

Environmental Assessment for a Controlled Deer Hunt on the Lake Lowell Unit of the Deer Flat National Wildlife Refuge

CANYON COUNTY, IDAHO

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1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The Deer Flat National Wildlife Refuge (Refuge) is situated in the Middle Snake subbasin. The Middle Snake subbasin is an area that lies in the Snake River Plain and is surrounded by several mountain ranges: Jarbidge and Owyhee mountains to the southwest, Boulder Mountains and the Sawtooth Range in the northeast, and the Seven Devils and Wallowa mountains surrounding the northwestern areas of the subbasin (Ecovista and IDFG 2004). Nestled in the high desert landscape in southwest Idaho, the Refuge provides important breeding area for birds and mammals, as well as other wildlife.

The Refuge has two management Units, the Snake River Islands and Lake Lowell. The Snake River Islands Unit contains about 800 acres on 101 islands. These islands are distributed along 113 river miles from the Canyon-Ada County Line in Idaho to Farewell Bend in Oregon. This plan is specific to the Lake Lowell Unit approximately 20 miles outside of Boise, Idaho. Lake Lowell is adjacent to Nampa, Idaho, the second largest city in the state. The Lake Lowell Unit is situated on a plateau between the Snake River and Boise River (IDEQ 2010). The Unit encompasses over 10,500 acres, including the almost 9,000-acre Lake Lowell. Lake Lowell is approximately 14.5 square miles in surface area with 28 miles of shoreline. Much of the lake is fringed with riparian habitat and mudflats that are pronounced at low-pool elevation levels (IDEQ 2010). The private lands surrounding the Lake Lowell Unit are a mix of rural irrigated agricultural lands and urban residential housing.

Before settlement, the area that was to become Deer Flat National Wildlife Refuge was a low-lying grassland nourished by many springs. In winter, herds of deer and elk were attracted to the spring fed grassland and marshes. Early settlers dubbed the area as 'Deer Flat' based upon the abundance of wintering animals. With settlement within Southwest Idaho, came the desire to irrigate cropland to sustain the populous. The challenge of irrigating the arid west largely fell to the newly established Bureau of Reclamation. By 1906 local landowners, including James H. Lowell, had lobbied the Bureau of Reclamation to construct an irrigation reservoir at Deer Flat. Upon completion of the reservoir, President Theodore Roosevelt realized the value a nearly 9,000 acre lake in an arid ecosystem would have to wildlife. In 1909 Roosevelt established Deer Flat National Bird Reservation as a "... preserves and breeding grounds for native birds", by Executive Order. In 1937 President Franklin D. Roosevelt by Executive Order reaffirmed the Deer Flat Migratory Waterfowl Refuge with the purpose of "a refuge and breeding grounds for migratory birds and other wildlife".

In 2010 The U.S. Fish and Wildlife Service embarked upon a comprehensive planning process for the Deer Flat National Wildlife Refuge. Upon completion, this Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) will provide guidance for the management of refuge habitats and wildlife and the administration of public uses on refuge lands and waters for 15 years. While the Draft CCP/EIS is still in preparation, preliminary CCP/EIS goals

received public comment prior to the release of the Draft CCP/EIS. Currently, the preliminary CCP/EIS goals for the Refuge are:

Wildlife and Habitat Goals

- Enhance, maintain and protect mudflat, emergent bed and open water habitats of Lake Lowell to benefit migratory birds and other wildlife.
- Enhance, maintain, and protect riparian forest to benefit migratory birds and other riparian dependent species.
- Enhance, maintain, and protect non-lake wetland habitats to benefit migratory birds and other wildlife.
- Enhance, maintain, and protect shrub-steppe habitats characteristic of the historic Columbia Basin.
- Provide agricultural crops to support migrating waterfowl as well as resident wildlife.
- Gather sufficient scientific information to guide responsible adaptive management decisions for Refuge's trust resources.

Public Use and Cultural Resources Goals

- With minimal impact, Refuge visitors experience abundant native wildlife and increase their understanding of the Refuge as wildlife habitat.
- Hunters enjoy a family-friendly, safe, undisturbed, quality hunt that minimally impacts Refuge habitats and wildlife and increases their understanding of the Refuge as wildlife habitat.
- Anglers enjoy a peaceful, family-friendly, quality fishing opportunity that minimally impacts Refuge habitats and wildlife and increases their understanding of the Refuge as wildlife habitat.
- Students, teachers and visitors understand the biology and management of the Refuge, the mission of the National Wildlife Refuge System and how to help conserve the Refuge and other wildlife habitats.
- Visitors feel safe during their visit and understand Refuge regulations and how they help protect wildlife, wildlife habitat and other visitors.
- Develop cooperative opportunities to build support for the Refuge and instill an understanding of the Refuge as wildlife habitat.
- Protect and manage Refuge cultural resources.

Until the CCP/EIS is finalized and approved, the aforementioned goals are subject to change. Additionally until the CCP/EIS is approved and implemented, the Refuge will maintain current management of the Refuge's wildlife and habitat programs. Refuge management will continue to have an emphasis on the Lake Lowell Unit focused on invasive species control with opportunistic restoration projects. The Refuge will continue to provide unique local habitat amidst surrounding agricultural and suburban landscapes. The emergent vegetation along the shorelines of Lake Lowell being among the distinctive Refuge environments supporting nesting grebes, foraging waterfowl and wading birds, and numerous fisheries within the lake.

1.2 PROPOSED ACTION

Initially in the CCP/EIS planning process and during public scoping deer management, deer hunting opportunities, and agricultural depredation, were identified as important issues to both the Idaho Department of Fish and Game (IDFG) and select community members. While CCPs generally address these types of topics, the significance of these issues has prompted the U.S. Fish and Wildlife Service (Service) to address deer management and deer hunting at the Refuge in a different and more expeditious format.

The Service is proposing to initiate an annual, safe, high quality, walk-in controlled deer hunting program beginning in the fall of 2012 on portions of the Lake Lowell Unit of Deer Flat NWR. The hunt will create a safe and quality recreational opportunity providing a reasonable opportunity to harvest game. Additionally, proposed is a depredation hunt intended to alleviate local agricultural depredation to lands surrounding the Refuge.

1.3 PURPOSE AND NEED

Nighttime spotlight surveys have estimated a minimum localized population of 125 deer residing on or near the Refuge during spring and early summer. The Refuge provides hiding and resting cover for deer. The foraging requirements for local deer are often obtained off the Refuge on adjacent private lands. Many adjoining private lands are under production for crops, providing seasonally important and enticing feed for deer, particularly when much of the natural vegetation on refuge is inundated with water in the spring.

The Refuge is surrounded by IDFG's Game Management Unit (GMU) 38. Deer management in the adjoining GMU 38 allows for high doe harvest to control the population and reduce depredation. The Refuge is a small part of the overall deer population in GMU 38, but contributes significantly to the local depredation issues. This proposed controlled hunt will be reviewed annually to measure its success in creating a quality and safe recreational experiences, alleviating depredation complaints, and reducing the local deer population. Additionally, this proposal will annually evaluate impacts to deer management, other resources, and programs; and the necessary measures to negate these impacts.

Hunting is identified by the National Wildlife Refuge Improvement Act of 1997 (Improvement Act)(Public Law 105-57) as a priority use for refuges when it is compatible with the refuge purpose and mission of the Refuge System. Hunting programs operations that are consistent and compatible with the refuge's purposes and goals, can provide a quality experience for the public. These programs contribute to the continuation of America's traditions and heritage in wildlife conservation and outdoor recreation.

Mule deer are Idaho's most abundant and widely-distributed big game animal. Individual mule deer in Idaho may also be migratory commonly traveling 20-100 miles between summer range and winter range. The 'Deer Flat' had long history of supporting wintering mule deer. Mule deer are largely dependent upon the fat stored during the spring, summer, and fall to survive winter. In the best winter range, deer lose weight throughout the winter. A main strategy for

winter survival is securing habitat with adequate thermal cover to conserve energy by becoming sedentary. To support this strategy, energy loss would be minimized by sufficient food resources in close proximity to cover habitat (IDFG 2010). The Refuge provides hiding and resting cover for a variety of wildlife, including deer. The juxtaposition of agricultural crops, especially row-crops and fruit/nursery trees, readily afford the resident deer feeding opportunities on nearby private property. Seasonally, private lands are under production for crops, providing important and enticing feed for deer. There has been a long history of depredation complaints in the agricultural area surrounding Lake Lowell. Complaints include direct browsing or rubbing on orchard and nursery stock, grazing on alfalfa stands or carrots planted for seed production. Recent depredations to carrot seed crops near Lake Lowell may amount to \$10,000 lost in annual seed production to a single producer. Idaho Code 36-1108 identifies appropriate actions IDFG must take to address depredation situations. Conditionally, IDFG may additionally be required to compensate for crop damages caused by deer. The biological purpose of this proposed action is to reduce the Refuge deer population to alleviate local agricultural depredation to lands neighboring the Refuge.

1.4 OTHER NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTS

The Service is currently developing a separate NEPA compliant document to provide guidance for the management of Refuge habitats and wildlife and the administration of public uses on Refuge lands and waters for 15 years. This CCP/EIS is scheduled to be available in draft form to the public in the spring of 2012. Preplanning and public scoping for the CCP/EIS identified deer hunting opportunities, deer management, and agricultural depredation, as an important topics for both the IDFG and community members. Consistent with NEPA, its implementing regulations and Service NEPA procedures, The Environmental Assessment for a Controlled Deer Hunt on the Lake Lowell Unit has been prepared to evaluate the effects on the human environment of opening portions of the Refuge to deer hunting.

1.5 DECISION TO BE MADE

Based on the analysis documented in this Environmental Assessment and supporting documents, the Regional Chief of Refuges for the U.S. Fish and Wildlife Service Pacific Region will determine whether or not to initiate controlled deer hunt and depredation hunt seasons on the Lake Lowell Unit of the Deer Flat National Wildlife Refuge, and whether or not preparation of an Environmental Impact Statement (EIS) is necessary. If the Regional Chief determines that the hunting programs should be initiated and that an EIS is not necessary, a Finding of No Significant Impact (FONSI) would be prepared, which would highlight the alternative selected for implementation. Following the signing of the FONSI, the preferred alternative in this Environmental Assessment would be implemented.

1.6 ISSUES

The issues that have been identified by the Service to be important in the decision making process to implement controlled and depredation deer hunts are biological, social and economic in nature. No impacts would be expected on physical resources such as soil, water and air. The issues include impacts on; deer; shrub steppe, riparian, and wetland habitats and their associated

wildlife species; federally-listed threatened species; and human concerns about cultural resources, impacts to private land, recreation, and economics.

1.6.1 BIOLOGICAL ISSUES

1.6.1.1 IMPACTS ON DEER

The primary issues regarding impacts to deer are direct effects associated with hunter harvest both on and off the Refuge and disturbance to deer that could potentially change the distribution of deer with regards to non-hunter areas.

1.6.1.2 IMPACTS ON SHRUB STEPPE, RIPARIAN, AND WETLAND HABITAT AND ASSOCIATED WILDLIFE

The primary issues concerning the effects of alternatives on shrub steppe and riparian habitats is alteration to vegetative communities, introduction of invasive species, and any impacts associated with the unintended redistribution of wildlife.

1.6.1.3 IMPACTS ON FEDERALLY LISTED THREATENED SPECIES

There are no known federally-listed threatened species in the hunt area.

1.6.2 SOCIAL AND ECONOMIC ISSUES

1.6.2.1 CULTURAL RESOURCES

Cultural resources on the Refuge take the form of archaeological artifacts associated with seasonal Native American encampments and food processing sites, historic homesteads and dump sites, and examples of historic construction and agriculture techniques such as drainage ditches or water control structures. Actions associated with implementing a hunt that may adversely affect these resources unless mitigated include vandalism and theft associated with increased visitation in the hunting units. Additionally, human activities which destroy artifacts or relocate their relative position, thereby, destroying information on their historic context. Cultural resource protection is required on all refuges. Project proposals must be reviewed for compliance. Protection involves survey of the project areas, avoidance of cultural sites or mitigation. Mitigation can involve more detailed survey and study of resources prior to implementing actions that will impact them. The risk of theft and vandalism may increase through the course of the hunting season as more areas of the Refuge are open to visitors.

1.6.2.2 IMPACTS ON ADJACENT LANDS

Depredation by deer on nursery/fruit trees and agricultural crops is the primary issue concerning impacts on private lands. While hunting activities on the Refuge should have a positive impact on those adjacent lands currently experiencing deer depredations, these activities could inadvertently shift depredation patterns to new locations, as result of increasing disturbance within current sanctuary areas and increased hunting pressure. Another primary issue is the

impacts of a Refuge deer hunt program on adjoining private residences along the south boundary of the Lake Lowell Unit.

1.6.2.3 IMPACTS TO OTHER RECREATIONAL OPPORTUNITIES

The primary issues concerning other recreational pursuits on the Refuge are the effects the deer hunts would have on the quality of the experience of the participants. The indicators used to evaluate effects of the proposed action on the key issue of recreation were based on the opportunities for several classes of public uses including nature/wildlife observation and bird watching, compatible non-motorized trail activities, and conflicts with other recreational groups.

Hunting could have an effect on these activities by either decreasing or increasing the abundance of wildlife through disturbance by hunters causing a variety of animals to move away from the hunted zones, safety conflicts between hunters and other recreationists, or diminishing the aesthetic value of the experience by the occasional sound of shots and perhaps even the knowledge that hunters are on the Refuge as evidenced by parked vehicles in lots and the sight of hunters transporting their harvested animals.

1.6.3.4 IMPACTS TO ECONOMICS

The economic issues associated with hunting on Deer Flat NWR are associated with the contributions that hunters would make to the local and regional economies as a result of expenditures for both activity-related equipment purchases and travel-related goods and services.

2.0 ALTERNATIVES INCLUDING THE PREFERRED ALTERNATIVE

2.1 INTRODUCTION

This section outlines three alternatives to manage deer populations on the Refuge. The action alternatives (Alternatives B and C) both serve to annually reduce the localized population of deer by establishing a deer hunt program along the southern Refuge boundary of the Lake Lowell Unit of Deer Flat NWR. The deer population has the potential to increase either through immigration or by reproduction. The herd is unlikely to decrease through emigration since deer experience increasing disturbance from human activities on private land neighboring the Refuge especially hunting. Deer would primarily use the relatively disturbance free portions of the Refuge leaving opportunistically to browse on adjoining agricultural lands. Initiating a deer hunt on the Refuge would provide a compatible recreational hunting opportunity to the public not previously available and is expected to reduce the impact of deer on neighboring lands. A deer hunt would serve to distribute deer from the Refuge's closed area which may be used disproportionately to other parts of their range on the Refuge.

2.2 ALTERNATIVES

2.2.1 ALTERNATIVE A - NO ACTION

Under the No Action Alternative, the deer population has the potential to increase either through immigration or by reproduction. The herd is unlikely to decrease through emigration since deer

experience increasing disturbance from human activities on private land surrounding the Refuge especially hunting. Additionally with local trends toward urbanization, deer have little incentive to emigrate from secure undeveloped habitat to areas with a higher population density, greater disturbance, and increased number of hazards. Deer would primarily continue to use the relatively disturbance free portions of the Refuge leaving opportunistically to feed on adjoining agricultural lands. GMU 38 would continue a short-range weapon general deer seasons with liberalized harvest of antlerless deer to reduce populations. Consistent with Idaho Code 36-1108, IDFG would continue to address confirmed depredation complaints utilizing integrated strategies including hazing, permanent fencing, depredation hunts, kill permits, and perpetual easements on private lands. Conditionally, IDFG may be required to compensate for crop damages caused by deer in the immediate vicinity.

2.2.2 ALTERNATIVE B – CONTROLLED DEER HUNT WITH OPTIONAL DEPREDATION HUNT ON REFUGE (PREFERRED ALTERNATIVE)

Beginning in the fall of 2012, the Refuge proposes to implement controlled and depredation deer hunt seasons on portions of the Lake Lowell Unit consistent with the IDFG's seasons, bag limits, and special conditions for GMU 38, which surrounds Lake Lowell. Annually, a set total of forty-five controlled hunt permits would be let for the Refuge controlled deer seasons. IDFG and Refuge personnel will work collaboratively to assess the success of the Refuge controlled deer hunt season and to evaluate the need for additional Refuge depredation permits.

Controlled Deer Season:

A set total of forty-five permits would be let for the Refuge controlled deer hunt season. The hunt would create a safe and quality recreational opportunity providing a reasonable opportunity to harvest game. Additionally, the hunt would be predominantly for antlerless deer with a goal of population reduction to reduce localized depredation complaints. Hunt seasons would be distributed into four antlerless controlled deer hunts with 10 permits each with each hunt spanning 20 days to distribute hunting pressure evenly over the entire season. Additionally an antlered deer controlled hunt would be allowed consisting of 5 permits. Table 2.2.2 shows the allocation of permits and seasons for the Preferred Alternative. The controlled antlered hunt would provide a quality hunt opportunity for bucks during the rut, while additionally reducing localized depredations. IDFG would use its pre-existing hunting framework to manage the controlled hunt. Within the State framework, hunters are allowed to harvest an Extra Antlerless Deer. The Extra Antlerless Deer harvest allows hunters to apply for special permits, as an extra deer, even if they are putting in for other controlled hunts. Hunters are allowed two deer under this mechanism, but only one deer within this specific controlled hunt. This is a regularly used framework to help attract hunters to controlled hunts that reduce deer populations when there is the potential that a controlled hunt be under subscribed.

Special Depredation Season:

IDFG and Refuge personnel will work collaboratively to assess the success of the Refuge

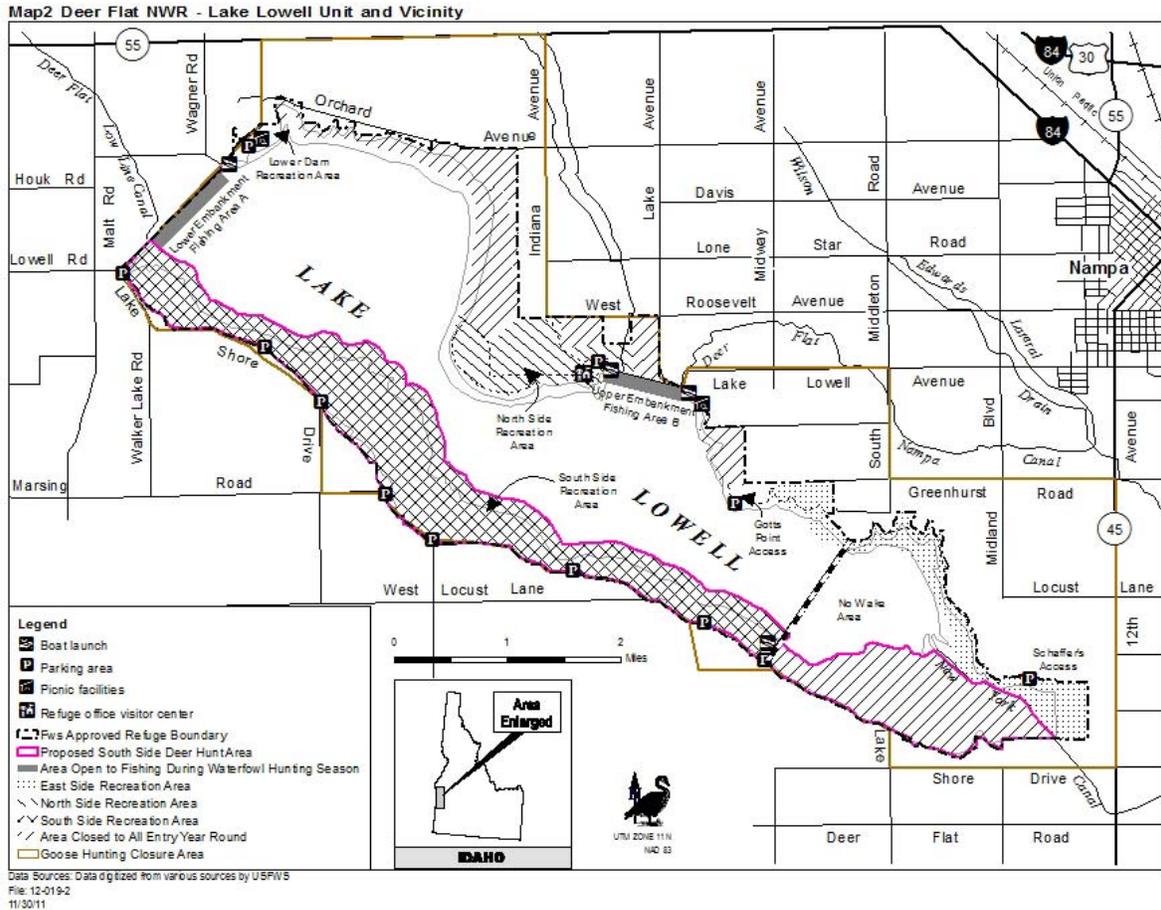
controlled deer hunt toward population reduction and to evaluate the need for additional Refuge depredation permits. Continuous collaboration on deer management will ensure that depredation hunt permits adequately address localized depredation issues while not extirpating the Refuge deer population. As established in Idaho Code 36-1108, IDFG would continue to receive and address depredation complaints where appropriate. Upon receipt of a depredation complaint, a delegate of IDFG would contact the landowner to determine the validity and seriousness of the complaint. The delegate of IDFG would inform the landowner of prevention options. These prevention options may include hazing, permanent fencing, depredation hunts, kill permits, and continued use agreements and perpetual easements. Under Idaho Administrative Rules (IDAPA 13.01.0800) depredation hunts may be prescribed to address depredation issues. If depredation hunts are prescribed, the request for the depredation hunt is forwarded to the IDFG Regional Supervisor for approval. The Regional Supervisor would evaluate the potential for crop loss, number of animals involved, anticipated effectiveness of the hunt to minimize damage, opportunity to harvest offending animals, and potential safety issues. Upon mutual IDFG and Refuge approval, permits would be issued to hunters to harvest of deer from the Refuge. If the depredation permits are found to be necessary, depredation hunts will be conducted in a way to minimize impacts to wildlife resources. To maintain flexibility in the program and to promptly and efficiently address depredation issues, the seasonality and duration of the depredation hunting season would individually be prescribed to have a high probability to resolve valid depredation complaints through direct harvest of deer on Refuge. Typically depredation hunts would be set outside the normal deer hunting season because of a lack of hunters available to be directed to the problem area.

Table 2.2

Proposed Controlled Hunt Season for the Lowell Unit, Deer Flat NWR:

Type of Hunt	Period	Permits Issued per Hunt	Duration
Antlerless Extra Deer	Oct 10 –Oct 29	10	20 days
Antlerless Extra Deer	Oct 30 – Nov 18	10	20 days
Antlerless Extra Deer	Nov 19- Dec 8	10	20 days
Antlerless Extra Deer	Dec 9 – Dec 28	10	20 days
Antlered Deer	Oct 10-Nov 24	5	46 days
Depredation Hunt – as set by IDFG/Refuge	Outside of Oct 10-Nov 24	As needed to adequately address localized depredation issues.	As needed to adequately address localized depredation issues.

The hunts would occur in designated areas on Service-owned lands, generally described as the south shoreline of Lake Lowell between Parking Lot 8 to the New York Canal. This area is between 880 to 2200 acres comprised depending upon the level of Lake Lowell comprised of mostly of riparian forest and wetland shoreline. Map 2 illustrates the areas to be opened for deer hunting.



The Refuge would implement, as needed, spatial and /or temporal closure areas to protect sensitive non-target wildlife resources such as eagle nests or waterbird nesting colonies. Of specific concern are nesting eagles, herons and grebes that may occur after the controlled deer hunt season, often in early February to March, as well as large concentrations of wintering waterfowl. Upon detection, sensitive resources would be mapped and closure areas established to buffer the resource. Hunters would be required to obtain a description of areas seasonally closed to hunting and other Refuge specific regulations. When complete, CCP/EIS will establish the size of buffers necessary and appropriate for sensitive wildlife resources.

Consistent with the hunting conditions on the surrounding GMU 38, hunting on Lake Lowell Unit would be limited to short-ranged weapons. Weapons currently allowed in GMU 38 include muzzleloaders, archery equipment, crossbow, shotgun using slugs or shot of size #00 buck or larger, or a handgun using straight-walled cartridge not originally developed for rifles. This restriction is imperative due to the many interspersed tracts of private land, thus creating a safety issue for long-range weapons. The controlled deer hunt would require the use of hunter supplied temporary tree stands. By requiring hunting to take place in tree stands, the trajectory of weapons would be downward and any errant shots would be directed toward the ground, preventing the potential for projectiles to carry over to adjacent properties. No permanent structures would be constructed on Service lands; therefore, only temporary portable tree stands would be authorized.

2.2.3 ALTERNATIVE C –DEER DEPREDATION HUNT ONLY ON REFUGE

Beginning in the fall of 2012, the Refuge would implement a depredation hunt season on portions of the Lake Lowell Unit. IDFG and Refuge personnel will work collaboratively throughout the year to evaluate the number of Refuge depredation permits to adequately address localized depredation issues while not extirpating the Refuge deer population. The actual amount of depredation permits issued in a given season would be directly related with the number of valid local depredation complaints associated with deer residing on the Refuge.

The Refuge could permit depredation hunts on Service lands to address specific agricultural depredation complaints. As established in Idaho Code 36-1108, IDFG would continue to receive and address depredation complaints where appropriate. Upon receipt of a depredation complaint, a delegate of IDFG would contact the landowner to determine the validity and seriousness of the complaint. The delegate of IDFG would inform the landowner of prevention options. These prevention options may include hazing, permanent fencing, depredation hunts, kill permits, and continued use agreements and perpetual easements. Under Idaho Administrative Rules (IDAPA 13.01.0800) depredation hunts may be prescribed to address depredation issues. If depredation hunts are prescribed, the request for the depredation hunt is forwarded to the IDFG Regional Supervisor for approval. The Regional Supervisor would evaluate the potential for crop loss, number of animals involved, anticipated effectiveness of the hunt to minimize damage, opportunity to harvest offending animals, and potential safety issues. Upon mutual IDFG and Refuge approval, permits would be issued to hunters to harvest of deer from the Refuge. To maintain flexibility in the program and to promptly and efficiently address depredation issues, the seasonality and duration of the depredation hunting season would individually be prescribed to have a high probability to resolve valid depredation complaints through direct harvest of deer on Refuge. Typically depredation hunts would be set outside the normal deer hunting season because of a lack of hunters available to be directed to the problem area.

In contrast to Alternative B, no controlled deer hunt permits would be issued to hunt the Refuge during the regular deer hunting season. Permits for deer harvest would be issued specifically on the basis of confirmed and valid depredation complaints. Comparable to Alternative B, the Refuge would annually produce a map of sensitive resources and seasonal closures on Service-owned lands and hunters issued depredation permits would be required to meet with Service personnel to attain a description of seasonal closures and other Refuge specific regulations. Additionally, consistent with the hunting conditions on the surrounding GMU 38, hunting on Lake Lowell would be limited to short-ranged weapons. This restriction is imperative due to the many interspersed tracts of private land, thus creating a safety issue for long-range weapons. Depredation hunts would be achieved from hunter supplied temporary tree stands, comparable to Alternative B. No permanent structures would be constructed on Service lands, therefore, only temporary portable tree stands would be authorized.

3.0 AFFECTED ENVIRONMENT

3.1 GENERAL OVERVIEW OF THE REFUGE ENVIRONMENT

The Deer Flat NWR planning area is situated in a dry climate region characterized by hot and dry summer months and cold and wet mild winters (IDEQ 2010). Climate in Idaho is largely governed by two influences: the Continental Divide and the Pacific Ocean. Although Deer Flat NWR is located more than 300 miles from the Pacific Ocean, its climate is nevertheless affected by the air that is borne eastward on the prevailing westerly winds from the coast (WRCC 2011a). The primary source of moisture for precipitation in Idaho is the Pacific Ocean (WRCC 2011a). By the time the weather patterns from the Pacific Ocean arrive at Deer Flat NWR, relatively little precipitation remains. In portions of the Boise, Payette, and Weiser river drainages, less than 30 percent of the annual precipitation falls between the months of April and September (WRCC 2011a). The dry season in southern Idaho tends to end by October (IDEQ 2010).

It is rare that Idaho experiences periods of extreme heat or cold that last more than a week at a time, because the normal ongoing progression of weather systems moving across the state usually results in weather changes at rather frequent intervals (WRCC 2011a). The highest temperatures for the refuge area tend to occur in July and August and the lowest temperatures in December and January (WRCC 2011b).

The Lake Lowell Unit of Deer Flat NWR is situated on a plateau between the Snake River and Boise River (IDEQ 2010). The lake was formed by three earth-fill embankments and one dike that hold water in a natural topographic depression in the Lower Boise River Valley: Deer Flat Upper Dam, Deer Flat Middle Dam, Deer Flat Lower Dam, and Deer Flat East Dike (BOR 2011; Ferrari 1995; IDEQ 2010; Simonds 1997). The Lake Lowell watershed covers approximately 63.5 square miles of the Lower Boise River Subbasin within Ada and Canyon counties (IDEQ 2010). Lake Lowell is primarily filled by water diverted at the Boise River Diversion Dam and conveyed to the lake via the 40-mile-long New York Canal, which discharges into the eastern (upper) end of the lake (BOR 2011). Ridenbaugh Canal is also diverted off the Boise River and flows through the densely populated areas of Boise, Meridian, and southeast Nampa before joining the New York Canal just before it flows into Lake Lowell (IDEQ 2010). Other water inputs to the lake via the New York Canal include stormwater from surrounding population centers and agricultural runoff from lands in southern Ada and Canyon counties. Lake Lowell's shoreline sits at 2,531 feet above MSL at full pool, 300 feet lower in elevation than the origin of the New York Canal (IDEQ 2010). The highest upland areas within the refuge boundary at Lake Lowell sit at approximately 2,640 feet above MSL.

Lake Lowell is 14.5 square miles in surface area, has 28 miles of shoreline, and covers approximately 9,000 surface acres at full pool (IDEQ 2010). Lake Lowell is managed first for irrigation purposes. The water stored in the lake irrigates 302,264 acres of land in the Snake and Boise river basins throughout the summer (IDEQ 2010). Water storage in the lake declines rapidly from late June through August as the irrigation releases exceed inflow from the New York Canal (IDEQ 2010). The lowest water levels are generally reached in late August or early September, exposing mudflats around the shallower portions of the lake; levels rise again in the fall as irrigation demands subside and the New York Canal continues to flow (IDEQ 2010). Figure 3.1 provides a graph of the annual average water levels by month. Much of the lake is fringed with riparian habitat including willow and cottonwood transitioning into shrub steppe vegetation in the higher arid terraces.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 DEER

This section will focus on the Refuge's most abundant deer, mule deer (*Odocoileus hemionus*). White-tailed deer (*Odocoileus virginianus*) may also be harvested in GMU 38, but are far less common on the Refuge. Mule deer are Idaho's most abundant and widely distributed big game animal providing more recreational opportunity than any other big game species (IDFG 2010). Mule deer densities are highest in Idaho south of the Salmon River. Conversely, north of the Salmon River mule deer are scattered in suitable habitat with white-tailed deer being the dominant deer species (IDFG 2010). Much of Idaho's historic mule deer winter range has been developed and is now occupied by man. Ranches, agriculture, subdivisions, and industry in the lower elevation and foothills have eliminated winter range. Mule deer are known to range from 20-100 miles between summer and winter range (IDFG 2010). Transportation corridors, fencing, and urbanization within mule deer range may disrupt or even eliminate migrations, encouraging residency in secure habitat and forcing deer into marginal habitat that may increase mortality. When mule deer range is interspersed with agriculture, deer commonly damage standing and stored crops. Depredation by mule deer is common to hay, ornamental plants, nursery trees, orchards, and row crops. Population surveys are not conducted within GMU 38 due to logistical challenges that make such surveys costly and complex. The mule deer population within Southwest Region of Idaho is generally robust and healthy. The three GMUs adjacent to GMU 38 (GMUs 32, 39, and 40) have an estimated mule deer population of over 55,000 animals, as projected after the annual hunt season. Initial deer surveys conducted on the Refuge and adjacent agricultural lands have estimated a minimum count of 125 deer proximal to the Refuge. The bulk of the local deer population has been observed along the south shore of Lake Lowell both on and off refuge property. The deer are seemingly using the riparian areas between the Refuge boundary and shoreline of Lake Lowell, an area that ranges from 880-2200 acres depending upon the elevation of water held in the lake. Regionally, riparian vegetation is somewhat uncommon and occupies a small proportion of the land area. However, it has an extremely important function in providing for the year-round habitat requirements of mule deer. These linear habitat features provide mature trees for thermal and screening cover and drainage patterns promote pooling of water, growth of forbs, and a greater diversity of important shrubs. Mule deer are primarily browsers, with a majority of their diet comprised of forbs (weeds) and browse (leaves and twigs of woody shrubs). Deer digestive tracts have a small rumen in relation to their body size and so they generally must be more selective in their feeding. Instead of eating large quantities of low-quality feed like grass, deer select the most nutritious plants and parts of plants. Because of this, deer have more specific forage requirements than larger ruminants (Cox et al. 2009). These foraging requirements are being filled through consumption of riparian vegetation on refuge and crops off Refuge.

The effects of harvest mortality are highly variable in mule deer. In Idaho most annual mortality is not hunter-harvest related. Factors such as predation, malnourishment over winter, accidents, and disease are responsible for most deaths in mule deer population. Therefore, population response tends to be independent of harvest. An exception includes antlerless opportunities designed to stabilize or reduce populations. Additionally, buck harvest during periods when bucks are vulnerable (rut, winter range), can reduce the proportion of bucks and particularly

older bucks in the population (IDFG 2010). Table 3.2.1 shows a decade of deer harvest data from the GMU 38 that surrounds Lake Lowell. Over the decade more than 2300 deer have been harvested with approximately 54% of the harvest on antlerless deer. The Preferred Alternative intends to apply hunting pressure over the duration of the hunting season to disperse deer from the Refuge and into the surrounding GMU 38. Additionally the Preferred Alternative intends to influence local deer numbers through focused antlerless harvest. The Preferred Alternative would offer a limited number of permits to capitalize on buck harvest during the rutting season while providing an expanded local hunting opportunity.

Table 3.2.1 GMU 38 General Deer Harvest Statistics (Short-Range Weapon)

Year	Hunters*	Harvest	Success%	Days	Antlered	Antlerless	%4+Pts	%5+Pts	% Whitetail
2010	858	260	30	3381	103	157	15	6	1
2009	980	240	25	4279	119	121	21	11	1
2008	1023	230	23	4351	74	151	19	3	1
2007	855	268	31	3154	84	182	22	6	9
2006	710	206	29		84	116	19	4	5
2005	745	224	30	2904	109	115	12	5	2
2004	706	171	24	2463	79	92	20	9	1
2003	2350	244	10	9326	131	109	20	6	1
2002	1023	206	20	5399	117	89	24	6	1
2001	963	294	31	3162	155	139	21	7	3

Source: <http://fishandgame.idaho.gov>

3.2.1 SHRUB STEPPE, RIPARIAN, AND WETLAND HABITAT AND ASSOCIATED WILDLIFE

Shrub Steppe and Associated Wildlife:

Currently the Lake Lowell Unit has approximately 920 acres of upland or shrub steppe habitat. These uplands typically consist of patches of sagebrush with a cheatgrass understory between agricultural fields, fences, roads, and irrigation dikes. Intact shrub steppe habitat would be characterized by unfragmented habitat blocks with native shrubs including sagebrush, bitterbrush, saltbush, and rabbitbrush with a native understory of native perennial forbs/bunchgrasses (bluebunch wheatgrass, Great Basin wildrye, Idaho fescue) and exposed areas of bare ground. Even though the current condition may be degraded, these areas provide nesting and foraging habitat for ground-nesting birds, resting and feeding areas for flocks of geese, foraging space for raptors, and habitat for small mammals and other wildlife. The area near the Visitor Center has the largest contiguous piece of sagebrush habitat on the Refuge at approximately 553 acres. The construction of Lake Lowell directly reduced the area of shrub steppe habitat, as sagelands were among those habitats inundated by the lakebed.

Wildlife that depend on sagebrush habitats are thought to be among the most imperiled in North America (Mac et al. 1998; Knick et al. 2003; Dobkin & Sauder 2004). Populations of shrubland and grassland birds, which represent an important component of the biodiversity in the western United States, are declining more rapidly than other groups of bird species in North America (Dobkin 1994; Saab & Rich 1997; Vickery & Herkert 2002). Most of this decline can be attributed to the once greater than 60 million ha of the intermountain west shrub steppe habitat being degraded, fragmented, converted to agriculture, or changed to vegetative states dominated by exotic annual grasses (West 1996; Miller & Eddleman 2001; Wisdom et al. 2005a). These

disturbance regimes have accelerated the loss of sagebrush ecosystems (West & Young 2000; Bunting et al. 2003) to a point where the ecological integrity has been pushed beyond a threshold from which they can recover (Allen 1988; Belnap & Lange 2001). Conservation and restoration of sagebrush lands are becoming high priorities for natural-resource agencies because of changing attitudes about the intrinsic value of sagebrush ecosystems, and the threat of petitions to list species under the Endangered Species Act (Bureau of Land Management 2002a). Less than 3% of the area dominated by sagebrush lies within areas that receive permanent legal protection (Wright et al. 2001). An estimated 99% of historical sagebrush habitats in the Snake River Plain now are used for cropland (Hironaka et al. 1983).

Many species are considered sagebrush obligate species, meaning that they require sagebrush to complete part of their life cycles (i.e., breeding, nesting, and successful reproduction). Many other species rely on sagebrush as part of their diet or for nesting, resting, or hiding cover. Some species, such as western sage grouse, (*Centrocercus urophasianus*), once a flourishing game bird, is now a federal candidate species for listing as threatened, relegated to very restrictive hunting seasons. Non-game species, such as loggerhead shrike (*Lanius ludovicianus*), sage sparrow (*Amphispiza belli*), and sage trashers (*Oreoscoptes montanus*), have fallen victim to habitat conversion and degradation. Although not specifically sage-obligate species, horned larks (*Eremophila alpestris*) and meadowlarks (*Sturnella neglecta*) are frequent nesting birds in sagebrush/bunchgrass habitats. Due to fragmentation and degradation of the habitat, western sage grouse does not use Refuge habitats.

Riparian and Associated Wildlife:

The Lake Lowell Unit contains approximately 2,116 acres of riparian and/or floodplain forest habitat in various seral stages. Before the construction of the reservoir, the area consisted of typical sagebrush steppe habitat that included springs and small riparian oases associated with these springs. The flooding of the reservoir eliminated the original habitats but over time riparian habitat re-established on the perimeter of the lake. Currently the majority of shoreline around Lake Lowell is a riparian zone dominated by eastern cottonwood, Russian olive, coyote and peach leaf willows, and false indigo bush. Most of this habitat on the Refuge is in a degraded condition due to invasive plants, past grazing practices, alteration of hydrologic regimes, and potentially poor native plant recruitment/recovery. Optimally, the riparian community would be a mosaic of early, mid, and late successional riparian forests comprised of canopy and sub-canopy woody species (e.g., great plains cottonwood, peachleaf willow) and native a mix of native shrubs (e.g., willows, golden currant, wild rose, elderberry).

Numerous bird species occasionally use riparian areas, while others are fully dependent on those areas- common species include American robin (*Turdus migratorius*), song sparrows (*Melospiza melodia*), and dark-eyed juncos (*Junco hyemalis*). Upland gamebirds that use this habitat include ring-necked pheasant (*phasianus colchicus*) and California quail (*Callipepla californica*). Cottonwood forests are used by herons and egrets for communal nesting colonies. Snags are used by many raptors for perching, woodpeckers for foraging and wood ducks and owls for nesting. Intact riparian areas, which support a higher diversity of breeding birds than do all other western habitats combined, are important to the conservation of Idaho's neotropical migrant birds (Anderson and Ohmart 1977, Johnson et al 1977, Johnson and Haight 1985). Over 60% of

western neotropical birds use riparian areas during the breeding season or as a stopover for migration (Krueper 1993). One study has shown that some riparian areas harbor up to 10 times the number of neotropical migrants than neighboring non-riparian habitats (Stevens et al. 1977).

Wetlands and Associated Wildlife:

Deer Flat NWR was established to provide a refuge and breeding grounds for migratory birds and other wildlife. The Refuge is within the Pacific Flyway and serves as an important resting and breeding location for neotropical migrants, migratory waterfowl, and shorebirds in an otherwise arid landscape. Deer Flat NWR has been identified as a notable waterbird site (The Intermountain West Waterbird Conservation Plan, Ivey and Herziger 2006), an “important site for aquatic birds in Idaho (Manning and Hartley 2006), and as a Globally Important Bird Area (American Bird Conservancy, IDFG and Audubon). Nineteen species of birds that utilize the Refuge’s emergent beds, open waters and mudflats are listed by The Idaho Comprehensive Wildlife Conservation Need Strategy as species of greatest conservation need. These species include Western and Clark’s grebes, northern pintail, great egret, and hooded merganser.

Several distinct wetland habitats are represented within the Lake Lowell lakebed. Seasonally flooded areas produce emergent plant beds (i.e., plants that grow in the water but pierce the water surface) on Lake Lowell benefiting aquatic migratory birds (e.g., Western and Clark’s grebes, mallards, etc) and other fish and wildlife. Emergent plant beds are exemplified by desirable moist-soil plants (e.g., smartweeds, spikerushes, salt grass) interspersed with taller emergent plants (e.g., bulrush, burreed, and cattail). Approximately 77 species in Idaho utilize marshes and lakes and 55 species depend on lakes and emergent beds as their primary habitat (Idaho Partners Flight 2000). Emergent beds typically occur along the entire south and east shoreline of Lake Lowell as well as pockets along the north shoreline. Lake Lowell’s approximately 1,200 acres of emergent plant beds are comprised predominantly of water smartweed, (*Polygonum coccineum*).

Lake Lowell also seasonally offers mudflat habitat important for a diversity of shorebirds. Mudflats are most common after July and August when water levels are at or below 2518 feet (MSL). Mudflats are characterized by sparse to no emergent or woody vegetation. Macro-invertebrates (e.g. chironomids) within the mudflats are a primary food resource for migratory shorebirds. Shorebirds depend upon wetland stopover sites like this to replenish depleted fat reserves used in their migratory flight (Trost et al. 1989, Hunter et al. 1991). The Intermountain West Regional Shorebird Plan identified Lake Lowell as one of only 2 sites in Idaho with greater than 5,000 shorebirds in more than half the years surveyed. The peak was just under 12,000 shorebirds in 1990 (Taylor et al. 1992). Shorebirds present in late summer and fall include: yellowlegs (*Tringa spp.*), sandpipers (*Calidris spp.*), marbled godwits (*Limosa fedoa*), long-billed dowitchers (*Limnodromus spp.*), and several plover species, as well as the black-necked stilt (*Himantopus mexicanus*) and American Avocet (*Recurvirostra americana*).

Open water is a prominent feature of Lake Lowell. Open water is maintained where water depths exceed approximately 2 feet in depth. Over this depth, emergent vegetation is unable to root in the lakebed and grow to emerge from the surface. Open water may host floating or submergent plants where light penetration would support such vegetation. Open water sites

such as Lake Lowell support large waterfowl concentrations during spring and fall staging, migration and wintering (Idaho Partners in Flight). The open water habitat provided by Lake Lowell is important for feeding and roosting to many species of birds at different times of the year, including common loons (*Gavia immer*), western and Clark's grebes (*Aechmophorus spp.*), American white pelican (*Pelecanus erythrorhynchos*), tundra swan (*Cygnus columbianus*), large numbers of dabbling and diving ducks, Franklin's and California gulls (*Larus spp.*), and Forster's (*Sterna forsteri*) and black terns (*Chlidonias niger*). Many waterbirds share time between emergent vegetation and open water depending upon the season. Waterfowl and grebes utilize emergent vegetation to conceal nests and brooding birds, eventually moving to open water for feeding and roosting as their offspring mature.

The impacts of deer hunters on waterfowl and waterfowl habitat of the Lake Lowell Unit of Deer Flat NWR is expected to be minor to moderate. The hunting season starts and ends outside of the growing season of most plants so trampling and the spread of invasive plants is not a major concern. The creation of social trails in the soil may be more of an issue but is still expected to be minor as most hunters spread out in available habitat as a way to reduce overcrowding.

Waterfowl use in and around the Refuge has been well documented and has seen some changes over time. Annual narratives contain photos and documentation of duck numbers in excess of half a million during the peak of migration. Staff at Deer Flat NWR has performed winter waterfowl surveys since 1951. From 2001 to 2010 peak numbers of geese (typically seen in November) on the Lake Lowell Unit averaged 11,892. Peak numbers of ducks (typically seen in December) during the same time frame averaged 61,535 on Lake Lowell. Even though numbers of ducks and geese in the valley have decreased over time they continue to provide a quality hunting experience and Deer Flat NWR is a waterfowl hunting destination for both local and out of state hunters.

In the past five years (2007 -2011), up to 91% of ducks and geese seen on winter waterfowl counts have been adjacent to the southeast sanctuary area during the times when the proposed hunt will be conducted. Waterfowl are wary, seeking refuge from all forms of disturbance, but particularly those associated with loud noise and rapid movement (Korschgen and Dolgren 1992). Numerous studies show human activities associated with hunting (boating, vehicle disturbance, human presence) cause increased flight time in waterfowl species, which requires a considerable amount of energy (Kahl 1991, Havera et al. 1992, Knapton et al. 2000, Kenow et al 2003). Human disturbance compels waterfowl to change feeding habits like feeding only at night or deserting feeding areas entirely resulting in weight loss (Korschgen and Dolgren 1992).

Deer hunting will likely cause some disturbance to non-target species because of noise (most notably the report of a firearm), human presence and general disturbance associated with the activity. However, it is expected that overall impacts to waterfowl species will be minor to moderate within the southeast sanctuary. Disturbance to the daily activities, such as feeding and resting, of wintering birds might occur. Though as mentioned above there may be impacts on local waterfowl related to this deer hunt (most notably disturbance) the proportion of total waterfowl populations susceptible to these disturbances on refuges is very low. Locally, there are several points that support the contention that impacts will be minimal including (1) the maximum number of hunters allowed into the sanctuary at any given time is 15 and it is likely

that the actual number will be less; 2) disturbance due to discharge of firearms will be minimal; 3) deer are likely not to be in close proximity to concentrations of waterfowl that are loafing in open water and inundated wetlands; 4) Refuge staff will implement appropriate closures around sensitive areas to provide space for migrating waterfowl; 5) The effects of this hunt will be monitored by Refuge staff and if significant impact are detected appropriate measures will be taken.

3.2.2 FEDERALLY LISTED SPECIES

Columbia spotted frogs (*Rana luteiventris*) (candidate) are found from Alaska and most of British Columbia to Washington east of the Cascades, Idaho, and portions of Wyoming, Nevada, and Utah. The Great Basin population range includes eastern Oregon, southwestern Idaho, and the northern drainages of Nevada. In Idaho, it occurs in the mid-elevations of the Owyhee uplands and in southern Twin Falls County. Spotted frogs live in spring seeps, meadows, marshes, ponds and streams, and other areas where there is abundant vegetation. They often migrate along riparian corridors between habitats used for spring breeding, summer foraging and winter hibernation. Lake Lowell is within former range for Columbia spotted frogs and may have wetlands and riparian to support portions of their life history, they haven't been confirmed on Deer Flat NWR.

The historic summer and nesting range for yellow-billed cuckoo (*Coccyzus americanus*) (candidate) includes dense riparian and thickets throughout the West. Over time, the range has reduced with rare observations of cuckoos remaining in their historic western range. Cuckoos are a very unusually vagrant species that have been observed in the riparian forests surrounding Lake Lowell during the summer months. The presence of dense riparian habitat would be attractive to vagrant cuckoos and formerly would have been conducive to breeding pairs when cuckoo breeding range included Idaho.

Greater sage-grouse (*Centrocercus urophasianus*) (candidate) are the largest grouse in North America. Males often weigh in excess of 4-5 pounds and hens weigh in at 2-3 pounds. While Lake Lowell is within historic range for sage-grouse, the Refuge lacks sufficient expanses of intact shrub-steppe to support sage grouse.

Snake River physa snail (*Physa natricina*) (endangered) is a freshwater mollusk found in the middle Snake River of southern Idaho including Canyon County. It has an ovoid shell that is amber to brown in color, and has 3 to 3.5 whorls (curls or turns in the shell). The physa can reach a maximum length of about 6.5 millimeters. While much information exists on the family Physidae, very little is known about the biology or ecology of this species. It is believed to be confined to the Snake River, inhabiting areas of swift current on sand to boulder-sized substrate. Given the snail's affinity to swift water within the Snake River system, the snail isn't associated with the habitats present on Lake Lowell.

Slickspot peppergrass (*Lepidium papilliferum*) (threatened) is endemic to this region, known only from the Snake River Plain and its adjacent northern foothills (an area approximately 90 by 25 miles, or 2,250 square miles, with a smaller, disjunct population on the Owyhee Plateau (an area of approximately 11 by 12 mi), or 132 square miles. Rangewide, Slickspot peppergrass is

associated with slickspots that cover a relatively small cumulative area within the larger sagebrush-steppe ecosystem. Slickspot peppergrass is not known to the limited shrub steppe habitat of the Lake Lowell Unit.

3.3 SOCIAL AND ECONOMIC ENVIRONMENT

3.3.1 CULTURAL RESOURCES

Prehistoric Resources

In general, the archaeological integrity of the site is not intact. Starting in 1906, massive amounts of gravel, dirt, and lava rock were quarried for the reservoir's construction. In its day, Lake Lowell was the largest off-stream reservoir on earth held in by earth filled dams. The dams required to hold the reservoir totaled 2 ½ miles in length. The compacted fill required for the project being borrowed from the nearby terrain. Archaeological sites within the footprint of Lake Lowell were largely disturbed by the nature of building the reservoir and associated dams. Undisturbed sites would be indefinitely submerged under Lake Lowell. Only the scrub steppe uplands have the potential of retaining prehistoric evidence.

Historic Resources

Upon approval of the Deer Flat Reservoir, the federal government started to acquire lands for the project. Lands acquired by purchase and condemnation were eventually covered by the waters of Lake Lowell, destroying early farms and ranches in the basin. The feat of constructing the Deer Flat reservoir has earned the Upper and Lower Embankments a place on the National Register of Historic Places. Other early canals and infrastructure have historic value representing the early 1900s. During the New Deal work-relief programs, the Works Progress Administration and Civilian Conservation Corps, placed 1800 workers at Lake Lowell. These crews were responsible for the construction of roads, buildings, observation towers, rip-rap, and stone walls. Many of these projects are still evident on the Refuge.

3.3.2 ADJACENT LANDS

The Lake Lowell Unit of Deer Flat NWR sits just outside the southwestern boundary of the Nampa comprehensive planning boundary (City of Nampa 2004) and just south of the Caldwell comprehensive planning boundary (City of Caldwell 2010). The remainder of the Unit is surrounded by the Canyon County comprehensive planning area (Canyon County 2005, 2011a). The Refuge is currently surrounded by both developed and agricultural lands.

The current Nampa comprehensive plan recognizes there are conflicts associated with the agricultural/urban interface in the region: slow-moving farm equipment disrupts travel routes, and long hours of equipment operation during the harvest season create noise and dust throughout the day and evening (City of Nampa 2004). The plan also acknowledges that the Lake Lowell Unit of the Refuge does not have adequate lands to support the existing diverse wildlife population and that the existing agricultural areas surrounding the Refuge provide food and cover for wildlife as well as protection for wetlands and watersheds (City of Nampa 2004).

The current City of Nampa Comprehensive Plan (2004) maps existing land uses north of the east pool as mostly agricultural land with a mix of rural residential (less than 1.45 dwelling units per acre) and low density residential (1.46-4.00 dwelling units per acre). The plan's future land use map indicates a conversion of the agricultural lands bordering the Refuge to rural and low-density residential to support population growth forecasts and future housing need projections (City of Nampa 2004).

The vast majority of the land surrounding the Lake Lowell Unit is unincorporated Canyon County and is zoned for agriculture (Canyon County 2011b). In addition to acknowledging Lake Lowell as an important natural resource in the county, the Canyon County 2010 Comprehensive Plan (2005) recognizes the importance of Deer Flat NWR as a special area in the county and encourages land use patterns around the Refuge that promote the integrity and purpose of the Refuge. The 2010 plan is being updated, and the proposed 2020 Canyon County Comprehensive Plan (2011c) continues to recognize the importance of the Refuge. The proposed plan also acknowledges that the county needs to preserve its natural resources while allowing for the expansion of cities and growth of the unincorporated areas (Canyon County 2011c). Although, the Canyon County Proposed Land Use (2011a) draft map appears to re-categorize the county lands south of Lake Lowell as rural residential, potentially adding population density and reducing agricultural lands south of the Refuge.

3.3.3 OTHER RECREATIONAL OPPORTUNITIES

Deer Flat NWR provides a variety of recreational opportunities and experiences with an estimated 200,000 annual visitors. The Refuge currently offers a mix of wildlife-dependent on-water uses (e.g., fishing) and non-wildlife-dependent on-water uses (e.g., jet skiing). The lake is open April 15 - September 30 with a no-wake zone imposed east of Parking Lot 1.

Lake Lowell is open to fishing all year, however during the non-boating season from October 1 to April 14 (excluding the waterfowl season), fishing is permitted from the bank or by human powered boats in Fishing Areas A and B, 200 yards in front of the Upper and Lower Dams. In all, Lake Lowell receives approximately 48,000 annual fishing visits. Fishing is only allowed from human powered boats in Fishing Areas A and B, 200 yards in from the Upper and Lower Dams during the waterfowl season.

Hunting on the Lake Lowell Unit is limited to the East Side and South Side Recreation Areas. Hunting at the Lake Lowell Unit is currently restricted to upland game birds, mourning doves, ducks, and coots. Lake Lowell receives over 6000 annual hunt visits. All duck and coot hunting must take place within 200 yards of the water's edge. Duck and coot hunting in the East Side Recreation Area is walk-in only. Duck and coot hunters in the South Side Recreation Area may use float tubes, non-motorized boats, or boats with electric motors only.

According to the Idaho Outdoor Recreation Demand Assessment (2002), Idahoans participate much more in wildlife activities than the rest of the nation, especially when it comes to hunting. Big game hunting is four times as popular as it is relative to the national average. Based on population, it is extrapolated that 418,000 Idahoans participate in big game hunting. Hunting to regulate deer depredation would likely be appreciated as a management tool to local agricultural

and hunt communities. However, some people are opposed to hunting in general and others may be opposed to hunting deer on a National Wildlife Refuge.

The Refuge offers a network of trails and roads in the North Side, East Side, and South Side Recreation Areas for wildlife observation, photography, jogging, bicycling, on-leash dog walking, and horseback riding. The Refuge additionally has a visitor center with a viewshed of a variety of habitats including uplands, riparian, and Lake Lowell. The visitor center attracts over 18,000 annual visitors. Wildlife observation is additionally supported by driving tour along the 29.5-mile Lake Lowell Unit Bird Tour. Additionally, the Refuge has offers environmental education programs to over 11,000 youth, annually.

3.3.4 ECONOMIC

Deer Flat NWR is located southwest of Boise Idaho. The area population increased by 34.5 percent from 1995 to 2005, compared with a 21.4 percent increase for the state of Idaho and a 11.4 percent increase for the U.S. as a whole. Area employment increased by 37 percent from 1995 to 2005, with the state of Idaho showing a 29.3 percent increase and the U.S. a 17.0 percent increase. Per capita income in the area increased by 8 percent over the 1995-2005 period, while the state of Idaho and the U.S. increased by 11.1 and 13.2 percent, respectively (Carver and Caudill 2007).

In 2007 the USFWS produced a report, *Banking on Nature*, which focused on select refuges and assessed: how recreational visitors impact local income and employment. Travel to participate in non-consumptive uses of the natural environment has been called “ecotourism.” It has been promoted as a way to derive economic benefits from the preservation of wildlife and habitat. Many refuges were established to protect wildlife resources; ecotourism broadens the scope of this mandate. Banking on Nature derived net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This figure is combined with the estimate of total expenditures and divided by the refuge budget for 2006. At Deer Flat \$10.29 of total economic effects are associated with every \$1 of budget expenditures. This ratio is provided only for the purpose of broadly comparing the magnitude of economic effects resulting from refuge visitation to budget expenditures and should not be interpreted as a benefit-cost ratio (Carver and Caudill 2007).

The economic impact of an individual hunting program is hard to assess. Hunting as a whole has an economic benefit to the economy. A survey of outdoor activities by the U.S. Fish and Wildlife Service (USFWS) in 2001 showed that over 4 million people hunted in the 18 western states. In 2001 alone, those hunters were afield for almost 50 million days and spent over \$7 billion.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes and compares the effects anticipated under each alternative. Effects are considered in four main topic areas: species and habitats, social, economic, and cultural

4.2 EFFECTS OF ALTERNATIVES

4.2.1 BIOLOGICAL ENVIRONMENT

4.2.1.1 MULE DEER

Effects from Deer Hunt

Under Alternative A, deer would continue to occupy security zones along the south boundary of Lake Lowell due to low levels of disturbance. The existing agricultural areas surrounding the Refuge would continue to provide food for deer resulting in continued depredation issues and financial losses to local farmers. Off-refuge deer harvest would remain a constant with deer continuing to seek sanctuary in Refuge woodlands, particularly during hunting seasons. The local deer population would presumably remain constant with deer mortality occurring from direct harvests on surrounding private and State lands. Over time land use adjoining the Refuge is anticipated to shift from agriculture to rural and low-density residential to support population growth. Deer impacts to remaining agricultural lands may be exacerbated due to reduced food resource abundance due to urbanization. Additional homes in the surrounding areas would represent no-shooting sanctuary areas with deer securing food resources in the form of ornamental shrubs, gardens, and landscaped plants. Eventually deer mortality due to hunting may reduce due to the juxtaposition of homes within a rural setting. However, mortality would probably be realized in compensatory forms directly related to urbanization such as starvation, predation, illness, and car strikes.

Alternative B would increase the opportunity for off-refuge deer harvest, as more of the Refuge security zone is open to hunting during the controlled deer hunt season. This increase in the intensity of disturbance to deer would serve to redistribute deer from the Refuge into surrounding hunted lands during the hunting season. Additionally, deer would be subject to direct mortality at the Refuge, thereby, reducing the local deer population. Depredation hunts could be prescribed to address valid individual depredation complaints. Collaboratively the Refuge and IDFG would establish the scope and duration of depredation to adequately address specific depredation issues; however, these hunts would generally be set outside the normal deer hunting season because of hunter availability. These hunts would additionally contribute to direct harvest of deer and potentially redistribute deer from Refuge security areas throughout the year. Collaboration between the Refuge and IDFG on deer management would ensure a sustained deer population on the Refuge.

Under Alternative B, the controlled mule deer hunt would issue 45 permits for the Refuge. Over the past decade GMU 38 has averaged a 25% harvest success rate with the general season deer hunt, so the Refuge controlled deer hunt would be expected to directly harvest at least 11 deer annually; though this success rate may be understated for the first few years, as Refuge deer may be initially unaccustomed to the deer hunting program. The Refuge and IDFG would collaborate on the need and allocation of depredation hunt permits to address localized depredation issues. Given the explicit intent to harvest the depredating animal, the success rate on prescribed depredation hunts is anticipated to be high. Therefore, the deer harvest due to depredation hunts

would be proportional to the number of depredation permits issued.

IDFG has suggested an initial reduction of 20-30% of the local population via the controlled deer season may be required to address depredation (L. McDonald pers. comm.). Assuming a population of 120 animals, the controlled deer hunt would have to harvest 24-36 animals to address depredation. Achieving this annual harvest might be difficult, but the option of prescribing a depredation hunt may ultimately realize this reduction. In subsequent annual seasons, as population reductions are realized and reproductive does are removed from the local population, it is assumed that the controlled deer hunt may achieve the desired reduction in depredation complaints. Under this scenario, a reduction in depredation complaints would correspond to fewer depredation permits issued for the Refuge. Cumulatively, Alternative B has the greatest immediate potential impact towards reducing the local population through direct harvest of deer on the Refuge and redistributing deer to the surrounding GMU 38 during hunting season.

The depredation hunt established by Alternative C would reduce the local deer population through the harvest of deer proportionate to the annual number of permits issued. However since depredation hunts typically would not coincide with the general deer hunt within GMU 38; Alternative C would not contribute to deer harvest off Refuge through redistribution of animals during a hunting period. Alternative C additionally has some potential to exacerbate depredation issues with Refuge hunting pressure redistributing deer to non-hunted areas. Since the hunt is outside the general deer hunt season, all surrounding private lands would represent non-hunted areas. While Alternative C would directly reduce the population via hunting, adjoining agricultural lands may see seasonal increases in deer use coinciding with the Refuge depredation season. Seasonal damage prevention may be achieved by non-lethal measures. However, non-lethal visual and auditory frightening devices are temporary and largely ineffective in deterring deer (Belant et al. 1996, Belant et al. 1998, Curtis et al. 1997, Gilsdorf et al. 2003, Gilsdorf et al. 2004a, Koehler et al. 1990, Roper and Hill 1985). Confounding the issue is a recent prohibition of cracker shells and similar exploding pyrotechnics.

Since disturbance associated with hunting has a greater influence on animal behavior than other public uses, deer would likely increase utilization of no shooting areas under Alternative B and C. These areas on the Refuge are represented by portions of the Refuge north of Lake Lowell including Public Use Areas and Closed Areas. The number of no-shooting areas is reduced by half under Alternative B & C with the deer hunt proposed between Parking Lot 1 and the New York Canal, a former Closed Area. Under both Alternatives B and C, increased deer density may seasonally occur in both no-shooting areas and adjoining agricultural lands due to deer disturbance induced by the Refuge hunt program.

Direct impacts to deer at the local scale are expected because of alteration of their distribution and anticipated reduction of the population size and population structure. These impacts are not expected however, to put the deer population at risk or to interfere with IDFG's management objectives for deer. There would be no significant effects on the health of the deer population resulting from implementation of alternatives B and C at the local or regional scale. The GMUs that comprise the local population are expected to maintain a population of over 55,000 animals and mule deer would continue to be abundant throughout their range.

4.2.1.2 SHRUB STEPPE, RIPARIAN, AND WETLAND HABITAT AND ASSOCIATED WILDLIFE

Effects from Deer Hunt to Shrub Steppe and Associated Wildlife

The Lake Lowell Unit has approximately 920 acres of upland shrub steppe habitat. The largest contiguous piece of sagebrush habitat on the Refuge at approximately 553 acres is outside the hunt area proposed under Alternatives B & C. The proposed hunt areas contain segments of marginal shrub steppe habitat. Even in a degraded state shrub steppe may provide nesting and foraging habitat for ground-nesting birds, foraging space for raptors, and habitat for small mammals and other wildlife. Under Alternative A, the no-action alternative, waterfowl and upland game hunting would continue to occur between Parking Lots 1 & 8 within the South Side Recreation Area. Hunters would continue to access these areas by foot, imposing minor impacts to marginal shrub steppe habitats through wildlife disturbance and habitat trampling. This use would be anticipated to remain constant with approximately 6000 annual hunt visits dispersed over both the East and South Side Recreation Areas.

The impacts to steppe habitat and steppe associated species imposed by the hunting alternatives results from disturbance of wildlife associated with hunting and potential redistribution of deer and their browse impacts by hunting. The presence of hunters within steppe habitat may have impacts to shrub steppe obligate species. Numerous studies have found that bird abundance and species composition are affected by the presence of people on foot. In the mixed-grass prairie ecosystem in Colorado, Miller et al. (1998) found that specialist species (western meadowlark, vesper sparrow, and grasshopper sparrows) were less common near heavily used recreational trails. Generalist species such as the American robin, brown-headed cowbird, and black-billed magpie were less affected by trail use. They also found that birds were less likely to nest near trails within the grassland ecosystem and that nest predation was greater near trails. For the majority of species, they found impact was greatest within a 246-foot (75 meter) zone of influence.

Alternative B and C do not propose any new infrastructure or trails; however, there would be a minor increase in use at existing Parking Lots 1-8 within the South Side Recreation Area with the addition of deer hunting visits. Additionally, Alternatives B & C would expand the public use footprint by opening the area between Parking Lot 1 and the New York Canal to deer hunting, this area is currently managed as sanctuary. Between Parking Lot 1 and the New York Canal are scattered areas of steppe habitat. Human disturbance would be associated with foot traffic radiating from established parking lots to access tree blinds during the hunting season. Under Alternative B, controlled deer hunters would be limited to 15 permits at any given time dispersed over a hunt area of 880–2200 acres. Under Alternative B, these impacts would be expected to be minimal because the use occurs during the period of plant dormancy and deer hunter density would be very small resulting in a very low probability that any area within the hunt units would receive repeated and prolonged use. Deer hunting would additionally occur from tree stands, rather than trails, minimizing the frequency and duration of trail use within the hunt area. The hunter density of Alternative C would be lower than Alternative B with depredation permits issued to address localized and specific depredation issues. Therefore, direct impacts to steppe

habitat would be minimal and largely regulated by the number of individual depredation permits issued over a particular period of time. Since Alternative C exclusively addresses specific depredation complaints, the seasonality of Alternative C has a greater potential to include spring and summer depredation hunts. In this regard, Alternative C has greater potential to coincide with growing seasons for shrub steppe plant communities and nesting seasons for steppe obligate species. Since a depredation hunt is also provided as an option under Alternative B, the same issues and controls apply to that alternative as well. Both Alternatives B & C would slightly increase wildlife disturbance due to gunfire above the current baseline of Alternative A. There would be a few more individual shots or shot clusters associated with the harvest of deer. This occurrence would be minor related to the harvest of upland game and waterfowl which require substantially more shots per harvested animal. Additionally Alternative B & C represent a minimal increase in the overall hunter days above the current baseline of 6000 hunter visits (Alternative A) with only 45 controlled deer hunt permits and a minimal number of deer depredation permits prescribed annually.

Both Alternatives B and C have the potential to redistribute deer from security areas into steppe habitat within non-hunting areas, especially those areas north of Lake Lowell. Increased deer densities could further degrade steppe plant communities through trampling and direct herbivory. These indirect impacts are anticipated to be minimal with deer potentially being redistributed over a large area and a mix of habitat types. Within shrub steppe habitats there would be no effect to listed species from the implementation of either Alternatives B or C.

4.2.1.3 RIPARIAN HABITAT AND ASSOCIATED SPECIES

Effects from Deer Hunt to Riparian and Associated Wildlife

The Lake Lowell Unit contains approximately 2,116 acres of riparian and/or floodplain forest habitat in various seral stages. This riparian habitat occurs in a band around the Lake's shoreline with the largest portions of this plant community on the south shoreline. Under Alternative A, the no-action alternative, waterfowl and upland game hunting would continue to occur between Parking Lots 1 & 8 within the South Side Recreation Area. Hunters would continue to access these areas by foot, imposing minor impacts to riparian habitat through wildlife disturbance and habitat trampling. This use would be anticipated to remain at or near 6000 annual hunt visits dispersed over both the East and South Side Recreation Areas. Resident songbirds, upland game birds and roosting eagles are the primary species groups potentially affected by public use activities in riparian zones under Alternative A. The current hunting programs (upland game and waterfowl) terminate in the end of January, thereby avoiding the nesting season for most riparian obligate species. However, site selection for bald eagle nests and heron colonies may initiate in late January implying that the existing hunt programs could influence nest site locations or the timing of nesting activity for these species. Lake Lowell additionally offers wintering eagles a food resource in the form of waterfowl concentrations, fish, and carrion. As a result of hunting disturbance, perches within closed areas may see a higher frequency of eagle use during the hunt season.

Alternatives B and C do not propose any new infrastructure or trails; however, there would be a minor increase in use at existing Parking Lots 1-8 within the South Side Recreation Area with the

addition of deer hunting visits. Additionally, Alternatives B & C would expand the public use footprint by opening the area between Parking Lot 1 and the New York Canal to deer hunting, 800 acres, containing scattered riparian habitat. Disturbance would increase between Parking Lot 8 and the New York Canal associated with foot traffic between established parking lots and temporary tree stands during the hunting season. Under Alternative B, controlled deer hunters would be limited to 15 permits at any given time dispersed over a hunt area of 880–2200 acres. These impacts would be expected to be minimal because the use occurs during the period of plant dormancy and deer hunter density would be very small resulting in a very low impact threshold. Deer hunters additionally only utilize trails to access their tree stands; thus having a lesser impacts than terrestrial based hunting, stalking and roaming. As discussed earlier, both Alternatives B & C would increase wildlife disturbance through a minor increase in gunfire associated with deer harvest. Alternatives B & C propose restrictions on the type and design of tree stands to eliminate damage to mature trees within the riparian community.

The anticipated hunter density of Alternative C is expected to be lower than Alternative B with specific depredation permits let to address local depredation issues. The direct impacts to riparian habitat under Alternative C would be directly proportional to the number and timing of permits issued. As previously discussed, the seasonality of Alternative C has a greater potential to coincide with the growing season for riparian communities and nesting season for riparian obligate species, as depredation hunts are typically outside of the controlled deer hunt season (October 10 – December 28). The presence of a regulated number of depredation hunters during the nesting season dispersed over the hunting area producing a few shots per depredation permit is not likely to have major impacts to riparian obligate species. Should impacts be anticipated (e.g. nesting eagles or heron colonies), the framework of the depredation hunting program would allow the Refuge to selectively close areas within the hunt area to buffer sensitive wildlife resources. Resource buffers would be employed utilizing current research to sufficiently safeguard nests or colonies from abandonment. Since a depredation hunt is also provided as an option under Alternative B, the same issues and controls apply to that alternative as well.

Since disturbance associated with hunting has a greater influence on deer behavior than other public uses, deer tend to habituate to non-hunting related human disturbance in no-shooting areas. Under all Alternatives (A, B, & C), hunting disturbance has the potential to redistribute deer from the south shore of Lake Lowell into other non-hunted areas, both on and off Refuge. Hunting disturbance within Alternative A is presumably relocating deer during the waterfowl and upland game bird season from the South Side Recreation Area into the sanctuary between Parking Lot 1 and the New York Canal. This increased deer density may be having a minor, but undocumented, impact to the riparian community in the current sanctuary area near the New York Canal. Alternatives B & C have the greatest potential to disperse deer since the hunting pressure is exerted on deer and the riparian forest near the New York Canal is open to hunting. Given this scenario, deer hunting could indirectly impact riparian communities north of Lake Lowell with deer relocating to the security of no-shooting areas, or at minimum areas with only waterfowl and upland game hunting. Higher densities of deer within riparian communities could serve to reduce habitat characteristics through trampling and browse. Of specific concern would be deer browse that would reduce the density of shrub and subcanopy vegetative cover. Additionally, browsing and trampling could reduce the recruitment of young trees into riparian area which overtime could shift the age structure of the forest. These impacts would be greatest

if induced hunting pressure does not additionally achieve a reduction in the local deer population.

4.2.1.4 WETLAND HABITAT AND ASSOCIATED SPECIES

Effects from Deer Hunt to Wetlands and Associated Wildlife

The proposed Lake Lowell hunt area is between 880-2200 acres. This variability is based upon the depth of Lake Lowell and the degree to which the adjoining shoreline and forested areas is inundated with water. When the lake level is greatest, water would expand over the landscape and into the adjoining riparian areas. In this scenario, the deer hunting area may be in juxtaposition with the wetland area. The presence of hunters near the water would have the greatest impacts to waterfowl that utilize shallow wetland margins in search of food including geese, swans, mallards, pintails, teal, and wigeon. Additionally, non-waterfowl wildlife would be disturbed with species including coots, herons, and grebes.

Deer hunting could impose physical alterations to wetland plant communities through trampling of aquatic vegetation and disturbance to saturated soils while traveling to the tree stand. Additionally, hunters increase the potential of invasive species introductions with clothing and equipment serving as a transportation vector between various hunting locations. With the very low density of deer hunters in Alternative B & C and the fact the activity would take place outside the growing season for most plants, impacts associated with either trampling or disturbance would likely be inconsequential. Restrictions on the use of motorized equipment under both hunting alternatives would greatly diminish the potential for soil disturbance and introduction of propagules of exotic species. Some potential for invasive species introductions may exist at the parking areas where hunters are concentrated in set locations and clothing and equipment are readied for hunting. These defined areas would be closely monitored for new introductions. Any new infestations would be quickly controlled.

Under Alternatives B & C, active deer hunting would occur from a single point in the tree canopy. The deer hunt program has a limited number of permits spread over the landscape. Over the span of a season, deer hunters may fire a single shot, perhaps a few shots, in the pursuit of a single animal. The disturbance to wetland obligate wildlife would be negligible beyond the baseline disturbance from the waterfowl hunting program that offers non-point free range hunting that is concentrated near waterfowl habitat, along the shoreline. Additionally, waterfowl hunting attracts a larger number of participants that may fire many shots, often in rapid succession, throughout the day in pursuit of a bag limit of many birds. Alternatives B & C both open existing sanctuary areas between Parking Lot 1 and New York Canal to hunting. This has the potential to add disturbance to new wetland areas redistributing waterfowl and wetland obligate species elsewhere on the lake. The probability that a hunter would spend significant time within wetlands or in adjacent shorelines is low, as deer would be seeking thermal cover in the forested areas above the waterline. Therefore no significant impacts to wetland habitat and associated species are expected to occur from deer hunting on the Refuge.

4.2.1.5 FEDERALLY LISTED SPECIES

Effects from Deer Hunt to Federally Listed Threatened Species

The Lake Lowell Unit of Deer Flat NWR represents historic range for Columbia spotted frogs (*Rana luteiventris*) (candidate). Hunting on Lake Lowell would not have any effect spotted frogs as they have not been identified on the refuge.

Greater sage-grouse (*Centrocercus urophasianus*) (candidate) are known to Southwest Idaho. Hunting on the Lake Lowell Unit would not impact greater sage grouse as currently sage grouse are not known to the refuge. Further, grouse are not hunted on the refuge.

Yellow-billed cuckoo (*Coccyzus americanus*) (candidate) have been documented on the Lake Lowell Unit as a rare summer vagrant species. The Refuge represents former range when cuckoos were a common breeding species in the west. Now, as a rare non-breeding summer visitor, deer hunting has little probability of jeopardizing vagrant cuckoos.

The range for Snake River physa snail (*Physa natricina*) (endangered) includes the middle Snake River of southern Idaho including Canyon County. It is believed to be confined to the Snake River, inhabiting areas of swift current on sand to boulder-sized substrate. Given the snail's affinity to swift water within the Snake River system, the snail isn't associated with the habitats present on Lake Lowell. If present, deer hunting would not overlap the species typical habitat association.

Slickspot peppergrass (*Lepidium papilliferum*) (threatened) is endemic to this region, known to persist in a relatively small cumulative area within the larger sagebrush-steppe ecosystem. Slickspot peppergrass is not known to the limited shrub steppe habitat of the Lake Lowell Unit.

In summary, The Lake Lowell Unit of Deer Flat NWR has no known federally-listed species, therefore, no adverse effects are anticipated by establishing a hunt program

4.3 EFFECTS OF ALTERNATIVES

4.3.1 SOCIAL AND ECONOMIC ENVIRONMENT

4.3.1.1 CULTURAL RESOURCES

Effects from Deer Hunt to Prehistoric and Historic Resources

The Alternatives addressed in the document do not require facilities construction, additional infrastructure, or ground disturbance activities that can have negative impacts to archeological and historical sites. Additionally, there are no known cultural resource sites within the proposed hunt areas.

Cultural resource protection procedures, which are required by National Historic Preservation Act for each project at the site specific level, are designed to reduce impacts from human activities. The potential to impact cultural resources and the workload for a cultural resource professional to implement cultural resource protection procedures would be no greater under any

Alternative.

Vandalism or surface collection is always a threat to cultural resources especially in areas open to the public. The risk of vandalism of cultural sites would increase proportionate to an expected increase in use of the Refuge. Under Alternatives B & C there would be a slight increase in risk related to vandalism to cultural resources because of a slight increase hunting visits and greater amount of the Refuge open to hunting.

4.3.1.2 ADJACENT LANDS

Effects from Deer Hunt to Adjacent Lands

Under either Alternative B or C which include deer hunting on the Refuge, there would be at least in the short term a potential for increasing use of deer on private land as deer react to increased human disturbance on the Refuge. Under Alternative B the controlled deer hunt on the Refuge would coincide with the hunting season for the surrounding GMU 38 resulting in increased harvest of deer in the Refuge vicinity. This could result in a reduction in the localized population. Additionally, depredation hunts proposed within Alternatives B & C would further serve to reduce depredation, financial loss to local agricultural interests, and expenditures by the State related to depredation management.

Increased Refuge hunting pressure, proposed under Alternatives B & C, may additionally redistribute deer to other nearby off Refuge no-hunting zones. Currently, these locations include low density residential and mixed rural areas where hunting is precluded due to safety. It is evident that urban interface would increase in areas adjoining the Refuge, increasing the abundance of urbanized no-hunting zones. These areas may see increased numbers of deer and subsequent impacts to gardens, ornamental plants, and landscaping. These areas may additionally experience compensatory forms of deer mortality relating to starvation, predation, and car strikes. These impacts would be greatest if Refuge induced hunting pressure does not additionally correspond with a reduction in the local deer population.

4.3.1.3 OTHER RECREATIONAL OPPORTUNITIES

Effects from Deer Hunt to Other Recreational Opportunities

Hunting (especially gunshot noise) has the potential to disturb Refuge visitors engaged in other wildlife-dependent public uses. Under Alternatives B & C, these impacts may be minimized by the location of the designated deer hunt on the south shore of Lake Lowell. The footprint of Alternatives B & C largely coincides with the current waterfowl and upland game hunting season within the South Side Recreation Area. Additionally, Alternatives B & C would open a previously closed area between Parking Lot 1 and the New York Canal, approximately 800 acres. This proposed hunt will occur in areas that are currently principally used by hunters and spatially separated from the public use areas at the North Side Recreation Area, Lower Dam Recreation Area, Fishing Area A, and Fishing Area B. The controlled deer hunt proposed in Alternative B would additionally be temporally removed from the general boating season on Lake Lowell which ends September 30th.

The South Side Recreation Area is used year-round for multiple recreational pursuits. Seasonally, the South Side Recreation Area sees infrequent use by non-hunters. The CCP/EIS will investigate opportunities to seasonally separate activities within the South Side Recreation Area to increase public safety and quality of experience for recreationalists. Adherence to the short-range weapon and tree stand requirements of Alternatives B & C are important safety provisions where hunting activities overlap within the South Side Recreation Area. The use of tree stands would bring deer hunters in close proximity to game, increasing public safety between hunting groups. Coupled with the use of tree stands the trajectory of weapons used for deer hunting would be downward, thereby, terminating errant shots into the ground adjacent to the intended target. These same provisions should additionally negate any potential for projectiles from straying into sensitive areas, private property, or other non-hunted areas.

There is a possibility that the non-hunting public would still observe hunters as they drive county roads bordering the Refuge. Some members of this group may be offended by seeing hunters with weapons and/or recently harvested animals. The addition of hunters to the Refuge would also slightly add to the number of gunshots heard by the visiting public. The proposed deer hunting area is on the opposite shore of Lake Lowell more than 1 ½-mile from the Visitor Center reducing the sound of gunshots at one of the Refuge's primary public use destinations.

Under Alternatives B & C, a reduction in the local population of mule deer is anticipated. This reduction may result in less opportunity for the public to view mule deer from public use areas. Hunting pressure may serve to redistribute deer from the hunting area to non-hunted public use areas having a slight compensatory effect to mule deer viewing opportunities.

4.3.1.4 ECONOMIC

Economic Effects of Deer Hunt

According to the Idaho Outdoor Recreation Demand Assessment (2002), Idahoans participate much more in wildlife activities than the rest of the nation, especially when it comes to hunting. Big game hunting is four times as popular as it is relative to the national average. Cooper and Unsworth (2000) estimated mule deer hunting in 2006 to result in direct expenditures of \$42 million in trip related expenses, not including equipment purchases. Using a typical multiplier of 2.5 (Gordon and Mulkey 1978) the total estimated economic impact of mule deer hunting in Idaho exceeds \$100 million annually. At this time it is not possible to determine the allocation of refuge permits to residents or non-residents. This would be a prime factor in determining the economic benefit associated with a hunt program. It is assumed that antlerless tags and depredation hunts would be most appealing to local residents seeking additional annual deer hunting and harvest opportunities. Generally, non-residents are drawn to antlered hunts with a greater probability of harvesting large or trophy bucks. Therefore, the Refuge hunt is likely to attract resident hunters from the surrounding area having a lesser economic benefit.

A survey of outdoor activities by the U.S. Fish and Wildlife Service (USFWS) in 2001 showed each hunter spent an average of \$1,581 in local communities across the West on lodging, gas, licenses, and hunting-related equipment. This financial figure is probably exaggerated relative to establishing a deer hunt at Deer Flat, as it reflects an average of hunting expenses across the spectrum of hunting including non-resident hunting with significant travel and licensing

expenses. However, the simple fact remains that the Preferred Alternative would increase the number of hunter days in the local area. These hunters would use consumable items such as fuel and ammunition. Additionally, durable sporting goods (e.g., tree stands, guns, and ammunition) would be utilized and may experience an accelerated replacement schedule due to increased utilization. The Refuge hunt may additionally precipitate economic activity with the initial purchase of short-ranged weaponry, ammunition, and tree stands. Hunts requiring this type of equipment is not common to deer hunting in Idaho. The implementation of the Preferred Alternative would be a benefit to local agricultural interests by reducing financial losses associated with deer depredation and lost productivity. The Preferred Alternative would additionally reduce expenditures by the State related to depredation management; however, in the context of the local economy, the aforementioned benefits do not represent a significant beneficial impact

4.4 CUMULATIVE IMPACTS ANALYSIS

4.4.1 MULE DEER

Regional Analysis

Idaho Code 36-103 establishes statewide policy for wildlife, and can be paraphrased as all wildlife would be preserved, protected, perpetuated, and managed to provide continuous supplies for hunting, fishing, and trapping. The Idaho Fish and Game Commission (Commission or IFGC) is charged with administering state wildlife policy through supervision and management of IDFG. Idaho Code 67-1903 requires state agencies to develop strategic plans expressing how they would meet core mission requirements. Plans must identify outcome based goals and performance measures. The current IDFG strategic plan, entitled “The Compass,” was implemented in 2005. The Compass, adopted broadly describes objectives for four major goals: 1) sustain Idaho’s fish and wildlife and the habitats upon which they depend, 2) meet the demand for fish and wildlife recreation, 3) improve public understanding of and involvement in fish and wildlife management, and 4) enhance the capability of Fish and Game to manage fish and wildlife and serve the public. The Compass calls for the development of “action plans” that describe programs, projects, and activities necessary to meet strategic plan goals (IDFG 2005). The 2008 Mule Deer Management Plan (Plan) tiers off of the IDFG strategic plan, functioning as the action plan for mule deer management in the state. Major issues affecting mule deer management are identified, setting overall direction for mule deer management during the next 10 years and providing performance targets and management strategies for management actions. Although the plan is not regulatory (e.g., statute or rule), it does incorporate IFGC policy and provide management direction to IDFG. This plan would guide IDFG in annual work plan development and program priority, and provide guidance on development of regulatory recommendations (IDFG 2008).

The Plan identifies the following major mule deer management goals for IDFG to achieve over the next 10 years:

- Provide mule deer hunting opportunities that reflect the preferences and desires of hunters.
- Maintain healthy and productive mule deer populations.

- Establish short-term and long-term population objectives that represent maintenance of, or increase in, current mule deer population levels.
- Maintain annual hunting opportunity.
- Increase the opportunity for mature buck hunting, equitably distributed throughout the state.
- Implement predator management actions when and where appropriate to aid in achieving management objectives.
- Encourage recruitment of new hunters and retention of existing hunters.
- Use antlerless harvest judiciously and conservatively to achieve management objectives.
- Develop simple and easily understood regulations that encourage participation in deer hunting.
- Fully implement the Mule Deer Initiative Action Plan.
- Improve and protect over 10,000 acres of habitat annually.
- Encourage land management agencies to incorporate mule deer habitat needs in agency decisions.
- Manage mule deer populations proportionate to habitat capabilities.
- Evaluate a cost-effective and reliable habitat monitoring program.
- Reduce illegal harvest, especially of mature mule deer bucks; and reduce commercialization of mule deer parts.
- Improve population monitoring programs.
- Work with landowners and sportsmen to minimize and mitigate for depredations.
- Improve management coordination with other agencies and organizations.
- Implement special investigations to improve population and habitat management capabilities.
- Provide information and improve public understanding of mule deer management in Idaho.
- Ensure continued citizen involvement in mule deer management.

To expand upon the goal “Work with landowners and sportsmen to minimize and mitigate for depredations”; the Plan acknowledges that mule deer can create depredation concerns when foraging on agricultural crops or rangeland vegetation. These situations are associated with overabundant deer populations, drought conditions, or in areas where cropland is adjacent to deer habitat. Idaho Code 36-1108 identifies statutory requirements that must be met and appropriate actions IDFG must take to address depredation situations. IDFG has Landowner/Sportsmen Coordinators to assist with addressing depredations. They work with partners to alleviate, and where possible, eliminate damages caused by deer. Hazing, permanent fencing, depredation hunts, kill permits, and perpetual easements are just some of the tools incorporated into depredation management strategies. The Plan sets a statewide mule deer management direction to reduce and minimize mule deer depredations with a performance target of reducing damage claims to below the 2002-2007 average. Among the strategies to achieve this performance measure is to use targeted antlerless harvest to remove deer causing depredation problems. The Plan recognizes the harvest of antlerless mule deer as an important management tool to decrease population density and to address depredation issues on private lands.

The Plan also establishes population goals for distinct Population Management Units (PMUs) which are a grouping of GMUs. PMUs are based on mule deer movements, similar habitats, and similar management objectives. The GMUs 38, 52A, 53, 63, 63A, 68A are all consolidated into the Snake River PMU. The 10,160 square mile PMU has a mule deer population goal of maintaining the population status. No actual population estimate has been projected within the PMU. Harvest statistics from the 2010 season in the PMU indicate that 928 deer were harvested

with a 36% harvest rate of antlerless animals. A total of 3787 hunters hunted within the PMU with a 25% success rate in 2010.

Local Analysis

Initial deer surveys conducted on the Refuge and adjacent agricultural lands have estimated a minimum count of 125 deer on and adjacent to the Lake Lowell Unit of Deer Flat NWR. These deer are managed as a subset of the larger population managed within GMU 38 which surrounds the Refuge. Due to logistical challenges the population of GMU 38 is not estimated. In general, the mule deer population within Southwest Region of Idaho is generally robust and healthy. Estimates do exist for the three GMUs adjacent to GMU 38 (GMUs 32, 39, and 40) which collectively have an estimated mule deer population of over 55,000 animals, as projected after the annual hunt season. Collectively, GMUs 32, 39, and 40 harvested over 5000 mule deer during the 2010 hunting season (L. McDonald pers. comm.). Hunter harvest of deer in GMU 38 has been relatively stable over the past few years with approximately 240 deer harvested annually.

Conclusion

The Refuge has coordinated closely with the state in developing a deer hunt that falls within the frameworks of the depredation hunts and the general deer hunt within GMU 38. Alternatives A & B would assist IDFG by supporting the goals and objectives of the 2008 Mule Deer Management Plan, specifically as it applies to alleviating depredation to agricultural croplands. The hunt plan offers additional local mechanisms for IDFG to fulfill its statutory requirements within Idaho Code 36-1108 to take appropriate actions to address depredation situations.

Under Alternative B, up to 45 refuge permits would be made available to harvest deer via the controlled deer hunt and with the potential of depredation hunt permits being issued to achieve reductions in depredation complaints. Under Alternative C, only depredation hunts would be used to reduce depredation complaints and would be estimated to be at least 45 permits. It is anticipated that no matter how many controlled or depredation hunt permits are issued, harvest success rates will not approach 100%. IDFG has suggested an initial reduction of 20-30% of the local population may be required by the controlled deer hunt to address depredation (L. McDonald pers. comm.). Alternative B has the greatest potential to achieve this initial reduction with Refuge hunting coinciding with hunting within GMU 38, culminating in greater hunting pressure over a greater area during the controlled deer season. While initially greater numbers of depredation permits may be warranted to address depredation complaints, subsequent hunt seasons may issue fewer depredation permits as the controlled hunt reduces the local population and a depredation threshold is realized.

With regional deer populations exceeding 55,000 animals, the proposed hunts in either Alternative B or C, would not result in significant cumulative impacts to either GMU 38 or the Snake River PMU. Locally an increase in harvest would actually help maintain the population at levels that are socially acceptable through the reduction of car strikes, direct financial losses, and wildlife conflicts in an urbanizing area.

The Refuge hunt program would be designed to provide a quality hunt, a safe experience, and a reasonable opportunity to harvest game species. By implementing the deer hunt program, no habitat degradation would be anticipated; disturbance to birds and other wildlife, if any, would be temporary and localized; and ample amounts of additional quality habitat for these wildlife species exists on the Refuge. Thus, it is anticipated that wildlife populations would find sufficient food resources and resting places such that their abundance and use of the Refuge and local area would not be measurably lessened from hunting activities. The number of individuals expected to be removed from the deer populations due to hunting would not impair the physiological condition and production of hunted species and their behavior and normal activity patterns would not be altered dramatically.

A controlled deer hunt and depredation hunt offering a limited number of permits on the Deer Flat Refuge would have minimal impacts on the Refuge environment, overall population of mule deer, non-target species, other wildlife-dependent recreational uses, and nearby residents. The Refuge environment includes wildlife, soils, vegetation, air quality, and water quality. Some disturbance to the Refuge environment is anticipated but impacts would be minor due to the dispersed nature of the activity entailing a limited number of participants over the duration of the hunt season. State and Federal regulations and Refuge-specific special conditions would help reduce or eliminate any unwanted impacts of the use to non-target species. The Refuge would implement, as needed, spatial and/or temporal sanctuary areas to protect sensitive non-target wildlife resources such as eagle nests, waterbird nesting colonies, and wintering waterfowl. The proposed hunt is not anticipated to have any impact on threatened or endangered species, as none are known to occur in the hunting area.

Specific Refuge regulations help safeguard Refuge habitat and adjoining private property. Disturbance to other wildlife would occur, but this disturbance is generally short-term with sufficient habitat in adjacent areas. Apart from the Refuge's deliberate efforts to reduce the localized deer population, this harvest would not significantly affect the regional population of mule deer. In addition, the proposed hunt is anticipated to have a positive benefit to adjoining agricultural lands by alleviating localized depredation impacts.

In summary, the hunt on the Refuge would not have any significant impacts to hunted species, to the regional populations of these species, to the Refuge environment, to adjacent lands, or to nearby residents.

5.0 COORDINATION, CONSULTATION, AND COMPLIANCE

5.0.1 NATIONAL ENVIRONMENTAL POLICY ACT (1969)

As a Federal agency, the Service must comply with provisions of the National Environmental Policy Act (NEPA). An environmental assessment is required under NEPA to evaluate reasonable alternatives that would meet stated objectives and to assess the possible impacts to the human environment. The environmental assessment serves as the basis for determining whether implementation of the proposed action would constitute a major Federal action significantly affecting the quality of the human environment.

The planning process has been conducted in accordance with National Environmental Policy Act Implementing Procedures, Department of Interior and Service procedures, and has been performed in coordination with the affected public. A 30-day public review and comment period for the Draft Environmental Assessment for a Controlled Mule Deer Hunt on the Lake Lowell Unit of the Deer Flat National Wildlife Refuge opened on December 6, 2011. Press releases announcing the availability of the plan were sent to local media outlets. The EA was also posted on the Refuge's website for the duration of the public comment period. Paper copies were made available at the Refuge's Visitor Center during the public comment period. Notice of the availability of the plan was mailed to land owners bordering the south boundary of the Refuge.

5.0.2 NATIONAL HISTORIC PRESERVATION ACT

The implementation of this plan should not affect cultural resources. The Service will comply with the National Historic Preservation Act if any management actions have the potential to affect any historic properties which may be present.

5.0.3 EXECUTIVE ORDER 13175. CONSULTATION and COORDINATION WITH INDIAN TRIBAL GOVERNMENTS

As required under Secretary of the Interior Order 3206 American Indian Tribal Rights, Federal Tribal Responsibilities, and the Endangered Species Act, the Service consulted and coordinated with the Shoshone-Bannock, Shoshone-Paiute, and Nez Perce Tribes regarding the proposed action (See 5.1.3).

5.0.4 EXECUTIVE ORDER 12898. FEDERAL ACTIONS to ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY AND LOW-INCOME POPULATIONS.

All Federal actions must address and identify, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations, low income populations, and Indian Tribes in the United States. This plan was evaluated and no adverse human health or environmental effects were identified for minority of low-income population, Indian Tribes, or anyone else.

5.0.5 NATIONAL WILDLIFE ADMINISTRATION ACT OF 1966, as amended by THE NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT OF 1997 (16 U.S.C. 668dd-668ee).

A Compatibility Determination has been prepared for deer hunting on Deer Flat National Wildlife Refuge.

5.0.6 ENDANGERED SPECIES ACT

Implementation of this plan is not expected to impact listed species. A Biological Assessment (Section 7) for the proposed hunt program is under development and review.

5.1 COORDINATION

5.1.1 STATE AGENCIES

Idaho Department of Fish and Game staff met with Refuge staff on October 11, 2011 to discuss the Lake Lowell hunting program. The Service and IDFG shared correspondences relating to deer management throughout the development of the plan. IDFG also provided comments and suggestions on preliminary drafts of planning documents. IDFG issued a letter in support of the Preferred Alternative within the Environmental Assessment on December 15, 2011.

5.1.2 INTERAGENCY COORDINATION

The plan was posted on the Deer Flat Refuge website (<http://www.fws.gov/deerflat/>) on December 6, 2011. A News Release was sent to local media outlets on December 7, 2011 directing interest to the Refuge website and announcing the 30-day public comment period. On December 6, 2011, letters were sent to federal legislators (Senator Michael Crapo, Senator James Risch, Congressman Raul Labrador, and Congressman Michael Simpson) informing their staff of the hunt plan and public comment period. On November 30, 2011 members of the CCP's Interagency Coordinating Team (ICT) received an emailed Monthly Update announcing the release of the planning documents and clarifying the difference between this plan and the CCP. Members of the ICT, comprised of members of State, Federal, County, and local government, were sent reminder messages about the public comment period on December 7, 2011 and December 22, 2011.

5.1.3 TRIBES

Letter were sent to Tribal contacts from the Shoshone-Bannock, Shoshone-Paiute, and Nez Perce Tribes by the Service informing them of the hunt plan and public comment period.

6.0 LITERATURE CITED

Allen, E. B. 1988. Some trajectories of succession in Wyoming sagebrush grassland: implications for restoration. Pages 89-112 IN E. B. Allen (ed.). *The Reconstruction of Disturbed Arid Lands: An Ecological Approach*. Westview Press. Boulder, CO.

Anderson and Ohmart. 1977. *Vegetation Management Annual Report*. U.S. Bur. Rec. Contract No. 7-07-30-V0009.

Belant, J. L., T.W. Seamans, and C. P. Dwyer. 1996. Evaluation of propane exploders as white-tailed deer deterrents. *Crop Protection* 15:575–578.

Beland, J.L., T.W. Semans ,and L.A. Tyson. 1998. Evaluation of electronic frightening devices as white-tailed deer deterrents. *Proceedings of the Vertebrate Pest Conference* 18:107–110.

Belnap, J. and O. L. Lange. 2001. Biological Soil crusts: Structure, Function, and Management. Springer-Verlag. New York, NY. 503 pages.

BOR. 2011. Project details: Boise Project. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=Boise%20Project&pageType=ProjectDataPage#Group22155. Accessed on April 19, 2011.

Bunting, S. C., J. L. Kingery, and M. A. Schroeder. 2003. Assessing the restoration potential of altered rangeland ecosystems in the Interior Columbia Basin. *Ecological Restoration* 21:77–86.

Canyon County. 2005. 2010 Canyon County comprehensive plan. Available at: <http://www.canyonco.org/dsd.aspx?id=1116>. Accessed on May 13, 2011.

Canyon County. 2011a. Canyon County proposed land use. Map available at Development Services Department, Canyon County, Idaho.

Canyon County. 2011b. Canyon County, Idaho zoning, revised March 9, 2011. Available at: <http://www.canyonco.org/dsd.aspx?id=1116>. Accessed on May 16, 2011.

Canyon County. 2011c. 2020 Canyon County proposed comprehensive plan. Available at: <http://www.canyonco.org/dsd.aspx?id=1116>. Accessed on July 8, 2011.

Carver, E. and J. Caudill. 2007. Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Division of Economics. U.S Fish and Wildlife Service: Washington D.C.

City of Caldwell. 2010. City of Caldwell 2030 comprehensive plan. Available at: http://www.cityofcaldwell.com/file_depot/0-10000000/10000-20000/13986/folder/59467/Comprehensive+Plan+-+adopted+May+2010.pdf. Access on July 8, 2011.

City of Nampa. 2004. City of Nampa comprehensive plan. Available at: http://www.cityofnampa.us/pages/View_File.php?id=1118. Accessed on May 13, 2011.

Cooper, A. B., and J. W. Unsworth. 2000. Southwest region big game modeling. Completion Report, Project W-160-R-127, Idaho Department of Fish and Game, Boise, USA.

Cox, M., D. W. Lutz, T. Wasley, M. Fleming, B. B. Compton, T. Keegan, D. Stroud, S. Kilpatrick, K. Gray, J. Carlson, L. Carpenter, K. Urquhart, B. Johnson, and C. McLaughlin. 2009. Habitat Guidelines for Mule Deer: Intermountain West Ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

Curtis, P. D, C. Fitzgerald , and M. E. Richmond. 1997. Evaluation of the Yard Gard ultrasonic yard protector for repelling white-tailed deer. *Proceedings of the Eastern Wildlife Damage Control Conference* 7:172–176.

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds – a literature review of impacts and mitigation measures – prepared for Stillwater National Wildlife Refuge. Appendix L

(114pp.) in Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR.

Dobkin, D. S. 1994. Conservation and management of neotropical migrant landbirds in the northern Rockies and Great Plains. University of Idaho Press, Moscow.

Dobkin, D. S., and J. D. Sauder. 2004. Shrubsteppe landscapes in jeopardy: distributions, abundances, and the uncertain future of birds and small mammals in the intermountain west. Bend, Oregon: High Desert Ecological Research Institute.

Ecovista and IDFG (Idaho Department of Fish and Game). 2004. Middle Snake subbasin assessment. Northwest Power and Conservation Council. Portland, OR. 58 pp.

Ferrari, R. 1995. Lake Lowell 1994 reservoir survey. Bureau of Reclamation, Sedimentation and River Hydraulics Group, Water Resources Services, Technical Service Center. Denver, CO. 13 pp.

Gilsford, J.M. ,S.E. Hygenstrom ,AND K. C. Vercauteren. 2003. Use of frightening devices in wildlife damage management. *Integrated Pest Management Reviews* 7:29–45.

Gilsford, J.M. ,S.E. Hygenstrom ,AND K. C. Vercauteren, E.E.Blankenship, AND R. M. Engemann. 2004a. Propane exploders and electronic guards were ineffective at reducing deer damage in cornfields. *Wildlife Society Bulletin* 32:524–531.

Gordon, J., and D. Mulkey. 1978. Income multipliers of community impact analyses – what size is reasonable? *Journal of Community Development Society of America* 9(1):86-93.

Hironaka, M., M. A. Fosberg, A. H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. *Bull* 35. Univ. Idaho, Forest, Wildl. and Range Exp. Stn. Moscow, ID. 44 pages.

Havera S.P., Boens L.R., Georgi M.M., Shealy R.T. 1992. Human Disturbance of Waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*, Vol. 20, No. 3 (Autumn, 1992), pp. 290-298. Allen Press

Hunter, L., Canevari, P. J. P. Myers, and L. X. Payne. 1991. Shorebird and wetland conservation in the western hemisphere. ICBP Tech. Publ. No. 12.

Idaho Department of Fish and Game (IDFG). 2005b. The compass: Idaho Department of Fish and Game strategic plan. Idaho Department of Fish and Game, Boise, USA.

Idaho Department of Fish and Game (IDFG). 2008. Idaho Mule Deer Management Plan 2008-2017. Idaho Department of Fish and Game, Boise, USA.

Idaho Department of Fish and Game (IDFG). 2010. Annual Report, Project W-170-R-33. Idaho Department of Fish and Game, Boise, USA.

Idaho Department of Fish and Game Website (IDFG).

<http://fishandgame.idaho.gov/ifwis/huntplanner/>. Accessed during November 2011.

IDEQ. 2010. Lake Lowell TMDL: addendum to the lower Boise River subbasin assessment and total maximum daily loads. Boise Regional Office. Boise, ID. 247 pp.

Idaho Partners in Flight (IDPIF). 2000. Idaho bird conservation plan. Version 1.0. 156pp.

Idaho Outdoor Recreation Demand Assessment. 2002.

http://parksandrecreation.idaho.gov/assets/content/docs/2002_needs.pdf. Accessed on November 22, 2011.

Ivey, G.L. and C.P. Herziger. 2006. Intermountain West Waterbird Conservation Plan, Version 1.2. A plan associated with the Waterbird Conservation for the Americas Initiative. Portland, Oregon. Manning and Hartley 2006.

Johnson, R. R., L. T. Haight, and J. M. Simpson. 1977. Endangered species vs. endangered habitats: a concept. Pp. 68-79. In: R. R. Johnson and D. A. Jones, tech. coords. Importance, preservation and management of riparian habitat: A symposium. Gen. Tech Rep. RM-43. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Johnson, R. R., and L. T. Haight. 1985. Avian use of xeroriparian ecosystems in the North American warm deserts. Pp 156-160. In: R. R. Johnson, C. D. Ziebel, D. R. Patton, P. F. Folliot, and R. H. Hamre, eds. Riparian ecosystems and their management: Reconciling conflicting uses. Gen. Tech. Rep. RM-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Kahl R. 1991. Boating Disturbance of Canvasbacks during Migration at Lake Poygan, Wisconsin Wildlife Society Bulletin, Vol. 19, No. 3 (Autumn, 1991), pp. 242-248. Allen Press

Kenow K.P., Korschgen C.E., Nissen J.M., Elfessi A., and Steinbach R., 2003 A Voluntary Program to Curtail Boat Disturbance to Waterfowl During Migration. *Waterbirds*, 26(1):77-87. 2003. The Waterbird Society.

Knapton R.W., Petrie S.A., Herring G. Human Disturbance of Diving Ducks on Long Point Bay, Lake Erie. *Wildlife Society Bulletin*, Vol. 28, No. 4 (Winter, 2000), pp. 923-930. Allen Press.

Knick, S. T., D. S. Dobkin, J. T. Rotenberry, M. A. Schroeder, W. M. Vander Haegen, and C. van Riper, III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. *Condor* 105:611–634.

Koehler, A. E., R. E. Marsh, AND T. P. Salmon. 1990. Frightening methods and devices/stimuli to prevent mammal damage – a review. *Proceedings of the Vertebrate Pest Conference* 14: 168–173.

Korschgen, C.E. and Dahlgren, R.B. 1992. Human disturbances of waterfowl: Causes, effects, and management. *Fish and Wildlife Leaflet* 13.2.15. 8 pp.

Krueper, D. J. 1993. Effects of land use practices on western riparian ecosystems. In: Finch, D.M.; Stangel, P. W., eds. Status and management of migratory landbirds. Gen. Tech. Rep.

RM229. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 321-330. Stevens et al. 1977.

Mac, M. J., P. A. Opler, E. P. Haecker, AND P. D. Doran. 1998. Status and trends of the nation's biological resources. Vol. 2. USDI, United States Geological Survey, Reston, VA.

Miller, R. F., and L. Eddleman. 2001. Spatial and temporal changes of sage grouse habitat in the sagebrush biome. Technical Bulletin 151. Agricultural Experiment Station, Oregon State University, Corvallis.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. *Ecological Applications*.

Roper, R. B., and E. P. Hill. 1985. An evaluation of visual and auditory electronic devices to repel deer. *Proceedings of the Eastern Wildlife Damage Control Conference* 2:186–191.

Saab, V. A., and T. D. Rich. 1997. Large-scale conservation assessment for neotropical migratory land birds in the interior Columbia River basin. USDA Forest Service General Technical Report PNW-GTR-399. Portland, Oregon.

Scott, J. M., M. Murray, R. G. Wright, B. Csuti, P. Morgan, AND R. L. Pressey. 2001. Representation of natural vegetation in protected areas: capturing the geographic range. *Biodiversity and Conservation* 10:1297–1301.

Simonds, W.J. 1997. The Boise project. Bureau of Reclamation History Program. Denver, CO. 58 pp.

Skagen, S.K., R.L. Knight, and G.H. Orians. 1991. Human disturbance of an avian scavenging guild. *Ecological Applications* 1:215-225.

Skolvin, J.M. 1982. Habitat requirements and evaluation, J.W. Thomas, D.E. Toweill, Editors , *Elk of North America: Ecology and Management*, Stackpole Books, Harrisburg (1982), pp. 219–278.

Stalmaster, M. V. and J. R. Newman. 1978. Behavioral responses of wintering Bald Eagles to human activity. *Journal of Wildlife Management* 42:506-513.

Taylor, D. M., C. H. Trost, and B. Jamison. 1992. Abundance and chronology of migrant shorebirds in Idaho. *Western Birds* 23:49-78.

Trost, C. H., D. M. Taylor, and B. Jamison. 1989. Migration and management of shorebirds at American Falls Reservoir, Idaho. Idaho State University, Pocatello, ID. 27p.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

U.S. Fish and Wildlife Service (USFWS). 2002. 2001 national survey of fishing, hunting, and

wildlife-associated recreation. U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Census Bureau. Idaho Department of Fish and Game (IDFG). 2008.

Vickery, P. D., and J. R. Herkert, editors. 2002. Ecology and conservation of grassland birds of the western hemisphere. *Studies in Avian Biology* 19.

West, N. E. 1996. Strategies for maintenance and repair of biotic community diversity on rangelands. Pages 327–347 in R. C. Szaro, and D. W. Johnston, editors. *Biodiversity in managed landscapes: theory and practice*. Oxford University Press, New York.

West, N. E., and J. A. Young. 2000. Intermountain valleys and lower mountain slopes. Pages 255–284 in M. G. Barbour and W. D. Billings, editors. *North American terrestrial vegetation*. 2nd edition. Cambridge University Press, Cambridge, United Kingdom

Wisdom, M. J., M. M. Rowland, and L. H. Suring, editors. 2005a. *Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin*. Alliance Communications Group, Lawrence, Kansas.

WRCC (Western Regional Climate Center). 2011a. Climate of Idaho. Available at: www.wrcc.dri.edu/narratives/IDAHO.htm. Accessed on April 19, 2011.

WRCC. 2011b. Western U.S. climate historical summaries. Available at: www.wrcc.dri.edu. Accessed on April 19, 2011.

Wright, R. G., J. M. Scott, S. Mann, and M. Murray. 2001. Identifying unprotected and potentially at risk plant communities in the western USA. *Biological Conservation* 98:97–106.

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