FINAL ENVIRONMENTAL ASSESSMENT – July 23, 2018

U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

HUNTING EXPANSION AT BEAR RIVER MIGRATORY BIRD REFUGE

This Environmental Assessment (EA) was prepared to evaluate effects associated with the proposed action and complies with the *National Environmental Policy Act* (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (43 CFR 46; 516 DM 8) and U.S. Fish and Wildlife Service (Service) (550 FW 3) regulations and policies. NEPA requires examination of the effects of proposed actions on the natural and human environment.

Proposed Action:

The Service is proposing to expand hunting opportunities for waterfowl and ring-necked pheasant on the Bear River Migratory Bird Refuge (MBR). This expansion revises and updates the refuge's 1995 Hunt Plan and proposes to open approximately 13,000 additional refuge acres to goose, duck, coot, swan, and pheasant hunting.

Background:

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act (NWRSAA) of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, the Refuge Recreation Act of 1962, and applicable provisions of the Code of Federal Regulations and U.S. Fish and Wildlife Service Manual. Additional laws, treaties, and executive orders that influence the operation and management of national wildlife refuges can be found in Appendix A.

Bear River Migratory Bird Refuge was established pursuant to a 1928 Presidential Proclamation and Public Law 304 of the 70th Congress. The Refuge's primary purpose is as "a suitable refuge and feeding, and breeding grounds for migratory wild fowl." Pursuant to Utah Code Ann. 23-21-6(1), the State of Utah also gave consent for "the acquisition of lands and water… as the United States may deem necessary… for the establishment and maintenance of migratory waterfowl refuges."

The mission of the NWRS, as outlined by the NWRSAA, as amended by the National Wildlife Refuge System Improvement Act (NWRSIA) (16 U.S.C. 668dd et seq.), is to:

"… 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"

The NWRSAA (16 U.S.C. 668dd(a)(4)) mandates the Secretary of the Interior in administering the System to:

- 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;
- Ensure that the mission of the NWRS described at 16 U.S.C. 668dd(a)(2), and the purposes of each refuge are carried out;
- 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;
- Assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the NWRS and the purposes of each refuge;
- 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;
- Ensure that opportunities are provided within the NWRS for compatible wildlife-dependent recreational uses; and
- Monitor the status and trends of fish, wildlife, and plants on each refuge.

Therefore, it is a priority of the Service to provide for wildlife-dependent recreation opportunities, including hunting, when those opportunities are compatible with the purposes for which a refuge was established and the mission of the NWRS. The Compatibility Determination for hunting on the refuge was reviewed and updated as part of this planning process (Appendix B).

Hunting has been a valued form of outdoor recreation at Bear River Migratory Bird Refuge since the refuge was established in 1928. Section 5 of the refuge's enabling legislation specifies, "That at no time shall less than 60 per centum of the total acreage of the said refuge be maintained as an inviolate sanctuary for such migratory birds. Therefore, the refuge can open up to 40% of its acreage to hunting, but 60% of the refuge must remained closed to hunting as an inviolate sanctuary.

In 1932, the year the Service began administering the refuge, 40% of the impounded area of the refuge, approximately 13,200 refuge acres, were open to hunting. In the early 1990s, refuge management decided to expand hunting opportunities, because the refuge had grown in acreage. In 1991, objectives for the refuge hunting program were proposed, put out for public review, and approved in the Restoration and Expansion of the Bear River Migratory Bird Refuge, Environmental Assessment (Hansen 1991). In 1995, a proposed refuge Hunt Plan and associated Environmental Assessment (1995 Hunt Plan and EA) were put out for public review and comment. Hunting was declared compatible with the purposes for which the refuge was established (as per 1995 Compatibility Determination, on file USFWS) and additional acreage was opened to waterfowl and pheasant hunting. Today, the total acreage of the refuge is 77,056

acres. Approximately 22%, or 17,256 acres, are open to hunting. For more information on the history of hunting in the area, see the refuge's 1995 Hunt Plan and EA.

Purpose and Need for the Proposed Action:

The purpose of this proposed action is to expand compatible hunting opportunities on Bear River MBR. The primary need of the proposed action is to meet the Service's priorities and mandates as outlined by the NWRSIA to "recognize compatible wildlife-dependent recreational uses as the priority general uses of the NWRS" and "ensure that opportunities are provided within the NWRS for compatible wildlife-dependent recreational uses" (16 U.S.C. 668dd(a)(4)). The additional needs of the proposed action are the following:

- Maintain 60% of the refuge as an "inviolate sanctuary" for migratory birds and closed to hunting.
- Maintain areas north of Forest Street as closed to swan hunting consistent with Federal migratory bird hunting frameworks.
- Facilitate hunting access for local and regional communities.
- Minimize conflicts with other wildlife-dependent recreation on the refuge.
- Minimize conflicts with refuge management and operations.
- Facilitate regulatory and public safety enforcement.
- Minimize disturbance to rest areas for swans.
- Minimize disturbance to rest areas for migratory waterfowl.
- Protect breeding populations of migratory waterfowl.
- Provide migration and breeding habitat for a diversity of waterfowl, wading birds, and shorebirds.

Alternatives Considered:

Actions Common to All Alternatives

Under all alternatives 60% of the refuge (46,234 acres) will be managed as inviolate sanctuary for migratory birds in accordance with the refuge's establishing legislation. Table 1 lists refuge units that will remain closed to hunting.

Areas north of Forest Street will remain closed to swan hunting consistent with current Federal migratory bird hunting frameworks described in the Final Environmental Assessment: Proposal to Establish Operational General Swan Hunting Seasons in the Pacific Flyway (USDI 2003).

Table 1. Refuge units that would remain closed to hunting.

Unit	Notes
1	Resting and feeding area for tundra and trumpeter swans.
1B	Resting and feeding area for tundra and trumpeter swans.
3C	Flight corridor for migratory waterfowl between hunting areas and resting areas.
3D	Flight corridor for migratory waterfowl between hunting areas and resting areas.
3E	Flight corridor for migratory waterfowl between hunting areas and

Unit	Notes
	resting areas.
3F	Resting and feeding area for waterfowl.
4A	Resting and feeding area for waterfowl.
4B	Flight corridor for migratory waterfowl between hunting areas and resting areas.
4C	Flight corridor for migratory waterfowl between hunting areas and resting areas.
5A	Resting and feeding area for waterfowl.
5B	Resting and feeding area for waterfowl.
5C	Resting and feeding area for waterfowl.
Jensen	Safety concerns due to occupied structures or other use occurring in the vicinity.
3-Bar	Safety concerns due to occupied structures or other use occurring in the vicinity.
N. Nichols (portion near visitor center)	Safety concerns due to occupied structures or other use occurring in the vicinity.
Christiansen	Reserved for non-consumptive public use.
Bunkhouse	Safety concerns due to occupied structures or other use occurring in the vicinity.

Alternative A – Continue Implementing 1995 Hunt Plan [No Action Alternative]

Currently, 17,256 acres of the refuge are open to duck, goose, coot, swan (with a special state permit) and ring-necked pheasant hunting.

Hunting activities are allowed in Units 1A, 2A, 3A, 2B, 2C, 2D, 3B, 3H, 3I, 3J, 3K, 9, and Block C – those portions of Units 7 and 8 that protrude south of the east-west refuge boundary line, also known as "Willard Spur" or "Dog Ears." Additional grassland and wet meadow acres are open to hunting in Unit 5D, and portions of tracts purchased from White and Nichols, along the eastern boundary of the refuge as posted. Figure 1 shows the areas currently open to hunting.

Current regulations for the areas listed above include:

- Airboats are allowed in Unit 9 and in Block C.
- Foot travel, canoes, and motorboats are allowed in all units open to hunting.
- Motor vehicle travel is allowed around Unit 2 (designated Auto Tour Route) and to the southeast corner of Unit 5D.
- Temporary blinds can be constructed using natural vegetation only. Permanent blinds or sunken boxes are prohibited.
- Off-road vehicles, open fires, and camping on the refuge are prohibited.
- Season dates, hours, bag and possession limits conform to current State and Federal regulations.

The refuge's 1995 Hunt Plan and EA (on file) provide more information on this alternative and the associated environmental impacts.

The No Action Alternative meets most of the purposes and needs of the proposed action as described in the 1995 Hunt Plan and EA; however, it does not meet the main purpose of the proposed action, which is to expand hunting opportunities on the refuge.

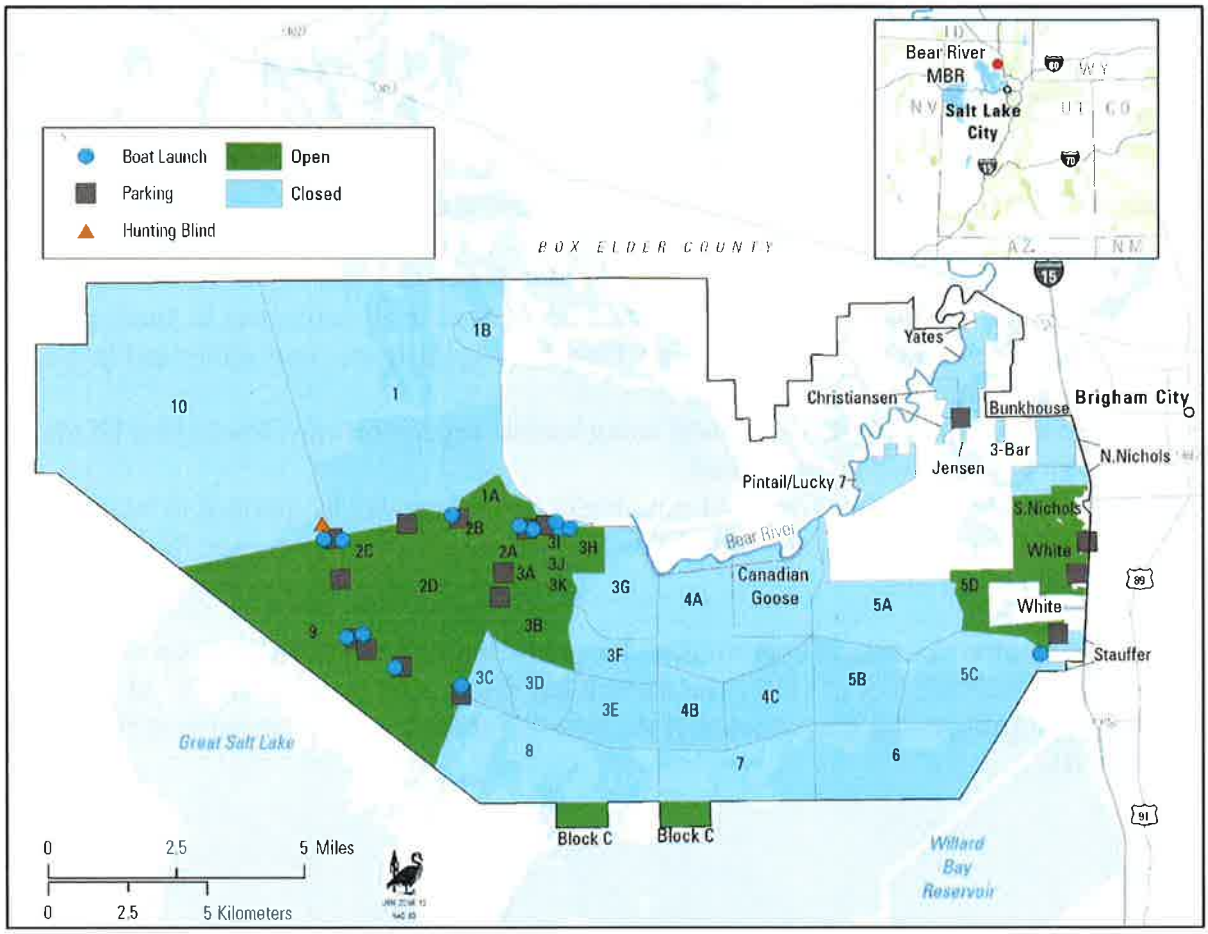

Figure 1. Alternative A - Existing open hunt units and existing closed units.

Alternative B – Expanding Waterfowl and Pheasant Hunting [Units 4A, 3F, 3G, 10 (portion of), Pintail Lucky/7, Yates, Christiansen (portion of), Stauffer, White, North Nichols (portion of)]

Under this alternative, the refuge would allow hunting on approximately 30,500 acres. This expands refuge lands open to hunting by approximately 13,250 acres. Figure 2 shows refuge areas proposed for opening under this alternative.

A majority of the new units proposed for opening are adjacent to current hunt areas to maintain large blocks of undisturbed habitat for wildlife and utilize existing parking and hunt unit access points. Three units north of Forest Street would also be opened to provide a unique upland hunting opportunity along the Bear River corridor.

The refuge would be open to duck, goose, coot, swan (with a special state permit) and ring-necked pheasant hunting. Hunting activities in compliance with State and Federal regulations would be allowed in Units 1A, 2A, 3A, 4A, 2B, 2C, 2D, 3B, 3F, 3G, 3H, 3I, 3J, 3K, 9, Pintail/Lucky 7, Yates, and Block C (i.e., the portions of Units 7 and 8 protruding south of the east-west refuge boundary line as posted, also known as "Willard Spur" or "Dog Ears"). Portions of Units 10 and the Pintail/Lucky 7, Christiansen, and Yates tracts would also be open to hunting. Additional grassland and wet meadow acres would be open to hunting including Unit 5D, and portions of tracts purchased from White, Stauffer, and Nichols, along the eastern boundary of the refuge as posted.

Proposed regulations for the areas listed above would include:

- Airboats would be allowed in Units 9, 10 and in Block C.
- Foot travel, canoes, and motorboats would be allowed in all units open to hunting.
- Motor vehicle travel is allowed around Unit 2 (designated auto tour route) and to the southeast corner of Unit 5D.
- Temporary blinds would be allowed using natural vegetation only. Permanent blinds or sunken boxes would be prohibited.
- Off-road vehicles, open fires, and camping on the refuge would continue to be prohibited.
- Season dates, hours, bag and possession limits would conform to current State and Federal regulations.

This alternative offers increased opportunities for public hunting and fulfills the Service's mandate under the NWRSIA of 1997. The Service has determined that waterfowl and pheasant hunting are compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

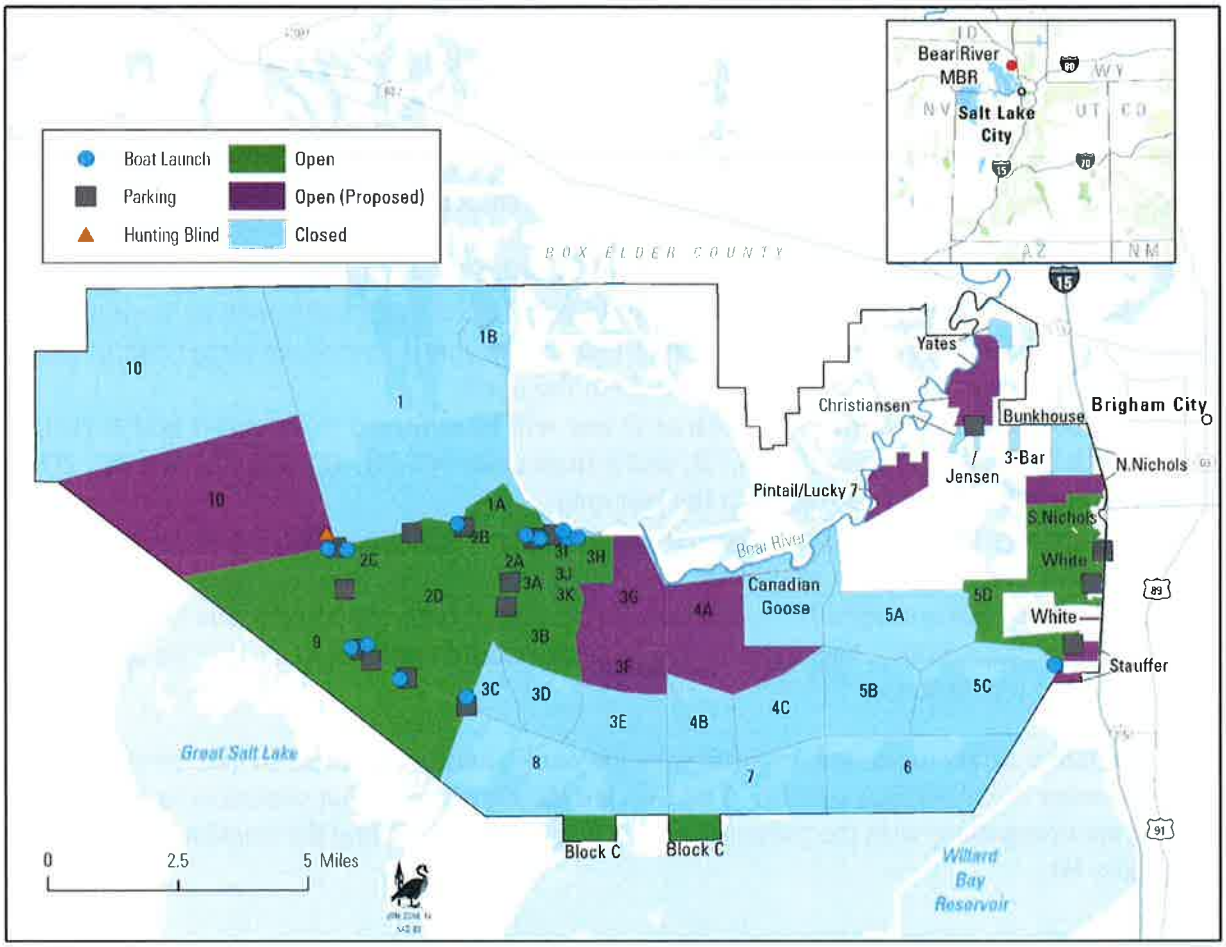

Figure 2. Alternative B – Existing open hunt units, closed units, and proposed open hunt units.

Alternative C – Expanding Waterfowl and Pheasant Hunting (Preferred Alternative)

Under this alternative, the refuge would allow hunting on approximately 30,100 acres. This expands refuge areas open to hunting by approximately 13,000 acres. Figure 3 shows refuge areas proposed for opening under this alternative.

Under Alternative C, new hunt areas would include units, or portions of units: 3G, 6, 7, 8, 10, Canadian Goose, Pintail/Lucky 7, Yates, Stauffer, White, and N. Nichols. This expands opportunities for hunters accessing the refuge by airboat in opened areas of Units 6, 7, 8, and 10. Unlike Alternative B, however, the Christiansen Unit and Units 3F and 4A would remain closed to hunting.

The refuge would be open to duck, goose, coot, swan (with a special state permit), and ring-necked pheasant hunting. Hunting activities in compliance with State and Federal regulations would be allowed in Units 1A, 2A, 3A, 2B, 3B, 2C, 2D, 3G, 3H, 3I, 3J, 3K, 6 (portion of), 7 (portion of), 8, 9, 10 (portion of), Canadian Goose (areas south of Forest Street), Pintail/Lucky 7,

Yates, and Block C (i.e. the portions of Units 7 and 8 protruding of the east-west refuge boundary line as posted, also known as "Willard Spur" or "Dog Ears"). Additional grassland and wet meadow acres would be open to hunting including Unit 5D, and portions of tracts purchased from White, Stauffer, and Nichols, along the eastern boundary of the refuge as posted.

Proposed regulations for the areas listed above would include:

- Airboats would be allowed in Units 6, 7, 8, 9, 10, and in Block C.
- Foot travel, canoes, and motorboats would be allowed in all units open to hunting.
- Motor vehicle travel is allowed around Unit 2 (designated auto tour route) and to the southeast corner of Unit 5D accessed from the north.
- A 100 yard no shooting area south of D line will be enforced in units 6, 7 and 8. (D line is the levee that separates units 6,7,8, and 9 from units 5C, 5B, 4C, 4B, 3E, 3D, 3C, 2D, and 2C) to reduce the disturbance to the rest area.
- Temporary blinds would be allowed using natural vegetation only. Permanent blinds or sunken boxes would be prohibited.
- Off-road vehicles, open fires, and camping on the refuge would continue to be prohibited.
- Season dates, hours, bag and possession limits would conform to current State and Federal regulations.

This alternative offers increased opportunities for public hunting and fulfills the Service's mandate under the NWRSIA of 1997. The Service has determined that waterfowl and pheasant hunting are compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

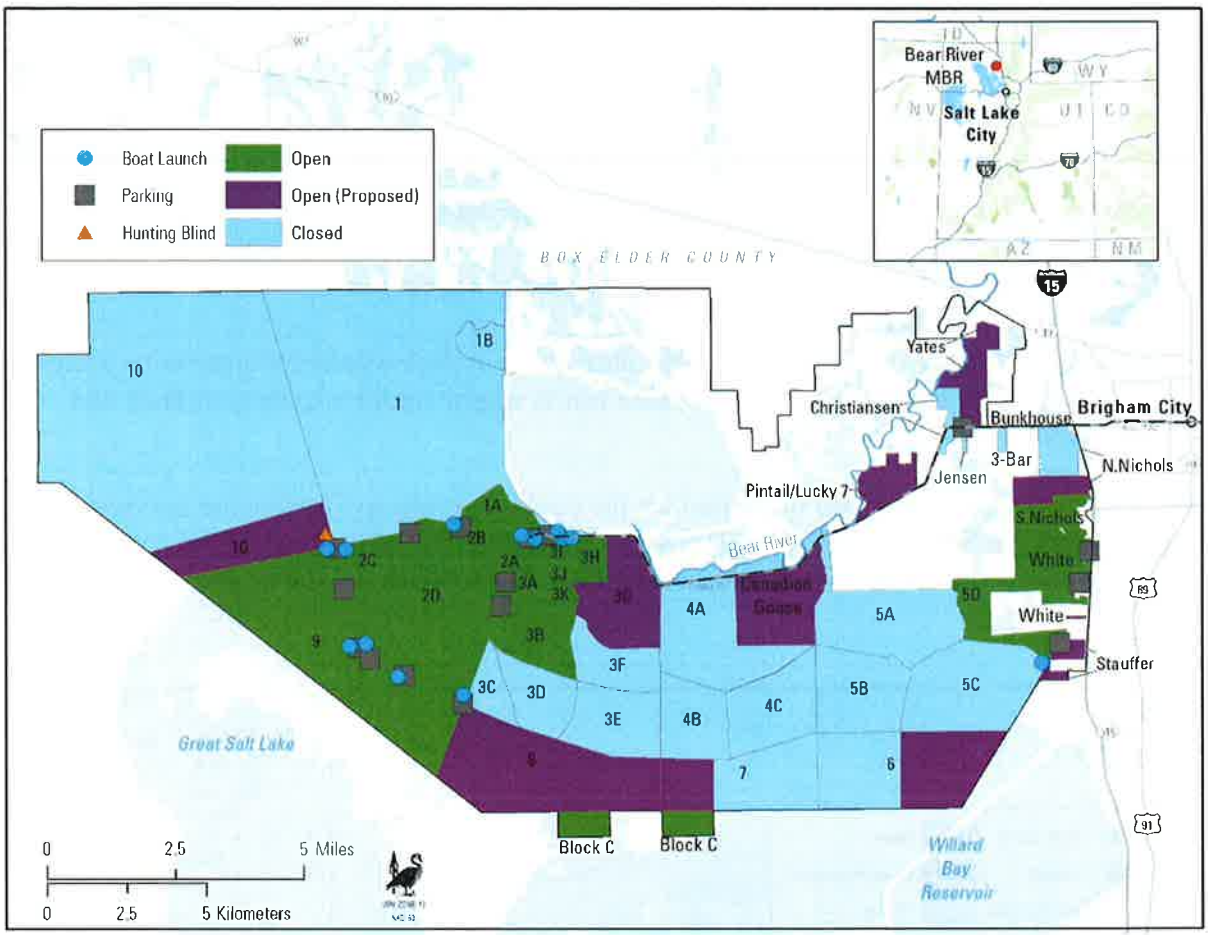

Figure 3. Alternative C – Existing open hunt units, closed units, and proposed open hunt units.

Alternative D – Expanding Waterfowl and Pheasant Hunting [Units 3C, 3D, 8, 10]

Alternative D would allow hunting on approximately 30,700 acres. This expands refuge areas open to hunting by approximately 13,450 acres. Figure 4 shows the refuge areas proposed for opening under this alternative.

Under Alternative D, new hunting opportunities would be focused in Units 3C, 3D, 8, and portions of 10 which include an accessible hunting blind. The three units north of Forest Street would remain closed to hunting.

The refuge would be open to duck, goose, coot, swan (with a special state permit), and ring-necked pheasant hunting. Hunting activities in compliance with State and Federal regulations would be allowed in Units 1A, 2A, 3A, 2B, 3B, 2C, 3C, 2D, 3D, 3H, 3I, 3J, 3K, 8, 9, 10 (portion of), and Block C (i.e. the portions of Units 7 and 8 protruding of the east-west refuge boundary line as posted, also known as "Willard Spur" or "Dog Ears"). Additional grassland and wet meadow acres would be open to hunting including Unit 5D, and portions of tracts purchased from White, Stauffer, and Nichols, along the eastern boundary of the refuge as posted.

Proposed regulations for the areas listed above would include:

- Airboats would be allowed in Units 8, 9, 10 and in Block C.
- Foot travel, canoes, and motorboats would be allowed in all units open to hunting.
- Motor vehicle travel is allowed around Unit 2 (designated auto tour route) and to the southeast corner of Unit 5D.
- Temporary blinds would be allowed using natural vegetation only. Permanent blinds or sunken boxes would be prohibited.
- Off-road vehicles, open fires, and camping on the refuge would continue to be prohibited.
- Season dates, hours, bag and possession limits would conform to current State and Federal regulations.

This alternative offers increased opportunities for public hunting and fulfills the Service's mandate under the NWRSIA of 1997. The Service has determined that waterfowl and pheasant hunting are compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

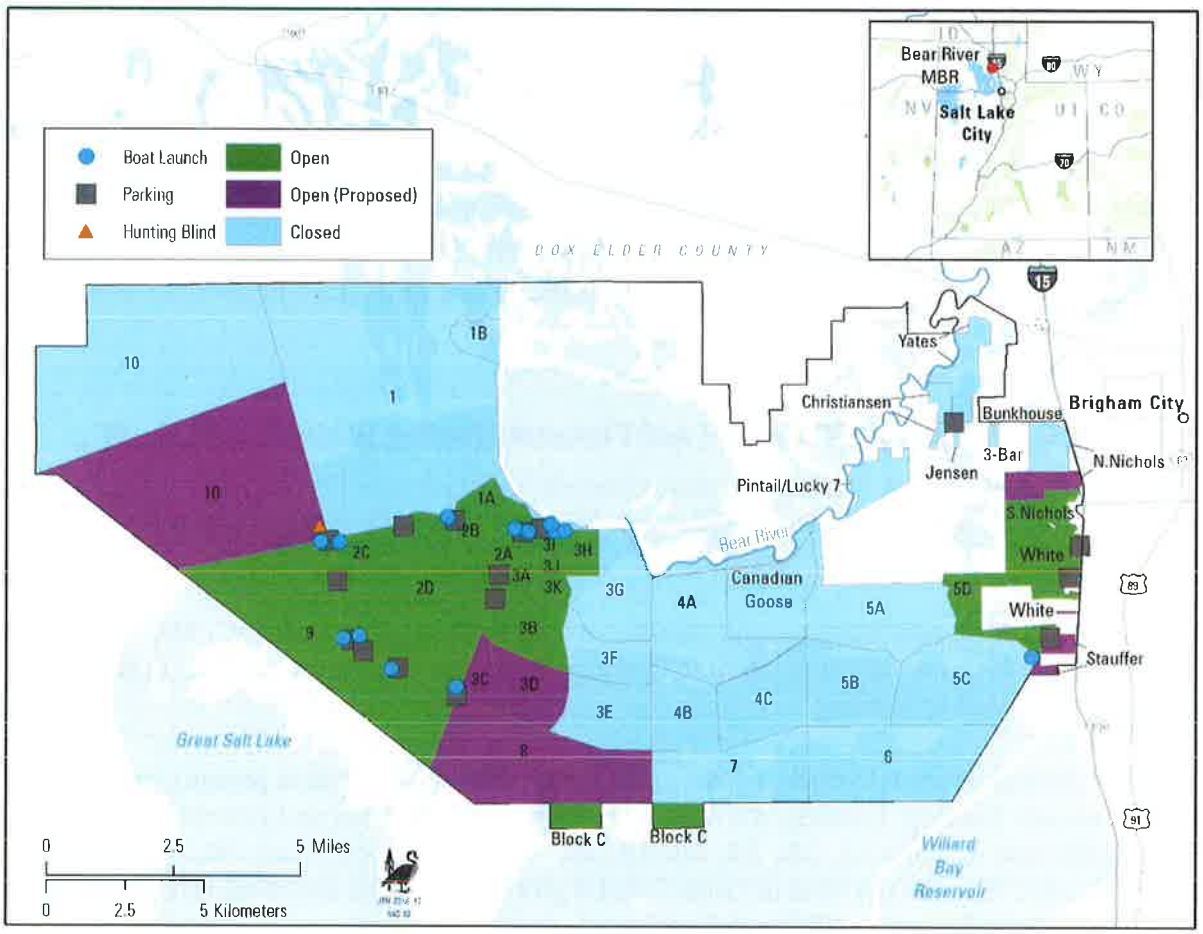

Figure 4. Alternative D – Existing open hunt units, closed units, and proposed open hunt units.

Mitigation Measures and Conditions

The refuge will take the following measures to avoid conflicts with other biological resources on the refuge; threatened and endangered species; and other refuge uses. These measures will be implemented under all of the alternatives:

- Areas north of Forest Street will remain closed to swan hunting consistent with current federal migratory bird hunting frameworks.
- No hunting is allowed from, or within 100 yards, of the tour route dike. This policy has been in effect since 1932 and no public safety issues related to this regulation have been recorded.
- A 100 yard no shooting area south of D line will be enforced in units 6, 7 and 8. (D line is the levee that separates units 6,7,8, and 9 from units 5C, 5B, 4C, 4B, 3E, 3D, 3C, 2D, and 2C) to reduce the disturbance to the rest area.
- Occasionally conditions occur that drastically alter habitat and jeopardize the health of wildlife. Flooding by the Great Salt Lake and severe drought may necessitate changes to hunt area boundaries to accommodate the needs of wildlife. Managers will give priority to the needs of wildlife and impacts to the refuge hunt program will be a secondary consideration. The refuge manager has the authority to change boundaries or close open hunt areas if conditions become detrimental to the health or well-being of wildlife populations.
- Use of toxic shot is prohibited on the refuge, ensuring that other wildlife on the refuge is not impacted by exposure.
- Notification of hunting activities on the refuge will be posted in key areas and at the visitor center to inform visitors that may want to participate in other activities such as fishing, wildlife observation, or wildlife photography that hunting is occurring within designated areas on the refuge.
- Hunters must abide by all terms and conditions in the refuge hunting brochure.

These mitigation measures are also currently being implemented under Alternative A.

Affected Environment:

The Bear River MBR is located at the north end of the Great Salt Lake at the mouth of the Bear River in Box Elder County near Brigham City, Utah. The cities of Logan and Ogden are within 30 miles and Salt Lake City, with a population of 3.1 million, is 60 miles to the south. Refuge lands are part of the Great Basin Ecosystem and, at a smaller spatial scale, the Bear River Watershed. Refuge lands include about 77,056 acres in fee title and an additional 46 acres are protected under easement agreements.

The refuge is located within the greater landscape of the Great Basin. Much of the Great Basin consists of north-south trending mountains separated by internally drained valleys. The refuge is part of the larger Bear River Watershed, which is the primary tributary to the Great Salt Lake

closed basin. The refuge encompasses the lower portion of the historic Bear River delta and the lower elevations of the Wasatch Front, which support a number of diverse plant and animal species in a mosaic of fresh and brackish marshes, remnant river channels, alkali salt flats, wet meadows, and knolls that support a bunchgrass and shrub plant community.

The refuge serves a vital role in the Bear River delta ecosystem by protecting and developing freshwater wetlands and alkali mudflats. Waterfowl, shorebirds, and other waterbirds, utilize the refuge as a breeding, staging, and wintering area. Over 210 species of birds regularly visit the refuge.

Area Open to Swan Hunting in the Pacific Flyway
A series of Environmental Assessments (USDI 1995, 2000, 2001, 2003) established operational swan seasons in the Pacific Flyway. The proposed action of these EAs was to establish a framework for hunting regulations that govern take of tundra and trumpeter swans. The framework describes hunting areas, outside dates, permits, quotas, required harvest monitoring, and other provisions. The only change since 1995 was in Utah beginning in 2000 when regulations generally became more restrictive to reduce the probability of trumpeter swan take. Changes in Utah included: (1) reducing the number of swan hunting permits available from 2,750 to 2000, (2) reducing the trumpeter swan quota from 15 to 10, (3) increasing the swan hunting area closure to include all lands north of the northern-most boundary of the Bear River Migratory Bird Refuge, and (4) extending the allowable season ending date from the first Sunday in December to the second Sunday in December. The Final Environmental Assessment (USDI 2003) and federal hunting frameworks define the area open to swan hunting in Utah as follows.

"Those portions of Box Elder, Weber, Davis, Salt Lake, and Toole Counties lying west of I-15, north of I-80, and south of a line beginning from the Forest Street exit to the Bear River Migratory Bird Refuge (BRMBR) boundary, then north and west along the BRMBR boundary to the farthest west boundary of the Refuge, then west along a line to Promontory Road, then north on Promontory Road to the intersection of SR-83, then north on SR-83 to I-84, then north and west on I-84 to State Hwy 30, then west on State Hwy 30 to the Nevada-Utah state line, then south on the Nevada-Utah state line to I-80."

Table 2 provides additional, brief descriptions of each resource affected by the proposed action.

Environmental Consequences of the Action:

This section analyzes the environmental consequences of the action on each affected resource, including direct and indirect effects. This EA only includes the written analyses of the environmental consequences on a resource when the impacts on that resource could be more than negligible and therefore considered an "affected resource." Any resources that will not be more than negligibly impacted by the action were dismissed from further analyses. Comments received during the public review are discussed and analyzed in the following section.

Table 2 provides:

1. A brief description of the affected resources in the proposed action area;

2. Impacts of the proposed action and any alternatives on those resources, including direct and indirect effects.

Table 3 provides a brief description of the cumulative impacts of the proposed action and any alternatives.

Impact Types:

1. *Direct effects* are those which are caused by the action and occur at the same time and place.
2. *Indirect effects* are those which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
3. *Cumulative impacts* result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions.

Table 2. Affected Resources and Anticipated Impacts of the Proposed Action and Alternatives.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
Migratory Birds The refuge contains extensive areas of emergent marsh, mudflats and open water that support hundreds of thousands of ducks, geese, and swans that use the refuge annually during fall and springs migrations. Common species include: mallard, northern pintail, northern shoveler, gadwall, green-winged teal, cinnamon teal, blue-winged teal, American wigeon, common goldeneye, redhead, canvasback, common merganser, red-breasted merganser, bufflehead, ruddy duck, lesser scaup, Canada geese, tundra swan, and	The annual take of wildlife under the current hunt program is estimated at 21,500 ducks and 75 geese. Feeding and resting habitat for waterfowl would be compromised in all open hunt areas during daylight (shooting) hours. Concentrating hunting in several large blocks and keeping 77% of refuge acreage closed to hunting may minimize overall disturbance. Hatch year and late hatching birds may be	The refuge anticipates that opening this additional acreage under this alternative would result in the additional take of 225 ducks and 10 geese. This is a 1% increase in take of ducks on the refuge and 13% increase in take of geese. Areas of the refuge open to hunting would be increased by about 13,250 acres. Under this alternative, approximately 40% of the refuge would be open to hunting with 60% of the refuge closed to hunting, which will provide	Same as Alternative B, except areas of the refuge open to hunting would be increased by about 13,000 acres. Under this alternative, hunt units would be more dispersed than Alternative B causing more disturbance to rest areas. More hunt areas could be accessed by airboats which create more disturbances to waterfowl as compared to foot, motorless,	Same as Alternative B, except areas of the refuge open to hunting would be increased by about 13,450 acres and more traditionally "wet areas" on the refuge would be opened to hunting relative to Alternatives B and C. Under this alternative, the flight corridor from inviolate sanctuary areas would be interrupted by opening Units 3C and 3D to hunting.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
occasionally trumpeter swan. Waterfowl, shorebirds, and other waterbirds, utilize the refuge as a breeding, staging, and wintering area. The Bear River delta is unmatched for diversity and productivity of migratory birds. Over 210 species of birds regularly visit the refuge. Although located in the Pacific Flyway, Bear River MBR hosts birds from both the Pacific and Central flyways. Band returns show that waterfowl stopping at the refuge are likely returning to, or originating, from breeding grounds in other western states stretching from the western edge of Minnesota to the western prairie provinces of Canada.	vulnerable to early season hunting mortality (Nelson 1966). Redheads and canvasbacks have been slow to recover from the habitat destruction caused by flooding on the refuge in the early 1980's. Poor recruitment may be a significant factor limiting local breeding populations. Numbers may rebound if hatch year birds are protected. Keeping 77% of the refuge closed as an inviolate sanctuary protects hatch year birds and provides vulnerable species the opportunity for population stabilization and recovery on the refuge.	46,556 acres of the refuge where migratory waterfowl will continue to be protected from any hunting disturbance. This complies with provisions of the refuge's establishing legislation. Hunting would be concentrated in large blocks of the refuge, ensuring that important habitat areas of the refuge remain an "inviolate sanctuary" for migratory birds. Additional hunting opportunities will disperse hunters over a larger portion of the refuge and provide enhanced hunting opportunities but will only lead to a small increase (5%) in the number of hunters visiting the refuge is anticipated due to general population growth in the Wasatch Front and new hunting area opportunities. This small increase in hunters, and this expansion of hunting acres, could possibly lead to some additional impacts to	or mud boats.	

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	Alternative B	Alternative C (Preferred Alternative)	Alternative D
		migratory birds on the refuge, including an estimated 1% increase on migratory bird take, a 13% increase in geese take, and possible less intense impacts on migratory bird fowl in certain areas due to increased open acreage for hunters but more of the refuge will have some disturbance to habitat and migratory birds from hunting in the new areas.		
Waterbirds Significant portions of the populations of American Avocet, Marbled Godwit, American White Pelican, Wilson's Phalarope, Long-billed Dowitcher, and Black Tern rely on undisturbed wetland habitats at the refuge (Olson et al. 2004, Shuford et al. 2002, Shuford et al. 1994). The Great Salt Lake Waterbird Survey Five-Year Report (1997-2001) studied the Great Salt Lake and its biota (Paul et al. 2002). A primary project objective of the study was to estimate individual species populations during the	The majority of the populations of waterbirds that utilize the refuge are not present on the refuge during hunting season, therefore no impacts to these species would occur.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
migration period, their periods of use, location, and habitat characteristics of use areas plotted against Great Salt Lake elevation. Table 6 of the report presents the migration chronology of waterbirds at Great Salt Lake. Findings indicate the majority of the population of American Avocet, Marbled Godwit, American White Pelican, Wilson's Phalarope, Long-billed Dowitcher, and Black Tern migrate to wintering grounds prior to hunting season (Appendix C).				
Swans Since at least 1930, migrating swans have favored the remote northern part of Unit 1 for resting and roosting. The swans are highly sensitive to disturbance and this large, visually unobstructed, secure space may be a key attribute of the refuge that attracts swans. The swan-hunting season in Utah is regulated and monitored by Federal and State wildlife agencies in accordance with the Pacific Flyway Council management plans for tundra and trumpeter swans and the General Swan Hunting Framework in the Pacific Flyway. Hunting	Hunters must have a state issued permit to hunt swans on the refuge. All swan hunters must report whether or not they harvested a swan. Successful hunters are required to bring the tagged swan or its head to a Utah Division of Wildlife Resources (UDWR) office, or the Bear River MBR office, to be checked within three days of harvest. Areas north of Forest Street would remain closed to swan	Hunters must have a state issued permit to hunt swans on the refuge. Opening additional areas for hunting will increase opportunities for permitted hunters. The number of available swan permits, however, is regulated by the state and not directly correlated by refuge hunt unit acreage, so no additional take of swans will occur under this alternative. Areas north of Forest Street would remain closed to swan hunting consistent with	Same as Alternative B.	Same as Alternative B.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	Alternative B	Alternative C (Preferred Alternative)	Alternative D
seasons are limited to specific areas, time periods, and numbers of hunters. Hunters must get a permit for each swan, and are required to report whether a swan was harvested. In recent years, approximately 4,400 tundra swans have been harvested annually in the U.S. during hunting seasons. Trumpeter swans are occasionally harvested by swan hunters because the two species of swans (tundra and trumpeter) are difficult to distinguish in the field. To minimize incidental take, areas open to swan hunting in Utah are limited to regions with small numbers of trumpeter swans. Additionally, swan seasons in Utah are shortened to end earlier in the winter before most trumpeters arrive. Swan identification training is provided to all hunters in Utah. Provisions for limited take (quotas) of trumpeter swans have been set to protect swan hunters from criminal liability if they accidentally shoot a trumpeter swan. The take limits are 10 birds in Utah. Biologists monitor the swan harvest to detect take of trumpeter swans. If the trumpeter swan limit is reached, all swan	hunting consistent with consistent with current federal migratory bird hunting frameworks.	consistent with current federal migratory bird hunting frameworks.		

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
hunting is closed for the remainder of the swan hunting season (USDI 2013).				
Ring-necked Pheasant In addition to wetlands, the refuge contains extensive grasslands that provide suitable habitat for pheasants. Pheasants utilize the refuge season long for breeding, nesting, brood-rearing, and wintering. UDWR has conducted rooster crow counts for pheasants in areas on and near the refuge for the past five years. Pheasant populations have been stable or slightly increasing during this time period.	The annual take of pheasant under the current hunt program is estimated at 55 pheasants. Impacts are considered minimal due to the low number of hunters and limited number of days per year when impacts occur.	The refuge anticipates that opening this additional acreage would result in a minimal increase (5-10) in the overall pheasant harvest. Impacts would be minimal due to the low number of hunters and limited number of days per year when impacts occur.	Same as Alternative B.	Same as Alternative B.
Other Wildlife (resident wildlife and non-hunted species) Bear River MBR hosts many other types and species of wildlife other than birds. The grassland and wetland habitats support a wide array of insects like dragonflies, damselflies, butterflies, mantids, grasshoppers and important brine flies and midge. Several species of mammal call the Refuge home as well, such as mule deer, yellow-bellied marmot, long-tailed weasel, red fox, coyote, beaver and muskrat. The Bear River and Refuge wetlands also host several species of fish, from mosquito	Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. The significant amount of closed areas offset the impacts to all other wildlife and aquatic species on the refuge, because it provides large areas of the refuge protected from disturbance. Some resident mammals and birds would be displaced from	The likelihood of disturbance to non-target wildlife (due to increased human presence and noise associated with hunting) would be greater relative to Alternative A. Disturbance to all other wildlife and aquatic species on the refuge would be short-term. Large areas of the refuge would continue to be protected from disturbance.	Same as Alternative B.	Same as Alternative B.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
fish to channel catfish, as well as amphibian species like Western chorus frogs and leopard frogs. Reptiles can also be found within Refuge grasslands, especially snakes such as Garter snakes, Gopher snakes and Rubber boas.	the hunt areas, but would find refuge in adjacent closed areas. Reptiles and amphibians would not be impacted.			
Habitat Collectively, refuge lands support a number of diverse plant species in a mosaic of fresh and brackish marshes, remnant river channels, alkali salt flats, wet meadows, and uplands, including a series of scattered knolls that support a bunchgrass and shrub plant community that is unique in the Bear River delta. The refuge serves a vital role in the Bear River delta ecosystem by protecting freshwater wetlands and alkali mudflats. The distribution and area of these communities have changed significantly from historic conditions due to changes in ecological processes driven by numerous stressors, including land-use change.	Seventy seven percent of the refuge is currently closed to public hunting. The enabling legislation for the refuge requires that 60% of the refuge remain as an "inviolate sanctuary" for migratory waterfowl. A diversity of habitats would be protected from disturbance, and species diversity would not be impacted, because the 60% of the refuge closed to hunting includes a range of diverse habitats and species of the refuge.	There would be an expected increase in overall disturbance to habitat on the refuge, because 17% more of the refuge would be open to hunting.	There would be an expected increase in overall disturbance to habitat on the refuge, because 17% more of the refuge would be open to hunting. Additional areas open to airboats would increase disturbance to habitat compared to Alternatives A and B.	Same as Alternative C.
Wetlands Wetlands are of particular importance at Bear River MBR. Refuge wetlands provide migratory and wintering	Seventy seven percent of the refuge is currently closed to public hunting. A diversity of habitats would be	Sixty percent of the refuge will remain close to hunting, which includes a large portion of refuge wetlands.	Sixty percent of the refuge will remain close to hunting, which includes a large portion of refuge wetlands.	Same as Alternative C.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
habitat for numerous species of waterfowl and shorebirds (Skagen et al. 1999). As noted in the Great Salt Lake Waterbird Survey 1997-2001 (Appendices 5 & 6), the highest concentrations of most species of birds occurring at the Lake are found at Bear River Bay, including the Refuge. Across the Great Salt Lake ecosystem, wetland habitats are decreasing due to development and climate change (Wurtsbaugh et al. 2017). The USFWS's Habitat Management Plan (Olson et al. 2004) states that the Bear River MBR is important to the conservation of a number of nesting, resting, feeding, and staging waterbirds, and the highest and best use is to continue managing the refuge as a functioning freshwater wetland.	protected from disturbance, and species diversity would not be impacted, because the 60% of the refuge closed to hunting includes a large portion of wetland habitat available on the refuge.	Loss of plants from boat or foot traffic would be minor, or temporary, since hunting occurs mainly after the growing season.	More areas would be open to airboats which causes more disruption to habitat than other means of hunting.	
Threatened and Endangered Species and Other Special Status Species Impacts to bald eagle and peregrine falcon were considered through the Intra-Service Section 7 Evaluation procedure required by the Endangered Species Act during the development of the 1995 Hunt Plan. The evaluation concluded the hunt	There are no federally-listed threatened or endangered species present on the refuge therefore; no impacts to threatened or endangered species would occur.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
program would not adversely impact populations of bald eagles or peregrine falcons. The bald eagle and peregrine falcon have since been recovered and are no longer listed as Federally threatened or endangered species.				
Visitor Use and Experience Approximately 50,000 people visit the refuge each year (2011 Refuge Annual Performance Plan measures). Visitors participate in hunting, fishing, wildlife observation, photography, environmental education, a 12-mile auto tour route and a variety of special programs and events at the modern Visitor Center. Abundant wildlife viewing will be available along the tour route. The auto tour route is popular among non-hunting visitors, even during the hunting season. The UDWR surveys indicate hunter access methods across the state as mud/motorboat (34%), motorless boat (2%), walk/bike (60%), and airboat (3%). Wildlife watching is the primary reason the public visits the Bear River MBR (Dietsch et al. 2012).	Currently, the refuge has approximately 25,000 hunt visits every year. Conflicts can occur between hunting and other uses such as bird watching, photography and wildlife viewing. Access by the non-hunting public is restricted to the auto tour route. Sixty seven percent of the auto tour route currently has hunting on both sides during hunting season, reducing opportunity for wildlife observation by non-hunters. Twenty two percent of Forest Street from Unit 5A to the beginning of the tour route currently has hunting on one side of the road.	3-Bar, Jensen, Bunkhouse, and a portion of N Nicolas Units would remain closed to hunting to ensure the safety of visitors and staff using these areas during hunting season. Additional hunt units along Forest Street may increase potential conflict between the consumptive and non-consumptive use groups during hunting season. Eighty eight percent of Forest Street from Unit 5A to the beginning of the tour route would have hunting on one side of the road. Noise impacts in the form of increased shotgun shots may be perceived as disruptive to the experience of wildlife observation/photog	Same as Alternative B, the Canadian Goose Unit would be open to hunting. The Christiansen Unit would remain closed to hunting. This unit could provide opportunities for non-consumptive public uses such as wildlife observation, photography, interpretation and environmental education during hunting season.	Same as Alternative B, except there would be less units open to hunting along Forest Street relative to Alternative B. More units would be open to hunting along the auto tour route. The Canadian Goose and Yates Units would remain closed to hunting. Eighty eight percent of the auto tour route would have hunting on both sides during hunting season, reducing opportunity for wildlife observation by non-hunters. The Canadian Goose and Yates Units may provide opportunities for non-consumptive

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
	The refuge has put in certain mitigation measures (e.g. no shooting 100 feet from the tour loop dike road) that ensure that hunting does not compromise public safety except for the general risks posed to hunters by hunting and boating. There have been zero incidents of visitor harm, due to the hunting program. Emergency services are located in Brigham City so a response is readily available. During the height of hunting season, activity on the tour route by hunters adds to traffic and disturbance. Shooting, especially during the early morning and late evening impacts the serenity and aesthetics of the tour loop. Hunting reduces the use of migratory waterfowl and other wildlife in areas open to hunting, reducing	raphy on the refuge. Visual impacts may be perceived by visitors when encountering increased numbers of hunters along the access road. There would be a need to increase information to refuge visitors to explain the expanded hunting opportunities which creates an added workload for staff to address questions. New brochures and informational materials would need to be developed. Increase in the number of hunters on the refuge would place more demand on infrastructure such as parking areas and restrooms. Additional law enforcement to patrol new hunt areas may be needed. Unit 10, which includes an accessible blind, would be open to all hunters. The Canadian Goose Unit would remain closed to hunting. This unit		public uses such as wildlife observation, photography, interpretation and environmental education during hunting season.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
	opportunities for wildlife viewing. However, about 40% of the tour route passes by areas closed to hunting where waterfowl and other birds are undisturbed.	may provide opportunities for non-consumptive public uses such as wildlife observation, photography, interpretation and environmental education during hunting season.		
Cultural Resources No sites eligible for listing on the National Register of Historic Places are found on the refuge. Section 106 compliance was completed for visitor use and hunting related facilities in the 1990s when the refuge was reconstructed after the flood in the 1983. Some artifacts were found when conducting Section 106 investigations ahead of construction work in various refuge locations. These artifacts were catalogued and stored. Section 106 compliance was completed with regard to the opening of additional acres to hunting on the Bear River MNR.	No impacts to cultural resources would occur under this alternative.	No adverse effect to historic properties with regard to the opening of additional acres to hunting on the Bear River MNR. New infrastructure or facilities such as fencing, posting and parking areas that may be developed in association with the new hunt areas would require additional compliance with Section 106 of the National Historic Preservation Act.	Same as Alternative B.	Same as Alternative B.
Refuge Operations and Administration Administering hunting on the refuge includes the following costs: law enforcement, education, maintenance of boundaries, roads, and access points, and search	Control and enforcement of the hunt program is currently accomplished primarily with refuge officers on staff. Currently two refuge employees have	Additional hunt areas would require an increase in Law Enforcement activities. Future funding required to administer and manage the hunting activities is	Same as Alternative B.	Same as Alternative B.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
and rescue efforts.	enforcement authority. From time to time, assistance is received from Utah Division of Wildlife Officers, Refuge Zone Law Enforcement Officer, and the Resident Special Agent. Hunters are not required to check in and out while hunting on the refuge. Funding required for administering and managing the hunt totals $30,125 in FY 18 dollars.	estimated to increase to $51,000 which is an increase of about $20,875 from current funding levels. There would also be an increase in costs associated with the installation and maintenance of infrastructure. Adding new hunt areas will require the development of additional informational kiosks new brochures, maps, and interpretive materials. These additional informative materials are estimated to cost an additional $10,000. Potentially new parking areas may be required along existing roads.		
Local and Regional Economies Maintaining a variety of public uses, including hunting, on the refuge stimulates the local economy. Hunting, in particular, provides an economic boost to local businesses. Tourists usually buy a wide range of goods and services while visiting an area. Major expenditure categories include	Annual waterfowl hunting use on the refuge is currently 25,000 hunt visits the majority of which are by local and regional hunters. Most hunters are from the Wasatch Front/SLC Valley. Hunters are not typically coming from out of state. Each visit representing	All types of visitor use are increasing due to the general increase in population along the Wasatch Front. Most hunters are from the Wasatch Front/SLC Valley. Hunters are not typically coming from out of state. The UDWR reports hunter	Same as Alternative B.	Same as Alternative B.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	**Alternative B**	**Alternative C (Preferred Alternative)**	**Alternative D**
lodging, food, supplies, and gasoline. Spending associated with refuge visitation can generate considerable economic benefits for the local communities near a refuge. For example, more than 34.8 million visits were made to refuges in fiscal year 2006; these visits generated $1.7 billion in sales, almost 27,000 jobs, and $542.8 million in employment income in regional economies (Carver and Caudill 2007). During the two sampling periods, 44% of surveyed visitors to Bear River MBR indicated that they live within the local 50-mile area while nonlocal visitors (56%) stayed in the local area, on average, for 3 days. During the two sampling periods, nonlocal visitors spent an average of $56 per person per day and local visitors spent an average of $31 per person per day in the local area. (Deicht, Sexton et al. 2012)	approximately $31 in expenditures (Carver and Caudill 2007). Total expenditures associated with 25,000 hunt visits associated with waterfowl hunting totals approximately $775,000.	numbers have been trending upward approximately 5% per year over the past 5 years. A similar growth rate in hunter numbers is anticipated at the refuge. The addition of new hunt areas on the refuge may spur an increase hunter numbers at a slightly higher rate initially as hunters are keen to experience new hunt areas.		
Environmental Justice Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all Federal agencies to incorporate environmental justice into their missions by identifying and	The Service has not identified any potential high and adverse environmental or human health impacts from this proposed action or any of the alternatives. The Service has identified no minority or low	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Affected Resource	Anticipated Direct and Indirect Impacts			
	Alternative A (No Action)	Alternative B	Alternative C (Preferred Alternative)	Alternative D
addressing disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.	income communities within the impact area. Minority or low income communities will not be disproportionately affected by any impacts from this proposed action or any of the alternatives.			
Indian Trust Resources There are no Indian Trust Resources on the refuge	This action would not impact any Indian Trust Resources.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Cumulative Impact Analysis:

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

For more information on the national cumulative impacts of the Service's hunting and fishing program on the National Wildlife Refuge System, see "Cumulative Impacts Report 2018-2019 National Wildlife Refuge Proposed Hunting and Sport Fishing Openings" (Appendix D).

Table 3. Anticipated Cumulative Impacts of the Proposed Action and Any Alternatives.

Past, Present, and Reasonably Foreseeable Activity in Area of Analysis	Descriptions of Anticipated Cumulative Impacts
Hunting Total duck and goose harvest in the United States from 2015-2016 was estimated at 11,607,400 (±5%) ducks and 3,266,900 (±5%) geese (Pacific Flyway Council 2017). For the period of 2015-2016, annual duck harvests for the Pacific Flyway	**Migratory Birds:** Migratory bird populations throughout the United States are managed through an administrative process known as flyways. The refuge is located in the Pacific Flyway. In North America, the process for establishing hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc.) in which information regarding the status of migratory bird populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the

Past, Present, and Reasonably Foreseeable Activity in Area of Analysis	Descriptions of Anticipated Cumulative Impacts
averaged 2,552,500 (±8%) ducks and during the same period, annual goose harvests for the Pacific Flyway averaged 414,700 (±10%) geese (Raftovich et al. 2017). For the period of 2016-17, the number of pheasant hunters in Utah was 22,299 and the annual harvest was 47,938 pheasant. State hunting areas near the refuge include: Public Shooting Grounds Waterfowl Management Area, Salt Creek Waterfowl Management Area, Harold Crane Waterfowl Management Area, Ogden Bay Waterfowl Management Area, Howard Slough Waterfowl Management Area, and Farmington Bay Waterfowl Management Area.	Federal Register to allow public comment. Annual waterfowl assessments are based upon the distribution, abundance, and flight corridors of migratory birds. An Annual Waterfowl Population Status Report is produced each year and includes the most current breeding population and production information available for waterfowl in North America (USFWS 2017b). The Report is a cooperative effort by the Service, the Canadian Wildlife Service, various state and provincial conservation agencies, and private conservation organizations. An Annual Adaptive Harvest Management Report (AHM) provides the most current data, analyses, and decision making protocols (USFWS 2017a). These reports are intended to aid the development of waterfowl harvest regulations in the United States for each hunting season. Coot, moorhen and rail species are also counted and analyzed. The state selects season dates, bag limits, shooting hours, and other options using guidance in these reports. The refuge follows the regulations set by the state of Utah and published in the yearly proclamation. The Service believes that hunting on the refuge will not add significantly to the cumulative impacts of migratory bird management on local, regional, or Pacific Flyway populations because the percentage likely to be taken on the refuge, though possibly additive to existing hunting takes, would be a tiny fraction of the estimated populations. In addition, overall populations will continue to be monitored and future harvests will be adjusted as needed under the existing flyway and State regulatory processes. Several points support this conclusion: 1) the proportion of the national waterfowl harvest that occurs on National Wildlife Refuges is only 6 percent (USFWS 2013c); 2) there are no populations that exist wholly and exclusively on national wildlife refuges; 3) annual hunting regulations within the United States are established at levels consistent with the current population status; 4) Refuges cannot permit more liberal seasons than provided for in Federal frameworks; and 5) Refuges purchased with funds derived from the Federal Duck Stamp must limit hunting to 40 percent of the available area. As a result, changes or additions to hunting on the refuge will have minor effects on wildlife species in Utah. Although the Proposed Action Alternative will increase hunting opportunities compared to the No Action Alternative, the slight increase in hunter activity will not rise to a significant cumulative effect locally, regionally, or nationally. **Pheasant:** The UDWR manages ring-necked pheasant populations in the State of Utah. The State selects season dates, bag limits, shooting hours, and other options using data obtained from monitoring efforts and harvest reports. The refuge follows the regulations set by the state of Utah and published in the yearly proclamation.
Climate Change Ecological stressors are expected to affect a variety of natural processes	While the impacts from climate change on the refuge wildlife and habitats are not certain, expanding hunting on the refuge will not add to the cumulative impacts of climate change because the refuge uses an adaptive management approach for its hunt program, consistently monitoring and

Past, Present, and Reasonably Foreseeable Activity in Area of Analysis	Descriptions of Anticipated Cumulative Impacts
and associated resources into the future. The most substantial concern at the refuge is reduction of water in the Bear River. This is already causing a decrease in the amount of water that reaches the refuge and the Great Salt Lake. These habitat changes may dramatically reduce the amount and quality of both grassland and marsh for migratory birds that are hunted. As a result, wildlife would be forced into reduced amounts of available habitat. Concentrating birds into smaller areas also has the potential to more readily allow disease to spread within overwintering waterfowl populations resulting in increased bird mortality.	reviewing the hunt program annually and revising annually (if necessary). Thee Service's hunt program will adjust the hunt program as necessary to ensure that it does not contribute further to the cumulative impacts of climate change on resident wildlife and migratory birds.

Monitoring

Migratory Waterfowl— Yearly monitoring activities provide information on harvest levels, population size, and habitat conditions for migratory birds in the United States. The Service's Division of Migratory Bird Management is responsible for conducting migratory bird surveys for all of the flyways, collecting and compiling much of the relevant biological data, and coordinating the regulatory effort with States and the public. Data collected from these activities are analyzed each year, and proposals for duck hunting regulations are developed by the Flyway Councils, States, and the Service. After extensive public review, the Service announces a regulatory framework within which States may set their hunting seasons. The refuge works with the State to ensure that all of its proposed hunting activities are in alignment with the results of these monitoring efforts and regulatory frameworks, using an adaptive management process to adjust hunting activities as necessary to ensure no adverse impacts to migratory bird populations. For more information on the extensive monitoring efforts for migratory bird populations in the United States, see the I*ssuance of Annual Regulations Permitting the Hunting of Migratory Birds: Final Supplemental Environmental Impact Statement* (USFWS 2013) (available at https://www.fws.gov/migratorybirds/pdf/policies-and-regulations/FSEISIssuanceofAnnualRegulations.pdf.

Pheasant— The UDWR collects harvest data for all hunted species in Utah. Harvest surveys provide biologists and managers vital information necessary for managing wildlife populations. The information is used for determining annual recommendations and management strategies. A variety of survey methods are used to obtain harvest information from hunters, such as mail-in questionnaires, online harvest reporting, toll-free telephone harvest reporting, mandatory check-in and randomized telephone surveys conducted by a private contractor. Depending on the species, harvest information collected may include: date of harvest, sex and age of the animal harvested, body/antler size measurements, area(s) hunted, number of days afield, weapon type or

hunt method and hunter satisfaction. Hunters are encouraged to keep track of numbers harvested and days afield, so they are able to report this information accurately at the end of the season. The UDWR compiles all harvest data into annual harvest reports for each species and these reports are posted as PDF files online. Look for these reports on each species page in the "Hunting" section of this Web site, wildlife.utah.gov. These reports are usually found under the headings "Harvest Information" or "Annual Reports."

Irreversible or Irretrievable Commitment of Resources

There are no irreversible or irretrievable resource commitments identified by this assessment, except for a minor consumption of fossil fuels for routine operations and by airboat operators.

Summary of Analysis

The purpose of this EA is to briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

Alternative A – No Action Alternative

This alternative does not meet the purpose and needs of the Service as described above, because it would not provide additional hunting opportunities.

There would be no additional costs to the refuge under this alternative. There would be no change to current public use and wildlife management programs on the refuge under this alternative. The refuge would not increase its impact on the economy and would not provide new hunting and access opportunities. Although this alternative has the least direct impacts of physical and biological resources, it would minimize our mandates under the NWRSAA and Secretarial Order 3356.

Alternative B

This alternative meets the purpose and needs of the Service as described above, because it provides additional hunting opportunities on the refuge and meets the refuge establishing purposes and maintains 60% of the refuge as inviolate sanctuary for migratory birds. Increased access to hunt areas via airboat are provided, as well as new hunt units along Forest Road that can be accessed via foot travel, canoe, or motorboat. New hunting areas may be accessed using existing infrastructure (i.e., parking lots, walking trails, dikes, boat ramps), thereby minimizing habitat and wildlife disturbance and implementation costs. The Canadian Goose Unit would remain closed to hunting and may offer other wildlife-dependent public use opportunities during hunting season. The Service has the resources necessary to carry out this alternative, and has determined that the proposed action described in this alternative is compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

Alternative C – Preferred Alternative

This alternative meets the purpose and needs of the Service as described above, because it provides additional hunting opportunities on the refuge and meets the refuge establishing purposes and maintains 60% of the refuge as inviolate sanctuary for migratory birds. This alternative provides greatly increased opportunities for hunting on the refuge via airboat. A smaller number of new hunt areas would be located along Forest Road. The Christiansen Unit

would remain closed to hunting and may offer non-consumptive public use opportunities during hunting season. The Service has the resources necessary to carry out this alternative, and has determined that the proposed action is compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

Alternative D

This alternative meets the purpose and needs of the Service as described above, because it provides additional hunting opportunities on the refuge and meets the refuge establishing purposes and maintains 60% of the refuge as inviolate sanctuary for migratory birds. This alternative provides increased opportunities for hunting on the refuge via airboat. However, a smaller number of new hunt areas would be located along Forest Road. The Yates and Canadian Goose Units would remain closed to hunting and may offer other wildlife-dependent public use opportunities during hunting season. The Service has the resources necessary to carry out this alternative, and has determined that the proposed action is compatible with the purposes of the Bear River MBR and the mission of the NWRS (Appendix B).

List of Sources, Agencies and Persons Consulted:

The following agencies and organizations were consulted during the development of this EA.

- Utah Division of Wildlife Resources, Salt Lake City, Utah
- Utah Legislative Sportsmen's Caucus
- Utah State Historic Preservation Office, Salt Lake City, Utah

References:

Carver, E., and Caudill, J. 2006. Banking on Nature—The economic benefits to local communities of National Wildlife Refuge visitation: Washington, D.C., U.S. Fish and Wildlife Service, Division of Economics, 372 p. http://www.fws.gov/refuges/about/msWord/BankingonNature_2006_11-23.doc. Accessed on September 30, 2011.

Dietsch, A. M., N. R. Sexton, L. Koontz, and S. J. Conk. 2012. National Wildlife Refuge Visitor Survey 2012: Individual Refuge Results for Bear River Migratory Bird Refuge. Prepared for the U.S. Fish and Wildlife Service and Communications Headquarters Office and the Department of Transportation, Arlington, Virginia.

Hansen, K. S. 1991. Environmental Assessment for the Restoration and Enhancement of Bear River Migratory Bird Refuge, U.S. Fish and Wildlife Service, Brigham City, Utah.

Nelson, N.F. 1966. Waterfowl hunting in Utah: Utah State Department of Fish and Game, Publication no. 66-10, 100 p.

Olson, B. E., K. Lindsey, and V. Hirschboeck. 2004. Habitat Management Plan Bear River Migratory Bird Refuge. Prepared for the U.S. Fish and Wildlife Service. Bingham City, Utah.

Pacific Flyway Council. 2017. Pacific Flyway management plan for the Rocky Mountain Population of Trumpeter Swans. Pacific Flyway Council, care of U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Vancouver, Washington. 50 pp.

Paul, D.S., and A.E. Manning. 2002. Great Salt Lake Waterbird Survey Five-Year Report (1997-2001). Publication Number 08-38. Great Salt Lake Ecosystem Program, Utah Division of Wildlife Resources, Salt Lake City.

Raftovich, R.V., S. C. Chandler, and K.K. Fleming. 2017. Migratory bird hunting activity and harvest during the 2015-16 and 2016-17 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

Shuford, W. D., G. W. Page, and L. E. Stenzel. 2002. Patterns of distribution and abundance of migratory shorebirds in the Intermountain West of the United States. Western Birds 33:134-174.

Shuford, W.D., V.L. Roy, G. W. Page, and D.S. Paul. 1994. A comprehensive survey of shorebirds in wetlands at Great Salt Lake, Utah, 10-11 August. Point Reyes Bird Observatory report, Point Reyes, California.

Skagen, S. K., P. B. Sharpe, R. G. Waltermire, and M. B. Dillon. 1999. Biogeographical profiles of shorebird migration in midcontinental North America. Biological Science Report USGS/BRD/BSR--2000-0003. Denver, Colorado.

U.S. Department of the Interior. 2003. Proposal to establish operational general swan hunting seasons in the Pacific Flyway. Final Environmental Assessment, U.S. Fish and Wildlife Service, Washington D.C. 55 pp.

U.S. Department of the Interior. 2013. Issuance of annual regulations permitting the hunting of migratory birds. Final Supplemental Environmental Impact Statement, U.S. Fish and Wildlife Service, Washington D.C. 418 pp.

U.S. Fish and Wildlife Service. 1995. Bear River Migratory Bird Refuge Hunt Plan and Environmental Assessment. Division of Refuges. Lakewood, CO: Department of the Interior, U.S. Fish and Wildlife Service, Region 6. 58 p.

U.S. Fish and Wildlife Service. 2013a. Banking on Nature, The economic benefits to local communities of national wildlife refuge visitation. USFWS, Division of Economics, Washington, DC. 365pp.

U.S. Fish and Wildlife Service. 2013b. Land Protection Plan—Bear River Watershed Conservation Area. Lakewood, CO: U.S. Department of the Interior, U.S. Fish and Wildlife Service, Regions 1 and 6. 227 p.

U.S. Fish and Wildlife Service. 2017a. Adaptive Harvest Management Report, 2018 Hunting Season. USFWS, Division of Migratory Birds and Management, Laurel, MD. 69pp.

U.S. Fish and Wildlife Service. 2017b. Waterfowl: Population Status, 2017. USFWS, Divison of Migratory Birds and Management, Laurel, MD. 74pp.

U.S. Fish and Wildlife Service. 2017c. https://www.fws.gov/refuges/airquality/ARIS/BRIG/. Accessed October 22, 2017.

Wurtsbaugh, W. A., C. Miller, S. E. Null, J. DeRose, P. Wilcock, M. Hahnenerger, F. Howe, and J. Moore. 2017. Decline of the world's saline lakes. Nature Geoscience. DOI: 10.1038/NGEO3052.

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Ella Wagener	Natural Resource Policy Advisor	FWS, Headquarters, Conservation Planning and Policy Branch

State Coordination:

Refuge staff met with UDWR representatives on May 29, 2018, to discuss the current hunting program and recommendations for the future. During that meeting, the UDWR offered a suggestion for another alternative to be considered and analyzed in the EA. Further conversations and emails were exchanged to gather more information which resulted in the development of Alternative D included in this EA.

In accordance with Section 106 of the National Historic Preservation Act of 1977 and its governing regulations (36 CFR Part 800), the Service reviewed the proposed actions for direct and indirect impacts to previously documented and as-of-yet-unidentified historic resources, and determined that the proposed Project will have no adverse effect on historic properties.

The Service consulted with the Utah Division of State History, requesting review and comment concerning the Service's determination of no adverse effect to historic properties with regard to the opening of additional acres to hunting on the Bear River MNR. The Utah Division of State History concurred with the Service's determination of effect for this undertaking in a letter to the Service dated June 21, 2018.

Tribal Coordination:

The Service offered to consult on a government-to-government basis with the Northwestern Band of the Shoshone Nation, Shoshone Tribe of the Wind River Reservation, and Shoshone-Bannock Tribes of the Fort Hall Reservation, concerning the determination of potential effects expanding waterfowl and pheasant hunting on the refuge could have on historic properties.

Public Outreach:

Initial scoping targeted representatives from the local county sportsmen groups and other organizations. They were informed that all members and the general public would have the opportunity to provide comments later in the process.

On June 8, 2018, the Service released the EA for a 30 day public comment period. The Service received 171 responses to our request for public comments on the EA. Most of the comments were in support of expanding hunting opportunities on the refuge. There was some opposition to the proposed action from those concerned about impacts to other wildlife and wetlands on the refuge and to other wildlife-dependent recreation on the refuge. The Service has made revisions to the EA to address and clarify some of the concerns raised about impacts of the action.

Many of the public comments suggested other alternatives to the ones the Service had proposed, some suggesting alternative units to be open to hunting to provide better hunting opportunities. Others suggesting closing certain units to reduce impacts to wildlife and wildlife-dependent

recreational use. The Service responded to these suggestions by modifying Alternative C (the selected action) to open units (3G, 6, 7, 8, 10, Canadian Goose, Pintail/Lucky 7, Yates, Stauffer, White, N. Nichols) that provide better opportunities for hunters and also maintaining the Christiansen Unit as closed to hunting for other wildlife-dependent recreational use on the refuge.

Additionally, on May 29, 2018, the Service published the draft 2018–2019 Refuge-Specific Hunting and Sport Fishing Regulations in the Federal Register. The Service did receive two comments requesting clarity on Bear River Migratory Bird Refuge's hunting regulations. The Service has removed all refuge-specific regulations from 50 CFR part 32 that were duplicative of other Service or State regulations, and thus unnecessary. The regulations removed from the refuge-specific regulations are all still enforceable on the refuge under Federal and State law. So, the regulations applicable to the hunting on the refuge have not changed as a result of the rulemaking this year. The refuge will ensure that refuge's hunting brochure includes all applicable regulations for hunting on the refuge.

Determination

This section will be filled out upon completion of any public comment period and at the time of finalization of the Environmental Assessment.

☒ The Service's action will not result in a significant impact on the quality of the human environment. See the attached **"Finding of No Significant Impact".**

☐ The Service's action **may significantly affect** the quality of the human environment and the Service will prepare an Environmental Impact Statement.

Preparer Signature: SUZANNE BAIRD Digitally signed by SUZANNE BAIRD Date: 2018.07.23 10:04:27 -06'00' Date: 07/23/2018

Name/Title/Organization: Suzanne C. Baird, Acting Project Leader, Bear River MBR

Reviewer Signature: Kelly M. Hogan Date: 7/23/18

Name/Title/Organization: Kelly Hogan, Chief, Division of operations

APPENDIX A
OTHER APPLICABLE STATUTES, EXECUTIVE ORDERS & REGULATIONS

STATUTES, EXECUTIVE ORDERS, AND REGULATIONS
Cultural Resources
American Indian Religious Freedom Act, as amended, 42 U.S.C. 1996 – 1996a; 43 CFR Part 7
Antiquities Act of 1906, 16 U.S.C. 431-433; 43 CFR Part 3
Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa – 470mm; 18 CFR Part 1312; 32 CFR Part 229; 36 CFR Part 296; 43 CFR Part 7
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810
Paleontological Resources Protection Act, 16 U.S.C. 470aaa – 470aaa-11
Native American Graves Protection and Repatriation Act, 25 U.S.C. 3001-3013; 43 CFR Part 10
Executive Order 11593 – Protection and Enhancement of the Cultural Environment, 36 Fed. Reg. 8921 (1971)
Executive Order 13007 – Indian Sacred Sites, 61 Fed. Reg. 26771 (1996)
Fish & Wildlife
Bald and Golden Eagle Protection Act, as amended, 16 U.S.C. 668-668c, 50 CFR 22
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544; 36 CFR Part 13; 50 CFR Parts 10, 17, 23, 81, 217, 222, 225, 402, and 450
Fish and Wildlife Act of 1956, 16 U.S.C. 742 a-m
Lacey Act, as amended, 16 U.S.C. 3371 et seq.; 15 CFR Parts 10, 11, 12, 14, 300, and 904
Migratory Bird Treaty Act, as amended, 16 U.S.C. 703-712; 50 CFR Parts 10, 12, 20, and 21
Executive Order 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Fed. Reg. 3853 (2001)
Natural Resources
Clean Air Act, as amended, 42 U.S.C. 7401-7671q; 40 CFR Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 CFR Part 23
Wilderness Act, 16 U.S.C. 1131 et seq.
Wild and Scenic Rivers Act, 16 U.S.C. 1271 et seq.
Executive Order 13112 – Invasive Species, 64 Fed. Reg. 6183 (1999)
Water Resources
Coastal Zone Management Act of 1972, 16 U.S.C. 1451 et seq.; 15 CFR Parts 923, 930, 933

STATUTES, EXECUTIVE ORDERS, AND REGULATIONS
Federal Water Pollution Control Act of 1972 (commonly referred to as Clean Water Act), 33 U.S.C. 1251 et seq.; 33 CFR Parts 320-330; 40 CFR Parts 110, 112, 116, 117, 230-232, 323, and 328 Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.; 33 CFR Parts 114, 115, 116, 321, 322, and 333 Safe Drinking Water Act of 1974, 42 U.S.C. 300f et seq.; 40 CFR Parts 141-148 Executive Order 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977) Executive Order 11990 – Protection of Wetlands, 42 Fed. Reg. 26961 (1977)

APPENDIX B
COMPATIBILITY DETERMINATION
BEAR RIVER MIGRATORY BIRD REFUGE
ESTABLISHED APRIL 23, 1928

Use: Hunting

Refuge Name: Bear River Migratory Bird Refuge

Establishing and Acquisition Authority(ies):

Bear River Migratory Bird Refuge was established pursuant to a 1928 Presidential Proclamation and Public Law 304 of the 70th Congress.

Refuge Purpose(s):

The purposes come from the authority under which Bear River Migratory Bird Refuge was established and from authorities under which subsequent major land additions to the Refuge were made. Purposes for Bear River Migratory Bird Refuge are:

"...refuge and feeding and breeding grounds for migratory waterfowl, ...shall be maintained as a refuge and breeding place for migratory birds included in the terms of the Convention between United States and Great Britain for the protection of migratory birds, ... 11 45 STAT. 448, dated April 23, 1928.

"...at no time shall less than 60 per centum of the total acreage of the said refuge be maintained as an inviolate sanctuary for such migratory birds." 45 STAT. 449, dated April 23, 1928.

...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds." 16 U.S.C. Section 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission:

"The mission of the National Wildlife 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."

Description of Use:

The use is public hunting of duck, goose, coot, swans (with a special state permit) and ring-necked pheasant in designated areas of the refuge. Season dates, bag limits, and harvest methods are generally consistent with state regulations, with a few refuge-specific regulations for public safety and minimizing impacts to other sensitive wildlife. Areas around buildings and roads or areas with high visitor use are closed to hunting to increase wildlife observation opportunities during the hunting season or to minimize conflict between user groups and ensure safety of non-

hunting public. A Refuge Hunting Regulations brochure will be available to inform the public of hunting opportunities and refuge regulations.

Availability of Resources:

Hunting has traditionally been allowed in a managed capacity on Bear River Migratory Bird Refuge and on refuge lands prior to refuge ownership. Hunters use the existing network of roads, dikes, and canals to access areas open to hunting. Parking lots, boat ramps, restrooms, information kiosks, signs, and brochures are provided by the refuge for use by hunters. The refuge also provides staff and volunteers to maintain these facilities and disseminate information to visitors. Refuge law enforcement officers, Service special agents, and state conservation officers/wardens enforce state and refuge hunting regulations.

Adequate resources are available to manage the hunting program at the proposed level of participation.

Anticipated Impacts of Use:

Accommodating this wildlife-dependent use is expected to result in minimal impacts. Although hunting causes mortality to wildlife, season dates and bag limits are set with the long-term health of populations in mind. Waterfowl seasons and bag limits are under the recommendation of the Flyway Council which considers overall harvest, population levels and trends. Harvest of waterfowl on the refuge is not considered as a negative impact as long as flyway-wide waterfowl population objectives are being met. Populations of certain species, for example ring-necked pheasant, are monitored by state agencies. Survey information indicates that a limited harvest will not adversely affect the overall waterfowl or pheasant population levels.

For more information on the anticipated impacts on this use, see the Environmental Assessment for Hunting Expansion at Bear River Migratory Bird Refuge (USFWS, 2018).

Disturbance to wildlife may result from hunting activity. Human activity hazes birds away from areas open to hunting; thus requiring them to change feeding patterns until they can safely return after dark. Motorized boats haze birds off channels and travel routes, and air thrust boats disturb resting birds for a considerable distance. Overall bird use is lower in areas open to hunting. This disturbance is expected to be limited in scope and duration. Hunting is limited to the fall seasons to minimize disturbance to nesting birds.

Hunters occasionally violate regulations, such as exceeding the daily bag limit or hunting in the wrong area. However, these incidents usually have only minor impacts to wildlife populations or refuge resources.

Public Review and Comment:

The Compatibility Determination is presented for public review as part of the 30-day public comment period for the Environmental Assessment for Hunting Expansion at Bear River Migratory Bird Refuge.

Determination:

____ Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary for Compatibility:

To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, hunting can occur on the refuge if the following stipulations are met:

1. This use must be conducted in accordance with State and Federal regulations, and special refuge regulations published in 50 CFR.
2. Pursuant to the refuge's enabling legislation, 60% of the refuge must remain closed to hunting as an inviolate sanctuary for migratory birds.
3. Hunters will be required to use approved non-toxic shot for migratory bird and upland game bird hunting on Service-owned lands.
4. Travel is restricted to the posted and marked public auto tour route.
5. Use of air thrust boats is allowed only below the perimeter dike; no airboats are permitted inside the impoundments.
6. Shooting is prohibited within 100 yards of the perimerter dike in units 6, 7, 8 and 9.
7. To ensure compatibility with trumpeter swan rangeexpansion, the following action items will be implemented: areas north of Forest Street will be closed to swan hunting; swan hunters will be required to check in and out of hunt areas; all harvested swans will be brought to a check station for inspection by biologists; swan numbers and movements will be monitored; and efforts will be made to observe and document any trumpeter swan use of therefuge.
8. Occasionally conditions occur that drastically alter habitat and jeopardize the health of wildlife. Flooding by the Great Salt Lake and severe drought may necessitate changes to hunt area boundaries to accommodate the needs of wildlife. Managers will give priority to the needs of wildlife and impacts to the refuge hunt program will be a secondary consideration. The refuge manager has the authority to change boundaries or close open hunt areas if conditions become detrimental to the health or well-being of wildlife populations.
9. The refuge will use an adaptive management process to adjust hunting activities as necessary to ensure that all of its hunting activities are in alignment with State and Flyway Council proposals for hunting regulations to ensure no adverse impacts to migratory bird populations.

Justification:

Hunting seasons and bag limits are established by the states and generally adopted by the Refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting removes a number of individuals from wildlife populations, but restrictions safeguard healthy, sustainable populations. Specific refuge regulations address equity and quality

of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from boat or foot traffic is minor, or temporary, since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to state and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, and the location of most hunting away from public use facilities.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

Submitted by: SUZANNE BAIRD Digitally signed by SUZANNE BAIRD Date: 2018.07.23 09:59:02 -06'00'

Suzanne Baird, Acting Project Leader — Date
Bear River Migratory Bird Refuge
Brigham City, Utah

Reviewed by: July 23, 2018

Amy Thornburg, Acting Refuge Supervisor — Date
Mountain Prairie Region
National Wildlife Refuge System
Lakewood, Colorado

Approved by: 7/23/18

Will Meeks, Assistant Regional Director — Date
Mountain Prairie Region
National Wildlife Refuge System
Lakewood, Colorado

Mandatory 15-year Reevaluations Date: 2033

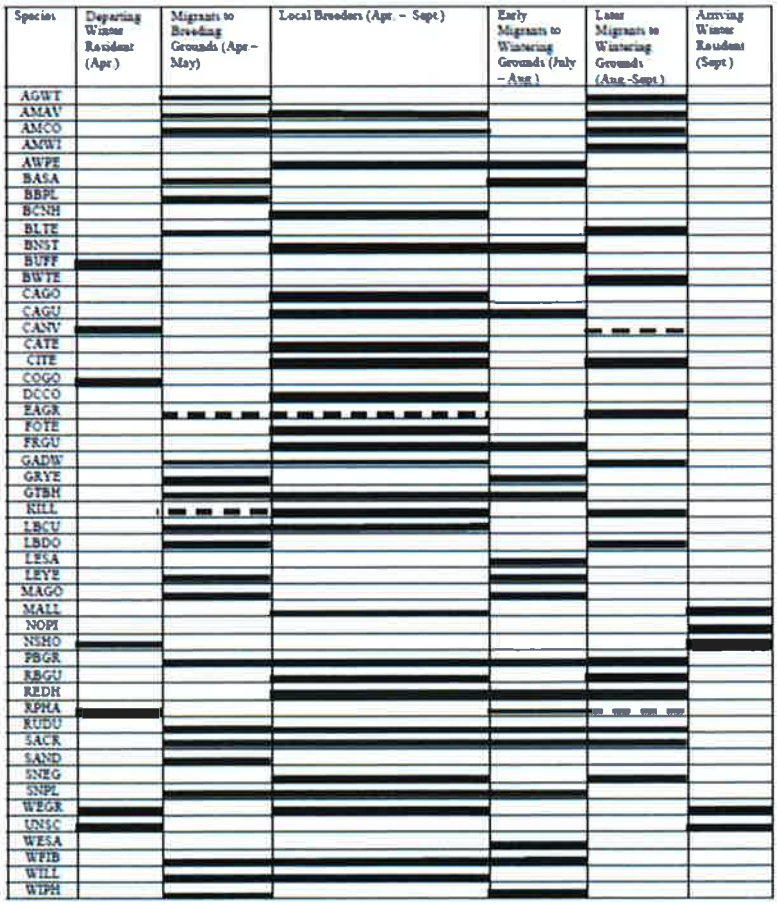
APPENDIX C
MIGRATION CHRONOLOGY OF WATERBIRDS AT GREAT SALT LAKE

The following information is excerpted from the Great Salt Lake Water Survey Five-Year Report (1997-2001), prepared by the Utah Division of Wildlife Resources. The full report may be viewed at: https://wildlife.utah.gov/gsl/gsl_ws_report/gsl_ws_report.pdf.

Migration Chronology

The five year study of species use at the Great Salt Lake allows for a break out of five significant categories of use as birds move through the season (Table 6). These classifications are based on data displayed in the species count charts (see Species Accounts). These categories are departing and arriving winter residents (April and September), migrants to breeding grounds (April-May), local breeders (April-September), early migrants to wintering grounds (July-August), and later migrants to wintering grounds (August-September). Some species fit within more than one of the 21 categories. A weighted line through the appropriate time periods shows species presence. Line designations are a subjective measurement of the portion of a species population known to be at Great Salt Lake at its peak time. Relative numbers of species by survey period are charted in the Species Accounts.

Table 6. Migration chronology of waterbirds at Great Salt Lake.
The majority of the Great Salt Lake (GSL) population is present.
Approximately half or more of the peak GSL population is present.
Less than half of the peak GSL population is present.



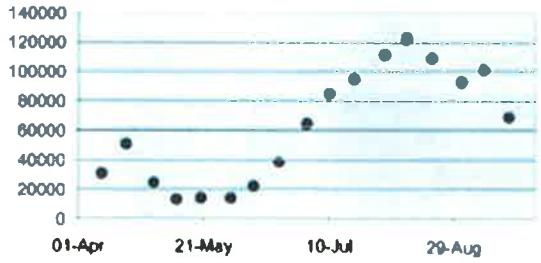
Appendix 5: Species Accounts

Each species account includes data collected from the Five-Year Waterbird Survey, and in many cases, population estimates on a broader scale from outside sources (br = breeding adults; Morrison et al. 2001; Wilkens et al. 2000; NAWCP Appendix 4; Jehl 2001). Means for each survey period are calculated over five years (1997-2001) and displayed in each chart. The mean number reported in the table for GSL is an average of survey period means for selected months during which the species is present in abundance. The peak number reported is the largest of the survey period means. The high count is the largest count at GSL at any time throughout the five-year study. The year of the high count is noted. The abundance status is taken from a Utah birds checklist (Bromley and Webb 1995) and is included as a description of species occurrence (C = common, seen frequently in habitat; FC = fairly common, small numbers or not always seen; U = uncommon, seldom seen but not a surprise; R = rare, always a surprise but not out of normal range; O = occasional, out of usual range and/or habitat). The map for each species reflects the distribution of the mean number across waterbird survey areas as data were reported. Areas not shaded represent a count of zero.

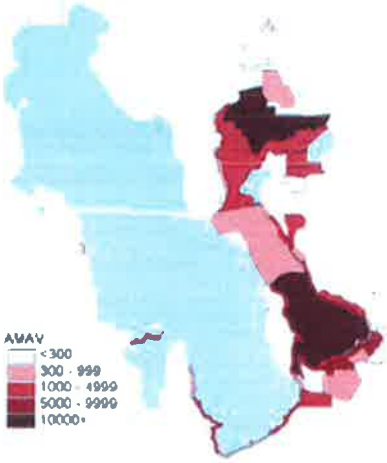
American Avocet

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Jul-Sep	Peak 10-Aug	High Count 1997	Abundance Status
AMAV	450,000	450,000	94,006	122,083	204,878	C

Mean number of AMAV at GSL by survey period.



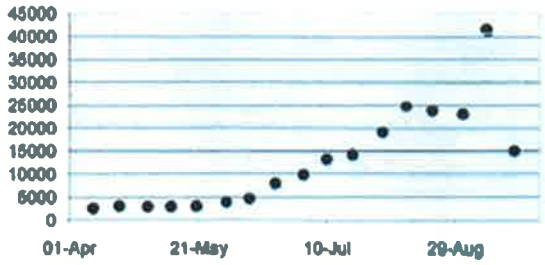
Five-year mean distribution of AMAV at GSL.



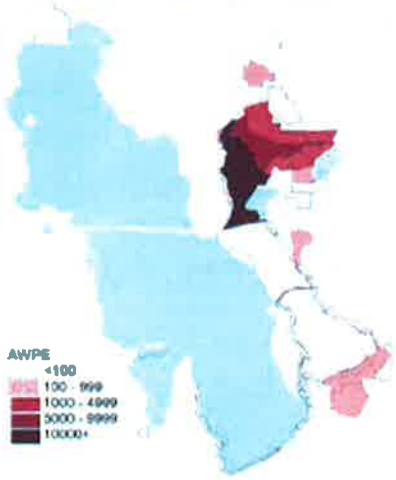
American White Pelican

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Aug-Sep	Peak 10-Sep	High Count 1997	Abundance Status
AWPE	NA	>120,000 br	25,480	41,318	85,834	C

Mean number of AWPE at GSL by survey period.



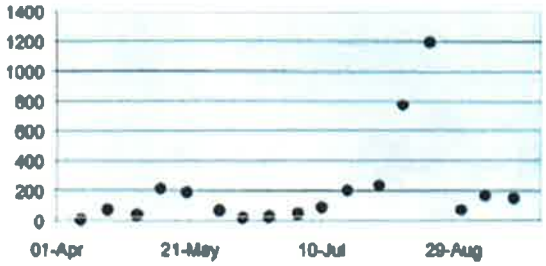
Five-year mean distribution of AWPE at GSL.



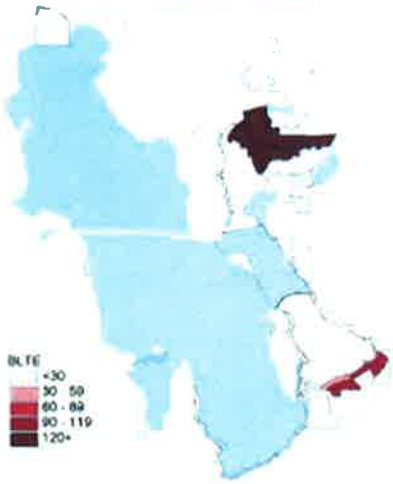
Black Tern

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Jul-Aug	Peak 20-Aug	High Count 2000	Abundance Status
BLTE	NA	100,000-500,000 br	426	1,195	1,504	FC

Mean number of BLTE at GSL by survey period.



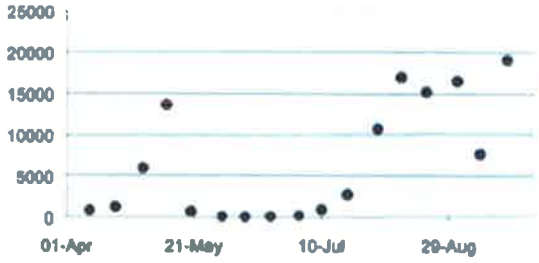
Five-year mean distribution of BLTE at GSL.



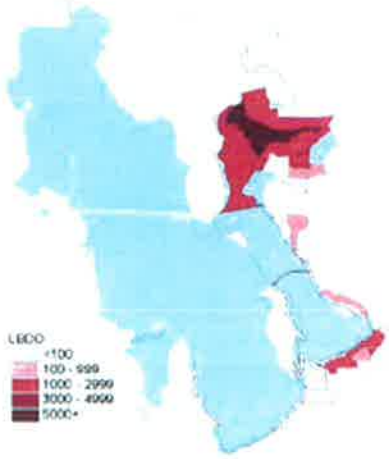
Long-billed Dowitcher

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Aug-Sep	Peak 20-Sep	High Count 1998	Abundance Status
LBDO	500,000	500,000	14,370	19,113	58,880	C

Mean number of LBDO at GSL by survey period.



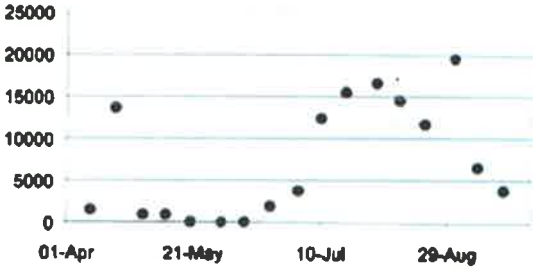
Five-year mean distribution of LBDO at GSL.



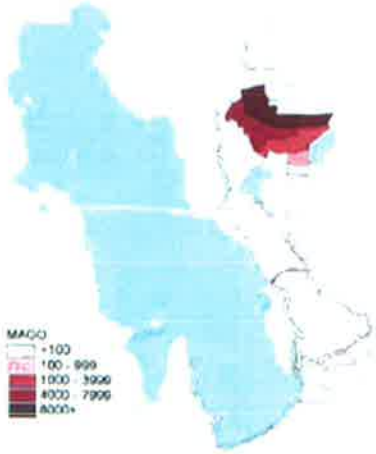
Marbled Godwit

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Jul-Aug	Peak 01-Sep	High Count 2000	Abundance Status
MAGO	171,500	171,500	15,125	19,599	43,833	FC

Mean number of MAGO at GSL by survey period.



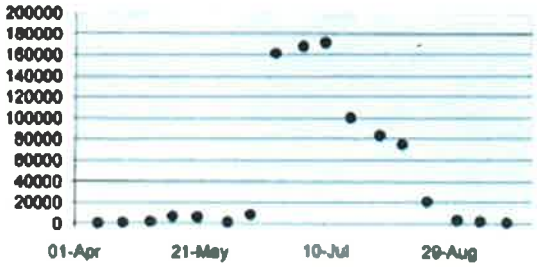
Five-year mean distribution of MAGO at GSL.



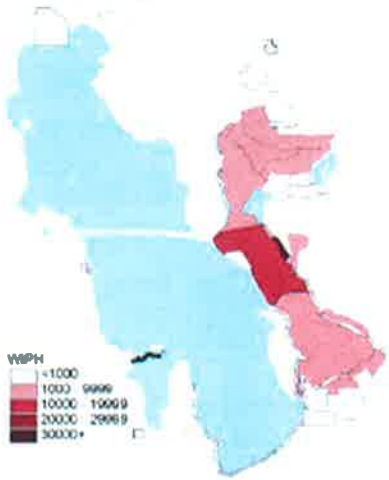
Wilson's Phalarope

	Population estimates		Great Salt Lake			
Code	Global	North America	Mean Jun-Aug	Peak 10-Jul	High Count 2000	Abundance Status
WIPH	1,500,000	1,500,000	126,629	171,876	354,729	C

Mean number of WIPH at GSL by survey period.



Five-year mean distribution of WIPH at GSL.



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APPENDIX D
CUMULATIVE IMPACTS REPORT
2018-2019 NATIONAL WILDLIFE REFUGE PROPOSED HUNTING AND SPORT FISHING OPENINGS
U.S. FISH AND WILDLIFE SERVICE

I. INTRODUCTION

Purpose and Scope

The headquarters of the National Wildlife Refuge System (Refuge System), U.S. Fish and Wildlife Service (Service), conducted a national-level review of refuge-specific Environmental Assessments (EAs) and Categorical Exclusions (CatExs) developed for the proposed expansion of hunting and/or fishing activities on 30 national wildlife refuges (NWRs) from the 2018-2019 proposed rule, including the opening of three refuges to hunting, the opening of one refuge to sport fishing, and the expansion of hunting and/or fishing activities at 26 refuges. We reviewed the refuge-specific EAs and CatExs for the 30 refuges to identify and assess the direct, indirect, and cumulative impacts of the proposed hunting and/or fishing activities on hunted populations of migratory birds and resident wildlife; non-hunted migratory and resident wildlife; Threatened and Endangered (T&E) Species; plant and habitat resources; other wildlife-dependent recreational uses; prescribed fire; physical resources including air, soil and water; cultural resources; refuge facilities; solitude; and socioeconomics. We also assessed impacts of the proposed opening or expansion of hunting and/or fishing activities on the 30 refuges by evaluating Compatibility Determinations (CDs) prepared by each refuge for their respective hunting and/or fishing programs, and intra-Service consultations on the effects of hunting and/or fishing on Threatened and Endangered Species conducted for each refuge hunting and/or fishing program as required by Section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884).

We provide an overview of hunting and fishing on NWRs in the context of federal management for migratory birds and state management of resident wildlife in Section II of this report. We document the detailed findings of the national level review and assessment of impacts, including cumulative impacts, in Section III, and provide discussion and conclusions in Sections IV and V.

This report covers the proposed 4 new hunting and sport fishing openings in 2018-2019 and the expansion, or redesign of programs on 26 other NWRs:

- At Bear River Migratory Bird Refuge in the State of Utah we added 13, 000 new acres to existing migratory game bird and upland game hunting.
- At Blackwater NWR in the State of Maryland we added 2,571.5 new acres to existing migratory game bird and big game hunting through a Categorical Exclusion.
- At Cedar Point NWR in the State of Ohio we opened 1,200 new acres to white-tailed deer hunting for the first time.
- At Charles M. Russell NWR in the State of Montana we opened 51,913 acres to elk hunting.

- At Cherry Valley NWR in the State of Pennsylvania we added 1,846 new acres to existing migratory game bird, upland game, and big game hunting through a Categorical Exclusion.
- At Cold Springs NWR in the State of Oregon we opened 3,102 acres to big game hunting and added elk to the list of available species to hunt. Of the 3,102 acres, 2,008 are new to hunting.
- At Cypress Creek NWR in the State of Illinois we added 179.22 new acres to existing migratory game bird, upland game, and big game hunting through a Categorical Exclusion.
- At Edwin B. Forsythe NWR in the State of New Jersey we opened 4,463 new acres to existing migratory game bird and big game hunting, and added wild turkey and upland game hunting (squirrel) to the list of available species to hunt.
- At Felsenthal NWR in the State of Arkansas we added 2,158 new acres to existing migratory game bird, upland game, and big game hunting.
- At Glacial Ridge NWR in the State of Minnesota we opened 14,663 new acres to existing migratory game bird, upland game, and big game hunting, and added ring-necked pheasant, gray (Hungarian) partridge, ruffed grouse, rabbit (cottontail and jack), snowshoe hare, squirrel (fox and gray), and wild turkey to the list of available species to hunt.
- At Great River NWR in the States of Illinois and Missouri we added 702 new acres to existing migratory game bird, upland game, big game hunting, and sport fishing through a Categorical Exclusion.
- At Hackmatack NWR in the States of Illinois and Wisconsin we opened 117 acres to migratory game bird, upland game, and big game hunting to all legal species in the State of Illinois.
- At J. Clark Salyer NWR in the State of North Dakota we opened 57,825 acres to moose hunting for the first time.
- At John Heinz NWR in the State of Pennsylvania we opened 170 acres to big game hunting, and added white-tailed deer to the list of available species to hunt.
- At Lake Woodruff NWR in the State of Florida we opened 11,000 acres to wild turkey hunting for the first time.
- At Lostwood NWR in the State of North Dakota we opened 26,287 acres to moose hunting for the first time.
- At Moosehorn NWR in the State of Maine we opened 747.26 new acres to existing migratory game bird, upland game, and big game hunting through a Categorical Exclusion.
- At Ottawa NWR in the State of Ohio we opened 847 new acres to existing migratory game bird and big game hunting, opened upland game hunting for the first time, and added rail, gallinule, coot, dove, woodcock, snipe, wild turkey, pheasant, squirrel, rabbit, fox, raccoon, skunk, opossum, groundhog, and coyote to the list of available species to hunt.
- At Patoka River NWR in the State of Indiana we opened 212 new acres to existing migratory game bird, upland game, big game hunting, and sport fishing through a Categorical Exclusion.

- At Patuxent Research Refuge in the State of Maryland we opened 168 new acres to existing white-tailed deer and wild turkey hunting through a Categorical Exclusion.
- At Rachel Carson NWR in the State of Maine we opened 90 acres to existing white-tailed deer and wild turkey hunting through a Categorical Exclusion.
- At San Pablo Bay NWR in the State of California we opened 1,726 new acres to existing migratory game bird hunting, and opened sport fishing.
- At Sevilleta NWR in the State of New Mexico we opened 590 new acres to existing migratory game bird hunting, opened upland game hunting, and added Eurasian-collared dove and Gambel's quail to the list of available species to hunt.
- At Shiawassee NWR in the State of Michigan we opened 4,653 new acres to existing migratory game bird and big game hunting, opened upland game hunting, and added ducks, coot, gallinule, sora, Virginia rail, Wilson's snipe, turkey, small game (eastern fox squirrel, eastern cottontail, ring-necked pheasant, American woodcock, and American crow), and furbearers (raccoon, coyote and red fox) to the list of available species to hunt.
- At Swan River NWR in the State of Montana we opened 1,960 new acres to big game hunting for the first time and added black bear, white-tailed deer, mule deer, and elk to the list of available species to hunt.
- At Trempealeau NWR in the State of Wisconsin we opened 254.5 new acres to existing migratory game bird and big game hunting, opened upland game hunting, and added wild turkey, ruffed grouse, ring-necked pheasant, bobwhite quail, Hungarian partridge, sharp-tailed grouse, coyote, gray and red fox, bobcat, raccoon, snowshoe hare, cottontail rabbit, and gray and red squirrel to the list of available species to hunt.
- At Umbagog NWR in the States of Maine and New Hampshire we opened 16,586 acres to existing migratory game bird, upland game, and big game hunting, and added wild turkey to the list of available species to hunt.
- At Upper Klamath NWR in the State of Oregon we opened 4,000 new acres to existing migratory game bird hunting through a Categorical Exclusion.
- At Wallkill NWR in the States of New Jersey and New York we opened 442 acres to existing migratory game bird hunting and 30 acres to existing sport fishing through a Categorical Exclusion.
- At William L. Finley NWR in the State of Oregon we opened 10 new acres to sport fishing.

II. OVERVIEW OF HUNTING ON NATIONAL WILDLIFE REFUGES

1. Migratory Bird Hunting

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703–712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any * * * bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds" and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the Service as the lead

Federal agency for managing and conserving migratory birds in the United States. Migratory game bird management is a cooperative effort of State, Tribal, and Federal governments.

The Service develops migratory game bird hunting regulations by establishing the frameworks, or outside limits, for season lengths, bag limits, and areas for migratory game bird hunting. Acknowledging regional differences in hunting conditions, the Service has administratively divided the Nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. The Flyway Councils, established through the Association of Fish and Wildlife Agencies (AFWA), also assist in researching and providing migratory game bird management information for Federal, State, and Provincial governments, as well as private conservation entities and the general public.

The process for adopting migratory game bird hunting regulations, located at 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rulemaking process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation.

For the regulatory cycle, Service biologists gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Because the Service is required to take abundance of migratory game birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with Service Regional Offices, the Canadian Wildlife Service, and State and Provincial wildlife-management agencies. To determine the appropriate frameworks for each species, we consider 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, 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.

The programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88–14)," filed with the Environmental Protection Agency (EPA) on June 9, 1988, addresses National Environmental Policy Act (NEPA) compliance by the Service for issuance of the annual framework regulations for hunting of migratory game bird species. We published a Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). We also address NEPA compliance for waterfowl hunting frameworks through the annual preparation of separate Environmental Assessments, as in the "Duck Hunting Regulations for 2012-13" with its corresponding August 23, 2012 Finding of No Significant Impact.

Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53376), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for

the migratory bird hunting program. We held public scoping meetings in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216). We published the 2010 Draft Supplemental Environmental Impact Statement in the Federal Register on July 9, 2010 (73 FR 39577). The public comment period closed on March 26, 2011. On May 31, 2013, we published a Notice of Availability in the Federal Register (78 FR 32686) announcing a Second Final Supplemental Environmental Impact Statement for the Issuance of Annual Regulations Permitting the Hunting of Migratory Birds. The programmatic document was filed with the EPA on May 24, 2013, pursuant to the NEPA. The public review period ended July 1, 2013.

We allow migratory bird hunting on refuges on designated areas only if we have determined such activity to be compatible with the establishment purpose(s) of the refuge and the mission of the (Refuge System), as required by the National Wildlife Refuge System Administration Act (NWRSAA, 16 U.S.C. 668dd-668ee).

2. Hunting and Fishing of Resident Wildlife

Individual states regulate hunting of resident wildlife, including upland game, big game, and fish. On a state-by-state basis, they annually establish hunting and fishing regulations with a goal of providing the public recreational opportunities while maintaining harvests at sustainable levels. Many states manage big game populations on a zonal basis (typically called Game Management Units), recognizing that discrete populations of resident big game species typically exist within a given state. States typically also manage resident small game and upland game on a statewide or zonal basis. We allow hunting and fishing of resident wildlife on NWRs only if we have determined such activity compatible with the establishment purpose(s) of the refuge and the mission of the Refuge System, as required by the NWRSAA. Hunting and fishing on NWRs generally occur consistent with state regulations, including seasons and bag limits. Refuge-specific hunting and fishing regulations can be more restrictive (but not more liberal) than state regulations - and often are.

III. DESCRIPTION AND EVALUATION OF CUMULATIVE IMPACTS

A cumulative impact is defined as an impact on the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can "accumulate" spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time. Sometimes different actions counterbalance one another, partially canceling out each other's effects on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource.

All uses of Refuge System lands and waters result in impacts to refuge wildlife and habitats, to other uses of the refuges, and to other refuge resources. As we initiate or expand wildlife-

dependent recreational activities for the public on NWRs, there is an increased potential for adverse cumulative impacts to occur on individual refuges and on the Refuge System as a whole. There are currently 338 NWRs and approximately 7,000 waterfowl production areas in 37 wetland management districts open to hunting of migratory birds, upland game and/or big game wildlife species. For the 2018-2019 season, the Service proposes to open and/or expand hunting and/or fishing opportunities on 30 NWRs.

Through the refuge-specific EAs for the respective proposed actions, we identified and analyzed the direct, indirect, and cumulative impacts of the proposed actions on populations of hunted (migratory birds, upland game, big game) and fished wildlife, non-hunted migratory and resident wildlife, habitats and plant resources, other wildlife-dependent recreational programs, refuge users, refuge environment (air and water resources, soils, cultural resources and solitude), and refuge infrastructure and facilities. This national-level review and assessment evaluates the cumulative impacts of the proposed actions to the aforementioned components for all 30 refuges combined and for the Refuge System as a whole.

Many of the proposed or expanded refuge hunting programs examined in this review were more restrictive than the hunting seasons allowed on nearby lands by State regulation. For the remaining refuges in the rulemaking, we operate in accordance with state regulations. Refuge-specific regulations proposing hunting and fishing of resident wildlife included restrictions on the number of days we allowed hunting and fishing within the state season, restricting the use of trailing dogs, specifying which equipment is permissible (e.g. bow and arrow, muzzle-loading rifles, rod and reel), and shortening the daily hunting and fishing hours. We would expect all of these restrictions to result in fewer animals being harvested, and by inference, would be well within sustainable harvest levels of resident and migratory wildlife populations.

The conclusions in the refuge-specific EAs that there would not be any significant adverse direct, indirect, or cumulative impacts on wildlife populations, other recreational uses, other refuge resources, and other aspects of the human environment were further supported by the Compatibility Determinations (CDs) and Section 7 evaluations. The CD process examines the anticipated impacts of a proposed activity on biological resources, and considers impacts to other wildlife-dependent recreational programs and other refuge resources. All CDs we reviewed determined that the hunting and fishing programs were compatible with refuge establishment purposes and the mission of the Refuge System. All of the Section 7 consultations determined that the proposed activities would have "No Effect" or were "Not Likely to Adversely Affect" T&E species.

Many of the EAs specifically stated that changes in refuge conditions, such as sizeable increases in refuge acreage or public uses, would trigger new hunt planning, NEPA, CD, and Section 7 evaluation processes. Many of the EAs also noted that the Service may reevaluate compatibility at any time if conditions warrant. These required planning processes ensure that adverse cumulative impacts will not accumulate over time.

1. Cumulative Impacts to Migratory Birds – Hunted Species

For some refuges, the projected harvest as a result of the proposed action results in no, or minimal, harvest. For these refuges, we estimate that expansion of a hunting program will result in no, or minimal, harvest. In many areas, numbers of hunters have been steadily decreasing, and we estimate that the additional hunting opportunity will not result in an additional number of hunters, or additional harvest of the species being analyzed.

Six of the refuges proposing to expand migratory game bird hunting (Blackwater, Cherry Valley, Edwin B. Forsythe, Moosehorn, Umbagog, and Wallkill NWRs) lie within the Atlantic Flyway. For the period of 2015-2016, annual duck harvests for the Atlantic Flyway averaged 1,599,900 (±12%) ducks and during the same period, annual goose harvests for the Atlantic Flyway averaged 754,000 (±9%) geese (Raftovich et al. 2017). Projected harvests of migratory waterfowl resulting from the proposed actions at the six refuges are as follows: Blackwater NWR- 0 ducks and 0 geese; Cherry Valley NWR- 0 ducks and 0 geese; Edwin B. Forsythe NWR- 400 ducks and 1000 geese; Moosehorn NWR- 15 ducks and 5 geese; Umbagog NWR- 10 ducks and 0 geese; and Wallkill NWR- 300 ducks and 250 geese.

One refuge in the Atlantic Flyway is expanding dove hunting (Cherry Valley NWR). Projected harvests of dove resulting from the proposed action is 10 doves. For the period of 2015-2016, average annual mourning dove harvests for Pennsylvania was 142,900 (±37%) doves. During the same period, averages for the Atlantic Flyway were 4,606,000 (±9%) doves for the Eastern Unit (Raftovich et al. 2017).

Four refuges in the Atlantic Flyway are expanding coot hunting (Cherry Valley, Edwin B. Forsythe, Umbagog, and Wallkill NWRs). Projected harvests of coots resulting from the proposed actions are as follows: Cherry Valley NWR- 0 coots; Edwin B. Forsythe NWR- 0 coots; Umbagog NWR- 0 coots; and Wallkill NWR- 2 coots. For the period of 2015-2016, average annual coot harvest for Pennsylvania was <50 (±192%), for New York was 600 (±148%), for New Jersey was 0, for Maine was 0, and for New Hampshire was 0 coots. The average for the Atlantic Flyway was 43,100 (±167%) coots (Raftovich et al. 2017).

Four refuges in the Atlantic Flyway are expanding woodcock hunting (Cherry Valley, Moosehorn, Umbagog, and Wallkill NWRs). Projected harvests of woodcock resulting from the proposed actions are as follows: Cherry Valley NWR- 10 woodcocks; Moosehorn NWR- 10 woodcocks; Umbagog NWR- 30 woodcocks; and Wallkill NWR- 5 woodcocks. For the period of 2015-2016, average annual woodcock harvest for Pennsylvania was 3,900 (±39%), for Maine was 6,700 (±31%) woodcocks, for New Hampshire was 6,600 (±55%), for New Jersey was 3,800 (±86%), and for New York was 4,800 (±24%). The average for the Eastern Region was 44,400 (±19%) woodcocks (Raftovich et al. 2017).

Four refuges in the Atlantic Flyway are expanding snipe hunting (Cherry Valley, Moosehorn, Umbagog, and Wallkill NWRs). Projected harvests of snipe resulting from the proposed actions are as follows: Cherry Valley NWR- 0 snipe; Moosehorn NWR- 5 snipe; Umbagog NWR- 0 snipe; and Wallkill NWR- 2 snipe. For the period of 2015-2016, average annual snipe harvest for Pennsylvania was 2,800 (±196%), for Maine was 0, for New Hampshire was <50 (±186%), for New Jersey was 0, and for New York was 400 (±146%) snipe. The average for the Atlantic Flyway was 69,100 (±76%) snipe (Raftovich et al. 2017).

Three refuges in the Atlantic Flyway are expanding rail hunting (Cherry Valley, Edwin B. Forsythe, and Wallkill NWRs). Projected harvests of rail resulting from the proposed actions are as follows: Cherry Valley NWR- 0 rails; Edwin B. Forsythe NWR- 0 rails; and Wallkill NWR- 0 rails. For the period of 2015-2016, average annual rail harvest for Pennsylvania was 0, for New Jersey was 2,700 (±54%), and for New York was 0 rail. The averages for the Atlantic Flyway were 12,100 (±44%) rails (Raftovich et al. 2017).

Nine of the refuges proposing to expand migratory game bird hunting (Patoka River, Cypress Creek, Felsenthal, Glacial Ridge, Great River, Hackmatack, Ottawa, Shiawassee, and Trempealeau NWRs) lie within the Mississippi Flyway. For the period of 2015-2016, annual duck harvests for the Mississippi Flyway averaged 4,962,600 (±6%) ducks and during the same period, annual goose harvests for the Mississippi Flyway averaged 1,178,200 (±9%) geese (Raftovich et al. 2017). Projected harvests of migratory waterfowl resulting from the proposed actions at the eight refuges are as follows: Patoka River NWR- 55 ducks and 5 geese; Cypress Creek NWR- 0 ducks and 0 geese; Felsenthal NWR- 500 ducks and 500 geese; Glacial Ridge NWR- 14 ducks and 4 geese; Great River NWR- 200 ducks and 20 geese; Hackmatack NWR- 50 ducks and 10 geese; Ottawa NWR- 128 ducks and 125 geese; Shiawassee NWR- 1080 ducks and 100 geese; and Trempealeau NWR- 160 ducks and 100 geese.

Three refuges in the Mississippi Flyway are expanding dove hunting (Patoka River, Cypress Creek, and Glacial Ridge NWRs) and three refuges in the Mississippi Flyway are opening dove hunting (Hackmatack, Ottawa, and Trempealeau NWRs). The projected harvest of doves resulting from the proposed actions is as follows: Patoka River NWR- 6 doves; Cypress Creek NWR- 0 doves; Glacial Ridge NWR- 2 doves; Hackmatack NWR- 0 doves; Ottawa NWR- 100 doves; and Trempealeau NWR- 50 doves. For the period of 2015-2016, average annual dove harvest for Indiana was 115,200 (±38%), for Illinois was 316,600 (±30%), for Minnesota was 96,700 (±79%), for Wisconsin was 45,500 (±30%), and for Ohio was 149,100 (±35%) doves. The averages for the Eastern Unit was 4,606,000 (±9%) doves (Raftovich et al. 2017).

Six refuges in the Mississippi Flyway are expanding coot hunting (Patoka River, Cypress Creek, Felsenthal, Glacial Ridge, Great River, and Trempealeau NWRs) and three refuges in the Mississippi Flyway are opening coot hunting (Hackmatack, Ottawa, and Shiawassee NWRs). Projected harvests of coots resulting from the proposed actions are as follows: Patoka River NWR- 2 coots; Cypress Creek NWR- 0 coots; Felsenthal NWR- 50 coots; Glacial Ridge NWR- 0 coot; Great River NWR- 10 coots; Trempealeau NWR- 10 coots; Hackmatack NWR- 0 coots; Ottawa NWR- 25 coots; and Shiawassee NWR- 50 coots. For the period of 2015-2016, average annual coot harvest for Indiana was 800 (±66%), for Illinois was 200 (±195%), for Arkansas was 0, for Minnesota was 18,700 (±123%), for Missouri was 0, for Wisconsin was 4,900 (±196%), for Ohio was 0, and for Michigan was 100 (±195%) coots. The average for the Mississippi Flyway was 59,600 (±69%) coots (Raftovich et al. 2017).

Three refuges in the Mississippi Flyway are expanding woodcock hunting (Patoka River, Cypress Creek, and Glacial Ridge NWRs) and three refuges in the Mississippi Flyway are opening woodcock hunting (Hackmatack, Ottawa, and Trempealeau NWRs). Projected harvests of woodcock resulting from the proposed actions are as follows: Patoka River NWR- 0

woodcocks; Cypress Creek NWR- 0 woodcocks; Glacial Ridge NWR- 1 woodcock; Hackmatack NWR- 0 woodcocks; Ottawa NWR- 10 woodcocks; and Trempealeau NWR- 5 woodcocks. For the period of 2015-2016, average annual woodcock harvest for Indiana was 900 (±43%), for Illinois was 1,600 (±173%), for Minnesota was 25,900 (±36%), for Wisconsin was 35,100 (±25%), and for Ohio was 3,200 (±81%) woodcocks. The average for the Central Region was 158,000 (±20%) woodcocks (Raftovich et al. 2017).

Three refuges in the Mississippi Flyway are expanding snipe hunting (Patoka River, Cypress Creek, and Glacial Ridge NWRs) and four refuges in the Mississippi Flyway are opening snipe hunting (Hackmatack, Ottawa, Shiawassee, and Trempealeau NWRs). Projected harvests of snipe resulting from the proposed actions are as follows: Patoka River NWR- 2 snipe; Cypress Creek NWR- 0 snipe; Glacial Ridge NWR- 0 snipe; Hackmatack NWR- 0 snipe; Ottawa NWR- 10 snipe; Shiawassee NWR- 10 snipe; and Trempealeau NWR- 5 snipe. For the period of 2015-2016, average annual snipe harvest for Indiana was 100 (±77%), for Illinois was 0, for Minnesota was 700 (±113%), for Wisconsin was 0, for Ohio was 0, and for Michigan was 200 (±195%) snipe. The average for the Mississippi Flyway was 26,200 (±111%) snipe (Raftovich et al. 2017).

Two refuges in the Mississippi Flyway are expanding rail hunting (Patoka River and Glacial Ridge NWRs) and four refuges in the Mississippi Flyway are opening rail hunting (Hackmatack, Ottawa, Shiawassee, and Trempealeau NWRs). Projected harvests of rail resulting from the proposed actions are as follows: Patoka River NWR- 2 rails, Glacial Ridge NWR- 0 rails, Hackmatack NWR- 0 rails, Ottawa NWR- 5 rails, Shiawassee NWR- 20 rails, and Trempealeau NWR- 10 rails. For the period of 2015-2016, average annual rail harvest for Indiana was 300 (±193%), for Minnesota was 0 rails, for Illinois was 0, for Wisconsin was 0, for Ohio was 400 (±155%), and for Michigan was 0 rail. The averages for the Mississippi Flyway were 1,100 (±84%) rails (Raftovich et al. 2017).

One refuge proposing to expand migratory game bird hunting (Sevilleta NWR) lies within the Central Flyway. For the period of 2015-2016, annual duck harvests for the Central Flyway averaged 2,430,800 (±18%) ducks and during the same period, annual goose harvests for the Central Flyway averaged 912,200 (±9%) geese (Raftovich et al. 2017). Projected harvests of migratory waterfowl resulting from the proposed actions at the refuge is Sevilleta NWR- 0 ducks and 0 geese.

One refuge in the Central Flyway is expanding dove hunting (Sevilleta NWR). The projected harvest of doves resulting from the proposed actions is 100 doves. For the period of 2015-2016, average annual dove harvest for New Mexico was 47,900 (±26%). The average for the Central Unit was 7,334,600 (±14%) doves (Raftovich et al. 2017).

One refuge in the Central Flyway is expanding coot hunting (Sevilleta NWR). Projected harvest of coots resulting from the proposed actions is 0 coots. For the period of 2015-2016, average annual coot harvest for New Mexico was 100 (±91%). The average for the Central Flyway was 12,200 (±114%) coots (Raftovich et al. 2017).

Three of the refuges proposing to expand migratory game bird hunting (San Pablo Bay, Bear River Migratory Bird Refuge, and Upper Klamath NWRs) lie within the Pacific Flyway. For the

period of 2015-2016, annual duck harvests for the Pacific Flyway averaged 2,552,500 (±8%) ducks and during the same period, annual goose harvests for the Pacific Flyway averaged 414,700 (±10%) geese (Raftovich et al. 2017). Projected harvests of migratory waterfowl resulting from the proposed actions at the two refuges are as follows: San Pablo Bay NWR- 100 ducks and 100 geese; Bear River Migratory Bird Refuge- 225 ducks and 75 geese; and Upper Klamath NWR- 800 ducks and 200 geese.

Three refuges in the Pacific Flyway are expanding coot hunting (San Pablo Bay, Bear River, and Upper Klamath NWRs). Projected harvests of coots resulting from the proposed actions are as follows: San Pablo Bay NWR- 100 coots; Bear River Migratory Bird Refuge- 0 coots; and Upper Klamath NWR- 0 coots. For the period of 2015-2016, average annual coot harvest for California was 8,900 (±105%), for Utah was 8,900 (±57%), and for Oregon was 900 (±163%) coots. The average for the Pacific Flyway was 23,200 (±49%) coots (Raftovich et al. 2017).

One refuge in the Pacific Flyway is expanding snipe hunting (Upper Klamath NWR). Projected harvests of snipe resulting from the proposed action are Upper Klamath NWR- 50 snipe. For the period of 2015-2016, average annual snipe harvest for Oregon was 0 snipe. The average for the Pacific Flyway was 4,600 (±136%) snipe (Raftovich et al. 2017).

Total duck and goose harvest in the United States from 2015-2016 was estimated at 11,607,400 (±5%) ducks and 3,266,900 (±5%) geese (U.S. Fish and Wildlife Service 2017). For the same period, the estimated average national harvest of coots was 138,200 (±61%), of mourning doves was 13,502,000 (±8%), of rails was 14,500 (±41%), of snipe was 118,400 (±55%), and of woodcocks was 202,300 (±16%) (Raftovich et al. 2017).

Collectively, for the proposed actions on these nineteen refuges, our estimates indicate that the proposed harvests of each species will constitute a negligible component of the national harvests.

2. Cumulative Impacts to Resident Wildlife

National wildlife refuges proposing to expand hunting or fishing programs for resident wildlife occur in Oregon (Cold Springs NWR), Maryland (Blackwater NWR and Patuxent Research Refuge), Wisconsin (Trempealeau NWR), Minnesota (Glacial Ridge NWR), Indiana (Patoka River NWR), Maine (Moosehorn NWR and Rachel Carson NWR), North Dakota (J Clark Salyer NWR and Lostwood NWR), New Mexico (Sevilleta NWR), Michigan (Shiawassee NWR), Montana (Swan River NWR and Charles M. Russell NWR), Maine and New Hampshire (Umbagog NWR), Pennsylvania (Cherry Valley NWR and John Heinz NWR), Illinois (Cypress Creek NWR), Utah (Bear River Migratory Bird Refuge), Illinois and Missouri (Great River NWR), Illinois and Wisconsin (Hackmatack NWR), New Jersey (Edwin B. Forsythe NWR), Arkansas (Felsenthal NWR), Florida (Lake Woodruff NWR), and Ohio (Cedar Point NWR and Ottawa NWR). We have considered the cumulative impacts of harvest of resident wildlife species on NWRs open to upland game hunting, big game hunting, and fishing on a national scale, and have concluded that consideration of cumulative impacts is most relevant at a more local geographic scale because of the discrete nature of these populations.

The proposed actions involve expanding opportunities for hunting resident wildlife at 26 refuges and fishing at 4 refuges. Patoka River NWR, Great River NWR, and Wallkill NWR are expanding both hunting and fishing opportunities. The refuge-specific EAs and CatExs evaluated impacts of harvest of resident wildlife species on refuge populations as well as populations at the appropriate geographic scale which best defines the discrete populations (i.e., state or zone within a state, or body of water).

States have the primary trust responsibility for managing resident wildlife. Each state manages its resident wildlife slightly differently. However, Congress charges all states with managing and perpetuating resident wildlife for the citizens of their respective states. State wildlife agencies provided much of the harvest and population information on resident wildlife contained in the refuge-specific EAs to the Service. All of the refuges had close working relationships with state wildlife agencies and consulted with them in developing their hunting and fishing proposals. Most refuges have annual meetings with state wildlife agencies to review and make adjustments to their hunting and fishing programs.

States concurred with and supported all of the proposed hunting and fishing seasons for resident wildlife on refuges. Refuge hunting and fishing seasons may be more restrictive than state-set seasons but never more liberal. Most refuge hunting and fishing seasons examined in this review were more restrictive than seasons allowed on nearby lands by state regulation. Refuge-specific regulations on those refuges proposing hunting of resident wildlife included restrictions on the number of days we allowed hunting within the State season, controlling the number and/or age (such as youth-only seasons) of hunters, restricting the use of hunting dogs, limiting equipment use (such as modern, high-powered rifles, archery or muzzle-loading rifles, use of boats), shortening the daily hunting and fishing hours, and placing size-limits on fish catches. We would expect all of these restrictions to result in hunters and anglers harvesting fewer animals.

Most state wildlife agencies subdivide their states into discrete "game management units" (GMUs) as a means to improve the management of big game species. State agencies use several different terms to describe GMUs. These units have population goals as well as harvest goals. Many units have either extended or restricted seasons and/or bag limits depending on the population and management objective of that particular unit. All of the state big-game hunting programs are designed to manage and maintain big-game populations at sustainable levels. Individual refuges generally occupy only a small fraction, or subset, of land area of any state-determined GMU. Big-game populations and harvests on refuges are also subsets of population and harvest goals of that particular GMU. While not all refuges provided numerical harvest estimates for big game, they all coordinated their seasons with state wildlife agencies.

Typically, big-game harvests on refuges were modest, representing a small fraction of the harvest in a GMU. Known, estimated, or projected refuge harvests were well within the sustainable harvest levels determined by the states. As they did with big-game seasons, all of the refuges consulted with state wildlife agencies in developing their hunting proposals. State wildlife agencies concurred with, and supported, all of the proposed hunting seasons for resident wildlife on refuges.

Small and upland game seasons are generally, but not always, set on a statewide basis. We also design small and upland game seasons to manage and maintain small and upland game populations at sustainable levels. While not all refuges provided numerical harvest estimates for small and upland game, they all coordinated their seasons with state wildlife agencies. Those numerical harvest estimates provided indicated that known, estimated, or projected refuge harvests were a very minor component of statewide harvests and well within sustainable harvest levels as determined by the states.

The specific species being proposed for hunting varied widely among refuges. Therefore, the annual and long-term cumulative impacts to resident wildlife populations, fox (gray and red), coyote, raccoon, squirrel (red, fox, and gray), deer (white-tailed, mule, and sika), moose, bear, feral hog, rabbit (cottontail), jackrabbit (black-tailed and white-tailed), snowshoe hare, elk, opossum, beaver, ring-necked pheasant, grouse (ruffed and sharp-tailed), wild turkey (Eastern and Rio Grande), quail (bobwhite and Gambel's), partridge, woodchuck, crow, skunk, porcupine, weasel, coyote, bobcat, nutria, and badger from the additional harvest of these species under the proposed actions will be negligible. We anticipate that the impacts of hunting on resident wildlife on any one or combination of refuges will have negligible effect on any or all of the other refuges. Resident wildlife proposed for fishing included surfperch (barred and silver), bat ray, cabezon, California halibut, jacksmelt, leopard shark, bass (striped, largemouth, and smallmouth), shiner perch, northern pike, bluegill, green sunfish, common carp, and whitesucker, among other legal fish species to be harvested in the states of Illinois, Missouri, Indiana, California, New Jersey, New York, and Oregon.

We did not determine or expect any of the known, estimated, or projected harvests of big game, upland game, or fish species resulting from the proposed activities on refuges to have significant adverse direct, indirect, or cumulative impacts to any hunted or fished wildlife population.

3. Cumulative Impacts to Non-hunted Migratory and Resident Wildlife

The primary impact to non-hunted migratory and resident wildlife identified in the refuge-specific EAs and CatExs was localized, temporary disturbance of individual animals, or groups of animals, caused by the mere presence of hunters and anglers (people), by hunters and anglers traveling to and from their destinations, and by conducting the hunting or fishing activity. We identified disturbance related to accessing hunting or fishing areas as likely being greater when using motorized vehicles or boats than by walking or using non-motorized means. We also note disturbance caused by the noise of gunshots and the presence and use of hunting dogs.

None of the EAs and CatExs reviewed identified any significant adverse cumulative impacts to non-hunted migratory and resident wildlife due to disturbance related to the proposed hunting or fishing activities. We based these findings on localized, temporary nature of the hunting and fishing activities, and the fact that we minimize or offset disturbance impacts on refuges by specific management of the hunting and fishing programs on refuges:

- Establishing sanctuaries and closed areas. We recognize establishing sanctuaries as the most effective mechanism to minimize disturbance. All of the refuges involved in the review established sanctuaries and closed areas to allow wildlife undisturbed areas to

feed and rest. Birds, particularly, are very mobile and will move to areas of little disturbance. In addition, refuge areas supporting sensitive species and/or habitats are not opened to hunting or fishing.

- Promulgating and enforcing refuge-specific regulations, such as limited entry regulations, which restrict the number of allowed hunters, restrictions on access modes, designating travel corridors, and restrictions on season length and hours open. For example, waterfowl hunting on refuges often closes at noon, and we allow it only a few days per week.
- Providing educational materials and programs to hunters, anglers, and other refuge users to keep them informed on how to minimize impacts to non-hunted wildlife.

We also note other factors related to hunting or fishing activities, which minimize disturbance impacts to non-hunted migratory and resident wildlife:

- The home ranges of many species, particularly small mammals, are often restricted. This limits the potential for local disturbance, as well any regional impact that any disturbance may cause.
- Many species are nocturnal and, therefore, would be only minimally impacted by any daytime activity.
- Hunting seasons often take place during the colder months of the year. Many species, such as small mammals, reptiles, and amphibians are hibernating or in torpor states that limits their interactions with hunters.
- Many species are migratory and have already passed through the refuge before hunting seasons take place. In northern and mid-latitude refuges, many migratory bird species are no longer in the area when hunting seasons take place.
- The number of hunters or anglers is often self-limited because of difficult access or equipment needs, such as requiring a boat to access an area.
- Some refuge hunting and fishing programs attract a very small number of participants. Often participation rates decline as a season progresses.
- The habitat may be difficult to traverse, requiring hunters or anglers to avoid areas such as thick vegetation and extensive mudflats, further localizing the disturbance and providing adequate escape cover even within areas open to hunting.

The EAs noted that most of the refuge hunting programs would take place outside of the primary nesting and brood-rearing seasons for most migratory and resident non-hunted wildlife, and, therefore, have no or minimal impact on reproduction. However, some of the refuge hunting programs included spring turkey hunting, which does occur during the reproductive season. We minimized impacts to reproductive success of nesting species from these activities on refuges through refuge-specific regulations, which limited the number of hunters. We also note that the nature of the hunt itself limits disturbance impacts of turkey hunting. Turkey hunters are particularly stealthy, often wearing camouflage and sitting motionless for long periods of time.

We also note illegal take of protected species as a potential impact of hunting or fishing activities on refuges. These are typically classified as rare, isolated, and negligible and not resulting in any significant adverse cumulative impacts to populations of non-hunted resident or migratory wildlife. We reduced the potential for this impact on the refuges through the enforcement of

regulations protecting species that are not specifically authorized as being open for hunting or fishing from both illegal take and harassment.

On some refuges, we note potential beneficial impacts of hunting to non-hunted wildlife. Reducing populations of overabundant ungulates (deer) and invasive species such as feral hog resulted in improved habitat conditions for other wildlife species by reducing browsing and grazing pressure on native plant communities, and reducing disturbance caused by hog wallowing that provided favorable conditions for the establishment of invasive plants. In addition, we note removal of meso-predators, such as raccoons and opossums, for its potential to increase reproductive success of birds, small mammals, reptiles, and amphibians. Deer, hogs, raccoons, and opossums can also be vectors of wildlife disease, so reducing their populations may reduce disease transmission to other species.

None of the EAs or CatExs reviewed identified any significant adverse cumulative impacts to non-hunted migratory and resident wildlife from any of the proposed hunting or fishing programs or significant adverse impacts from past, present, or foreseeable future hunts or fishing programs if we allowed impacts from these individual hunts or fishing programs to accumulate.

4. Cumulative Impacts to Threatened and Endangered Species

We examined refuge-specific EAs and CatExs for the 30 refuge units opening or expanding hunting and/or fishing programs to evaluate the impacts of the proposed hunting or fishing activities on federally listed T&E species. The Service also conducted intra-Service consultations on the proposed hunting and/or fishing activities, as required under Section 7 of the Endangered Species Act. We also assessed associated Section 7 reviews as part of this report.

The most common impact to T&E species that may have been present on the refuges during the hunting seasons documented in the EAs and CatExs was minor, localized, temporary disturbance of individual animals, or groups of animals caused by the mere presence of hunters (people), by hunters traveling to and from their hunting destinations, and by conducting the hunting activity. Most T&E species were not present in the open areas of the refuges during the hunting season, because they were aquatic species not found on upland or near-shore areas that were hunted, had migrated off of the refuge prior to the start of the hunting season, were hibernating or in a torpid state, or were found in habitat types other than that which was going to be hunted. Because hunting seasons typically take place during the fall and winter, T&E plant species are normally in a dormant state that was not likely to be significantly impacted by minor trampling.

The EAs and CatExs reviewed determined that disturbance impacts would not result in significant adverse cumulative impacts to T&E species from any of the proposed hunting programs or significant adverse impacts from past, present or foreseeable future hunts if we allowed impacts from these individual hunts to accumulate. All of the Section 7 consultations determined that the proposed hunting activities would have "No Effect" or were "Not Likely to Adversely Affect" T&E species or designated critical habitat.

5. Cumulative Impacts to Habitats and Plant Resources

We examined refuge-specific EAs for the 30 refuge units opening or expanding hunting programs to evaluate the impacts of the proposed hunting activities on habitats and plant resources. Trampling was most prevalent near parking lots and on footpaths leading to hunting areas. Most trampling would occur during plant-dormant periods in the fall and winter. Spring turkey seasons resulted in light trampling during the growing season. Local control of access points or limiting hunter numbers minimized these impacts. We prohibit cutting of vegetation on refuges. We found these impacts to be localized and minor, and hunting and/or fishing activities did not result in any significant adverse cumulative impacts to vegetation and habitats on any of the refuges. We also considered impacts to habitats and plant resources at each refuge through the CD process.

In addition to providing compatible wildlife-dependent recreational opportunities, an objective of hunting resident wildlife and some migratory bird species on NWRs and over broader areas is to maintain wildlife populations at levels consistent with the carrying capacity of habitats supporting these populations. Several EAs identified the benefits from hunting that could accrue to the habitats and vegetation as a result of controlling ungulate and invasive species populations through hunting. These benefits include improved vegetative cover, plant regeneration and abundance, particularly of highly preferred food plants (some of which may be rare or species of concern), and habitat structure. While most of these beneficial impacts would be localized, they could have cumulative impacts for ground- and shrub-understory nesting/dependent migratory birds.

Overpopulations of resident wildlife species such as white-tailed deer can result in damage to native habitats, reducing the value of these habitats to other wildlife. Nonnative invasive species such as feral hog can be especially damaging to native habitats and native wildlife. Overabundance of some migratory bird species can also adversely impact native habitats and other wildlife species. For example, overabundance of mid-continent snow geese in North America is currently resulting in substantial degradation of wetland habitats in the Arctic. Overpopulations of wildlife often lead to increased disease outbreaks and excessive die-offs resulting from starvation or malnutrition.

None of the refuge-specific EAs determined that the effects of vegetation trampling and soil compaction resulting from hunting or fishing activities on the refuges would have significant adverse cumulative impacts on habitats and plant resources from any of the proposed hunting or fishing programs, or significant adverse impacts from past, present, or foreseeable future hunting or fishing programs if we allowed impacts from these individual activities to accumulate.

6. Cumulative Impacts to Other Wildlife-Dependent Recreational Uses

We examined refuge-specific EAs for the 30 refuge units opening or expanding hunting or fishing programs to evaluate the impacts of the proposed activities on other wildlife-dependent recreational uses. Hunting activities on some refuges required a closure of areas open to hunting to other uses while we conducted the hunts, resulting in an impact to those users. Another potential impact of hunting activities is that users may choose to not visit the refuge while the hunt was taking place. This seasonal displacement of refuge users would be temporary and would not cause significant adverse cumulative impacts to other recreational users.

Most refuge hunt programs have established refuge-specific regulations to improve the quality of the hunting or fishing experience as well as provide for quality wildlife-dependent experiences for other users. We adjust refuge visitor use programs, as needed, to eliminate or minimize conflicts between users. Virtually all of the refuges open to hunting and other wildlife-dependent recreational uses use time and space zoning as an effective method to reduce conflicts between hunting and other uses. Eliminating or restricting overlap between hunt areas and popular areas for other wildlife-dependent recreation allows opportunities for other users to safely enjoy the refuge in non-hunted areas during hunting seasons. We also frequently use restrictions on the number of hunters and the time in which they could hunt to minimize conflicts between user groups. We frequently use public outreach accompanying the opening of hunting and/or fishing seasons to make other wildlife-dependent recreational users aware of the seasons and minimize conflicts.

None of the refuge-specific EAs determined that the effects of hunting or fishing on the refuges would have significant adverse cumulative impacts on other wildlife-dependent recreational uses from any of the proposed hunting or fishing programs, or significant adverse impacts from past, present, or foreseeable future hunting or fishing programs if we allowed impacts from these individual activities to accumulate.

7. Cumulative Impacts on Physical Resources (air, water, soils), Cultural Resources, Refuge Facilities, and Solitude

Potential impacts to air and water quality and soils from the public's use of refuges for recreation include vehicle emissions, dust, runoff from roads and trails, and increased erosion if use is heavy enough to compact soils. Increased visitation to refuges could decrease opportunities for solitude. The refuge-specific EAs and CatExs analyzed impacts of the proposed actions on air and water quality, soils, cultural resources, and solitude and determined that these impacts were negligible. Refuge actions taken to minimize impacts on the refuge environment include developing regulations which establish designated areas for use and access, controlling use levels, and monitoring of uses and law enforcement. Hunting is generally a dispersed activity that has minimal impact on the environment and causes no significant indirect, direct, or cumulative impacts on air, soil, water, habitats, plants, or other resources.

We identified additional automobile traffic and motorboat usage by hunters as sources of impact to air quality through emissions. We generally confined hunter vehicles to regularly traveled roads and waterways. Hunters make up a small portion of refuge visitors, and we expect increases in either source of emissions to be minor.

We identified minor soil erosion and potential minimal increase in water turbidity, as a local issue in situations where we allowed hunters to travel on dirt roadways during sustained periods of wet weather and thereby cause rutting in the road surface. Dirt roads are common in many rural areas, including refuges. Any adverse impacts would be localized and would not likely cause any significant adverse cumulative impacts. We would manage these situations on a case-by-case situation by simply closing the road until conditions improved.

We also identified minor temporary soil disturbance from increased foot traffic on trails that hunters use. Any adverse impacts would be localized and would not cause any significant adverse cumulative impacts. These situations would generally self-correct during the next growing season.

We also identified some potential additional water turbidity stemming from the use of motorboats in shallow areas for waterfowl hunting. Any adverse impacts would be localized and would not cause significant adverse cumulative impacts. Hunters self-manage these situations by paddling their boats when they encounter shallow water.

Per Title 50 §32.2(k) "You may possess only approved nontoxic shot while in the field, which we identify in 50 CFR 20.21(j), while on Waterfowl Production Areas, or on certain other areas of the National Wildlife Refuge System as delineated on maps, leaflets and/or signs, available at each refuge headquarters or posted at each refuge, or as stated in refuge-specific regulations. Where we allow turkey and deer hunting, you may use slugs and shot containing lead to hunt these species unless prohibited by refuge-specific regulations and/or State law."

Historically, the principal cause of lead poisoning in waterfowl was the collection of high densities of lead shot in wetland sediments associated with migratory bird hunting activities (Kendall et al. 1996). In 1991, as a result of high bird mortality, the Service instituted a nationwide ban on the use of lead shot for hunting waterfowl and coots (50 CFR §32.2(k)). The Service requires any new shot types for waterfowl and coot hunting to undergo rigorous testing in a three-tier approval process that involves an ecological risk assessment and an evaluation of the candidate shot's physical and chemical characteristics, short- and long-term effects on reproduction in waterbirds, and potential toxic effects on invertebrates (50 CFR §20.134). Because of this rigorous testing, the shot toxicity issue of the past is substantially less of an ecological concern.

However, there remains a concern about the bioavailability of spent lead ammunition (bullets) on the environment. Studies have shown higher concentration of lead levels in areas in and around shooting ranges (Bannon 2009, Stansley 1995) and evidence suggests this lead is available for tissue uptake in small mammals and frogs (Stansley 1995).

Research continues on the effects of lead ammunition and the fragments it can deposit in killed game. Avian predators and scavengers can be susceptible to lead poisoning when they ingest lead fragments or pellets in the tissues of animals killed or wounded by lead ammunition. Lead poison may weaken raptors and increase mortality rate by leaving them unable to hunt or more susceptible to vehicles or power line accidents (Kramer and Redig 1997). In a study of bald eagles and golden eagles admitted to the Raptor Rehabilitation Program, College of Veterinary Medicine at Washington State University from 1991 to 2008 it was found that 48% of bald eagles and 62% of golden eagles tested had blood lead levels considered toxic by current standards. Of the bald and golden eagles with toxic lead levels, 91% (bald) and 58% (golden) respectively, were admitted to the rehabilitation facility after the end of the general deer and elk hunting seasons in December (Stauber 2010).

Another concern considered is the use of lead sinkers and jigs for fishing. 'Sinkers' are weights of various sizes and shapes used to sink a fishing line below the surface of the water; 'jigs' are weighted hooks, often brightly painted or otherwise decorated, used as lures in angling. Because sinkers and jigs are generally much larger than shot pellets, a single lead sinker may induce acute lead poisoning. In North America, lead poisoning from sinker ingestion has been documented in common loons; trumpeter, tundra, and mute swans; and sandhill cranes (USEPA, 1994). Many other species of waterbird have feeding habits similar to those in which sinker ingestion has been documented (e.g. diving ducks, grebes, herons, osprey, bald eagles). These species could also be at risk for lead poisoning from sinker ingestion (Scheuhammer 1996).

Lead poisoning is the most common cause of death for the endangered California condor (Rideout 2012). Roughly 20% of the condors tested each year in California are treated for lead poisoning (Finkelstein et al. 2012). In response to wildlife health concerns, the California Fish and Game Commission on July 1, 2008 modified the methods of take to prohibit the use of projectiles containing lead when hunting big game and nongame species in an area designated as the California condor range. In October 2013, Assembly Bill 711 was signed into law requiring the use of non-lead ammunition when taking any wildlife with a firearm in California. This law requires the Commission to adopt by July 1, 2015, regulations that phase-in the statute's requirements, but it must be fully implemented by July 1, 2019. Currently the State is in its second phase of a three part process (CDFW 2017).

Though a concern remains on the possible effects spent lead may have on endangered and threatened species, each of the hunting and fishing openers proposed in this package have carefully evaluated possible effects to endangered and threatened species as part of the NEPA process. In addition, each refuge complied with section 7 of the Endangered Species Act, which requires Federal agencies to ensure that the actions they carry out, fund, or authorize do not jeopardize the continued existence of endangered or threatened species (''listed species'') (50 CFR §402). For each refuge, the Service determined that the proposed action was not likely to affect any listed species.

Additionally, recent studies have found that wildlife hunted with lead ammunition can increase risks to human health due to the ingestion of lead (Hunt et. al 2009). While no lead poisoning of humans has been documented from ingestion of wild game, some experts, including the Center for Disease Control have recommended the use of non-toxic bullets when hunting to avoid lead exposure and that pregnant women and children under 6 should not consume wild-game shot with lead ammunition. (Streater 2009). This recommendation comes after a study done in North Dakota found that those who ate wild game had significantly higher levels of lead in their blood than those who did not (Iqbal et. al 2009).

In 2016 the firearms and ammunition industry was responsible for as much as $51.3 billion in total economic activity in the country. (NSSF 2017). There is concern that alternatives to traditional ammunition are not practical due to high cost and low availability. This study states that limiting the choice of ammunition to non-toxic ammunition could increase costs, on average, up to 190 percent more than the equivalent traditional ammunition. These publications claim higher costs will decrease demand for hunting and recreational shooting activities and result in

lost tax and licensing revenues and decrease the ability for citizens to participate in recreational activities (NSSF 2011).

Non-toxic ammunition is becoming more available as the demand for this ammunition increases (Kelly et al. 2011). Copper ammunition is a good alternative since it is less toxic and frangible than lead ammunition (Hunt et al. 2006).

Although there is not a Service-wide ban on lead ammunition or lead fishing tackle, certain refuges have made refuge-specific regulations prohibiting these uses. The Service encourages refuge-State partnerships to reach decisions on usage, and will continue to encourage hunters and fishers to voluntarily use non-toxic ammunition and tackle for all harvest activities. The intent is to reduce the potential of lead poisoning to migratory birds and birds of prey, as well as lower the risk of lead exposure for humans ingesting wild game hunted on refuges.

Several documents identified the benefits from hunting that could accrue to the physical environment as a result of controlling ungulate and invasive species populations through hunting. These benefits include reducing soil erosion from heavily used game trails, improved vegetative cover, and reduced number of wallows caused by feral hogs. Beneficial impacts would also be localized and not likely to be significant at larger geographic scales.

Hunting activities on most refuges required minimal, if any, "facilities" beyond basic infrastructure such as roads, trails, and parking lots. This infrastructure would receive slightly more "wear and tear," but generally not to a significant extent. We created some seasonal, temporary parking lots, but any impacts would be local, and we anticipate no cumulative impacts. Some refuges do construct duck blinds and check stations, but these structures tend to be "minimal" in their construction and would not result in any significant cumulative impacts. We generally prohibit hunters from constructing permanent blinds or stands, prohibiting use of nails, spikes, or screws. Hunters must remove most temporary blinds/stands the end of each hunting day. Hunting activities did not result in significant adverse cumulative impacts to refuge facilities on any of the refuges.

Hunters, as well as other refuge users, generally seek out solitude. Impact to solitude could arise from the sound of gunfire, but this impact is generally minimal, localized, and temporary. We expected no significant adverse cumulative impacts to solitude.

None of the EAs or CatExs reviewed identified any significant adverse cumulative impacts to physical resources, cultural resources, facilities, and solitude from any of the proposed hunting or fishing programs, or significant adverse impacts from past, present, or foreseeable future hunting or fishing programs if we allowed impacts from these individual activities to accumulate.

8. Cumulative Socioeconomic Impacts

Hunting seasons often attract people from outside of the immediate refuge area. This results in positive economic activity. The magnitude of this activity is highly variable. Most refuges anticipated overall positive impacts on local economies. However, none of the refuge hunting programs reviewed anticipated any significant boost in the local economy as a result of their

hunting program. We also projected some decrease in economic activity in situations where other refuge users chose not to use the refuge for other recreation during hunting season. We expect these impacts to be minimal. Hunting activities did not result in any significant adverse (or positive) cumulative impacts to local or regional economies.

Refuges reported that they worked closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources. We expected no significant adverse cumulative impacts to occur due to the hunting activities.

Cold Springs NWR in Oregon is proposing to expand elk hunting in support of the Oregon Department of Fish and Wildlife's (ODFW) elk management plan for Wildlife Management Unit (WMU) 44. Currently, there is an elk herd of approximately 385 animals located on the refuge that are causing depredation on nearby lands, at an estimated cost of $700,000 in losses. The large numbers of elk using the refuge have also caused impacts to habitat and food resources used by waterfowl and other migratory birds. Refuge staff has noted elk damage to plants in moist-soil units (e.g. smartweed) that are important waterfowl foods during migration. Staff has also noted a well-demarcated browse line in riparian vegetation, which provides cover, nesting, and foraging areas for both migratory and resident landbirds. The proposed hunt would reduce the elk population in WMU 44 to minimal levels, likely within 5-10 years. This will result in positive impacts to the agricultural segment of the local economy by reducing agricultural losses.

We occasionally cited wildlife damage to nearby lands from overabundant geese populations. These impacts are local, and we anticipate no significant cumulative impacts.

Some refuges noted potential impacts to public safety as a result of hunting activities. Analyses of these impacts cited low probability of hunting accidents. We determined controlling hunter numbers, restricting equipment (such as the use of modern high-powered rifles), establishing safety zones, area closures, hunting zones, and posting boundaries to be effective measures to minimize any safety concerns. Many areas have concerns regarding deer-auto collisions when the deer populations are higher than recommended. Reducing the deer population on a refuge may help alleviate these issues on a local level. Hunting activities did not result in any significant adverse cumulative impacts to public safety on any of the refuges.

We found providing affordable public hunting and/or fishing opportunities on refuges to have local and regional benefits. In some regions, hunting and fishing are important aspects of rural-based culture. We determined perpetuating hunting and fishing traditions to be important for cultural and recreational values, as well as having long-term conservation benefits. It is unknown if these benefits will cumulatively accrue beyond the region.

9. Cumulative Climate Change Impacts

Climate change is a change in climate, attributed directly or indirectly to human activity that alters the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods (UNFCCC 1992). These changes are expected to impact a variety of natural processes and resources. Using available and emerging science the Service continues to assess predictions of these complex effects. The effect of climate change and its

influence on hunting and fishing include those national and regional impacts on migratory bird populations, fish and wildlife species pursued by anglers and hunters.

Climate Change effects on Migratory Birds

A serious concern is the impact global climate change will have on the remaining valuable migratory bird habitat. The rate of global climate change is accelerating, and many areas are predicted to experience extensive warming, changing precipitation patterns, shifts in vegetation, rising sea levels, increased frequency and intensity of severe weather events (e.g., fire, flood, drought), increased numbers of pests, pathogens, and invasive species, changes in the timing and length of the seasons, and declining snowpacks (MacCracken et al. 2000; Inkley et al. 2004; IPCC 2007). Climate model predictions, generally given for the year 2100, express that these effects are likely to have a significant impact on migratory bird species, either directly or indirectly in the next 100 years. The specific effects will depend greatly upon local conditions and the ability of different species to respond to various components of the changing environment.

Predictions forecast climate and habitat changes for nearly every region important to migratory birds in North America. Recent studies suggest that factors such as timing of migration, range distribution, and productivity may all be affected by the changing climate (Crick 2004). For example, the Western Boreal Forest region of Alaska and northwestern Canada support a significant portion of the Nation's breeding waterfowl. This region is projected to be among the habitats most affected by global warming. Consequences of these temperature increases include melting permafrost, rising sea levels, extended ice-free seasons on lakes and rivers, early runoff, and shifts in vegetation (Inkley et al. 2004). The extent to which migratory birds will be able to adapt to these changes is not presently known and complete adaptation by all species is viewed as highly unlikely (Crick 2004).

Millions of birds migrate to and from the Arctic each year, but rapid climate change in the High North could strongly affect where species are able to breed, disrupting migratory connections globally. Scientists have modelled the climatically suitable breeding conditions of 24 Arctic specialist shorebirds and projected them to 2070. This study showed that climatically suitable breeding conditions could shift, contract and decline over the next 70 years, with 66–83% of species losing the majority of currently suitable area. Suitable climatic conditions are predicted to decline acutely in the most species rich region, Beringia (western Alaska and eastern Russia), and become concentrated in the Eurasian and Canadian Arctic islands. These predicted spatial shifts of breeding grounds could affect the species composition of the world's major flyways (Wauchope 2017).

Climate change may have an effect on rising sea levels in the future. Regions with coastal habitats that are critical to breeding and migrating bird species include the Pacific Northwest region, the Central California Coast, the Gulf Coastal Prairie, and the Mid-Atlantic Coast. Sea levels in these regions are expected to rise an average of 0.48 meters by the year 2100 (projected range 0.03-0.95 m) (U.S. Global Change Research Program 2000), and will have varying impacts on different coastal habitats. Of concern are the serious negative effects increased seawater levels and saltwater intrusion could have on tidal wetlands and marshes. A majority of these prime waterfowl habitats may be permanently lost, since extensive land development

prohibits their reestablishment (U.S. Climate Change Science Program 2009). Of the eighteen refuges proposing to open or expand migratory bird hunting, six refuges (Blackwater NWR in Maryland, Cherry Valley NWR in Pennsylvania, Edwin B. Forsythe NWR in New Jersey, Moosehorn NWR in Maine, Umbagog NWR in Maine and New Hampshire, and Wallkill NWR in New Jersey and New York) are a part of the Atlantic Flyway. On the Atlantic coast, up to 45% of wetland habitat important to waterfowl is projected to be destroyed by rising sea levels by the year 2100 (Yaich and Wentz 2007). A similar scenario is expected on the Pacific coast, which could affect the hunting opportunities at San Pablo Bay NWR in California and Upper Klamath NWR in Oregon in the future, as they lie within the Pacific Flyway. Regions of the Gulf Coast are projected to be so inundated by seawater that they may only support 1% of current populations by the year 2100 (Yaich and Wentz 2007). Refuges such as Patoka River NWR in Indiana, Cypress Creek NWR in Illinois, Felsenthal NWR in Arkansas, Glacial Ridge NWR in Minnesota, Great River NWR in Illinois and Missouri, Hackmatack NWR in Illinois and Wisconsin, Ottawa NWR in Ohio, Shiawassee NWR in Michigan, and Trempealeau NWR in Wisconsin lie in the Mississippi Flyway and these bird species may be affected by future rising sea levels on the Gulf Coast.

Other regions important to breeding, staging and wintering migratory birds, such as the Mississippi Alluvial Valley, Great Basin, southern Great Plains, and the Great Lakes region, are likely to encounter a different range of impacts. The changes in precipitation, higher temperatures, and increased evaporation predicted for these regions are likely to lead to lower water levels in streams, lakes, and in underground aquifers (Milly et al. 2005). Competition among domestic, industrial, and agricultural uses of water could increase, leaving even less water for wildlife related needs. It is estimated that lowering water levels in the Upper Great Lakes area could result in a 39% decrease in regional duck populations by the year 2100 (Yaich and Wentz 2007), which would affect the species at Patoka River NWR, Cypress Creek NWR, Felsenthal NWR, Glacial Ridge NWR, Great River NWR, Hackmatack NWR, Ottawa NWR, Shiawassee NWR, and Trempealeau NWR.

Lastly, the Prairie Pothole Region (PPR) of the north central U.S. is an area of particular importance to waterfowl productivity in North America. A significant percentage of North America's ducks nest and are produced in the PPR. In fact, the PPR provides approximately 50% of the breeding habitat for North American ducks (Linduska 1964). Many waterfowl require 2.5 to 3.5 months of wetland habitat in order to raise their young to fledglings and for adult birds to complete their molt (Baldassarre and Bolen 1994). Climate models predict that increasing temperatures and shifting climate patterns associated with global warming may lead to reductions in water volume and longevity in wetland habitat, as well as changes in wetland vegetation. These changes likely would severely reduce the time available for waterfowl to use wetlands during the breeding season (Glick 2005; Johnson et al. 2010). In the PPR specifically, models indicate that a 4°C increase in temperature is likely to substantially decrease breeding waterfowl abundance in the PPR. This decrease could result as habitat in both the eastern and western prairie potholes becomes too dry to support historical levels of waterfowl (Johnson et al. 2010). The Service offers many hunting opportunities in the PPR, both on Wetland Management Districts and on refuges, which could be impacted by these changes. However, debate continues as to whether such a scenario will occur (Loesch et al. 2012).

Currently, these effects of climate change on migratory bird populations are based on model predictions. There is no definitive information on how exactly these changes in climate will impact species populations. The Service bases migratory bird hunting decisions (e.g., bag limits, season length, framework dates) for hunting seasons on the United States' Adaptive Harvest Management (AHM) program. The AHM approach provides a framework for making objective decisions in the face of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts (USFWS 2016). Though the program was not created with the intent to respond to climate change, this adaptive approach to harvest management will contribute to the Service's ability to respond to future climate change impacts for migratory bird hunting season parameters. Changes in populations will be detected annually, and appropriate hunting season adjustments will be made yearly based on the anticipated changes in migratory bird populations. If the Service detects early negative population trends, individual refuges may choose to restrict harvest opportunities (e.g., closing certain areas) for the species at issue.

In the refuge-specific hunt plans, each refuge analyzed the harvest data for the hunted migratory bird populations to ensure that the numbers were still healthy and that current and proposed harvest management changes would not result in any adverse impacts to migratory bird populations. Because harvest data analysis will continue to be done on an annual basis, waterfowl hunting on refuges should not contribute to the adverse cumulative impacts of climate change on migratory birds in the United States. Refuge managers will continue to make adjustments as needed to mitigate for impacts to migratory bird populations from climate change.

Climate Change effects on Resident Game and Fish

A serious concern, but not so easily analyzed at a population level, is the impact climate change will have on resident fish, wildlife and their habitat. Refuge ecosystems will respond to climate change in different ways and to varying extents, due in part to the heterogeneous impacts of climate change factors themselves and in part to other factors, such as the amount of stress an ecosystem may already be under and the adaptability of the species within it (Griffith et al. 2009). The ability of a species to adapt will depend on multiple factors such as species mobility, motility, degree of specialty, the extent to which life cycles are timed with natural events, and other characteristics. The rate of adaptation may or may not be enough to keep pace with the current and future rates of climate change (Parmesan 2006).

Multiple refuges acknowledged the need to address the impacts of climate change on refuge resources. Ecological stressors are expected to affect a variety of natural processes and associated resources into the future. The most substantial concern at Edwin B. Forsythe NWR in New Jersey is sea level rise and the impact on marsh elevation. This is already causing marsh migration, marsh inundation, and increased mortality in forests adjacent to saltmarshes. These habitat changes may dramatically reduce the amount and quality of both forest for resident wildlife and saltmarsh for migratory birds that are hunted. As a result, wildlife would be forced into reduced amounts of available habitat. Concentrating birds into smaller areas also has the potential to more readily allow disease to spread within overwintering waterfowl populations resulting in increased bird mortality. The refuge plans to use an adaptive management approach for its hunt program. They plan on reviewing and revising the hunt program annually (if necessary), which can be adjusted to ensure that it does not contribute further to the cumulative impacts of climate change on resident wildlife and migratory birds.

The complexity of ecological systems means that there is a tremendous amount of uncertainty about the impact climate change will actually have. In particular, the localized effects of climate change are still a matter of much debate. That said, at Umbagog NWR in Maine and New Hampshire, species associated with boreal habitats to the north are likely to suffer consequences and their range may retract north associated with a warming climate, whereas species associated with temperate habitats to the south are likely to benefit from a warming climate and expand their ranges north.

Inland freshwater fisheries are also predicted to feel the effects of climate change in the future. A long-term (1973–2010) study of field patterns for Lake Erie yellow perch, *Perca flavescens*, showed that failed annual recruitment events (when a juvenile fish does not survive to be added to a population, by birth or immigration) followed short, warm winters. Subsequent laboratory experimentation and field investigations revealed this was caused by reduced reproductive success. Following short winters, females spawn at warmer temperatures and produce smaller eggs that both hatch at lower rates and produce smaller larvae than females exposed to long winters. This research suggested that continued climate warming can lead to unanticipated, negative effects on temperate fish populations (Farmer 2015). Similarly, coldwater fish in the western United States could experience stress from the impacts of a changing climate. Drought, fires, and hot summer temperatures are putting stress on these fish, such as cutthroat trout, at an increasing risk (NPS 1995). In Yellowstone National Park, several tributaries critical for spawning native trout are now running dry in late summer, interrupting migration and making trout more vulnerable to predation. By the end of this century, native cutthroat trout across the western United States are expected to lose an additional 58% of their current habitat (Wenger et al. 2011). With cold water fish species around the country experiencing similar declines, the number of days anglers participate in cold-water fishing is projected to decline by more than 1 million days by 2030 and by more than 6 million days by the end of the century (Jones et al. 2013).

Also, climate warming is influencing the cycle of snowmelt and already leading to major changes in arctic ecosystems, including redistributions of vegetation (Pearson et al. 2013) and changes in certain species' breeding habits (Grabowski et al. 2013). These changes can be seen as examples of impacts that may affect resident species of fish and wildlife in other parts of North America. For example, mammal species, such as beaver, American mink, muskrat, northern river otter, and arctic fox are projected to experience habitat losses of 5–33 percent over the century because of expected declines in rare habitat types (specific coastal habitats in the case of arctic fox) or declines in habitats associated with freshwater (wet meadows, lowland lakes, and riverine shrub habitat) (Marcot et. al 2015).

Several refuges are proposing to expand wild turkey hunting opportunities. The wild turkey is expected to lose 87% of its current winter range by 2080 (Audubon 2014). Stress caused by drought can affect turkey mating rate, thus hurting the overall population (Israel 2013) and with drought rates expected to increase as the climate warms, turkey populations may be impacted.

Felsenthal NWR in Arkansas, in addition to expanding its existing migratory game bird and upland game hunting opportunities, is proposing to expand feral hog hunting. Wild pigs were

first brought to the southern United States in the 1500s as a source of food for early explorers and settlers and in the 1900s, the Eurasian or Russian wild boar was introduced for sport hunting. Today's invasive wild pigs, *Sus scrofa*, are the descendants of introduced wild boar, escaped domestic pigs, and hybrids of the two. Invasive wild pigs cause substantial damage to property, agriculture and native ecosystems (Bates 2017). A recent study found the average rate of northward expansion increased from 6.5 to 12.6 km per year, suggesting most counties in the continental USA could be inhabited within the next 3–5 decades (Snow et al. 2017). The spread of invasive pigs was primarily associated with expansion into areas with similar environmental characteristics as their previous range, with the exception of spreading into colder regions. Climate change may assist this inconsistent spread into northern regions by generating milder winters with less snow. The rate of expansion places much of the United States and even southern Canada at risk of invasion by the species (Snow et al. 2017).

Global climate change may have an effect on the distribution of parasitic organisms, such as the meningeal worm, *Parel-aphostrongylosis tenuis*, a parasitic nematode commonly found in white-tailed deer in North America that causes damage to the central nervous system (Pickles et. al 2013). Parasite distribution is expected to shift with the overall habitat suitability of the parasite declining in the Great Plains and southeastern USA, but increasing in the Boreal Forest ecoregion, particularly in Alberta, Canada. These results have important implications for wildlife conservation and management due to the known pathogenicity of the "brain worms" to alternate hosts including moose, caribou and elk (Pickles et. al 2013). As stated in the Environmental Assessment for the J. Clark Salyer and Lostwood NWR moose hunts, moose mortality from brainworm infections is a potential factor in recent population declines in the eastern part of the state (Maskey 2008). Increased winter tick infestations, due to higher temperatures and shorter winters that enhance winter tick survival, is the other major threat to North American deer and moose from climate change (Inkley et al. 2015). Severe infestations can cause high moose mortality, particularly in calves (Samuel 2007). Heavily infected moose may starve to death because they eat less when irritated by ticks, lose body heat due to hair loss, become vulnerable to infection, and suffer extensive blood loss to ticks (Cusick 2012). Deer are also susceptible to hemorrhagic disease (HD). Infected deer can rapidly become ill, losing their appetite and natural fear of humans, and develop a fever and extensive internal bleeding, often followed by death (MDNR 2017). HD is expected to thrive with climate change bringing warmer summers, longer droughts, and more intense rain events—the perfect environment for the midges that transmit HD (Diefenbach 2015). However, this information is predictive and there is no definitive information on how exactly these changes in climate will impact resident species populations in North America or on a specific refuge.

Each refuge analyzed the health of its resident fish and wildlife species to ensure that the populations are healthy and that current harvest management on the refuge, as well as any proposed changes to harvest management, would not result in any adverse impacts to resident fish or wildlife populations. Additionally, none of the proposed revisions to refuge-specific hunting and fishing regulations would result in a harvest strategy that is not sustainable. The Service will continue to base the annual level of harvest on the observed population size and habitat conditions. As discussed above, if results of monitoring programs indicate that resident fish and wildlife populations are unable to withstand the current harvest management strategies on a refuge, the regulations will be made more restrictive or seasons will be closed until the

population can withstand the harvest pressure. Because monitoring will continue to be done on an annual basis, harvest management of resident game and fish on the National Wildlife Refuge System should not add to the adverse cumulative impacts of climate change on resident fish, wildlife and their habitats, but rather be adjusted as needed to mitigate impacts on these species from climate change.

IV. DISCUSSION AND CONCLUSIONS

1. Migratory Birds – Hunted Species

The Service's proposed actions included expanding migratory bird hunting programs on 18 NWRs.

Known, estimated or projected harvests of migratory birds resulting from the proposed hunting activities on the 18 refuges constituted a small percentage (all were less than 1% and many were less than a tenth of a percent) of the statewide and flyway-wide harvests of ducks, geese, doves, woodcock, and other migratory birds; and harvests on these refuges are well within sustainable harvest levels for these species' populations. While we determined impacts of the proposed hunting activities on several of the refuges to directly and indirectly affect migratory birds and other wildlife through disturbance and altering of habitat, we considered these impacts to be minor, localized, and temporary and were routinely minimized or offset through a variety of refuge management activities conducted at each refuge.

We did not determine or expect any of the known, estimated, or projected harvests of migratory birds resulting from the proposed hunting activities on the refuges to have significant adverse direct, indirect, or cumulative impacts to any migratory bird population at local, statewide, flyway-wide, and national scales. Based upon our review of the refuge-specific EAs and CatExs, and for the following reasons, we conclude that the cumulative impacts of the additional migratory bird harvests on the aforementioned refuges, and combined harvests on all NWRs open to migratory bird hunting, will not negatively impact the short- or long-term viability of continental and Flyway migratory bird populations, Refuge System-wide migratory bird populations, and/or local migratory bird populations on refuges open to hunting. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to migratory bird populations at relevant geographic scales when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we anticipate that hunting on any one or combination of refuges will have negligible effect on migratory bird populations on any or all refuges open to hunting.

- We annually develop federal regulatory frameworks governing harvest of migratory birds in the United States. We promulgate these regulations using extensive collection and analyses of migratory bird population, habitat, and harvest data. We adjust these annual regulations as needed to ensure sustainable harvests.
- The Service manages hunting of migratory birds on NWRs under the federal framework regulations established for each Flyway (specifically, under regulations adopted by states within the flyways under the federal frameworks), and through refuge-specific regulations that often are more restrictive than the state-adopted regulations. We adjust

refuge-specific regulations annually, or as needed, to protect refuge resources including migratory birds.

- Harvests of migratory birds on these 18 refuges, individually and collectively, constitute a very minor percentage of the statewide, flyway-wide and national harvests, and are well within sustainable harvest levels for these species' populations.
- Before opening a refuge to hunting, we must determine whether the activity will be compatible with (will not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. The CDs must consider the impacts of hunting on biological resources. We determined hunting to be compatible on the 18 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. Compatibility determinations for hunting programs must be completed at least every 10 years even if programs do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.
- We annually conduct refuge management activities on NWRs that minimize or offset the disturbance and habitat impacts of hunting on migratory birds and other wildlife. These include establishment of non-hunted sanctuary areas, habitat management and restoration activities that increase the value of refuge wetland and upland habitats for migratory birds and other wildlife, enforcement of refuge-specific hunting regulations, and public education.

2. Resident Wildlife – Hunted Species

The Service's proposed actions included opening, expanding, or continuing hunting or fishing programs for resident wildlife on 23 NWRs. Resident wildlife species proposed for hunting on these refuges included fox (gray and red), coyote, raccoon, squirrel (red, fox, and gray), deer (white-tailed, mule, and sika), moose, bear, feral hog, rabbit (cottontail), jackrabbit (black-tailed and white-tailed), snowshoe hare, elk, opossum, beaver, ring-necked pheasant, grouse (ruffed and sharp-tailed), wild turkey (Eastern and Rio Grande), quail (bobwhite and Gambel's), partridge, woodchuck, crow, skunk, porcupine, weasel, coyote, bobcat, nutria, and badger. Resident wildlife proposed for fishing included surfperch (barred and silver), bat ray, cabezon, California halibut, jacksmelt, leopard shark, bass (striped, largemouth, and smallmouth), shiner perch, northern pike, bluegill, green sunfish, common carp, and whitesucker, among other legal fish species to be harvested in the states of Illinois, Missouri, Indiana, California, New Jersey, New York, and Oregon. The refuge-specific EAs evaluated impacts of refuge harvests of resident wildlife species populations at the appropriate geographic scale for resident species, i.e. at statewide or state-designated management units within a state.

On all of the 30 refuges, known, estimated, or projected refuge harvests were a very minor component of overall statewide or zone-wide harvests. While we determined impacts of the proposed hunting activities on several of the refuges to directly and indirectly affect resident and migratory wildlife through disturbance and altering of habitat, we considered these impacts minor, localized and temporary, and routinely minimized or offset them through a variety of refuge management activities conducted at each refuge.

We expect none of the known, estimated, or projected resident wildlife harvests resulting from these hunting and/or fishing activities on any of the 30 refuges to have significant and adverse direct, indirect or cumulative impacts to resident wildlife species populations at relevant geographic scales (management units and/or statewide). Based on our evaluation of the refuge-specific EAs and for the following reasons, we conclude that hunting and/or fishing of resident wildlife on the 30 refuges collectively will not result in significant and adverse cumulative impacts to resident wildlife populations at local, zonal (Game Management Unit, Management Zone, etc.) and statewide scales. We also conclude that hunting and/or fishing on these refuges will not result in significant adverse cumulative impacts to resident wildlife populations at relevant geographic scales when added to impacts from past hunting or fishing and hunting or fishing that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting and/or fishing of resident wildlife on any one or combination of the refuges will have a negligible effect on resident wildlife populations at any or all other refuges open to hunting or fishing.

- The states regulate hunting and fishing of resident wildlife populations through an annual regulation setting process. We adjust these annual regulations as needed to ensure sustainable harvests.
- The Service manages hunting and fishing of resident wildlife on NWRs under state regulations, and through refuge-specific regulations that often are more restrictive than the state regulations. Harvests of resident wildlife species on these refuges, individually and collectively within a state, constitute a very minor percentage of the zonal and/or statewide harvests and are well within sustainable harvest levels for these species' populations.
- Before opening a refuge to hunting or fishing, we must determine that the activity is compatible with (does not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. The CDs must consider the impacts of hunting on biological resources. We determined hunting and fishing to be compatible on the 30 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. Compatibility determinations for hunting programs must be completed at least every 10 years, even if programs do not change, and compatibility can be reevaluated at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.
- None of the refuge-specific EAs determined that disturbance and/or altering of habitats caused by hunting of resident wildlife and/or migratory birds on the 30 refuges would have significant adverse cumulative impacts on hunted or fished resident wildlife populations. We annually conduct refuge management activities on NWRs that minimize or offset the disturbance and habitat impacts of hunting and/or fishing on resident and migratory wildlife. These include establishment of non-hunted sanctuary areas, habitat management and restoration activities that increase the value of refuge wetland and upland habitats for resident wildlife and migratory birds, enforcement of refuge-specific hunting regulations, and public education.

3. Non-hunted Resident and Migratory Wildlife Species

Several of the refuge-specific EAs identified both direct and indirect impacts of migratory bird hunting, resident wildlife hunting, and/or fishing to non-hunted wildlife. Direct impacts included disturbance, and indirect impacts included alteration of habitats such as vegetation trampling. We considered impacts from disturbance and alteration of habitat to be minor, localized and temporary, and we routinely minimized or offset them through a variety of refuge management activities conducted at each refuge. Illegal take is a potential impact associated with refuge hunting activities. We expect incidences of illegal take of protected species to be rare and isolated and minimized through enforcement of federal, state, and refuge-specific regulations and public education.

None of the EAs reviewed identified any significant adverse cumulative impacts to non-hunted migratory and resident wildlife from any of the proposed hunting or fishing programs or significant adverse impacts from past, present, or foreseeable future programs if we allowed impacts from these individual activities to accumulate. Based upon our review of the refuge-specific EAs and for the following reasons, we conclude that cumulative impacts of hunting or fishing on the aforementioned refuges, including impacts which might accumulate over time, will not negatively impact non-hunted migratory wildlife populations or discrete populations of resident wildlife on these refuges.

None of the refuge-specific EAs determined that the effects of disturbance, altering of habitats, and/or potential illegal take of protected species associated with hunting on the refuges would have significant adverse cumulative impacts on non-hunted wildlife populations. Based on our evaluation of the refuge-specific EAs and for the following reasons, we conclude that hunting and/or fishing of resident wildlife and/or migratory birds on the 30 refuges collectively will not result in significant adverse cumulative impacts to non-hunted wildlife populations on the refuges and at larger geographic scales. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to non-hunted wildlife populations when added to impacts from past hunting on refuges and hunting that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting on any one or combination of the refuges will have negligible effect on non-hunted wildlife populations on any or all refuges open to hunting.

- We would manage refuge hunting programs proposed for opening and/or expansion with provisions in place to prevent significant adverse impacts to non-hunted migratory and resident wildlife.
- We annually conduct refuge management activities on NWRs which minimize or offset the disturbance and habitat impacts of hunting on resident and migratory wildlife. These include establishment of non-hunted sanctuary areas, habitat management and restoration activities that increase the value of refuge wetland and upland habitats for resident wildlife and migratory birds, enforcement of refuge-specific hunting regulations, and public education. We minimize illegal take of protected species through enforcement of Federal, State, and refuge-specific regulations and public education.
- Before opening a refuge to hunting or fishing, we must determine that the activity is compatible with (does not materially interfere with or detract from) accomplishing refuge

purposes or the Refuge System mission. The CDs must consider the impacts of hunting on biological resources. We determined hunting and/or fishing to be compatible on the 30 refuges.

- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. We must complete CDs for hunting programs at least every 10 years, even if they do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.

4. Threatened and Endangered Species

Several of the refuge-specific EAs identified both direct and indirect impacts of hunting on Threatened and Endangered (T&E) species when those species were present on the refuges during the hunting seasons. Direct impacts included disturbance, and indirect impacts included alteration of habitats such as vegetation trampling. We considered impacts from disturbance and alteration of habitats to be minor, localized, and temporary (short term); and we minimized or offset them through a variety of refuge management activities conducted at each refuge.

Refuge managers must consider impacts of allowing hunting on a refuge on T&E species and/or designated critical habitat(s) prior to opening the refuge for those activities. The refuge manager conducts an intra-Service consultation under Section 7 of the Endangered Species Act for any T&E species and/or critical habitat that we may impact. We also consider impacts from hunting to T&E species at each refuge through the CD process. For the vast majority of T&E species considered on these refuges, hunting programs did not have any impacts because the T&E species were not present on the refuge during the hunting seasons or because we prohibited hunting in areas that supported the T&E species.

None of the EAs reviewed determined that disturbance impacts would result in significant adverse cumulative impacts to T&E species. Most of the Section 7 consultations determined that the proposed hunting activities would have "No Effect" or were "Not Likely to Adversely Affect" T&E species or designated critical habitat. Based on our evaluation of the refuge-specific EAs and the Section 7 Intra-Service consultations, and for the following reasons, we conclude that hunting and fishing programs on the 30 refuges collectively will not result in significant adverse cumulative impacts to T&E species on the refuges and at larger geographic scales. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to T&E species when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting on any one or combination of the refuges will have a negligible effect on any T&E species or designated critical habitat on any or all refuges open to hunting.

- The Service prohibits hunting or any other recreational activities on NWRs where such activities could jeopardize a population of T&E species or designated critical habitat.
- We annually conduct refuge management activities on NWRs that minimize or offset the disturbance and habitat impacts of hunting on T&E species. These include establishment of non-hunted sanctuary areas, habitat management, and restoration activities that

increase the value of refuge wetland and upland habitats for T&E species and other wildlife, emergency closures of hunting on refuges when T&E species subject to accidental/illegal harvest are present (as is the case with whooping cranes migrating through some refuges during the fall), enforcement of refuge-specific hunting regulations, and public education.

- Before opening a refuge to hunting or fishing, we must determine that the activity is compatible with (does not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. The CDs must consider the impacts of hunting on biological resources, including T&E species. We determined hunting and/or fishing to be compatible on the 30 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. We must complete compatibility determinations for hunting programs at least every 10 years even if they do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. We would require a new Section 7 consultation if changes occurred that resulted in a potential impact to a T&E species or designated critical habitat. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.

5. Habitats and Plant Resources

The refuge-specific EAs identified impacts to habitats and plant resources from hunting activities on refuges to include vegetation trampling, spread of invasive species, and damage to trees and other vegetation. Most impacts were associated with accessing hunt areas by motorized vehicle, boat, or by walking, and impacts tended to be most pronounced in areas receiving high visitation. We considered impacts to habitats and plant resources to be minor, localized, and temporary (short term); and we minimized or offset them through a variety of refuge management activities conducted at each refuge. Some refuge-specific EAs also identified actual and potential beneficial impacts of hunting to habitats and plant resources, particularly if hunting resulted in reducing population levels of some native and nonnative ungulate species.

None of the refuge-specific EAs determined that the effects of vegetation trampling and soil compaction resulting from hunting activities on the refuges would have significant adverse cumulative impacts on habitats and plant resources. Based upon our evaluation of the refuge-specific EAs and for the following reasons, we conclude that hunting and fishing programs on the 30 refuges collectively will not result in significant adverse cumulative impacts to habitats and plant resources on the refuges. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to habitats and plant resources when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting on any one or combination of the refuges will have negligible effect on habitats and plant resources on any or all refuges open to hunting.

- We annually conduct refuge management activities on NWRs which minimize or offset impacts of hunting to plant and habitat resources. These include establishment of non-hunted sanctuary areas, restricting access to designated travel corridors, restricting hunter

numbers, habitat management and restoration activities, enforcement of refuge-specific hunting regulations, and public education.

- Before opening a refuge to hunting or fishing, we must determine that the activity is compatible with (does not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. The CDs must consider the impacts of hunting on biological resources. We determined hunting and/or fishing to be compatible on the 30 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. We must complete compatibility determinations for hunting programs at least every 10 years even if the programs do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.

6. Other Wildlife-Dependent Recreational Uses

The National Wildlife Refuge System Administration Act, as amended, (NWRSAA, 16 U.S.C. 668dd-668ee) established that hunting, fishing, wildlife observation and photography, environmental education, and interpretation were the six priority wildlife-dependent recreational uses of the Refuge System. Further, the NWRSAA mandated that the Service give these uses enhanced consideration over other uses in planning and management, and facilitate them wherever possible on refuges where the use(s) have been determined to be compatible with the refuge establishment purpose(s) and the Refuge System mission.

Refuge-specific EAs for some refuge hunting programs identified impacts to other recreational uses including temporary seasonal closures of parts or all of refuges to other public uses while hunts were ongoing, and impacts on perceptions of some refuge users that resulted in them not visiting the refuges while the hunts were ongoing. We considered these impacts to be minor, and we could minimize or eliminate them through effective management of public use programs.

For this assessment, the Service evaluated the availability of opportunities for the other priority wildlife-dependent recreational uses on the 30 refuges on which we opened or expanded hunting and/or fishing programs. The Service provides opportunities for wildlife observation and photography, interpretation, and/or environmental education on the majority of the 10 refuges.

None of the refuge-specific EAs determined that the effects of hunting on the refuges would have significant adverse cumulative impacts on other wildlife-dependent recreational uses. Based upon our evaluation of the refuge-specific EAs, we conclude that hunting and fishing programs on the 30 refuges collectively will not result in significant adverse cumulative impacts to other wildlife-dependent recreational uses on the refuges. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to other recreational programs when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting on any one or combination of the refuges will have negligible effect on recreational programs on any or all refuges open to hunting.

- We would manage all refuge hunting programs proposed for opening and/or expansion with provisions in place to prevent significant adverse impacts to other wildlife-dependent recreational uses.
- We annually conduct refuge management activities on NWRs that minimize or offset impacts of hunting to other recreational uses, including establishing designated areas that spatially separate uses, establishing seasonal timeframes for uses, restricting levels of use to reduce potential conflicts, providing educational programs and materials for hunters, anglers, and other users, and conducting law enforcement activities.
- The Service provides opportunities for the other priority wildlife-dependent recreational uses including wildlife observation and photography, interpretation, and environmental education on the majority of the 30 refuges.
- Before opening a refuge to hunting or fishing, we must determine that the activity is compatible with (does not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. The CDs must consider the impacts of hunting on other priority recreational uses. We determined hunting and/or fishing to be compatible on the 30 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. We must complete CDs for hunting programs at least every 10 years, even if the programs do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.

7. Refuge Environment – Air, Water, Soils, Cultural Resources, Refuge Facilities, Solitude

Refuge-specific EAs for refuge hunting programs identified impacts to physical resources including air, water and soils, including motor emissions, dust, and compaction to surface soils. Impacts from public use of refuge facilities and infrastructure associated with hunting activities occurred on refuge roads, trails, boat ramps, and parking areas. Increased visitation resulting from opening new or expanding existing programs resulted in additional maintenance requirements for infrastructure and facilities. We note no impacts to cultural and historic resources. Increased visitation to refuges in some cases decreased opportunities for solitude. As we similarly manage hunting programs throughout the Refuge System and determine these uses compatible, we conclude that the cumulative impacts of these activities to physical resources, cultural resources, facilities, and solitude, including impacts which might accumulate over time, are negligible across the Refuge System.

None of the refuge-specific EAs determined that the effects of hunting on the refuges would have significant adverse cumulative impacts on refuge physical and cultural resources, refuge facilities, and solitude. Based upon our evaluation of the refuge-specific EAs and for the following reasons, we conclude that hunting programs on the 30 refuges collectively will not result in significant adverse cumulative impacts to other refuge physical and cultural resources, refuge facilities, and solitude. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to these resources when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we

anticipate that the impacts of hunting on any one or combination of the refuges will have negligible effect on these resources on any or all refuges open to hunting.

- We would manage all refuge hunting programs proposed for opening and/or expansion with provisions in place to prevent significant adverse impacts to these aspects of the refuge and human environment. We annually conduct refuge management activities on NWRs which minimize or offset impacts of hunting on physical and cultural resources, including establishing designated areas for hunting, restricting levels of use, confining access and travel to designated locations, providing educational programs and materials for hunters, anglers, and other users, and conducting law enforcement activities.
- Before opening a refuge to hunting or fishing, we must determine whether the activity will be compatible with (will not materially interfere with or detract from) accomplishing refuge purposes or the Refuge System mission. We determined hunting and/or fishing to be compatible on the 30 refuges.
- The Service's administrative processes serve as a safeguard to prevent the accumulation of adverse impacts over time. We must complete compatibility determinations for hunting programs at least every 10 years even if the programs do not change, and we can reevaluate compatibility at any time if conditions change and new factors warrant reconsideration. Substantive changes in a refuge hunting program would trigger a new refuge hunt planning process with associated NEPA compliance.

8. Socioeconomic Impacts

Refuge-specific EAs for several of the 30 refuges identified minor beneficial impacts to local economies from refuge visitors participating in refuge hunting programs. There is the potential for some refuges to experience minor adverse impacts to local economies from a temporary reduction in other refuge visitors while hunts are conducted. We would expect that the cumulative economic impact resulting from the increased visitation to these refuges would be beneficial to local and regional economies. Most refuge-specific EAs noted the beneficial effects of providing hunting for the recreational value it provides. Refuges and other public lands provide affordable hunting opportunities for the public.

9. Climate Change Impacts

The Service concludes that climate change will have negligible impacts on its hunt program, but refuges will continue to monitor hunted species populations and make adjustments to hunting regulations in response to any declining populations. As analyzed in the cumulative impacts of climate change, none of the refuges proposed revisions to refuge-specific hunting and fishing regulations would result in a harvest strategy that is not sustainable. Climate change remains a major concern for refuge species and habitats and recreational hunting and fishing opportunities enjoyed by Americans across the Refuge System. The Service will continue to monitor changes and develop methods to combat climate change and ensure viable habitat for future refuge species.

V. SUMMARY CONCLUSIONS

The headquarters of the National Wildlife Refuge System, U.S. Fish and Wildlife Service, reviewed and evaluated refuge-specific Environmental Assessments for hunting programs on the 30 refuges in order to identify the direct, indirect, and cumulative impacts of the proposed hunting activities on hunted populations of migratory birds and resident wildlife, non-hunted migratory and resident wildlife, T&E species, plant and habitat resources, other wildlife-dependent recreational uses, physical resources including air, water, and soils, cultural resources, refuge facilities, solitude, and socioeconomics.

Based upon our evaluation of the refuge-specific Environmental Assessments and Categorical Exclusions, we conclude that hunting and/or fishing programs on the 30 refuges collectively will not result in significant adverse cumulative impacts to the human environment. We also conclude that hunting on these refuges will not result in significant adverse cumulative impacts to the human environment when added to impacts from past refuge hunting and hunting that we reasonably expect will occur in the future. Finally, we anticipate that the impacts of hunting on any one or combination of these refuges will have negligible effects on the human environment on any or all refuges open to hunting.

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directs federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities' access to public information and participation in matters relating to human health or the environment.

None of the EAs or CatExs will disproportionately place any adverse environmental, economic, social or health impacts on minority and low income populations. Implementation of the proposed actions is anticipated to be beneficial for the environment over the long-term and people in the surrounding communities.

None of the hunting programs would result in a large commitment of nonrenewable resources. Implementation would require a moderate commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles for road maintenance and general maintenance of the areas to be hunted. Trails will be of little impact or temporary and increased law enforcement activities may become necessary.

Literature Cited

[Audubon] The National Audubon Society. 2014. The Climate Report. National Audubon Society Manhattan, New York. Available at http://climate.audubon.org/birds/wiltur/wild-turkey.

Baldassarre, G.A. and E.G. Bolen. 1994. Waterfowl Ecology and Management. John Wiley & Sons, Inc., NY.

Bates, Mary. 2017. Invasive Wild Pigs Leave a Swath of Destruction Across U.S. – And They Keep Spreading. PLOS Ecology Community. Available at http://blogs.plos.org/ecology/2017/02/01/invasive-wild-pigs-leave-a-swath-of-destruction-across-u-s-and-they-keep-spreading/.

Bannon, Desmond I., J.W. Drexler, GM. Fent, S.W. Casteel, P.J. Hunter, W.J. Brattin and M.A. Major. 2009. Evaluation of small arms range soils for metal contamination and lead bioavailability. Environmental Science and Technology 43(24): 9071-9076. doi. 10.1021/es901834h.

[CDFW] California Department of Fish and Wildlife. 2017. Nonlead Ammunition in California. Sacramento, California: CDFW. Available at https://www.wildlife.ca.gov/hunting/nonlead-ammunition.

Crick, H.Q.P. 2004. The impact of climate change on birds. Ibis 146:48-56.

Cusick, Daniel. 2012. Rapid Climate Changes Turn North Woods into Moose Graveyard. Scientific American. Available at https://www.scientificamerican.com/article/rapid-climate-changes-turn-north-woods-into-moose-graveyard/.

Diefenbach, D. 2015. Will Climate Change Change Deer? Penn State College of Agricultural Sciences. Available at http://ecosystems.psu.edu/research/projects/deer/news/2015/weather-and-climate.

Farmer, T.M., E.A. Marschall, K. Dabrowski and S.A. Ludsin. 2015. Short winters threaten temperate fish populations. Nature Communications 6:7724. doi: 10.1038/ncomms8724.

Finkelstein, Myra E., D.F. Doak, D. George, J. Burnett, J. Bradranct, M. Church, J. Granthem and D.R. Smith. 2012. Lead poisoning and the deceptive recovery of the critically endangered California condor. PNAS 109(28): 11449-11454. doi: 10.1073/pnas.1203141109.

Glick, P. 2005. The waterfowlers' guide to global warming, Washington, DC: National Wildlife Federation.

Good, T.P., R.S. Waples, and P. Adams, eds. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center and Southwest Fisheries Science Center. Seattle, WA, and Santa Cruz, CA. NOAA. Technical Memorandum NMFS-NWFSC-66

Grabowski, M.M., F.I. Doyle, D.G. Reid, D. Mossop, D. Talarico. 2013. Do Arctic-nesting birds respond to earlier snowmelt? A multi-species study in north Yukon, Canada. Polar Biology 36(8):1097–1105. doi:10.1007/s00300-013-1332-6.

Griffith, B., J.M. Scott, R.S. Adamcik, D.M. Ashe, B. Czech, R.L. Fischman, P. Gonzalez, J.J. Lawler, A.D. McGuire, and A. Pidgorna. 2009. Climate change adaptation options for the US National Wildlife Refuge System. Environmental Management 44: 1043-1052. doi: 10.1007/s00267-009-9323-7.

Hunt WG, Burnham W, Parish CN, Burnham KK, Mutch B, Oaks JL. 2006. Bullet fragments in deer remains: implications for lead exposure in avian scavengers. Wilderness Society Bulletin 34: 167–170. doi:10.4080/ilsa.2009.0123.

Hunt W.G., Watson R.T., Oaks J.L., Parish C.N., Burnham K.K., Tucker R.L., Belthoff, and G. Hart. 2009. Lead Bullet Fragments in Venison from Rifle-Killed Deer: Potential for Human Dietary Exposure. PLoS ONE 4(4): e5330. doi:10.1371/journal.pone.0005330.

Inkley, D.B., M.G. Anderson, A.R. Blaustein, V.R. Burkett, B. Felzer, B. Griffith, J. Price, and T.L. Root. 2004. Global climate change and wildlife in North America. Wildlife Society Technical Review 04-2. The Wildlife Society, Bethesda, Maryland, USA. 26 pp.

Inkley, D., J. Rowland, S. Lockhart, T. Losoff, J. Murphy. 2015. National Wildlife Federation. Game Changers: Climate impacts to America's hunting, fishing and wildlife heritage. Merrifield, Virginia. Available at https://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2015/~/media/PDFs/Media%20Center%20-%20Press%20Releases/2015/NWF_Game_Changers_Report.pdf.

IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

Iqbal S., W. Blumenthal, C. Kennedy, F.Y. Yip, S. Pickard, W.D. Flanders, K Loringer, K. Kruger, K.L Caldwell, M. Jean Brown. 2009. Hunting with lead: association between blood lead levels and wild game consumption. Environmental Research 109(8):952-9. doi: 10.1016/j.envres.2009.08.007.

Israel, Brian. 2013. Turkey hunting in the Lone Star State has dried up along with the state's water. Scientific American. Available at https://www.scientificamerican.com/article/drought-gobbles-up-texas-turkey-hunt.

Johnson, W.C., B. Werner, G.R. Guntenspergen, R.A. Voldseth, B. Millett, D.E. Naugle, M. Tulbure, R.W.H. Carroll, J. Tracy, and C. Olawsky. 2010. Prairie wetland complexes as landscape functional units in a changing climate. BioScience 60(2):128-140. doi:10.1525/bio.2010.60.2.7.

Jones, R., C. Travers, C. Rodgers, B. Lazar, E. English, J. Lipton, J. Vogel, K. Strzepek and J. Martinich. 2013. Climate change impacts on freshwater recreational fishing in the United States. Mitigation & Adaptation Strategies for Global Change 18(6): 731-58.

Kelly, T.R., P.H. Bloom, S.G. Torres, Y.Z. Hernandez, R.H. Poppenga, W.M. Boyce, C.K. Johnson. 2011. Impact of the California lead ammunition ban on reducing lead exposure in golden eagles and turkey vultures. PLoS ONE. 6(4): e17656. doi:10.1371/journal.pone.0017656.

Kendall, R. J., T. E. Lacher Jr., C. Bunck, B. Daniel, C. Driver, C. E. Grue, F. Leighton, W. Stansley, P. G. Watanabe, and M. Whitworth. 1996. An ecological risk assessment of lead shot exposure in non-waterfowl avian species: upland game birds and raptors. Environmental Toxicology and Chemistry 15:4–20.

Kramer, J.L., P.T. Redig. 1997. Sixteen years of lead poisoning in eagles, 1980-95: An epizootiological view. Journal of Raptor Research. 31(4): 327-332.

Linduska, J.P. 1964. Waterfowl Tomorrow. Washington, DC:U.S. Department of the Interior, Bureau of Sport fisheries and Wildlife, Fish and Wildlife Service.

Loesch, C., R. Reynolds, and L.T. Hansen. 2012. An Economic Assessment of Re-directing Conservation Efforts in Regard to Recent Predictions about the Impact of Climate Change on Waterfowl in the U.S. Prairie Pothole Region. Journal of Fish and Wildlife Management 3(1):1-22. doi: http://dx.doi.org/10.3996/032011-JFWM-020.

MacCracken, M., E. Barron, D. Easterling, B. Felzer, and T. Karl. 2000. Chapter 1: Scenarios for climate variability and change: the potential consequences of climate variability and change for the United States. U.S. Global Change Research Program, National Science Foundation, Washington, DC: USGCRP.

Maskey, J. J. 2008. Movements, resource selection, and risk analyses for parasitic disease in an expanding moose population in the northern Great Plains. Ph.D Dissertation. Grand Forks, North Dakota: University of North Dakota.

Marcot, B.G., M.T. Jorgenson, J.P. Lawler, C.M. Handel, A.R. DeGange. 2015. Projected changes in wildlife habitats in Arctic natural areas of northwest Alaska. Climate Change 130(2):145-154. doi:10.1007/s10584-015-1354-x.

[MDNR] Michigan Department of Natural Resources. 2017. Epizootic Hemorrhagic Disease (EHD) in White-Tailed Deer. State of Michigan. Available at www.michigan.gov/dnr/0,1607,7-153-10370_12150- 26647--,00.html (April 2017).

Milly, P., K. Dunne, and A. Vecchia. 2005. Global pattern of trends in streamflow and water availability in a changing climate. Nature 438(7066):347-350. doi:10.1038/nature04312.

[NPS] National Park Service. 1995. The Yellowstone Lake Crisis: Confronting a Lake Trout Invasion. Yellowstone Center for Resources National Park Service, Yellowstone National Park, Wyoming. Available at https://www.nps.gov/parkhistory/online_books/yell/trout_invasion.pdf.

[NSSF 2011] National Shooting Sports Foundation. 2011. Economic Impact of Traditional Ammunition Ban. Available: http://nssf.org/factsheets/PDF/EconomicImpactTraditionalAmmoBan.pdf (March 2017).

[NSSF 2017] National Shooting Sports Foundation. 2017. Firearms and Ammunition Industry Economic Impact Report 2017. Available: http://nssf.org/impact/EconomicImpactofIndustry2017.pdf (March 2017).

Parmesan, C. 2006 Ecological and evolutionary responses to recent climate change. Annual Review of Ecology, Evolution and Systematics 37:637-69. doi: 10.1146/annurev.ecolsys.37.091305.110100.

Pearson, R.G., S.J. Phillips, M.M. Loranty, P.S.A. Beck, T. Damoulas, S.J. Knight, S.J. Goetz. 2013. Shifts in Arctic vegetation and associated feedbacks under climate change. Nature Climate Change 3:673–677. doi:10.1038/nclimate1858.

Pickles, R.S.A., D. Thornton, R. Feldman, A. Marques, D.L. Murray. 2013. Predicting shifts in parasite distribution with climate change: a multitrophic level approach. Global Climate Change Biology 19;2645–2654, doi: 10.1111/gcb.12255.

Raftovich, R.V., S. C. Chandler, and K.K. Fleming. 2017. Migratory bird hunting activity and harvest during the 2015-16 and 2016-17 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

Rideout, B.R. et al. 2012 Patterns of mortality in free-ranging California condors (Gymnogyps californianus). Journal of Wildlife Diseases 48:95-122.

Samuel, W.M. 2007. Factors affecting epizootics of winter ticks and mortality of moose. Alces 43: 39-48.

Scheuhammer, A. M., and S. L. Norris. 1996. The ecotoxicology of lead shot and lead fishing weights. Ecotoxicology 5(5):279-95. doi: 10.1007/BF00119051.

Snow, Nathan P., M.A. Jarzyna, K.C. VerCauteren. 2017. Interpreting and predicting the spread of invasive wild pigs. Journal of Applied Ecology. doi:10.1111/1365-2664.12866.

Stansley, W. and D.E. Roscoe. 1995. The uptake and effects of lead in small mammals and frogs at a trap and skeet range. Environmental Contamination and Toxicology 30(2): 220-226. doi: 10.1007/BF00215801.

Stauber, Erik, N. Finch, P.A. Talcott and J.M. Gay. 2010. Lead poisoning of bald (Haliaeetus leucocephalus) and golden (Aquila chrysaetos) eagles in the US inland Pacific \Northwest- An

18-year retrospective study: 1991-2008. Journal of Avian Medicine and Surgery 24:279-287. doi: http://dx.doi.org/10.1647/2009-006.1.

Streater, Scott. 2009. Wild meat raises lead exposure. Environmental Health News. Available: https://www.scientificamerican.com/article/wild-game-deer-venison-condors-meat-lead-ammunition-ban/ (March 2017).

[UNFCCC] United Nations Framework Convention on Climate Change. 1992. 1771 UNTS 107 / [1994] ATS 2 / 31 ILM 849 (1992). Available at https://unfccc.int/resource/docs/convkp/conveng.pdf.

U.S. Climate Change Science Program. 2009. Coastal sensitivity to sea level rise: a focus on the Mid-Atlantic region. Synthesis and Assessment Product 4.1. Washington, DC: U.S. Environmental Protection Agency.

[USEPA] United States Environmental Protection Agency. 1994. Lead fishing sinkers; response to citizens' petition and proposed ban; proposed rule. Federal Register. Part III. Vol 40, Part 745. Wednesday March 9. pp. 11121-43.

[USFWS 2016] U.S. Fish and Wildlife Service. 2016. Adaptive Harvest Management: 2017 Hunting Season. U.S. Department of Interior, Washington, D.C. Available online at http://www.fws.gov/birds/management/adaptive-harvest-management/publications-and-reports.php.

U.S. Global Change Research Program. 2000. National assessment synthesis team. Climate change impacts on the United States: the potential consequences of climate variability and change. Washington, DC: USGCRP.

Wauchope, H. S., J. D. Shaw, Ø. Varpe, E.G. Lappo, D. Boertmann, R.B. Lanctot and R.A. Fuller. 2017. Rapid climate-driven loss of breeding habitat for Arctic migratory birds. Global Change Biology 23(3): 1085–1094. doi: 10.1111/gcb.13404.

Wenger, S.J., D.J. Isaak, C.H. Luce, H.M. Neville, K.D. Fausch, J.B. Dunham, D.C. Dauwalter, M.K. Young, M.M. Elsner, B.E. Rieman, A.F. Hamlet, and J.E. Williams. 2011. Flow regime, temperature, and biotic interactions drive differential declines of trout species under climate change. PNAS 108(34): 14175-80.

Yaich, S. and A. Wentz. 2007. Conserving Waterfowl and Wetlands Amid Climate Change. D.M. Browne and R. Dell, eds. Memphis, TN: Ducks Unlimited, Inc.

DEFINITION OF TERMS

Sustainable harvest levels means a harvest level which does not exceed net annual recruitment to the population and accounts for all forms of removal from the population, and which considers the status of the population, based on the best available scientific information.

Effects—Direct effects are the impacts that would be caused by the alternative at the same time and place as the action.

Indirect effects are impacts that occur later in time or distance from the triggering action.

Negligible effects result from a specified management action that can be reasonably expected to have no detectable effect on identified refuge resources or recreation opportunities at the identified scale.

Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

Impact Type—Beneficial/positive impacts are those resulting from management actions that maintain or enhance the quality and/or quality of identified Refuge resources or recreational opportunities.

Adverse/negative impacts are those resulting from management actions that degrade the quality and/or quantity of identified refuge resources or recreational opportunities.

Significant Adverse impacts take into consideration both the context and intensity of an action. Both short-and long-term effects must be analyzed. The severity of the effect must also be analyzed.

Duration of Impacts—Short-term impacts affect identified refuge resources or recreational opportunities; they occur during implementation of the management action but last no longer.

Medium-term impacts affect identified refuge resources or recreational opportunities that occur during implementation of the management action; they are expected to persist for some time into the future though not throughout the life of the CCP.

Long-term impacts affect identified refuge resources or recreation opportunities; they occur during implementation of the management action and are expected to persist throughout the life of the Plan and possible longer.

Intensity of Impact—Insignificant/negligible impacts result from management actions that cannot be reasonably expected to affect identified refuge resources or recreational opportunities at the identified scale.

Minor impacts result from a specified management action that can be reasonably expected to have detectable through limited effect on identified refuge resources or recreation opportunities at the identified scale.

Moderate impacts result from a specified management action that can be reasonably expected to have apparent and detectable effects on identified refuge resources or recreation opportunities at the identified scale.

Major impacts result from a specified management action that can be reasonably expected to have readily apparent and substantial effects on identified refuge resources and recreation opportunities at the identified scale.