



View from Ted's Trail
Lelaina Marin/USFWS

Environmental Consequences

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Introduction

This chapter describes the foreseeable consequences of implementing the management alternatives described in chapter 2 on the physical, biological, and human environment of the refuge described in chapter 3. Specifically, it predicts the effects of implementing the strategies for each objective of the two alternatives: alternative A, “Current Management,” and alternative B, “The Service-preferred Alternative.”

For details of the alternatives for managing the refuge, see chapter 2, “Alternatives.” For details of the physical, biological, and human environment of the refuge, see chapter 3, “Affected Environment.”

We organized this chapter by major resources; the impacts of each alternative accompany them. It discusses the direct, indirect, short-term beneficial and adverse effects likely to occur over the 15-year period of this plan. We speculate more in describing those effects beyond that 15-year planning horizon. At the end of this chapter, table 4.1 compares side-by-side summaries of the predictable effects of each alternative.

This chapter also identifies any irreversible or irretrievable commitments of resources and the relationships between short-term and long-term productivity. When detailed information is available, we compare scientific analyses of the expected consequences, which we describe as impacts or effects. When detailed information is unavailable, we base those comparisons on our professional judgment and experience.

When we lack reliable, quantitative information, we use the terms “positive,” “negative,” or “neutral” as qualitative measures.

- A positive impact would benefit or enhance the resources under consideration and help accomplish refuge management goals and objectives over the short term (< 15 years) or the long term (> 15 years).
- A negative impact arises from an action that we predict would be detrimental to a resource over the short or long term and, possibly, affect our ability to achieve refuge purposes, goals and objectives.
- A neutral impact means either (a) no discernible effect either positive or negative, or (b) positive and negative effects would cancel each other out.

Some of the actions we propose in chapter 2 do not require additional NEPA analysis, because they are routine administrative actions that do not significantly affect, either individually or cumulatively, the human environment. This chapter does not describe those actions further. They are “categorically excluded” from further NEPA analysis or review, and include the following:

- Conducting research and inventories or collecting other information on resources;
- Conducting routine trail maintenance (e.g., installing water diversions or transporting large rocks to prevent erosion);
- Installing an interpretative sign;
- Making minor changes in the amount or types of public use; and,
- Enforcing laws and refuge regulations.

Effects on the Socioeconomic Environment

Alternative A

In summary, implementing alternative A would not affect the existing socioeconomic environment. The refuge helps to maintain the quality of life not only for local residents, but also for all refuge visitors. Alternative A would not change the opportunities for public use, and current refuge regulations would remain in effect (see chapters 2 and 3).

Refuge land provides socioeconomic benefits through refuge revenue sharing payments (see chapter 3, table 3.1 and narrative on page 3-4 for a complete description and a table of payments from 2000 through 2006). It also provides benefits from public use, as in the increasingly important ecotourism industry. The refuge complements the ecotourism in adjacent natural areas, including Miller State Park and the Joanne Bass Bross Preserve, which attract many outdoor enthusiasts (see chapter 3, pages 3-3 and 3-4 for complete descriptions and amounts of revenues). Applying the estimates for economic values for wildlife-related recreation in chapter 3, the refuge's annual visitation of approximately 30,000 could contribute \$2,372,400 annually to the state or local economies. This estimate is also based on the assumption that 58 percent of visitors to the refuge are state residents and 42% are from out-of-state (USFWS 2003b).

Alternative B

In summary, implementing alternative B would not adversely affect the local socioeconomic environment, and the increase in visitation we predict in this alternative would contribute more to the local economy. We do not expect that prohibiting jogging, camping, mountain biking, horseback riding, and organized or facility-supported picnicking on the refuge will detract from the local economy or from the quality of life for local residents.

The benefits of refuge revenue sharing would resemble those in alternative A. The alternatives differ in that alternative B proposes some changes in our outreach and visitor services program (see chapter 2) that would contribute to a small increase in visitation.

The New Hampshire State Comprehensive Outdoor Recreation Plan finds that visitation at New Hampshire state parks increased by 82 percent between 1998 and 2001 (NH OEP 2003). We are not expecting as large an increase in the number of refuge visitors, because we do not allow such activities as hunting or fishing, which typically attract many visitors.

However, we are predicting an increase in visitation of up to 15 percent, based on the "2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: State Overview," which finds a 15 percent increase in the number of people watching wildlife near their homes in New England between 2001 and 2006 (USFWS & US DOC 2007). Using that statistic, coupled with our proposed changes in outreach in allowed uses, we believe we can expect at least a 15 percent increase in refuge visitors over the next 15 years: an increase from the current estimated 30,000 visitors per year to an estimated 34,500 visitors per year.

Based on estimates that residents and non-residents respectively spend \$27 and \$151 per person, per day when watching wildlife (USFWS 2003a), and the New Hampshire state visitor ratio of 58 percent state residents and 42 percent non-residents (USFWS 2003b), we predict a contribution of \$2,728,260 annually to the state or local economy each year. See chapter 3 for more information on social and economic values attributed to the refuge.

Effects on Air Quality

Alternative A

In summary, we do not expect any major impacts on the air quality on the refuge or the surrounding landscape from implementing alternative A. Refuge activities (e.g., vehicle emissions) would result in only a negligible adverse effect on air quality, and would not affect Class I air quality areas. We predict no violations of the Federal Clean Air Act from implementing alternative A.

We would not remove trees, or implement methods such as prescribed fire, either to manage vegetation or for any other purpose. Alternative A does not propose the use of pesticides or herbicides on the refuge. In alternative A, we would continue to protect the forest ecosystem to maintain carbon sequestration at its current level or increase it. Carbon sequestration in terrestrial ecosystems is either the net removal of carbon dioxide from the atmosphere or the prevention of carbon dioxide emissions into the atmosphere (DOE 1999). Thus, alternative A would continue to benefit regional air quality and would not cause any major impacts.

Alternative A would continue to protect refuge land from residential, commercial, or industrial development, and prevent the additional degradation of air quality from increased vehicle emissions or industrial air pollutants associated with that development. Although the emissions of visitors' vehicles contribute additional pollutants, such as ozone, that contribution is negligible compared to that of the urban and industrial centers within 100 miles of the refuge. In addition, protecting natural vegetation (see carbon sequestration, above) would partially offset those vehicle emissions.

The USFS Lye Brook Wilderness Area in Vermont is the Class I air quality area closest to the refuge, approximately 90 miles away. However, we do not expect any of our current activities to affect the air quality in those areas, because of their distance and the prevailing winds, and because our activities contribute virtually no pollutants.

Alternative B

In summary, implementing alternative B would result in only minimal impact on air quality, but would not affect Class I air quality areas. Therefore, we predict no violations of the Federal Clean Air Act from implementing alternative B or any impacts to Class I air quality areas. Alternative B would provide most of the same positive effects on air quality as those described in alternative A.

The only change that might cause a minimal impact on air quality is the anticipated increase in visitors, and thus, an increase in vehicles, as a result of improved Service and refuge outreach. Still, those car emissions would contribute only a negligible amount compared to those of the urban and industrial centers within 100 miles of the refuge.

Effects on Physical Resources

Water Quality

Alternative A

We do not expect any impacts on the current water quality on the refuge or the Wapack Range. Alternative A does not propose the application of pesticides or herbicides, nor does it propose the removal or installation of infrastructure, or the creation of non-permeable surfaces. It proposes no projects that would alter the hydrology of the refuge. It would protect refuge land from residential, commercial, or industrial development, and prevent the degradation of water quality associated with them: namely, non-point and point-source pollution. The natural vegetation on the refuge filters water pollutants, although we have not done a study to quantify that benefit.

Alternative B

In summary, we predict no violation of the Clean Water Act from implementing alternative B. It does not propose any major management or construction projects that would impact the hydrology of the refuge, nor do we expect any impacts on the current water quality of the Wapack Range. The only exception is our proposal to explore a location for a new trailhead parking area. Although we anticipate laying a permeable gravel surface, we lack the final design plans and definite location to fully analyze their impacts. We will conduct the appropriate level of NEPA analysis when we have the final plans and location.

As in alternative A, alternative B does not propose the application of any pesticides or herbicides that would degrade water quality. We would protect refuge land from residential, commercial, or industrial development, and prevent the effects on water quality associated with them, particularly point- and non-point-source pollution. Natural vegetation on the refuge would continue to filter water pollutants that might otherwise degrade water systems nearby.

Soils

Alternative A

In summary, this alternative proposes no major construction or demolition projects that require the disturbance of significant areas of earth or soil, other than the possible installation of water diversions to prevent soil erosion. Although foot travel leads to soil compaction, we do not expect any significant adverse impacts on refuge soils in alternative A.

The only management activity on the refuge with the potential to affect soils is maintaining the trails. That includes removing major obstructions and litter, creating water diversions, or rerouting a trail if necessary to minimize erosion. Only hand tools are used for those maintenance projects, thus mitigating soil compaction that might result from the use of larger construction equipment. We expect visitors to stay on the designated trails to minimize the compaction and erosion of off-trail areas. This alternative does not propose the use of herbicides or revegetation, thereby preventing additional mechanical or chemical impacts on soils.

Alternative B

In summary, alternative B proposes no major construction or demolition projects that would disturb significant areas of earth or soil, or cause additional soil compaction, erosion or loss of soil productivity. However, minor soil disturbance may result from several small maintenance projects and public use activities, described below.

We propose to install an informational sign at the Wapack trailhead and “Welcome to the National Wildlife Refuge” signs at the entrances to the Ted’s and Carolyn’s trails. Installing those signs would cause minimal soil compaction and negligible mechanical impacts on a very small area of the refuge. This alternative also would continue trail maintenance as described above in alternative A, with the same minimal effects. We may install water diversions throughout the trails which would cause minor soil disturbance during installation, but would provide long-term benefits against soil erosion. As in alternative A, alternative B does not propose revegetation or the use of herbicides that would result in additional mechanical or chemical impacts on the soil.

Foot travel from visitors using the refuge for walking/hiking, backpacking, cross country skiing, snowshoeing, dog walking, berry picking, or conducting research on the refuge may lead to soil compaction. However, under current levels of use on the refuge or with a 15 percent increase in visitation, we expect that soil compaction would be minor and insignificant; particularly if visitors stay on designated trails. Furthermore, prohibiting mountain biking and horseback riding should prevent future degradation and erosion of trails from these activities. Prohibiting organized picnicking and camping should reduce the number of visitors wandering off trail to find sites and consequently causing increased soil compaction.

We also anticipate laying a permeable gravel surface for a new trailhead parking area, but we lack the final design plans and definite location to fully analyze their impacts. When we have them, we will conduct the appropriate level of NEPA analysis.

Other than the small projects described below and the possible installation of water diversions throughout the trails, we predict no additional soil compaction, erosion, or loss of soil productivity from implementing alternative B.

Effects on the Natural Soundscape

Alternative A

In summary, this alternative proposes no projects that would change the natural noise levels of the refuge. Therefore, we do not expect implementing alternative A to cause any significant adverse impacts on the refuge soundscape¹.

The noise contributed by vehicles would be negligible, considering that no major highways pass nearby, and the only roads close to the refuge sustain minimal use. The only other activity on the refuge that may contribute minimal noise impacts is the use of a chainsaw in maintaining trails. However, that use is limited and temporary; we expect negligible to no impacts on the natural soundscape.

Alternative B

Same as alternative A

Effects on Biological Resources

Vegetation

Alternative A

In summary, we do not expect any major impacts on vegetation by implementing alternative A. Implementing alternative A would continue to maintain the “wilderness-like” setting of the refuge and, consequently, prohibit the removal of or other detrimental effect on refuge vegetation.

We would continue to comply with the deed restrictions which prohibit the removal of any trees, except for trail maintenance. The only shrub or herbaceous vegetation removal we expect on the refuge would result only if any major obstructions or litter were present on the trails. Because we expect refuge visitors to stay on the designated trails and the number and impact of berry pickers to be minimal (see alternative B discussion below), we expect minimal vegetation compaction.

Alternative B

In summary, as in alternative A, we would continue to comply with the deed restrictions that prohibit any removal of trees except for trail maintenance. Implementing alternative B would maintain the “wilderness-like” setting of the refuge, and thus, prohibit the removal of vegetation unless for trail maintenance purposes. Vegetation would be removed only if major obstructions or litter were present on the trails. Further, no collecting of native vegetation or materials is allowed, except for the picking of berries for personal-use.

¹ **soundscape** *n* the total acoustic environment associated with a given area (NPS 2003)

Foot travel from visitors using the refuge for walking/hiking, backpacking, cross country skiing, snowshoeing, dog walking, berry picking, or conducting research on the refuge increases root exposure, trampling effects, and crushing of plants. We would continue to expect and encourage refuge visitors to stay on designated trails, thus minimizing vegetation compaction and soil loss. Those impacts would primarily occur in the trail footprint. Under current levels of use on the refuge or with a 15 percent increase in visitation, we expect that any effects from foot traffic would be minor and insignificant. Furthermore, prohibiting mountain biking and horseback riding should prevent future degradation of trails and erosion from these activities. Prohibiting organized picnicking and camping should reduce the number of visitors wandering off trail to find sites and consequently causing increased soil compaction and trampling of vegetation.

In concentrated areas at high use, visitors walking off established trails to collect berries may impact plants indirectly by compacting soils and diminishing soil porosity, aeration and nutrient availability, affecting plant growth and survival (Kuss 1986). Re-colonization of plants can be limited because root growth and penetration becomes more difficult in compacted soils (Hammitt and Cole 1998). However, many of the berry bushes grow adjacent to the trail alleviating the need for much traffic off the trail. Furthermore, under alternative B berry picking would be permitted only in designated trail areas to minimize off-trail soil compaction and vegetation trampling. Our observations of harvest levels and technique indicate that berry picking is not efficient or extensive enough to impact the regeneration of berries. More of a long-term impact to the berries on the refuge is that the surrounding vegetation is beginning to shade out plants. Portions of the berry picking area or, if appropriate, the entire area can be closed at any time for any length of time if the refuge manager determines that wildlife or wildlife habitat is being impacted by the activity.

Visitors may also spread invasive plants. When people move from one area to another, they can be vectors for the seeds or other propagules of invasive plants. Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Additionally, horse manure may contain viable seeds from invasive plants (Wells and Lauenroth 2007). Prohibiting horseback riding on the refuge would prevent the introduction of invasive plants through horse manure. The threat of invasive plants establishing themselves will always be an issue that requires monitoring. Within 2 years of CCP completion, the USFS Forest Health Protection Program would complete a full forest health assessment that would help determine if any invasive species inhabit the refuge.

This alternative proposes the installation of an informational sign at the Wapack trailhead and “Welcome to your National Wildlife Refuge” signs on the Ted’s and Carolyn’s trails which might require the removal of minimal, if any, vegetation.

Endangered and Threatened Species

No federal- or state-listed endangered or threatened species are known to use the refuge.

Birds

Alternative A

In summary, we expect minimal adverse effects on forest-dwelling birds from implementing this alternative. The refuge contains many forest-dwelling bird species. Several of those are identified as species of concern or priority by the New Hampshire Wildlife Action Plan (NHFG 2005) and the Atlantic Northern Forest Bird Conservation Region (BCR 14) Blueprint (Dettmers 2005). See chapter 3 for lists of species.

This alternative would continue the maintenance of the 1,625 acres of contiguous, mature forest habitat to benefit all of those species. Trail maintenance or visitor use may temporarily displace them, and disturbance may be elevated if dogs are present (see alternative B discussion below), but that impact is not permanent, limited in time and area, and focused on trail use. Berry picking for personal use occurs in the summer. Our

observations indicated that the harvest of berries by refuge visitors is not sufficiently efficient nor so extensive so as to negatively impact the use and availability of the overall berry crop by wildlife.

Alternative B

In summary, alternative B would continue to benefit forest-dependent birds on the refuge by maintaining 1,625 acres of mature forest and conducting bird surveys.

- It proposes no habitat management or manipulation, and consequently, would continue to provide 1,625 acres of contiguous mature forest habitat for the forest dwelling birds species identified in chapter 3.
- It proposes that our partners assist us in increasing the number of wildlife surveys conducted on the refuge. That would help us better quantify the effects of this alternative on bird populations on the refuge.

Visitors using the refuge may directly impact birds sensitive to human presence. We would continue to expect and encourage refuge visitors to stay on designated trails, thus minimizing disturbance to birds. However, we predict any disturbance from visitors would only result in a temporary displacement of birds without long-term effects on individuals or populations. Under current levels of use on the refuge or with the projected 15 percent increase in visitation, the incidence of any problems would be minor and insignificant. Furthermore, prohibiting mountain biking and horseback riding should prevent future disturbance and degradation of trails and wildlife habitat from these activities. Prohibiting organized picnicking and camping should reduce the incidences of visitors leaving behind trash and food waste that could attract nuisance species, and should also reduce the number of visitors who wander off trail and consequently cause increased soil compaction, trampling of vegetation, and disturbance to wildlife.

Some particularly sensitive bird species may avoid areas frequented by people, such as the trail. There are other birds, however, such as chickadees and titmice, which seem unaffected or even drawn to human presence. Visitors also have the potential to supply an unnatural food source for birds, either through feeding food scraps or littering. We will advise against feeding birds in our outreach program, and we already prohibit littering. We also describe under alternative A “Birds” the potential for berry picking to affect food resources for birds. However, as we describe, we estimate there is minimal impact. To ensure this is true, under alternative B berry picking will be permitted only in designated trail areas to minimize the damage to vegetation by trampling. Portions of the berry picking area or, if appropriate, the entire area can be closed at any time for any length of time if the refuge manager determines that wildlife or wildlife habitat is being impacted by the activity.

Dog walking might cause additional disturbance to birds. There can be an increase in wildlife disturbance from dog walking simply due to normal dog behavior (i.e. jumping, barking, running off a leash). At some level, domestic dogs maintain instincts to hunt and/or chase. Given the appropriate stimulus, those instincts can be triggered in many different settings. Even if the chase instinct is not triggered, dog presence in and of itself has been shown to disrupt many wildlife species (Sime 1999). Sime presents some effects of disturbance, harassment, and displacement on wildlife attributable to domestic dogs that accompany recreationists. Sime states that authors of many wildlife disturbance studies concluded that dogs with people, dogs on-leash, or loose dogs provoked the most pronounced disturbance reactions from their study animals. Dogs extend the zone of human influence when off-leash.

Although dogs can increase disturbance to wildlife, the refuge will enforce a leash law under alternative B to keep dogs and disturbances localized with the pedestrian. There are no documented incidences of domestic dog-wildlife disturbances, or dog-people problems on refuge trails. We have not observed or had reports about significant negative impacts from this use. Through increased signage and outreach by refuge staff and volunteers regarding dog walking proposed under alternative B, we will encourage visitors to comply with the leash law. We believe most dog walkers are local residents, who regularly visit the refuge for

wildlife-dependent recreation, and who will adhere to our regulation. Since alternative B would require that dogs be on leash, minimizing the zone of human influence compared to dogs running off leash under alternative A, we predict a reduced impact on birds under alternative B. We plan to use our volunteers and partners to help us monitor dog walking over the next 5 years to determine if visitors are adhering to the regulation. If we find that the majority of visitors are not complying, we would be prepared to prohibit dog walking altogether. We would print the availability of dog walking as an activity on the refuge as well as the rules and consequence of violating the new policies on the new orientation sign.

Disturbance to birds and other wildlife by researchers could occur through observation, mist-netting, banding, and accessing the study area by foot. It is possible that direct mortality could result as a by-product of research activities. Mist-netting for example, can cause stress, especially when birds are captured, banded and weighed. There have been occasional mortalities to these birds, namely when predators such as raccoons and cats reach the netted birds before researchers do. Overall, however, allowing well designed and properly reviewed research to be conducted by non-Service personnel is likely to have very little impact on refuge wildlife populations. If the research project is conducted with professionalism and integrity, potential adverse impacts are likely to be outweighed by the knowledge gained about an entire species, habitat or public use. Any request for research would require a Special Use Permit issued by the Service.

Effects on Fisheries

The refuge has no bodies of water that contain fish.

Effects on Mammals

Alternative A

In summary, we do not expect any adverse impacts on refuge mammal populations from implementing alternative A. It would maintain vegetative cover types at the same size and distribution, and does not propose any management activities that would permanently displace mammal populations or individual animals. Essentially, implementing alternative A would maintain the status quo.

Temporary displacement may occur during trail maintenance and visitor use, and may be elevated if visitors are walking dogs (see alternative B discussion below), but that impact would be limited in duration and area, and focused on trail use. Although we have conducted no mammal surveys on the refuge, we suspect that such species as black bear, bobcat, deer mouse, eastern gray squirrel, eastern chipmunk, porcupine, white-footed mouse, and white-tailed deer are present and benefit from the intact forest on the refuge.

Alternative B

In summary, alternative B primarily would benefit mammal species on the refuge by maintaining current vegetation cover types. Alternative B also proposes partnerships to increase the number of wildlife surveys on the refuge, to help us better quantify the effects of our management on mammal populations on the refuge. It does not propose any construction or management activities that would permanently displace individuals or populations.

The impacts of refuge visitors to mammals would be similar to that described under “Birds.” Likewise, the specific impacts from research conducted by non-Service personnel, berry picking, and dog walking we described under “Birds” are similar for mammals. In addition, many ungulate species such as deer and moose demonstrated more pronounced reactions to unanticipated disturbances, as a dog off-leash would be until within very close range (Sime 1999). Dogs, noted predators for various species of wildlife during all seasons, can force the movement of ungulates (avoidance or evasion during pursuit), which is in direct conflict with overwinter survival strategies which promote energy conservation (Sime 1999). Domestic dogs can also potentially introduce diseases (distemper, parvovirus, and rabies) and transport parasites into

wildlife habitats. While dog impacts to wildlife likely occur at the individual scale, the results may still have important implications for wildlife populations.

We have not observed, nor have we received, complaints about dogs directly disturbing wildlife. Dogs chasing wildlife violates both federal and state law and would be strictly enforced. In addition, under alternative B, our requirement to have dogs on leash would minimize the potential for wildlife disturbance. Further, we have no information that wildlife diseases are, or have been, a concern in this area. In summary, we do not expect that the number of visitors or visitors with dogs on-leash would significantly affect mammal populations.

Under current levels of use on the refuge or with the projected 15 percent increase in visitation, the incidence of any problems would be minor and insignificant. Furthermore, prohibiting mountain biking and horseback riding should prevent future disturbance and degradation of trails and wildlife habitat from these activities. Prohibiting organized picnicking and camping should reduce the incidences of visitors leaving behind trash and food waste that could attract nuisance species, and would also reduce the number of visitors who wander off trail and consequently cause increased soil compaction, trampling of vegetation, and disturbance to wildlife. As stated under “Birds,” we plan to step-up our monitoring program to insure compliance with regulations and would respond with further restrictions as appropriate to unacceptable levels of wildlife disturbance.

Effects on Amphibians and Reptiles

Alternative A

In summary, implementing alternative A would essentially maintain the status quo for these species and we do not expect it to adversely affect any amphibian and reptile populations. It would maintain the present size and distribution of vegetative cover types, and proposes no management actions that would permanently displace amphibian or reptile populations or individual animals. Trail maintenance or visitor use may temporarily displace them, but that effect would be limited in duration and area. Although we have not surveyed the refuge for populations of amphibians or reptiles, we suspect that species such as the red backed salamander, American toad, bull frog, eastern box turtle, garter snake, milk snake, pickerel frog, red-spotted newt, and spring peeper are present, and thus, would benefit from alternative A.

Alternative B

In summary, alternative B primarily would benefit amphibian and reptile species on the refuge by maintaining current vegetation cover types. Alternative B also proposes partnerships to increase the number of wildlife surveys on the refuge, to help us better quantify the effects of our management on mammal populations on the refuge. It does not propose any construction or management activities that would permanently displace individuals or populations.

The impacts of refuge visitors to amphibians and reptiles would be similar to that described under “Birds.” Likewise, the specific impacts from research conducted by non-Service personnel, berry picking, and dog walking we described under “Birds” are similar for reptiles and amphibians. Under current levels of use on the refuge or with the projected 15 percent increase in visitation, the incidence of any problems would be minor and insignificant. Furthermore, prohibiting mountain biking and horseback riding should prevent future disturbance and degradation of trails and wildlife habitat from these activities. Prohibiting organized picnicking and camping should reduce the incidences of visitors leaving behind trash and food waste that could attract nuisance species, and would also reduce the number of visitors who wander off trail and consequently cause increased soil compaction, trampling of vegetation, and disturbance to wildlife.

Effects on Invertebrates

Alternative A

We have not conducted surveys for invertebrates on the refuge. However, we predict that alternative A would yield generally neutral impacts on the current invertebrate community, because it would maintain vegetation cover types at their present size and distribution. Trail maintenance or visitor use may temporarily displace invertebrates, and disturbance may be elevated if dogs are present, but that impact is not permanent, limited in time and area, and focused on trail use.

Alternative B

Overall, alternative B would yield generally neutral impacts on the invertebrate community because it would maintain the existing vegetation cover types on the refuge. Visitors using the refuge for walking/hiking, backpacking, cross country skiing, snowshoeing, dog walking, berry picking, or conducting research on the refuge may disturb invertebrates and degrade habitat through increased root exposure, trampling effects, and crushing of plants. Non-Service personnel conducting research on invertebrates, depending on the type of research, will likely impact them in ways similar to those described for “Birds.” Under current levels of use on the refuge or with the projected 15 percent increase in visitation, the incidence of any problems would be minor and insignificant. Furthermore, prohibiting mountain biking and horseback riding should prevent future disturbance and degradation of trails and wildlife habitat from these activities. Prohibiting organized picnicking and camping should reduce the incidences of visitors leaving behind trash and food waste that could attract nuisance species, and would also reduce the number of visitors who wander off trail and consequently cause increased soil compaction, trampling of vegetation, and disturbance to wildlife. The U.S. Forest Service forest health assessment proposed in alternative B would include a survey of invertebrates on the refuge. That survey would help us better quantify the effects of our management on invertebrate populations.

Effects on Public Use and Access

Alternative A

In summary, alternative A maintains the present level of programs and types of public use on the refuge. Those seem to satisfy visitor demand; we have not received any comments that we should allow new or different uses; nor have we received any complaints about current uses. That indicates we are now accommodating a reasonable number of activities on the refuge. Activities currently allowed on the refuge include observing and photographing wildlife, berry picking, hiking/backpacking, jogging/walking, picnicking, and snowshoeing and cross-country skiing. Activities prohibited by deed restrictions include hunting, fishing, trapping, traveling in or using vehicles, and the cutting of trees except to maintain trails. Previous refuge managers determined the following activities to be incompatible: camping, mountain biking, and horseback riding. Dog walking has never been formally evaluated by a refuge manager and is therefore technically prohibited.

Visitors are required to remain on the designated trail system to minimize environmental damage and prevent accidents. Collecting of any kind is not allowed, nor is disturbing or feeding wildlife. Trails are monitored and maintained by the Friends of the Wapack and the Mountain View Hiking Club to provide a safe and quality visitor experience. The trail surfaces are maintained each year as necessary.

For full discussions of the details of public use activities, see chapter 2, “Alternatives,” and chapter 3, “Affected Environment.”

Alternative B

In summary, we estimate an increase of approximately 15 percent in annual visitor use over the next 15 years based on recreational trend information from New Hampshire. Although we cannot quantify the

increase exactly, we expect that the increase in visitors can be supported on the refuge without impacts on other users or creating new user conflicts. Most visitors use the refuge during the spring and fall and primarily on weekends. We do not expect visitor use patterns to appreciably change as a result of alternative B management.

Jogging, mountain biking, and horseback riding would be prohibited under this alternative primarily as a result of a deed restriction which requires the refuge to be used "...for wilderness purposes the preservation of the area as a place where the earth and its community of life remain untrammelled by man, where man is a visitor who does not remain, in order that the area will remain unimpaired for future use and enjoyment as a wilderness" Alternative B also proposes that we prohibit camping and organized or facility-supported picnicking on the refuge. By prohibiting camping, we would avoid the potential for law enforcement and safety issues for campers, as well as any aesthetic consequences for other visitors who may come across trampling, trash, or human waste that may be left behind. Prohibiting picnicking does not preclude those visitors walking on the trails from having a snack. We are simply indicating our intent that no facilities or improvements (e.g., picnic tables, trash cans) would be provided in the future to support this activity. Since none currently exist, the vast majority of visitors would not be impacted. We do not expect the impacts of prohibiting the activities above to be significant among current or future visitors because they are rarely observed on the refuge and were not activities in which the public expressed interest during public scoping. Furthermore, by not allowing jogging, mountain biking, and horseback riding we will avoid the potential of detracting from the enjoyment of the refuge for other visitors engaged in wildlife-dependent activities, particularly with the expected 15 percent increase in visitation.

Alternative B also proposes that we establish a parking area at the northern end of the refuge on Old Mountain Road. This would improve safety and convenience for visitors accessing the refuge since currently they must park on the road shoulder. However, describing all the effects before we have selected a definite location is difficult. We would conduct the appropriate NEPA analysis once we have selected a site. Until then, we would continue to direct visitor access as in alternative A. For full discussions of the details of those activities, see chapter 2, "Alternatives," and chapter 3, "Affected Environment."

Alternative B would officially open the refuge to dog walking on a leash. As we have already discussed, dog walking is currently prohibited, but we realize that at current levels of Service visibility and proper enforcement, visitors have been unaware of this prohibition and have walked their dogs. In fact, in our observations, most dogs are walked off-leash. That being said, we have not observed or received complaints about dogs impacting other visitors. We predict that if all dogs are kept on leash under the command and control of their owners, all visitors can continue to have a quality refuge experience. We understand that this policy will affect those refuge visitors who have enjoyed letting their dogs roam free. However, we feel the elevated potential to impact other visitors and wildlife is too great to allow it. Given that we do not expect a major increase in dog use with our new policy, we do not expect this activity will significantly effect other visitor's enjoyment of the refuge.

The entire refuge may be open and available for scientific research. Any request for research would require a Special Use Permit issued by the Service. Research by non-Service personnel is often conducted by colleges, universities, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public. An individual research project is usually limited to a particular habitat type, plant or wildlife species. On occasion research projects will encompass an assemblage of habitat types, plants or wildlife. The research location will be limited to those areas of the refuge that are absolutely necessary to conduct of the research project. Scientific research would be allowed to occur on the refuge throughout the year. The timing of each individual research project will be limited to the minimum required to complete the project. We do not expect research activities, if approved, will significantly effect visitor's enjoyment of the refuge.

Effects on Cultural and Historic Resources

Alternative A

We know of no archaeological or historic sites or structures on the refuge. The refuge owns no museum property. Please note, however, that we have conducted no archaeological surveys. Service policy requires us to survey for cultural and historic resources before disturbing any ground. No activities of that magnitude would occur under alternative A. Should we identify sites eligible for the National Register, we would coordinate their protection with our regional archeologists and the New Hampshire SHPO. We have submitted this document for their review of its compliance with Section 106 of the National Historic Preservation Act and the Archeological Resources Protection Act.

Alternative B

Same as in alternative A

Cumulative Impacts

Cumulative impacts on the physical, biological, and human environment result from the combined effects of the proposed actions added to those of other past, present, and reasonably foreseeable future actions. They can result from individually minor but collectively significant actions taking place over a period of time.

This assessment of cumulative impacts includes other agencies' or organizations' actions if they are interrelated and influence the same environment. Thus, it considers the interaction of activities at the refuge with others occurring in a larger spatial and temporal frame of reference.

Socioeconomic Resources

We expect none of the alternatives to have significant cumulative adverse impacts on the economy of the local community. Neither of the alternatives proposes Service land acquisition. Thus, property tax revenue, the cost of community services, and local property values would not be negatively impacted. In addition, the refuge provides such direct economic benefits as refuge revenue sharing payments to the Towns of Greenfield and Temple. Often, property adjacent to national wildlife refuges increases in market value due to their proximity. Moreover, the refuge preserves open spaces, and helps to maintain the rural character of the area, which is undergoing rapid residential development.

Alternative B proposes improvements in our visitor services program. Therefore, we expect minor, additional increases in economic benefits to the local community from the predicted 15 percent increase in the number of visitors. Promoting the refuge as a wildlife-dependent recreational destination will encourage more people to use local community businesses. Activities prohibited under this alternative will not

Air Quality

None of the proposed alternatives would result in a significant cumulative impact on air quality on the refuge or surrounding areas. We expect some minor, short-term deterioration in air quality from the emissions of refuge visitors' automobiles. We predict that contribution to be insignificant in comparison to others. The biggest contribution to air pollution comes from industrial and commercial centers outside the area.

Physical Resources (Water Quality and Soils)

None of the proposed alternatives would result in a significant cumulative impact on water quality or soils. Natural vegetation on the refuge would continue to filter water pollutants that might otherwise degrade water systems nearby. Neither of our alternatives proposes the use of pesticides or herbicides, the removal or installation of large infrastructure, or the creation of non-permeable surfaces.

Minimal soil compaction may result from the use of the trails by maintenance crews and refuge visitors participating in wildlife observation and photography, environmental education, interpretation, walking/hiking, backpacking, dog walking, berry picking, or conducting research. Snowshoeing and cross country skiing are less likely to impact soils since those activities take place only when there is snow covering the ground. Under current levels of use on the refuge, or with the projected 15 percent increase in visitation, the incidence of any problems would be minor and insignificant. Soil compaction would be partially offset by our trail maintenance techniques, which require only the use of hand tools. The installation of water diversions throughout the trail system would also minimize soil erosion. Soil erosion and compaction would be limited to the trail system. We encourage refuge visitors to remain on the designated trails to minimize the degradation of surrounding areas. Furthermore, prohibiting mountain biking, and horseback riding should prevent degradation and erosion of trails from these activities. Prohibiting organized picnicking and camping should reduce the incidences of visitors wandering off trail and consequently causing increased soil compaction.

In general, the highest present and foreseeable future adverse impacts on water quality and soils in the refuge and surrounding area will be from the increasing residential development and commensurate loss in vegetation, and the increasing contribution from run-off of household and landscape pollutants.

Natural Soundscape

None of the proposed alternatives would result in a significant impact to the natural soundscape on the refuge. Some short-term effect on the natural soundscape would result from vehicles on nearby roads and highways. In alternative B, the short-term, temporary degradation from noise on the refuge might result from trail maintenance (e.g., the use of a chainsaw). Generally, the highest present and foreseeable future adverse impacts of noise in the refuge and surrounding area will be from the increasing residential development and the resulting increase in road construction and vehicles.

Biological Resources (Vegetation and Wildlife)

Although visitors, visitors with leashed dogs, and researchers may directly disturb wildlife sensitive to human presence, the incidence of these disturbances would be minor and insignificant to the biological resources on the refuge or surrounding area under both alternatives. This would likely remain true even with the projected 15 percent increase in visitation. Furthermore, prohibiting mountain biking and horseback riding should reduce disturbance and degradation of trails and wildlife habitat. Prohibiting organized picnicking and camping should reduce the incidences of visitors leaving behind trash and food waste that could attract nuisance species, and would also reduce the number of visitors who wander off trail and consequently cause increased soil compaction, trampling of vegetation, and disturbance to wildlife.

We intend both alternatives to maintain the existing integrity and diversity of biological resources on the refuge and surrounding area. We would continue to prohibit hunting, fishing, trapping, travel in or use of vehicles, and the cutting of trees except for the maintenance of trails and manage the refuge in the “wilderness-like” setting as described in the deed. The combination of these refuge actions and partnerships with other federal agencies, state agencies, conservation organizations and individuals could result in considerable beneficial cumulative effects by (1) maintaining the protection of species of conservation concern; (2) maintaining forest habitat that is regionally declining with the increase in development; and (3) reducing, exotic, invasive plants if surveys find any on the refuge.

Increasing residential development, including road construction in the surrounding area, are factors that would create adverse impacts on wildlife in the present or in the foreseeable future through increased road kills and habitat fragmentation.

Public Use and Access

Both alternatives allow visitors to observe and photograph wildlife, participate in environmental education and interpretation programs, pick berries, walk/hike, backpack, snowshoe, and cross country ski. Deed

restrictions applicable to both alternatives prohibit hunting, fishing, trapping, traveling in or using vehicles, and the cutting of trees except to maintain trails. The differences between the two alternatives are that alternative A permits jogging and picnicking whereas alternative B would prohibit them; and alternative B would also prohibit camping, horseback riding, and mountain biking and proposes to allow dog walking and research conducted by non-Service personnel. The rationale for what activities to allow or prohibit in alternative B compared to alternative A were based on public demand, new Service policies, and changing conditions of the refuge; including a projected 15 percent increase in visitation. Since we have not received any comments that we should allow new or different uses, nor have we received any complaints about current uses we do not anticipate visitor use patterns to appreciably change as a result of alternative B management. However, by prohibiting jogging, mountain biking, and horseback riding we feel we reduce the potential for these activities to detract from the enjoyment of the refuge by visitors participating in other activities, particularly in light of the 15 percent increase in visitation. Without those three activities, we expect that the number of visitors can be supported on the refuge without impacts on other users or creating new user conflicts.

Cultural Resources

None of the proposed alternatives would have a significant cumulative adverse impact on cultural resources on the refuge or surrounding area. The refuge has not been surveyed for cultural resources; however, the state SHPO has no recorded sites. If we identify sites eligible for the National Register appropriate actions to protect those resources will be taken.

Short-Term and Long-Term Productivity

This section evaluates the relationship between local, short-term uses of the human environment and maintaining the long-term productivity of the environment. By long-term, we mean that the impact would extend beyond the 15 year planning horizon of this draft CCP/EA. Short-term means less than 15 years. Both alternatives clearly aim at enhancing the long-term productivity and sustainability of natural resources on the refuge, while also promoting this stewardship in the larger community. In varying degrees, the alternatives propose actions that promote long-term partnerships and land and resource protection. Both alternatives propose to reduce impacts on wildlife and habitats by continuing to restrict inappropriate and incompatible, non-wildlife-dependent uses. An example of a non-wildlife-dependent use considered inappropriate on this refuge is horseback riding.

Unavoidable Impacts

Neither alternative would result in an unavoidable, adverse environmental impact. We would undertake monitoring biological inventories as part of alternative B, to enable the Service to adapt its management actions as needed and address any unforeseen situations.

Potential Irretrievable and Irreversible Impacts

Irreversible commitments of resources are those which cannot be reversed, except perhaps in the extremely long term or under unpredictable circumstances. An example of an irreversible commitment is an action that contributes to a species' extinction. Once extinct, it can never be replaced.

By comparison, irretrievable commitments of resources are those which can be reversed. For example, an irretrievable commitment is the conversion of shrubland to grassland. If for some reason that conversion was terminated, the grassland would gradually revert to shrubland.

Neither alternative would result in irretrievable or irreversible impacts.

Summary of Environmental Consequences by Alternative

Table 4.1. A summary of the foreseeable consequences of each alternative

Refuge Resource or Program	Alternative A <i>Current Management</i>	Alternative B <i>Service-preferred alternative</i>
<i>Effects on Socioeconomic Environment</i>	No change in current condition. Estimate of total annual refuge visitation of 30,000 potentially contribute up to \$2,372,400 to the state or local economy. Service land ownership would remain the same; refuge revenue sharing payments and impacts on property taxes are not affected.	Increase in refuge visitation by 15% over the next 15 years would contribute annually, up to approximately \$2,728,260 to the state or local economy. Service land ownership would remain the same; refuge revenue sharing payments and impacts on property taxes are not affected.
<i>Effects on Air Quality</i>	No impacts; no change in current condition.	Short-term negative impacts from predicted increase in the number of visitors' car emissions These impacts are not expected to exceed federal Clean Air Act air quality standards. No Class I air quality areas are affected.
<i>Effects on Water Quality</i>	No impacts; no change in current conditions.	No impacts; no change in current conditions. No violations of the Federal Clean Water Act from any activities.
<i>Effects on Soils</i>	No impacts; no change in current condition.	Short-term soil compaction and erosion from trail maintenance crews and refuge visitors, but impact area limited to existing trail ways. No long-term loss of soil productivity expected.
<i>Effects on Natural Soundscape</i>	No impacts; no change in current condition.	Short-term negative impacts on natural soundscape from nearby vehicles and trail maintenance. No long-term effects on the natural soundscape of the refuge.
<i>Effects on Vegetation</i>	No impacts; no change in current condition.	Short-term vegetation compaction from trail maintenance crews and refuge visitors; but impact area limited to existing trail footprints. Minimal removal of vegetation. Vegetation removed only if any major obstructions or litter is present on the trails. Impacts from berry picking minimal. Visitors may potentially act as vectors in the spread of invasive species. Long-term positive impact on native vegetation from maintenance of "wilderness-like" setting.
<i>Effects on Endangered and Threatened Species</i>	No federal- or state-listed endangered or threatened species are known to use the refuge.	Same as alternative A.
<i>Effects on Birds</i>	No impacts on forest-dependent birds; no change in current condition.	Minimal habitat manipulation forest habitat would maintain distribution and quality for forest dwelling birds. Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs; however, the requirement to stay on trails and the

Refuge Resource or Program	Alternative A <i>Current Management</i>	Alternative B <i>Service-preferred alternative</i>
<i>Effects on Fisheries</i>	The refuge has no water bodies that contain fish.	<p>new requirements to keep dogs on leash will minimize the extent and duration of impacts.</p> <p>Increased knowledge and understanding of bird populations resulting from various surveys and inventories would help us better quantify effects on birds on the refuge.</p> <p>Same as alternative A.</p>
<i>Effects on Mammals</i>	No impacts; no change in current condition.	<p>Minimal habitat manipulation would maintain forest habitat distribution and quality for mammals.</p> <p>Short-term, temporary impacts resulting from the presence of humans on trails, research, and the presence of dogs; however, requirements to stay on trails and the new requirements to keep dogs on leash will minimize extent and duration of impacts.</p> <p>Increased knowledge and understanding of mammal populations resulting from various surveys and inventories would help us better quantify our effects on mammal species on the refuge.</p>
<i>Effects on Amphibians and Reptiles</i>	No impacts; no change in current condition.	<p>Minimal habitat manipulation would maintain forest habitat distribution and quality for amphibians and reptiles.</p> <p>Short-term, temporary impacts from the presence of humans on trails, research, and the presence of dogs; however, the requirement to stay on trails and the new requirement to keep dogs on leash will minimize extent and duration of impacts.</p> <p>Increased knowledge and understanding of amphibian and reptile populations resulting from various surveys and inventories would help us better quantify our effects on amphibian and reptile species on the refuge.</p>
<i>Effects on Invertebrates</i>	No impacts; no change in current condition.	<p>Increased knowledge and understanding of invertebrate populations resulting from U.S. Forest Service inventory would help us better quantify the effects on invertebrate species on the refuge.</p>
<i>Effects on Public Use and Access</i>	<p>No impacts; no change in current condition.</p> <p>Visitor demand seems to be satisfied.</p> <p>Accommodating a reasonable number and diversity of activities on the refuge.</p> <p>Parking on the side of the road leaves limited spaces for visitors' cars, creates possible safety concern, and causes problems for the Town of Greenfield Department of Transportation when plowing snow.</p>	<p><i>Same as alternative A, with the following changes:</i></p> <p>Expect increase of up to 15% in visitation; however, predict that programs and allowed uses would continue to satisfy demand.</p> <p>Officially opening the refuge to dog walking on leash would adversely affect people who have enjoyed walking dogs off leash. Having dogs on leash, under control of owners, would minimize impacts on other visitors who do not enjoy encountering dogs.</p> <p>Encouraging environmental education, interpretation and research by Service partners on refuge land would facilitate an expansion of wildlife-dependent recreation.</p>

Refuge Resource or Program	Alternative A <i>Current Management</i>	Alternative B <i>Service-preferred alternative</i>
<i>Effects on Cultural and Historic Resources</i>	<p>No archaeological or historic sites or structures are known on the refuge. The refuge owns no museum property.</p> <p>If we should identify sites eligible for the National Register, we will coordinate their protection with our Regional Archeologists and the New Hampshire State Historic Preservation Office (SHPO).</p>	<p>Installing an informational sign at the Wapack trailhead and refuge entrance signs to the Ted and Carolyn's trails would result in long-term benefits for visitors by improving Service visibility and increasing visitor knowledge of the refuge.</p> <p>Until the establishment of the proposed new parking area, continue to direct visitor access to the northern end of the refuge (beginning of the Wapack Trail), with parking on Old Mountain Road, and to the southern end of the refuge through Joanne Bass Bross Preserve (with parking at Miller State Park).</p> <p>Same as alternative A</p>