

Environmental Assessment for Hunting Eastern Massachusetts National Wildlife Refuge Complex

This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this 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 open or expand recreational hunting opportunities in Massachusetts on the Eastern Massachusetts National Wildlife Refuge Complex (NWRC, Complex, refuge) in accordance with the refuge's Hunting Plan. The Complex will open opportunities for big game (white-tailed deer, bear, and/or wild turkey), upland game (fox, coyote, grouse, rabbit, and/or squirrel) and/or migratory game birds (waterfowl, woodcock, and/or snipe). The Complex is proposing to open or expand hunting and fishing opportunities on refuge-owned lands when found to be compatible, and consistent with Federal, State, and refuge hunting and fishing regulations.

This proposed action is often iterative and evolves over time during the process as the agency refines its proposal and learns more from the public, Tribes, and other agencies. Therefore, the final proposed action may be different from the original. The final decision on the proposed action will be made at the conclusion of the public comment period for the EA.

Background

National wildlife refuges are guided by the mission and goals of the National Wildlife Refuge System (Refuge System), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the Refuge System Administration Act of 1966, as amended by the Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations (CFR) and Service Manual.

The Complex is made up of eight refuges, three of which are covered in this plan. Each national wildlife refuge is established under specific legislation. Similarly, each refuge has one or more specific legal purposes for which it was established. The establishing legislation and purposes for three of the refuges in the Complex are given below.

Table B-1: Refuge Purposes and Establishing Authorities

Refuge	Establishing Authorities	Refuge Purposes
Assabet River National NWR	...was established September 28, 2000 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes. (16 U.S.C. 667b).	... purpose is its“...particular value in carrying out the national migratory bird management program.” (16 U.S.C. 667b-d, as amended)
Great Meadows NWR	...was established May 3,1944 under authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1)	<p>... “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d),</p> <p>“... suitable for -- incidental fish and wildlife-oriented recreational development,” (16 U.S.C. § 460k-1),</p> <p>“the protection of natural resources,” (16 U.S.C. § 460k-1),</p> <p>“and the conservation of threatened or endangered species...” (16 U.S.C. § 460k-1)</p>
Oxbow NWR	...was established May 24, 1974 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes. (16 U.S.C. 667b).	... is its “...particular value in carrying out the national migratory bird management program.” (16 U.S.C. 667b-d, as amended)

These refuges are managed as part of the Refuge System whose mission, as outlined by the National Wildlife Refuge System Administration Act (NWRSA), and as amended by the Refuge System Improvement Act (16 U.S.C. 668dd et seq.) is to:

“administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans”

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

- Provide for the conservation of fish, wildlife, and plants, and their habitats within the Refuge System;

- Ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans;
- Ensure that the mission of the Refuge System 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 Refuge System are located;
- Assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the Refuge System and the purposes of each refuge;
- Recognize compatible wildlife-dependent recreational uses as the priority general public uses of the Refuge System through which the American public can develop an appreciation for fish and wildlife;
- Ensure that opportunities are provided within the Refuge System for compatible wildlife-dependent recreational uses; and
- Monitor the status and trends of fish, wildlife, and plants in each refuge.

This plan sets forth guidance on the expansion and continued implementation of hunt programs at Assabet River, Great Meadows, and Oxbow NWR. All three refuges have been opened for hunting since at least 2005. Portions of Oxbow NWR south of Route 2 have been open to hunting of turkey, gray squirrel, cottontail rabbit, ruffed grouse, snipe and American woodcock since 1976 under previous ownership.

Purpose and Need for the Proposed Action

Hunting is a healthy, traditional recreational use of renewable natural resources deeply rooted in America's heritage, and it can be an important wildlife management tool. The Refuge System Administration Act of 1966, the Refuge System Improvement Act of 1997, and Service policy permit hunting on a national wildlife refuge as a priority wildlife-dependent recreational opportunity when it is compatible with the purposes for which the refuge was established and acquired.

The purpose of this proposed action is to expand opportunities for compatible hunting opportunities on Assabet River, Great Meadows, and Oxbow NWRs. Currently, there are five refuges in the Complex that conduct hunting programs within the framework of Federal and State regulations, including Assabet River, Great Meadows, Oxbow, Mashpee, and Monomoy NWRs. All authorized hunts are at least as restrictive as the State of Massachusetts. By maintaining hunting regulations that are as, or more, restrictive than the State, individual refuges ensure that they are maintaining seasons which are supportive of management on a local and

regional basis. Hunters on the refuge are expected to be ethical and respectful of other hunters, non-consumptive users, wildlife species, and the environment while on refuge lands.

The objectives of the hunting program on refuge lands are to:

- Provide the public with a high-quality recreational experience on refuge lands and increase opportunities and access for hunters;
- Implement a hunting program that is safe for all refuge users;
- Design a hunting program that is administratively efficient and manageable with existing staffing levels; and
- Design a hunting program that is in alignment with refuge habitat management objectives.

Department of the Interior Secretarial Order 3356 directs the Service to enhance and expand public access to lands and waters on national wildlife refuges for hunting, fishing, recreational shooting, and other forms of outdoor recreation. The proposed action will also promote one of the priority public uses of the Refuge System, and will promote stewardship of our natural resources and increase public appreciation and support for the refuge by providing opportunities for visitors to hunt. To address the needs stated above, the purpose of the proposed action will bring the refuge into compliance with management guidance detailed in the orders, policy, and Federal law to “recognize compatible wildlife-dependent recreational uses as the priority general uses of the Refuge System” and “ensure that opportunities are provided within the Refuge System for compatible wildlife-dependent recreational uses.” 16 U.S.C. 668dd(a)(4).

This EA serves as the NEPA document that analyzes the impacts on environmental, cultural, and historical resources of expanding hunting opportunities on the refuge.

Alternatives Considered

Alternative A: No Action Alternative

The No Action Alternative would continue the refuge’s current hunting program, which allows for hunting on specific areas of Assabet River, Great Meadows, and Oxbow NWRs as described in the 2007 refuge-specific EAs and Hunt Plans. Under this alternative, Assabet River NWR permits white-tailed deer, turkey, woodcock, grouse, rabbit, and squirrel hunting. Oxbow NWR permits white-tailed deer, turkey, woodcock, waterfowl, grouse, rabbit, and squirrel hunting. Great Meadows NWR permits white-tailed deer and waterfowl hunting. Hunting regulations for these refuge lands are consistent with State hunting regulations. Additional refuge-specific regulations also apply.

Alternative B: Proposed Action Alternative – Expand Hunting Opportunities at Assabet, Great Meadows, and Oxbow NWRs

The refuge Complex has prepared a hunt plan, which is presented in this document as the Proposed Action Alternative.

Under the Proposed Action Alternative, at Assabet River NWR, 2,273 acres (of 2,357 total) will be maintained or opened to hunting opportunities for new species or method of take, with exception of rifles or handguns, including 123 acres to be opened to hunting for the first time. New species added would include bear, coyote, fox, and waterfowl.

At Great Meadows NWR, 3,401 acres (of a total 3,874 acres) will be maintained or opened to hunting opportunities. Approximately 778 additional acres will be opened to archery-only deer hunting. Additionally, Great Meadows NWR will open all deer hunting units to turkey and coyote using archery equipment only. A total of 2,623 acres will be open to black bear hunting using archery equipment only for the first time. Currently 334 acres is open for waterfowl hunting and an additional 670 acres will be open to waterfowl hunting for a total of 1,004 acres.

At Oxbow NWR, 1,671 (of 1,695 acres total) will be maintained or opened to hunting opportunities, including 128 acres to be opened to hunting for the first time. New species added would include bear, coyote, and fox. New methods of take will be introduced in specific hunt units as outlined in the hunt plan.

Special Refuge-Specific Regulations

- Eastern Massachusetts NWRC only permits non-toxic ammunition for migratory bird and upland game hunting.
- Refuge lands are closed to night hunting. Refuge hunting hours are half hour before sunrise to half hour after sunset, except for migratory waterfowl which is open to sunset.
- Hunters may enter the refuge 1.5 hours before legal hunting time and must leave the refuge within 1.5 hours after legal sunset.
- We allow the use of dogs consistent with State regulations when hunting migratory birds and upland game species.
- On Great Meadows NWR, only archery equipment may be used to hunt white-tailed deer, bear, turkey and coyote.
- On Assabet River and Oxbow NWR, no rifles or handguns are permitted for hunting of any species.
- Scouting can occur once the hunter has obtained a refuge permit. Scouting can begin no earlier than 4 weeks from the opening day of the hunt season from half hour before sunrise to half hour after sunset.

The proposed action builds on an existing hunting program, and includes areas developed during the completion of each refuge’s respective CCP, which involved an extensive public review process; therefore, the Service does not need to consider additional alternatives (43 CFR 46.310).

Mitigation Measures to Avoid Conflicts

The refuge-specific regulations detailed in the plan (and in 50 CFR) are measures under the Proposed Action Alternative that will reduce or avoid impacts. Refuge and State law enforcement officers enforce hunting regulations. Providing hunting information through various forums will ensure the public is aware of applicable laws and policies.

To minimize conflict, refuge-specific hunt regulations and hunt unit maps (brochures) will be made available to hunters at kiosks, the refuge website and at the Refuge Complex Headquarters in Sudbury, Massachusetts. To help reduce interaction between hunters on the refuge and other user groups off the refuge, refuge boundaries and hunt area boundaries will be clearly posted. Further restrictions on season will be imposed at Assabet River NWR to accommodate youth environmental education visits. At Great Meadows NWR, only archery equipment may be used to hunt white-tailed deer, bear, turkey and coyote to mitigate concerns in a high density and fragmented urban area. Additionally, refuge lands are closed to night hunting. Refuge units may be closed to other public activities during special group hunts to increase overall safety and quality of the hunt.

This proposed alternative offers increased opportunities for public hunting and fishing and fulfills the Service’s mandate under the Refuge System Improvement Act of 1997. The Service has determined that the hunt and fish plan is compatible with the purposes of the Assabet River, Great Meadow, and Oxbow NWRs and the mission of the Refuge System.

Affected Environment

The Assabet River, Great Meadows, and Oxbow NWRs are located in the Boston Metrowest area. Assabet River NWR totals 2,357 acres. Great Meadows NWR totals 3,863 acres. Both are located in Middlesex County Massachusetts. Oxbow NWR totals 1,695 acres and is located in Middlesex and Worcester Counties. All three refuges are made up of a wide range of habitat types. Table B-2 provides a list of habitat types and descriptions of the dominant habitat types found on all three refuges.

Table B-2: Habitat Types and Descriptions

Habitat Type	Description
Grassland and Old Field	<i>Ruderal Grassland/Shrubland</i> is a community commonly referred to as “old field successional grassland.” This community develops in areas originally converted from forest to agriculture once agricultural practices are ended.

<p>Freshwater Wetland</p>	<p><i>Freshwater Marsh</i> is a wetland community occurring on flat-bottomed, shallow basins where the substrate consists of muck over mineral soil. <i>Phragmites australis</i> frequently invades emergent marsh communities.</p> <p><i>Forested Wetland (swamp)</i> is a forest where soils are saturated or flooded for at least a portion of the growing season, and vegetation, dominated by trees, is adapted to tolerate flooded conditions.</p> <p><i>Scrub- shrub Wetland</i> includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes except subtidal are included.</p> <p><i>Freshwater Pond</i> is an area filled with water, either natural or artificial, that is smaller than a lake which arises naturally in floodplains as part of a river system, or be a somewhat isolated depression (such as a kettle pond or vernal pool). It may contain shallow water with marsh and aquatic plants and animals.</p> <p><i>Vernal Pools</i> are small freshwater wetland communities occurring within forests. Vernal pools form in seasonally flooded basins that are too shallow to maintain water year-round. Vernal pools are important breeding areas for a number of amphibians because they do not support fish populations that would prey on eggs and larvae.</p>
<p>Open Water</p>	<p>Open water habitats include rivers, streams, and tidal estuaries and associated transitional habitats influenced by fluctuating water levels. Diadromous, anadromous and indigenous fish, freshwater mussels, mayflies, dragonflies, and amphibians rely on these communities for some stage of their life cycle. These habitats also provide foraging opportunities for other taxa including, waterfowl, herons, egrets, mink, and otter.</p>
<p>Oak-Pine Forest</p>	<p><i>Oak-pine forests</i>, known as transition hardwood forests, contain a combination of species typical in central and northern hardwood forest communities. Often, dominant species can be oak, sugar maple, yellow birch, American beech, red maple, black cherry, and sweet birch. It is also common to find eastern hemlock and white pine in this forest type. These forests are moderately vulnerable to climate change given the potential buffering effects of central hardwood species (red oak, black birch) on the loss of northern hardwood tree species (yellow birch) from these communities.</p>
<p>Shrubland</p>	<p><i>Scrub Oak Shrublands</i> are dense shrublands dominated by shrub oaks forming almost impenetrable thickets ranging from 2 to 3 feet (about 1m) to greater than 6 feet (2m) in height. They occur on sandplains, usually in</p>

	depressions where localized frosts keep out competing trees, and on ridge tops. Disturbances in both environments maintain mosaics in space and time of grassland and heathland openings.
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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 focuses primarily on 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.” Resources that will not be more than negligibly impacted by the action have been dismissed from further analyses.

Tables B-3 through B-7 provide: (1) a brief description of the affected resources in the proposed action area; and (2) anticipated impacts of the proposed action and any alternatives on those resources, including direct and indirect effects. Table B-8 provides a brief description of the cumulative impacts of the proposed action and any alternatives.

Impact Types

Direct effects are those which are caused by the action and occur at the same time and place. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or medical.

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. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or medical.

Negligible impacts result from management actions that cannot be reasonably expected to affect identified refuge resources or recreational opportunities at the identified scale.

Table B-3. Affected Natural Resources and Anticipated Impacts

NATURAL RESOURCES	
AFFECTED RESOURCE	ANTICIPATED IMPACTS
<p>Big Game (<i>White-tailed Deer, Wild Turkey, Black Bear</i>) Populations of these species have generally remained steady in Massachusetts. The State monitors the populations and will continue to adjust seasons, and limits to maintain healthy populations.</p>	<p>No Action Under this alternative, the current hunt program would be maintained.</p> <p><u>White-tailed deer:</u> White-tailed deer hunting would continue to be permitted in designated areas of Assabet River,</p>

White-tailed deer:

For white-tailed deer, each refuge is within a Wildlife Management Zone (WMZ) that is either within or above the target deer density for that area (MassWildlife 2018).

The white-tailed deer population in Massachusetts is estimated at over 100,000 deer in total (MassWildlife 2018). In some areas, deer density is as high as 25 to 30 deer per square mile. Oxbow NWR is located in Massachusetts' wildlife management zone (WMZ) 9. Assabet River and Great Meadows NWRs are located in WMZ 10. For WMZ 9, the State has set the target deer density at 12 to 18 deer per square mile of forest. In 2018, WMZ 9 was within that target range. For WMZ 10 the State has set the target deer density at 6 to 8 deer per square mile of forest. In 2018, WMZ 10 was well above that target range (MassWildlife 2018).

Wild turkey:

Wild turkeys are a resident wildlife species, whose population is managed by MassWildlife. Wild turkeys were reintroduced to Massachusetts in the 1970s and their populations have increased with the help of in-State transplants (ceased in 1996) and dispersal from adjacent states. The State population is estimated at greater than 30,000 to 35,000 birds with about 3,000 harvested statewide annually (MDFW 2018b). Wild turkey harvest is restricted to two bearded birds in the spring season and one bird in the fall season. This limit is set to maintain a healthy and stable population.

Black bear:

MassWildlife approved Statewide black bear hunting in 2014 to aid in population management. Black bear hunting has been permitted since 2015 and the number of

Oxbow, and Great Meadows NWRs. For the 2019 season, 555 permits for the various seasons (archery, muzzleloader, and shotgun) were issued for deer hunting on the Complex. During the 2019 season, we estimate that 18 deer were harvested from Assabet River NWR, 12 deer were harvested from Oxbow NWR, and 20 deer were harvested from Great Meadows NWR. Current levels of harvest would be expected under this action as no new opportunities would be provided.

Wild turkey:

Wild turkey hunting would continue to be permitted in designated areas of Assabet River and Oxbow NWRs. For the 2019 season, 52 permits were issued for turkey hunting on the Complex. During the 2019 season, 1 turkey was harvested from Assabet River NWR and 2 turkey were harvested from Oxbow NWR. Current levels of harvest would be expected under this action as no new opportunities would be provided.

Black bear:

Bear hunting would not be offered at Assabet River, Oxbow, and Great Meadows NWRs. There would continue to be no bears harvested on refuge property as no hunting opportunities would be provided.

Proposed Action

White-tailed deer:

Under this proposed action, white-tailed deer hunting opportunities will be expanded by 1,029 acres in total across the three refuges. It is unlikely that hunter numbers in this area will increase considerably, though some increase is expected. Under current level of use there is approximately 1 deer hunter for every 11 acres of land. If the current levels of use remain stable, the refuge can expect the additional 1,029 acres of open hunting land to support up to 93 new deer hunters in 2020. While the refuge can support the capacity of 93 additional

<p>permits granted have increased each year. There are currently only records of bears at Oxbow NWR, although there has been reports that the population is expanding east to more urban areas where human conflict will increase.</p> <p>There are an estimated 4,500+ black bears in Massachusetts and the population is estimated to be increasing by about 8 percent annually with hunters harvesting less than 6 percent of the population yearly. The estimated population of 45,000 to 50,000 occurs throughout New England.</p> <p>MassWildlife authorizes 3 statewide hunting seasons for black bear. During the three hunting seasons in 2018, a total of 204 bears were harvested statewide. This represents a drop from the 270 bears taken in 2017 and record of 283 bears taken in 2016. The breakdown by season for 2018 is as follows:</p> <p>First season (Sept. 4 – Sept. 22): 152 Second season (Nov. 5 – Nov. 24): 19 Shotgun season (Nov. 26 – Dec. 8): 33</p> <p>The September and November seasons were virtually identical in 2017 (151 and 26) and 2018. The big decrease in harvest in 2018 was during the Shotgun season. Bears were active very late in 2017, resulting in a high Shotgun season harvest, 93 bears taken. The lack of hard mast in 2018 saw bears enter their dens early, which resulted in a corresponding reduction in the Shotgun season harvest, with only 25 bear taken. Assabet River NWR and Great Meadows NWR are located in Middlesex County, and Oxbow NWR is in Middlesex and Worcester Counties.</p>	<p>deer hunters, we anticipate that 40 to 50 additional hunters is more likely. An increase in the hunting area would increase the number of deer harvested on the refuge and that is estimated to be an additional 10 to 12 deer harvested in the Complex. Disturbance to deer in the area will occur during the hunting season, but the disturbance is considered negligible, as deer are prone to move regularly over large areas. With the deer populations on each refuge either within or above the carrying capacity for that area, white-tailed deer hunting on the Complex is expected to have minimal adverse impacts to the State-wide population.</p> <p><u>Wild turkey:</u> 3,652 additional acres would be provided for turkey hunting on the Complex. Expanding opportunities for turkey hunting will have a minor impact the local turkey population. Under the current level of use, there is approximately 1 turkey hunter for every 71 acres of land. If the current levels of use remain stable, we can expect the additional 3,652 acres of open hunting land to support up to 51 new turkey hunters in 2020. As with deer hunting, while the refuge can support the capacity of 51 additional turkey hunters, we anticipate that 40 to 50 total additional hunters is more likely. The State generally does not change the number of permits issued for turkey hunting under refuge alternatives, so there no expected increase in harvested turkeys statewide. However, expanding turkey hunting opportunities may result in a minor increase in turkey harvest on the Complex that is estimated to be an additional 3 to 5 turkeys harvested. The harvest on the refuge would have a negligible impact on the overall population. Disturbance to turkeys in an area will occur during the hunting season, but the disturbance is considered negligible, as flocks are prone to move regularly over large areas.</p> <p><u>Black bear:</u></p>
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Black bear harvest by county, 2008-2018			
Year	State Total	Middlesex	Worcester
2018	204	3	13
2017	270	-	9
2016	283	1	12
2015	237	1	16
2014	240	4	8
2013	148	1	8
2012	185	1	6
2011	131	-	7
2010	144	-	3
2009	169	1	3
2008	100	-	3

Bear populations are expected to continue to expand eastward to more densely populated counties of Middlesex and Worcester County. As part of MassWildlife’s effort to radio collar black bears, three male bears were trapped at a site less than 2 miles from the Hospital South Unit at Oxbow NWR (Pers comm, MassWildlife) As of winter 2019/2020, there have been no confirmed reports of bears in or near Assabet River and Great Meadows NWR; however, there have been sightings of bears further east in Lexington, Bedford, and Arlington, MA.

The Complex will open 6,465 acres for black bear hunting for the first time. Disturbance to this species may occur during the hunting season, although it is considered negligible, as the number of individuals encountered will be small. In Massachusetts the use of dogs, night hunting, and baiting bear are all prohibited. This includes the use of lures, scents, or any other substance as a bear attractant.

Given the limited occurrence, the Complex does not anticipate a huge demand for bear permits, and estimates only issuing five to six bear hunting permits in 2020 under this proposed expansion. Given the state hunting restrictions and the very small number of bears reported within the Complex, we estimate only one bear to be harvested over a five to eight year period in the Complex.

At Assabet River NWR, the North Unit B, Unit C, and South Unit will open to black bear hunting for archery only. North Unit A will open to all methods of take in alignment with State regulations for bear hunting, with exceptions of no rifles or handguns. For all units bear hunting will only be open during the second bear and shotgun seasons. This restriction will mitigate potential conflicts with other user groups and other youth environmental education programs that take place during first State bear seasons.

At Great Meadows NWR areas open to deer and turkey hunting (except North of Sherman Bridge Road and South of SR 225) will be open to bear hunting via archery only for all State seasons.

At Oxbow NWR, the Route 2 South, Waterfowl Area, Sheridan Road, Hospital Road South, Hospital Road North, Bishop Road and Walker Road units will open to black bear hunting in alignment with State regulations for

	<p>method of take and seasons, with exception of no rifles or handguns. The Hospital Road North Unit and Still River Depot will be open to bear hunting via archery only for all State seasons.</p>
<p>Upland Game (<i>Coyote, Fox, Grouse, Rabbit, Squirrel</i>) The State will adjust seasons, and limits to maintain healthy populations.</p> <p><u>Coyote and fox:</u> For coyote and fox, there are currently no bag limits. MassWildlife estimates the statewide population of coyotes is between 9,500 and 11,500 animals. This number is not expected to increase significantly, as coyotes have exhausted all suitable habitat in the State. Studies shows that it would take about a 70 to 75 percent reduction in the population to permanently decrease the population of coyotes (MassWildlife 2019, Wade, 1981). Over the last 10 years, the annual harvest has been between 400 to 750 (which is less than 10 percent of the population).</p> <p>In 2018, 522 tagged coyotes were harvested in Massachusetts (MassWildlife 2018). On average, this number has increased over the previous four years, from 486 in 2017, 532 in 2016, 465 in 2015, and 420 in 2014 (MassWildlife 2017, 2016, 2015, 2014).</p> <p>Red and gray foxes are common and abundant species in Massachusetts. In 2018, 126 tagged foxes (red and gray) were harvested in Massachusetts (MassWildlife 2018). This number varied slightly over the previous four years, from 126 in 2017, 87 in 2016, 114, in 2015, and 130 in 2014.</p> <p><u>Rabbit and squirrel:</u> For rabbit and squirrel, the current bag limit is 5 per day with no annual limit. These species are common and abundant in the State of Massachusetts with high</p>	<p>No Action Under this alternative, the current hunt program would be maintained.</p> <p><u>Coyote and Fox:</u> Coyote and fox hunting would not be offered at Assabet River, Oxbow, or Great Meadows NWRs. There would continue to be no coyotes or foxes harvested on refuge property as no hunting opportunities would be provided.</p> <p><u>Rabbit and squirrel:</u> Rabbit, squirrel, and grouse hunting would continue in designated areas of Assabet River and Oxbow NWRs. Current levels of harvest would be expected under this action as no new opportunities would be provided. In 2019, 35 permits were issued for upland game and it is estimated that 40 squirrel and 50 rabbits were harvested in the 2,515 acres opened to rabbit and squirrel hunting.</p> <p><u>Ruffed Grouse:</u> Grouse hunting would continue on designated areas of Assabet River and Oxbow NWRs. Current or lower levels of harvest would be expected under this action as no new opportunities would be provided. In 2019, 35 permits were issued for upland game and it is estimated that less than 10 grouse were harvested in the Complex in the 2,515 acres opened to grouse hunting.</p> <p>Proposed Action <u>Coyote and fox:</u> Coyote and/or fox hunting would be opened for the first time at Assabet River, Oxbow, and Great Meadows NWRs. 7,345 new acres of hunting area would be provided for coyote hunting. A total of 3,944 new acres of hunting</p>

<p>reproductive success. Studies have suggested that Rabbits both compete with native animals for food and shelter and act as easy prey for abundant populations of mesopredators including fox and coyotes. By over-grazing vegetation and reducing habitat complexity, they support unsustainable populations of mesopredators (Lurgi, et al, 2018)</p> <p><u>Ruffed Grouse:</u> For grouse the current bag limit is 3 per day and 15 per season. Ruffed grouse populations are generally declining the the Eastern United States (Bomberg et. al. 2011) but bag limits are set to maintain viable populations.</p>	<p>area would be provided for fox hunting. Night hunting and baiting are not permitted on the refuge and the season would only be open concurrent with the deer season. Since the hunting season is limited and these species are typically less active during the daytime, we do not expect a large harvest to occur, and estimate harvests less than 10 coyotes and less than 10 fox. The Complex does not anticipate a high demand for coyote hunting, and estimates issuing approximately 25 additional permits to account for coyote and fox hunting in 2020. This harvest would have a negligible impact on the overall population. Disturbance to these species in the area will occur during the hunting season, although the disturbance is considered negligible compared to the Statewide populations. Hunting will end before the spring breeding season to prevent impacts of compensatory reproduction from hunting pressures resulting in the unintended increase in coyote and fox populations.</p> <p><u>Rabbit and squirrel:</u> Under the Proposed Action, 234 additional acres of Oxbow NWR would be opened for rabbit and squirrel hunting. Under the current level of use, there is approximately 1 small game hunter for every 71 acres of land. If the current levels of use remain stable, the refuge can expect the additional 234 acres of open hunting land to support approximately 3 new small game hunters in 2020. Therefore, disturbance to these species from the proposed action will be considered negligible.</p> <p><u>Ruffed Grouse:</u> Under the Proposed Action, 234 additional acres of Oxbow NWR would be opened for grouse hunting. Under the current level of use, there is approximately 1 small game hunter for every 71 acres of land. If the current levels of use remain stable, the refuge can expect the additional 234 acres of open hunting land to support approximately 3 new small game</p>
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	<p>hunters in 2020. We estimate an additional 2 to 3 grouse harvested as a result of the additional acres opened. Therefore, disturbance to these species from the proposed action will be considered negligible.</p>																																																															
<p>Migratory Game Bird <i>(Waterfowl, woodcock, snipe)</i> Harvest for these species is cooperatively regulated among an international consortium (Atlantic Flyway Council (AFC)) of wildlife managers and are based on surveys, harvest data, and habitat data.</p> <p>Estimates of waterfowl harvest and hunter activity (Raftovich, R.V., K.K. Fleming, S. C. Chandler, and C.M. Cain, 2019) in Massachusetts during the 2017 and 2018 hunting seasons include:</p> <table border="1"> <thead> <tr> <th></th> <th>2017</th> <th>2018</th> </tr> </thead> <tbody> <tr><td>Mallard</td><td>4,178</td><td>7,186</td></tr> <tr><td>Black Duck</td><td>2,289</td><td>3,721</td></tr> <tr><td>MallardBlackHybrid</td><td>94</td><td>0</td></tr> <tr><td>Wigeon</td><td>0</td><td>171</td></tr> <tr><td>Green-winged Teal</td><td>755</td><td>770</td></tr> <tr><td>Northern Pintail</td><td>24</td><td>0</td></tr> <tr><td>Wood Duck</td><td>3,115</td><td>5,004</td></tr> <tr><td>Greater Scaup</td><td>47</td><td>0</td></tr> <tr><td>Lesser Scaup</td><td>71</td><td>0</td></tr> <tr><td>Goldeneyes</td><td>189</td><td>128</td></tr> <tr><td>Bufflehead</td><td>1,487</td><td>1,198</td></tr> <tr><td>Long-tailed Duck</td><td>1,815</td><td>598</td></tr> <tr><td>Eiders</td><td>4,698</td><td>2,991</td></tr> <tr><td>Scoters</td><td>2,029</td><td>2,222</td></tr> <tr><td>Hooded Merganser</td><td>283</td><td>599</td></tr> <tr><td>Other Mergansers</td><td>354</td><td>813</td></tr> <tr><td>Total Duck Harvest</td><td>21,400</td><td>25,400</td></tr> <tr><td>Active Duck Hunters^a</td><td>2,900</td><td>3,400</td></tr> <tr><td>Hunter Days Afield^a</td><td>15,400</td><td>18,500</td></tr> <tr><td>Duck Harvest/Hunter^a</td><td>4.4</td><td>5.8</td></tr> </tbody> </table> <p>Refuge populations of these species have remained relatively stable.</p>		2017	2018	Mallard	4,178	7,186	Black Duck	2,289	3,721	MallardBlackHybrid	94	0	Wigeon	0	171	Green-winged Teal	755	770	Northern Pintail	24	0	Wood Duck	3,115	5,004	Greater Scaup	47	0	Lesser Scaup	71	0	Goldeneyes	189	128	Bufflehead	1,487	1,198	Long-tailed Duck	1,815	598	Eiders	4,698	2,991	Scoters	2,029	2,222	Hooded Merganser	283	599	Other Mergansers	354	813	Total Duck Harvest	21,400	25,400	Active Duck Hunters ^a	2,900	3,400	Hunter Days Afield ^a	15,400	18,500	Duck Harvest/Hunter ^a	4.4	5.8	<p>No Action Under this alternative, the current hunt program would be maintained. Current levels of migratory bird harvest would be expected under this action as no new opportunities would be provided. In 2019, the Complex issued 173 migratory bird permits for the refuge. Based on current levels, we estimate annual harvest totals at the 3 refuges is approximately:</p> <p>Assabet (currently closed): 0 ducks/0 geese Great Meadows: 48 ducks/24 geese Oxbow: 12 ducks/10 geese/6 woodcock</p> <p>Proposed Action This alternative would open new lands to migratory game bird hunting, including 2,686 acres for waterfowl and 234 acres for woodcock. This may result in a small increase in hunter numbers and harvest. Under current level of use, there is approximately 1 migratory bird hunter for every 17 acres of land. If the current levels of use remain stable, the refuge can expect the additional 2,920 acres of open hunting land to support up to 172 new migratory bird hunters in 2020. While the refuge can support the capacity of 173 additional waterfowl hunters, we anticipate that 40 to 50 additional hunters is more likely.</p> <p>With the proposed action, we anticipate that annual harvest totals at the 3 refuges would approximately be:</p> <p>Assabet River: 25 ducks/24 geese Great Meadows: 75 ducks/40 geese Oxbow: 22 ducks/18 geese/12 woodcock</p>
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	<p>Massachusetts sets State season length and harvest limits (within the limits set for the Atlantic Flyway) for all species we propose to open to hunting at the refuge units. They have determined that populations are at levels acceptable to support a public hunt while maintaining healthy population levels that are commensurate with the carrying capacity of the habitat. The Massachusetts migratory bird season is currently open from September through February. Hunting would not have a significant impact on local, regional, or Atlantic Flyway waterfowl populations, because the percentage taken on the Complex, though possibly additive to existing hunting take (i.e., less than 125 ducks and 85 geese), would measure a fraction of a percent of the estimated migratory game birds populations. Potential impacts to target migratory species include direct mortality or injury and indirect changes in behavior. In addition to direct mortality, hunting could result in some short-term redistribution due to disturbance.</p> <p>It is not anticipated that the proposed action at the refuge would influence populations at the Flyway or Continental level.</p>
<p>Other Wildlife and Aquatic Species The refuge supports a diversity of wildlife species in Eastern Massachusetts including game and nongame species, reptiles, amphibians, and invertebrates, which are important contributors to the overall biodiversity on the refuge. Some songbirds and raptors breed at the refuge, whereas others utilize the refuge for wintering and during migration.</p>	<p>No Action Under this alternative, the current hunt program would be maintained with a total of 6,316 acres available in the Complex to some form of hunting. A total of 401 hunters (555 total permits issued for multiple hunt opportunities) is estimated Complex-wide, and results in an average density of one hunter per 15 acres. However, hunting pressure is spread over the duration of the hunting season for multiple species, thereby minimizing the impacts. This alternative currently results in some short-term, but negligible, negative impacts to small mammals, birds, and other wildlife due to</p>

	<p>disturbance in areas where human access for hunting activities occurs.</p> <p>Proposed Action Hunting can have direct and indirect impacts on both target and non-target species. These impacts include: direct mortality of individuals, changes in wildlife behavior, changes in wildlife population structure, dynamics, and distribution patterns, and disturbance from noise and hunters walking on- and off-trail (Cole and Knight 1990, Cole 1990, Bell and Austin 1985). However, under the anticipated levels of use these impacts are expected to be minimal. Hunters tend not to disperse very far from parking areas and roads, which leaves large areas of refuge land undisturbed. While resident and non-game wildlife in areas newly opened to hunters and hunting may be negatively impacted by disturbance, that impact is expected to be negligible. This proposed action will open an additional 1,029 acres, bringing the total acres to 7,345 total acres for multiple species over the duration of the hunting season. While the available hunt area would be able to support additional hunters as noted above, the total increase is estimated to be between 40 to 50 new hunters a year total due to this proposed action. This estimated number of hunters is low in proportion to the available hunt area, and as it has been observed that the current hunt program has only minor and temporary impacts on other wildlife; thus, this expansion is anticipated to have minor and temporary impacts, with the dispersed nature of hunting across wide areas, and that human disturbance is both uncommon and short-term.</p> <p>Deer and turkey hunt participants will be encouraged to voluntarily use non-toxic ammunition. Scavenging of unrecovered deer and deer gut piles resulting from the permit deer hunt will likely occur and may cause detrimental impacts caused by lead exposure.</p>
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<p>Threatened and Endangered Species and Other Special Status Species With the exception of occasional (most likely wintering) bald eagles, no federally listed threatened or endangered species currently inhabit Assabet River, Great Meadows, and Oxbow NWRs.</p> <p>State-listed species occurring on the refuges include Blanding’s turtle, blue-spotted salamander, and whip-poor-will, American bittern, and least bittern.</p>	<p>No Action Under this alternative the current hunt program would be maintained. No federally listed species occur regularly on the refuges and therefore there are no direct impacts to those trust resources.</p> <p>Proposed Action Under the proposed plan, there will be negligible impacts to State-listed species as the majority of the hunting season occurs outside of the breeding and active season of those species and any impacts are expected to be negligible due to low hunter numbers.</p>
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<p>Vegetation (including vegetation of special management concern) Vegetation varies throughout the refuges; however, hunt areas are generally forested wetlands and uplands, shrublands, and old fields.</p>	<p>No Action Under this alternative, the current hunt program would be maintained. The current number of hunters comprises a small fraction of the Complex’s total visitation, with a total of 6,316 acres open to in the Complex to some form of hunting. A total of 401 hunters results in an average density of one hunter per 15 acres. However, hunting pressure is spread over the duration of the hunting season for multiple species, thereby minimizing the impacts. Minor impacts on vegetation observed with the current hunting program include trampling or creation of foot paths.</p> <p>Proposed Action Trampling of vegetation on newly opened lands could increase slightly because of an increased number of users and increase in frequency of use. However, the proposed action will open an additional 1,029 acres, bringing the total acres to 7,345 total acres for multiple species over the duration of the hunting season. The refuge does not anticipate a high demand for the new opportunities, and estimates that the expected increase in number of hunters is low in proportion to available hunt area (estimate of 40 to 50 new hunters per year) and dispersed, and therefore adverse impacts to vegetation are not expected to increase.</p> <p>Most hunting activities occur during the fall, and some hunt seasons extend into winter when plants are dormant and the ground is frozen and/or covered in snow. Hunters would have minimal impacts on plants during this period. For these reasons, hunting is expected to have minimal adverse short-term, long-term, or cumulative impacts on vegetation.</p> <p>High deer and rabbit densities have been shown to negatively affect plant and animal communities. A hunting program would help to facilitate ecological diversity by mitigating the effects of overbrowsing. Deer and rabbit</p>
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	<p>densities, if maintained through regulated hunting, will sustain the native vegetation and forest regeneration associated with the natural communities in those regions. Regulated deer hunting will also maintain a deer herd in good physical condition that staves off malnutrition and disease.</p>
<p>Water Resources Assabet River, Great Meadows, and Oxbow NWRs contain rivers and streams. These habitats are located throughout the hunt area.</p>	<p>No Action Motorized boats used by migratory bird hunters can inadvertently leak polluting substances or introduce aquatic invasive species into water bodies near or on the refuge. Additionally, creek bank erosion caused by wake from fast-moving boats has been documented; therefore, the refuge enforces a 10-mph speed limit on all portions of the rivers owned by the Service. Given factors of the affected environment (e.g., the size of the river, the types of boats used, the areas available for waterfowl hunting, the number of waterfowl hunters expected, an duration of the season) and staff observations, we estimate that less than two small engine boats are in the waterway at any given time engaged in waterfowl hunting. The amount of any potential pollution leaked is low, and would have minimal impact when diluted in the water. The hunting season is typically in the fall to winter season when most aquatic invasive species are dormant, so impacts are likely minimal.</p> <p>Proposed Action New areas open to hunting could see an impact from increased activities and boats, but anticipated to stay in relative proportion to current levels of use. Disturbance is expected to remain minor, with estimated use between one to two boats in the waterway at any given time.</p>
<p>Wetlands Assabet River, Great Meadows, and Oxbow NWRs contain wetland habitats including freshwater marsh forested wetland (swamp),</p>	<p>No Action Hunters are permitted to walk on lands throughout designated hunting areas mostly without restriction. Waterfowl hunters have</p>

<p>freshwater pond, and vernal pools. These habitats are located throughout the hunt area and would be traveled by deer and migratory game bird hunters, in particular.</p>	<p>caused trampling and vegetation die-offs along frequently traveled paths. Although these impacts have been obvious, such paths are few in number and small in area, so overall impacts are considered minor. Migratory bird hunters are permitted to place blinds on refuge marshes, but must remove them daily. This minimizes impacts to vegetation. Access to wetlands can also pose a moderate risk of spreading disease and invasive species without proper disinfecting procedures.</p> <p>Proposed Action Opening new areas to hunting for additional species will slightly increase the number of hunters and lengthen the period of time hunters will be traversing the landscape, leading to an increase in vegetation trampling. The refuge does not anticipate a high demand for the new opportunities, and estimates that the expected increase in number of hunters is low in proportion to available hunt area (i.e., estimate of 40 to 50 new hunters per year) and spread over the duration of the hunt season.</p> <p>Most hunting will also take place during the dormant season when vegetation is least vulnerable. Some of the new areas will be accessed by foot, which may result in addition trampling of wetland vegetation. Access to wetlands also pose a moderate risk of spreading disease and invasive species without proper disinfecting procedures.</p>
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Table B-4. Affected Visitor Use and Experience and Anticipated Impacts

VISITOR USE AND EXPERIENCE	
AFFECTED RESOURCE	ANTICIPATED IMPACTS

<p>Assabet River, Oxbow, and Great Meadows NWRs are open to all six priority public uses (hunting, fishing, wildlife observation, photography, environmental education, and interpretation). Oxbow NWR is also open to canoeing and kayaking. In 2017, Assabet River, Oxbow, and Great Meadows NWRs received 919,980 total recreational visits. Of this total, only 2,353 visits were for hunting.</p>	<p>No Action</p> <p>Currently, Assabet River, Oxbow, and Great Meadows NWRs are open to all six priority public uses. In the past, refuge visitors have been concerned with personal safety during hunting seasons. In response, refuge staff ensure that all safety zones are communicated to hunters through maps and brochures. For the benefit of all visitors, hunting information is posted on kiosks, at headquarters, and on refuge websites. Orange safety vests are also made available to visitors at the Assabet River NWR visitor center.</p> <p>Proposed Action</p> <p>We expect between 40 to 50 new hunters due to the increased opportunities for hunting on the refuge; thus, we can expect to see a slight increase in the number of conflicts among user groups. Non-hunters will likely see hunters entering and exiting the refuge on the same trails that hiking is allowed on the refuges. Non-hunting users may feel uncomfortable seeing hunters on the trails. Information will be posted at the contact station and kiosk to alert non-hunters of hunting activity, and to recommend wearing blaze orange while walking the trails during hunting season.</p> <p>At Assabet River NWR, bear hunting will only be open during the second bear and shotgun seasons. This restriction will mitigate potential conflicts with user groups such as Urban Education and other youth environmental education programs that take place during first State bear seasons. We anticipate additional conflict to stem from the opening up to hunting of black bear on all three refuges, since neither of them have a current population and sightings of bear in these areas may still be considered a novelty to the public.</p>
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Table B-5. Affected Cultural Resources and Anticipated Impacts

CULTURAL RESOURCES	
AFFECTED RESOURCE	ANTICIPATED IMPACTS
<p>Native American occupation at the refuges began during the Paleoindian period (as early as 12,500 years Before Present (B.P.)) and continued through European Settlement.</p> <p>Five prehistoric sites have been identified at Assabet River NWR (Gallagher et. al. 1986). Assabet River NWR should be considered highly sensitive for such cultural resources. A few farmhouses from the period of European development remain at Assabet River NWR, although all are in a serious state of decay and will be removed at a future date.</p> <p>Oxbow NWR is considered moderately to highly sensitive for archaeological resources in areas not impacted by military ordnance. The refuge has potential to yield archaeological sites that will contribute to our understanding of prehistoric settlement in the region (MHC 1985). There are no known archaeological or historical sites at Oxbow NWR.</p> <p>Several known Native American sites occur within the boundary of Great Meadows NWR (Ritchie 1985). Several farm archaeological sites dating back to Early European settlement occur within the boundary (Gupta 2004, Donahue 2004). There are two federally recognized Indian tribes in the State of Massachusetts, the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts.</p>	<p>No Action No adverse impacts would occur under this alternative.</p> <p>Proposed Action Section 106 of the National Historic Preservation Act of 1966, as amended, requires the Service to evaluate the effects of any of its actions on cultural resources (historic, architectural and archeological properties) that are listed or eligible for listing in the National Register of Historic Places (NRHP). It is believed the proposed action would not likely affect any cultural resources found on the Complex.</p> <p>Hunting, regardless of method or species hunted, is a consumptive activity that does not pose any threat to prehistoric or historic properties on and/or near the refuge. No impacts to cultural resources are anticipated above what may be caused by any refuge visitor. Although hunters would be able to access parts of the refuge that are closed to non-hunters, this access alone is not expected to increase vandalism or disturbance to cultural resources by individuals while they are hunting, nor is it likely that hunters will be more likely to engage in vandalism or disturbance than any other refuge visitor.</p>

Table B-6. Affected Refuge Management and Operations

REFUGE MANAGEMENT & OPERATIONS	
AFFECTED RESOURCE	ANTICIPATED IMPACTS
<p>Eastern Massachusetts NWRC is headquartered at Great Meadows NWR. Great Meadows NWR currently maintains the headquarters building, roads, refuge trails, and an observation tower. Assabet River NWR maintains a Visitor Center, refuge trails, roads, and a fishing/wildlife observation pier. Oxbow NWR maintains a visitor contact station, boat launches, roads, and refuge trails.</p> <p>The eight Eastern Massachusetts NWRs are managed as a Complex, with centrally stationed staff at Great Meadows NWR taking on duties at multiple refuges. At Assabet River NWR there are no full-time staff members. At Oxbow NWR there are no full-time staff members.</p>	<p>No Action Current levels of use are manageable within the Complex’s infrastructure, staffing, and budget. The Refuge Manager coordinates the budget each year to ensure funds are available, and the estimated cost to run the current hunt program is between \$35,000 to \$41,000 annually.</p> <p>Proposed Action The proposed action would open additional refuge lands to hunting. Staff costs are expected to increase as the number of hunting opportunities increase. The estimated initial costs to implement the proposed hunt plan is \$48,500 and the annual costs is \$41,600, which could be offset in part by the permit fee collected. A detailed cost breakdown can be found in the Hunting Plan. There may be a slight increase to traffic on refuge roads, trails, and parking lots during the hunting season. The greatest impact will be to dirt hunter parking lots and boat launches increasing the need to perform more frequent maintenance of these facilities.</p>

Table B-7. Affected Socioeconomics and Anticipated Impacts

SOCIOECONOMICS	
AFFECTED ENVIRONMENT	ANTICIPATED IMPACTS
<p>From an economic perspective, Assabet River, Oxbow, and Great Meadows NWRs provide a variety of environmental and natural resource goods and services used by people either directly or indirectly. Spending in the local area of the refuge units generates and supports economic activity in the Boston MetroWest area.</p> <p>The total economic output of Assabet River, Oxbow, and Great Meadows NWRs in the local economy amounted to approximately \$16,311,000 in 2017 (USFWS 2017). At Assabet River and Great Meadows NWRs, hunting accounted for less than one percent of recreational expenditures on either refuge in 2017. At Oxbow NWR, hunting accounted for three percent of expenditures on recreational activities in 2017.</p>	<p>No Action The current hunting program generates and supports positive economic activity through the multiplier effect, as hunters spend money on hunting equipment, fuel for boats, and patronize local restaurants and business before and after hunting trips on the refuge. This spending cycles through the local economy and contributes to the total economic output as calculated using the IMPLAN analysis. In 2017, an estimated 919,980 users visited the Complex, but only 2,353 were for hunting. In general, hunters contribute more money proportionately than other user groups, with spending on equipment and permits. While not measurable, we assume there may be additional indirect beneficial economic impacts of maintaining the current hunt program by mitigating agricultural damage, reducing vehicle collision, and controlling tick population and Lyme disease.</p> <p>Proposed Action While hunting visitation is expected to increase due to increased opportunities, hunting only accounts for a small portion of local economic impacts generated by all refuge users. Expanding hunting opportunities on the refuge will result in a minor increase in hunter numbers resulting in a small increase in local sales of goods and services. However, direct economic impact is expected to be negligible under this proposed action.</p>

ENVIRONMENTAL JUSTICE	
<p>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 addressing disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.</p>	<p>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 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.</p>

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 *2020-2021 National Wildlife Refuge and National Fish Hatchery Proposed Hunting and Sport Fishing Openings* (2020).”

TABLE B-8. ANTICIPATED CUMULATIVE IMPACTS

Other Past, Present, and Reasonably Activity Foreseeable Impacting Affected Environment	Descriptions of Anticipated Cumulative Impacts
<p>Hunting Hunting occurs on public and private lands that are found adjacent to several units of the refuge. Other national wildlife refuges in Massachusetts that allow hunting include: Parker River NWR, Silvio O. Conte NFWR, Mashpee NWR, and Monomoy NWR. Great Bay NWR in New Hampshire is approximately 60 miles from Great Meadows NWR.</p>	<p>The Service considers hunting to be an important tool for wildlife management. Hunting gives resource managers an effective means to control populations of some species that might otherwise exceed the carrying capacity of their habitat and threaten the well-being of habitats (composition, structure, and function) and other wildlife species, and in some instances, threaten human health and safety.</p> <p>Assabet River, Oxbow, and Great Meadows NWRs conduct their hunting programs within</p>

	<p>the framework of State and Federal regulations. The proposed hunting programs have been reviewed by and are supported by MassWildlife. Additionally, the Complex will coordinate with MassWildlife annually to maintain consistent regulations and programs.</p> <p>Under the Proposed Action Alternative, the refuge would allow the harvest of four new species at Assabet River, three new species at Great Meadows, and three new species at Oxbow NWRs from approximately 40 to 50 new hunters. Even at the local level, the refuge only adds slightly to cumulative impacts on resident wildlife, and a negligible amount to regional and statewide populations. For example, during the 2018 hunt season, 1,458 deer were harvested from WMZ 9, and 2,651 deer from WMZ 10 (of the Statewide total of 14,516), while a total of 50 deer were harvested at the three refuges of the Complex.</p> <p>Annual waterfowl assessments are based upon the distribution, abundance, and flight corridors of migratory birds. An <i>Annual Waterfowl Population Status Report</i> is produced each year and includes the most current breeding population and production information available for waterfowl in North America (USFWS 2017a). An Annual Adaptive Harvest Management Report (AHM) provides the most current data, analyses, and decision-making protocols (USFWS 2017b). These reports are intended to aid the development of waterfowl harvest regulations in the United States for each hunting season.</p> <p>Hunting on the refuge will not add significantly to cumulative impacts of migratory waterfowl management on local, regional, or Atlantic Flyway waterfowl populations, as the percentage to be taken on the refuge, though additive to existing hunting takes, would be a small fraction of the estimated populations. Refuge estimates for annual harvest</p>
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	<p>of migratory game birds suggest that Assabet River NWR will have a take of 25 ducks and 24 geese, Great Meadows NWR will have a take of 75 ducks and 40 geese, and Oxbow NWR will have a take of 22 ducks, 18 geese, and 12 woodcock, total under this proposed expansion. This harvest is relatively small in comparison to the number of waterfowl taken in Massachusetts as a whole, which in 2018 included: 16,400 ducks, 8,900 geese, and 3,500 woodcock (Raftovich et al., 2019). In addition, overall populations will continue to be monitored and future harvests will be adjusted as needed under the existing processes.</p> <p>Management of wildlife populations is important to ensure the health of the ecosystem, and the refuge’s hunting program provides minor, additional beneficial impacts to the cumulative impacts of wildlife management in the State.</p>
<p>Development and Population Increase Assabet River, Oxbow, and Great Meadows NWRs are located in Middlesex and Worcester counties in Massachusetts. Middlesex County is the second-most densely populated in the State. Worcester County is the ninth most densely populated in the State. From April 2010 to July 2018 the population of Middlesex County is estimated to have increased by 7.4 percent. From April 2010 to July 2018 the population of Worcester County is estimated to have increased by 4.1 percent. The population of these counties are expected to continue growing at or above this rate for the next 15 years (Renski et. al 2015). In a study of GIS cover between 1990 and 2010, there was an average 14% change from natural ecosystems (forest, grassland, wetlands) to development in Middlesex County, MA (Tardie, 2010). This trend continues and impacts available</p>	<p>It is uncertain how projected population and development trends in Massachusetts will measurably influence species and hunting impacts. The refuges’ geographic position, diverse biological resources, and accessibility to local and regional communities make them attractive for wildlife dependent recreational uses including environmental education, interpretation, hunting, and fishing. While many lands adjacent to the refuges are State, town, or private conservation lands, there are also some residential areas near refuge properties. Additional development in the area is increasing the urban-wildland interface and can eventually lead to some management conflicts. The slow but steady urban expansion can decrease availability of habitat, and have increasing demands on water resources. However, the slight increases in the number of hunters and visitors from additional outreach and an increasing population can be expected to have a negligible impact. Impacts will in part be influenced by changing societal interests and</p>

<p>habitat for wildlife populations including game species.</p>	<p>other developments (e.g., transportation, equipment).</p> <p>Because the refuge uses an adaptive management approach for its hunt program, reviewing the hunt program annually and revising annually (if necessary), the Service’s hunting program can be adjusted to ensure that it does not contribute further to the cumulative impacts of population growth and development and potentially help mitigate impacts on non-game and game species.</p>
<p>Use of lead ammunition/tackle Lead ammunition is permitted in Massachusetts and on the Eastern Massachusetts NWRC for all hunts except migratory birds and upland game. Only non-toxic shot is permitted for migratory bird and upland game hunting.</p>	<p>With the expanded hunting plans, a small influx in refuge users is anticipated. Any increase in annual hunt visits would increase the addition of lead shot to the local landscape. The refuge only permits the use of lead shot for big game hunting.</p> <p>Under current levels of use, the refuge could expect up to 93 new deer hunters, 51 new turkey hunters, and up to 6 bear hunters in 2020. However, not all of these hunters will use lead ammunition. In 2019, only 33 percent of deer hunters on the Complex used shotguns or muzzleloaders, with the vast majority of hunters using archery equipment. Archery equipment is the only permitted method of take at Great Meadows NWR. If this level of use remains consistent, the refuge can expect up to 90 new big game hunters who may utilize lead shot.</p> <p>This increase in the use of lead ammunition, distributed across 3,401 acres open to firearm big game hunting at the Complex is not expected to result in lead poisoning.</p>
<p>Climate Change Warming, whether it results from anthropogenic or natural sources, is expected to affect a variety of natural processes and associated resources. Based on NOAA’s summary of potential climate</p>	<p>The Service adjusts management based on changing environmental conditions. Hunt programs and mitigation measures will adapt with changing conditions to continue to conserve natural resources and balance compatible recreational uses. The refuge would review the</p>

<p>change effects on Massachusetts (https://statesummaries.ncics.org/chapter/ma/; Runkle, Kunkel et al. 2017), the prediction is that Massachusetts will experience warmer winter and spring temperatures. Average annual temperatures have increased almost 3°F in Massachusetts over the past century. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century, with associated increases in heat wave intensity and decreases in cold wave intensity. Precipitation has increased during the last century, with a record-setting number of extreme events occurring over the last decade. Winter and spring precipitation is projected to increase, as well as heavy precipitation events.</p> <p>Changing the climate threatens ecosystems by disrupting relationships between species. Wildflowers and woody perennials are blooming—and migratory birds are arriving—sooner in spring. Not all species adjust in the same way, however, so the food that one species needs may no longer be available when that species arrives on its migration. Warmer temperatures allow deer populations to increase, leading to a loss of forest underbrush, which makes some animals more vulnerable to predators. Rising temperatures also enable invasive species to move into areas that were previously too cold. (https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ma.pdf).</p>	<p>hunt program annually and revise if necessary, and a refuge Inventory and Monitoring Plan (IMP) is in development.</p>
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Monitoring

Many game species populations are monitored by MassWildlife through field surveys and game harvest reports, which provide an additional means for monitoring populations. Refuge hunters will be required to submit a harvest report at the end of the hunting season. The State has determined that populations of game species are at levels acceptable to support hunting and these assessments are reviewed and adjusted periodically. The refuge will be adaptive towards harvest management under the hunt program to ensure species and habitat health. Refuge-specific hunting regulations may be altered to achieve species-specific harvest objectives in the future. The refuge is currently developing an Inventory and Monitoring Plan (IMP) which is expected to be completed in 2021.

Summary of Analysis

No Action Alternative: There would be no additional costs to the refuge under this alternative. There would be no change to the current public use and wildlife management programs on the refuge. The refuge would not increase its impact on the economy and would not provide new hunting and access opportunities. This alternative has the least direct impacts of physical and biological resources. In addition, this alternative would reduce not meet mandates under the Refuge System Administration Act and Secretarial Order 3356.

Proposed Action Alternative: This alternative is the Service's proposed action because it offers the best opportunity for public hunting that would result in a minimal impact on physical and biological resources, while meeting the Service's mandates under the Refuge System Administration Act and Secretarial Order 3356. The Service believes that hunting on the refuge will not have a significant impact on local or regional wildlife populations because the percentage likely to be harvested on the refuge, though possibly additive to existing hunting takes, would be a tiny fraction of the estimated populations. Additional hunting would not add more than slightly to the cumulative impacts to wildlife from hunting at the local or regional levels, and would only result in minor, negative impacts to wildlife populations.

List of Sources, Agencies and Persons Consulted

Massachusetts Division of Fisheries and Wildlife (MassWildlife)

Michael Huguenin – Assistant Director of Wildlife Research

Johnathan Regosin – Deputy Director

List of Preparers

U.S. Fish and Wildlife Service, Eastern Massachusetts NWR Refuge Complex Staff

Linh Phu – Project Leader

Tom Eagle – Deputy Project Leader

U.S. Fish and Wildlife Service, DOI North Atlantic-Appalachian Region Office Staff

Thomas Bonetti – Senior Planner, Hunting and Fishing Coordinator

Noah Kahn – Hunting and Fishing Chief

Laura Howard – Visitor Services Assistant
Caleb Robitaille – Visitor Services Assistant

State Coordination

Coordination with MassWildlife regarding hunting began with the drafting of Assabet River, Oxbow, and Great Meadows previous hunting plans in 2004. MassWildlife was also involved in each refuge’s CCP process. In preparation for this plan, refuge leadership met with Michael Huguenin (Assistant Director of Wildlife Research) and Johnathan Regosin (Deputy Director) from MassWildlife in May 2019 to discuss proposed changes to the refuge hunting plans. In September 2019, MassWildlife provided a letter with formal comments to the proposed changes and these comments were considered in drafting the hunt plan expansions. A follow up correspondence summarizing areas of expansion was sent to MassWildlife in November 2019.

Tribal Consultation

Refuge staff will coordinate with federally recognized Tribal governments in areas of mutual interest, including hunting opportunities. The Federally recognized tribe that we will be coordinating with is the Mashpee Wampanoag Tribe. We will reach out to this Tribe prior to the release of the draft documents.

Public Outreach

The public will be notified of the availability of the Eastern Massachusetts National Wildlife Refuge Complex Hunting Plan, CD, and EA in April 2020 for a 30-day review and public comment period. We informed the public through local venues, the refuge website, and social media. The refuge will host at least one public meeting during the 30-day public review and comment period.

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: _____ Date: _____

Name/Title/Organization: _____

*Eastern Massachusetts National Wildlife Refuge Complex
Appendix B – Environmental Assessment*

Reviewer Signature: _____ Date: _____

Name/Title: _____

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OTHER APPLICABLE STATUTES, EXECUTIVE ORDERS & 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

Eastern Massachusetts National Wildlife Refuge Complex
Appendix B – Environmental Assessment

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- 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.
- 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).