and R.B. Dahlgren. 1992. Human Disturbance of Waterfowl: Causes, Effects and Management. U.S. Fish and Wildlife Service Leaflet 13.2.15. 7 pp.
- Korschgen, C.E., L.S. George and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. *Wildlife Society Bulletin* 13: 290–296.
- Kuss, F. R. 1986. A review of major factors influencing plant responses to recreation impacts. *Environmental Management*, 10:638–650.
- Liddle, M. J. 1975. A selective review of the ecological effects of human trampling on natural ecosystems. *Biological Conservation*, 7:17–36.
- Liddle, M. 1997. *Recreation ecology: the ecological impact of outdoor recreation and ecotourism*. Chapman & Hall Ltd.

- Livezey, K. B., E. Fernández-Juricic, and D. T. Blumstein. 2016. Database and metadata of bird flight initiation distances worldwide to assist in estimating human disturbance effects and delineating buffer areas. *Journal of Wildlife Management* 7. <https://doi.org/10.3996/082015-JFWM-078>
- Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. *Biological Conservation* 33:53-63.
- Madsen, J. 1995. Impacts of disturbance on migratory waterfowl. *Ibis*, 137:S67-S74.
- Madsen, J., and A. D. Fox. 1995. Impacts of hunting disturbance on waterbirds – a review. *Wildlife Biology*, 1:193-207.
- Marion, J. L., Y. F. Leung, and S. K. Nepal. 2006. Monitoring trail conditions: New methodological considerations. *The George Wright Forum* 23:36-49.
- Marion, J. L., Y. Leung, H. Eagleston, and K. Burroughs. 2016. A review and synthesis of recreation ecology research findings on visitor impacts to wilderness and protected natural areas. *Journal of Forestry* 114:352-362.
- Martín, B., S. Delgado, A. de la Cruz, S. Tirado, and M. Ferrer. 2015. Effects of human presence on the long-term trends of migrant and resident shorebirds: Evidence of local population declines. *Animal Conservation* 18:73-81.
- Marzano, M., and N. Dandy. 2012. Recreationist behaviour in forests and the disturbance of wildlife. *Biodiversity and Conservation* 21.11 (2012): 2967-2986.
- Massei, G., S. Roy, and R. Bunting. 2011. Too many hogs?: A review of methods to mitigate impact by wild boar and feral hogs. *Human-Wildlife Interactions* Vol. 5, No. 1, pp. 79-99.
- McLeod, E. M., P.-J. Guay, A. J. Taysom, R. W. Robinson, and M. A. Weston. 2013. Buses, cars, bicycles and walkers: The influence of the type of human transport on the flight responses of waterbirds. *PLoS ONE* 8:e82008.
- McNeil, R., P. Drapeau, and J. D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. *Biological Review* 67:381-419.
- Midwest Association of Fish and Wildlife Agencies. 2019. MAFWA Ad-hoc Feral Swine Committee – 2019 Annual Report. MAFWA Ad-hoc Feral Swine Committee 5/10/2019 Compiled and Submitted by Steven E. Backs, Chr. [http://www.mafwa.org/wp-content/uploads/2019/05/feral-swine\\_rpt19.pdf](http://www.mafwa.org/wp-content/uploads/2019/05/feral-swine_rpt19.pdf)
- Miller, S. G., R. L. Knight, and C. K. Miller. 1998. Influence of recreational trails on breeding bird communities. *Ecological Applications*, 8:162-169.



- Moore, K. A. 2004. Influence of seagrasses on water quality in shallow regions of the lower Chesapeake Bay. *Journal of Coastal Research* 2009:162–178.
- Mortensen, D.; E. Rauschert, A. Nord, B. Jones, 2009. Forest roads facilitate the spread of invasive plants. *Invasive Plant Sci. Manage.* 2009, 2(3), 191–199.
- Mosby, H. S. 1969. The influence of hunting on the population of a woodlot grey squirrel population. *Journal of Wildlife Management*, 33(1):59–73.
- Müllner, A., K. E. Linsenmair, and M. Wikelski. 2004. Exposure to ecotourism reduces survival and affects stress responses in hoatzin chicks (*Opisthocomus hoazin*). *Biological Conservation* 118:549–558.
- Nielson, T., S. M. Palmatier, and A. Proffitt. 2019. *Literature review: Recreation conflicts focused on emerging e-bike technology*. Boulder County Parks and Open Space. <https://assets.bouldercounty.gov/wp-content/uploads/2020/01/e-bike-literature-review.pdf>
- Orth, R. J., M. C. Harwell, and J. R. Fishman. 1999. A rapid and simple method for transplanting eelgrass using single, unanchored shoots. *Aquatic Botany* 64:77–85.
- Owens, N. W. 1977. Responses of wintering brant geese to human disturbance. *Wildfowl*, 28:5–14.
- Paulus, S. L. 1984. Activity budgets of nonbreeding gadwalls in Louisiana. *Journal of Wildlife Management*, 48:483–489.
- Pease, M. L., R. K. Rose, and M. J. Butler. 2005. Effects of human disturbance on the behavior of wintering ducks. *Wildlife Society Bulletin* 33:103–112.
- Pescott, O. L. and G. B. Stewart. 2014. Assessing the impact of human trampling on vegetation: A systematic review and meta-analysis of experimental evidence. *PeerJ* 2:e360.
- Raveling, D. G. 1979. The annual cycle of body composition of Canada geese with special reference to control of reproduction. *Auk*, 96:234–252.
- Roovers, P., K. Verheyen, M. Hermy, and H. Gulinck. 2004. Experimental trampling and vegetation recovery in some forest and heathland communities. *Applied Vegetation Science*, Vol. 7:111–118.
- Sagerman, J., J. P. Hansen, and S. A. Wikström. 2020. Effects of boat traffic and mooring infrastructure on aquatic vegetation: A systematic review and meta-analysis. *Ambio* 49:517–530. <https://doi.org/10.1007/s13280-019-01215-9>

- Schmitz, O. J., and A. R. E. Sinclair. 1997. Rethinking the role of deer in forest ecosystem dynamics. Pages 201–223 in W. J. McShea, J. Rappole, and B. Underwood, eds. *The science of overabundance: deer ecology and population management*. Smithsonian Institution Press, Washington, D.C., USA.
- Schultz, R. D., and M. Stock. 1993. Kentish plovers and tourist-competitors on sandy coasts? *Wader Study Group Bulletin*, 68 (special issue):83–92.
- Skagen, S.K. 1980. Behavioral response of wintering bald eagles to human activity on the Skagit River, Washington. Pages 231–241 in R.L. Knight, G.T. Allen, M.V. Stalmaster and C.W. Servhenn, eds., *Proceedings of the Washington Bald Eagle Symposium*. The Nature Conservancy, Seattle, Washington.
- Spahr, R. 1990. Factors affecting the distribution of bald eagles and effects of human activity on bald eagles wintering along the Boise River. MSc Thesis. Boise State University, Boise, ID.
- Speakman, J. R., P. I. Webb, and P. A. Racey. 1991. Effects of disturbance on the energy expenditure of hibernating bats. *Journal of Applied Ecology* 28:1087–1104.
- Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: A bibliography and review. *Discussion Papers in Conservation No. 4*. University College of London, England. 35 pp.
- Sterling, T. and A. Dzubin. 1967. Canada goose molt migrations to the Northwest Territories. *Transactions of the North American Research Conference* 32:367–369.
- Striker G. G., F. P. O. Mollard, A. A. Grimoldi, R. J. C. León, and P. Insausti. 2011. Trampling enhances the dominance of graminoids over forbs in flooded grassland mesocosms. *Applied Vegetation Science* 14:95–106.
- Taylor, A. and R. Knight. 2003. Wildlife Responses to recreation and associated visitor perceptions. *Ecological Applications* 13:951–963.
- Thiel, D., S. Jenni-Eiermann, V. Braunisch, R. Palme, and L. Jenni. 2008. Ski tourism affects habitat use and evokes a physiological stress response in capercaillie *Tetrao urogallus*. A new methodological approach. *Journal of Applied Ecology* 45:845–853.
- Thomas, V. G. 1983. Spring migration: the prelude to goose reproduction and a review of its implication. In *Fourth Western Hemisphere Waterfowl and Waterbird Symposium*, edited by H. Boyd. Ottawa, Canada: Canadian Wildlife Service.
- Thomas, K., R. G. Kvitek, and C. Bretz. 2003. Effects of human activity on the foraging behavior of sanderlings *Calidris alba*. *Biological Conservation* 109:67–71.

- U.S. Fish and Wildlife Service. 2008. Patoka River National Wildlife Refuge and Management Area Comprehensive Conservation Plan. 164 pp. <chrome-extension://efaidnbnmnibpcajpcglclefindmkaj/https://ecos.fws.gov/ServCat/DownloadFile/1502>
- U.S. Fish and Wildlife Service. 2014. Sam D. Hamilton Noxubee NWR Comprehensive Conservation Plan. Atlanta, GA: U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.
- U.S. Fish and Wildlife Service. 2019. Land Protection Plan and Environmental Assessment for Green River National Wildlife Refuge and Conservation Partnership Area. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region. September 2019. Atlanta, GA.
- U.S. Fish and Wildlife Service. 2024. Green River National Wildlife Refuge Draft Migratory Game Bird and Big Game Hunting Plan and Environmental Assessment. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region. June 2024. Atlanta, GA.
- Weimerskirch, H., S. A. Shaffer, G. Mabile, J. Martin, O. Boutard, J. L. Rouanet. 2002. Heart rate and energy expenditure of incubating wandering albatrosses: Basal levels, natural variation, and the effects of human disturbance. *Journal of Experimental Biology* 205:475–483.
- White-Robinson, R. 1982. Inland and salt marsh feeding of wintering brant geese in Essex. *Wildfowl*, 33:113–118.
- Wolder, M. 1993. Disturbance of wintering northern pintails at Sacramento National Wildlife Refuge, California. Master's thesis, Humboldt State University, Arcata, CA.
- Yasue, M. 2005. The effects of human presence, flock size and prey density on shorebird foraging rates. *Journal of Ethology* 23:199–204.