2. Management Alternatives

This chapter presents three alternatives for managing Tetlin National Wildlife Refuge (Tetlin Refuge, Refuge), including continuation of current management and the U.S. Fish & Wildlife Service's (Service) Preferred Alternative (Alternative B).

This chapter is divided into eight sections. Goals and objectives are presented in section 2.1. The process used to develop alternatives is described in section 2.2, and a discussion of management options eliminated from detailed consideration is presented in section 2.3. Section 2.4 contains some of the key elements that will be included in the Comprehensive Conservation Plan regardless of the alternative adopted. Sections 2.5 through 2.7 describe the three alternatives being analyzed, and section 2.8 provides a summary comparison of the alternatives.

2.1 Goals and Objectives

The Tetlin Refuge vision statement and purposes (see chapter 1) provide the framework for developing goals and objectives for managing the Refuge. Goals are broad statements of desired future conditions. Objectives are concise statements of what the Refuge wants to accomplish.

Objectives identified for one goal are often applicable to other goals. To avoid unnecessary duplication, each objective is listed only under the goal that represents the clearest connection.

A. Conserve fish and wildlife populations representative of the natural diversity of the Upper Tanana Valley and the boreal forest ecosystem.

A.1 Objective: Within two years of the Plan's approval, revise the Tetlin Refuge Wildlife Inventory and Monitoring Plan (TNWR 1986) to include statistical benchmarks and/or management action thresholds for trust, harvested, and indicator species. (Also relates to Goals C, E, F, H, and G).

Rationale: An inventory and monitoring step-down plan is required by Service Manual 701 FW 2, Inventory and Monitoring of Populations. The existing plan was last revised in 1986 and does not reflect new legislation or changes to Service policy and refuge goals and objectives. The revised plan will outline the techniques and schedules for routinely conducted inventories and monitoring efforts, and ensure information is collected in a biologically and statistically sound manner. As outlined in 602 FW 4 of the Service Manual, the revised Refuge Wildlife Inventory and Monitoring Plan will achieve goals and objectives of the revised Comprehensive Plan through specific, achievable strategies (including those developed as part of Objectives A.5, A.6, A.7, A.8, A.11, A.12, B.3, C.9, C.10, and F.4) to be carried out on the Refuge as part of its biological program.

A.2 Objective: Within three years of the Plan's approval, assist the Fairbanks Fish and Wildlife Field Office in updating or revising the Tetlin Refuge Fisheries Management Plan (USFWS 1990). (Also relates to Goals G, H, and J).

Rationale: The 1990 Tetlin Refuge Fisheries Management Plan is a five year step-down plan that provides numerous strategies for achieving refuge goals and objectives, and addresses various issues and concerns regarding fisheries resources on the

Refuge. A revision of the Fisheries Management Plan is needed to accurately reflect current Service policy and refuge management direction.

A.3 Objective: Continue aerial surveys of moose on the Refuge and adjacent lands at regular intervals of no more than five years to determine population trend in cooperation with the ADF&G, Wrangell-St. Elias National Park and Preserve, and Ministry of Yukon Environment. (Also relates to Goals G and K).

Rationale: Moose are integral to the Refuge, both in terms of ecological function and harvest opportunities. Data from standardized surveys allow Federal and State land managers to provide guidance on hunting regulations that require current information.

A.4 Objective: Within five years of funding, complete efforts to determine the seasonal distribution and critical habitats of the moose population which occupies Tetlin Refuge and surrounding lands. (Also relates to Goals B, E and G).

Rationale: Moose occur throughout the boreal landscape and are culturally and economically important to humans in interior Alaska. Longstanding concerns about moose availability and harvest opportunities have been voiced by local users. Delineating the distribution and habitat use of the local moose population will allow us to identify and address potential management issues (e.g., hunting, wildfire management, development).

A.5 Objective: Continue aerial surveys to determine the distribution and density of wolves on the Refuge and surrounding lands and incorporate a protocol for periodic monitoring into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goal G).

Rationale: Wolves are part of the natural diversity that the Refuge is mandated to conserve under Alaska National Interest Lands Conservation Act (ANILCA) and, as top-level predators, wolves are an important component of the Refuge's ecosystem. Recent actions by the Board of Game to liberalize wolf hunting regulations and implement wolf population reduction programs, including efforts on lands adjacent to Tetlin Refuge, have generated controversy regarding wolf management. These surveys will provide us with a means to monitor population trends and assess the effects of harvest and predator control on wide-ranging wolf packs whose ranges include refuge lands. In addition, the data will provide valuable information towards understanding the relationship between wolves and prey species in our area.

A.6 Objective: In cooperation with partners in Alaska and Canada, continue to quantify snowshoe hare population cycles and incorporate monitoring protocols into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goals B, G, and K).

Rationale: The snowshoe hare is a keystone herbivore in the boreal forest with the potential to impact other species both as prey and as a competitor, and by changing plant characteristics through their browsing. Lynx and several raptors, in particular, respond favorably to increasing populations of snowshoe hares. These data are critical for interpretation of wildlife population trends.

A.7 Objective: Within five years of the Plan's approval, determine the distribution, relative abundance, and/or density of black and brown bear on the Refuge and incorporate procedures for periodic monitoring into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goal G)

Rationale: Little is known about refuge bear populations. Recent actions by the Alaska Board of Game that are intended to reduce bear populations and their predation on big game animals in many areas of the State, including areas adjacent to Tetlin Refuge, have generated controversy regarding bear population management. Refuge surveys will provide us with a means to assess bear populations and trends on lands within and near the Refuge, and valuable baseline information towards understanding the relationship between bears and prey species in the Upper Tanana Valley.

A.8 Objective: Within five years of the Plan's approval, conduct surveys to determine the relative abundance and winter distribution of furbearers, including marten, mink, weasel, lynx, fox, and coyote, on the Refuge and incorporate monitoring protocols into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goals E and G).

Rationale: Little is known about furbearer populations and their distribution on the Refuge. Furbearers are a significant component of the Refuge's natural diversity, and have subsistence, cultural, and economic value to local residents. Data on the distribution and relative abundance of furbearers are needed to evaluate the effects of fire management and harvest on furbearer populations.

A.9 Objective: In cooperation with Wrangell-St. Elias National Park and Preserve, Alaska Department of Fish and Game, and the U.S. Geological Survey, continue winter reconnaissance flights to document caribou numbers and distribution on the Refuge and surrounding lands. (Also relates to Goals G and K).

Rationale: Caribou are currently periodic winter migrants onto the Refuge. When present, they provide subsistence hunting opportunity and serve as a prey source for wolves and other carnivores. The Refuge seasonally monitors caribou density and distribution within the Refuge through aerial tracking of radio collared individuals. This information is used to manage the winter subsistence caribou harvest as part of the Mentasta Caribou Management Plan. This plan sets fall harvest quotas and bag limits for the Mentasta Caribou Herd that allow for subsistence use and a strategy to minimize incidental harvest during winter hunts targeted for the Nelchina and Fortymile Caribou Herds.

A.10 Objective: Continue to develop partnerships to monitor stocks, assess the harvest, and fill data gaps for management of humpback whitefish. (Also relates to Goals G and H.)

Rationale: Humpback whitefish are an important component of local native culture and the primary subsistence fishery species in the Upper Tanana Valley. Concerns expressed by local residents about possible declines in humpback whitefish populations led to a cooperative study incorporating traditional ecological knowledge and scientific methods. Using radio telemetry and involvement from local rural residents, this

project has located two significant spawning areas within the Refuge on the Nabesna and Chisana Rivers and several important fishing areas.

A.11 Objective: Within two years of revising the Refuge Fisheries Management Plan, initiate baseline inventories to describe distributions and critical habitats of burbot, northern pike, Arctic grayling, and lake trout. (Also relates to Goals G and H.)

Rationale: There is limited information about distributions, critical habitats or harvest for these species. These fish species are harvested for subsistence and recreational purposes, and they are seasonally important as supplements to subsistence humpback whitefish harvests. More information is needed to effectively manage these species.

A.12 Objective: Within five years of the Plan's approval, determine the distribution and relative abundance of wolverine on the Refuge and adjacent lands and incorporate a monitoring protocol into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goal G).

Rationale: Wolverine were once considered a common species throughout Tetlin Refuge; however, they are now only generally found in the foothills and more inaccessible mountainous areas. Wolverines are part of the natural diversity that the Refuge is mandated to conserve under ANILCA and, as top-level predators, wolverines can be a gauge of the health of the Refuge's ecosystem. Wolverines are also highly valued by trappers. These data will establish a baseline for monitoring trends in wolverine populations.

A.13 Objective: Within five years of the Plan's approval, determine the distribution and relative abundance of muskrats on the Refuge and incorporate monitoring protocols into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goal G).

Rationale: Muskrats were once the most heavily harvested furbearer in the region and are still heavily harvested during population highs. Muskrat has also been identified by local subsistence users as a species of special concern, as population levels are believed to be low. These data will provide a baseline for the distribution and relative abundance of muskrat on the Refuge and identify important habitats. Long-term monitoring will identify environmental variables that affect abundance and increase our understanding of population cycles.

A.14 Objective: Continue to collaborate with Ecological Services in conducting studies of abnormal wood frogs within and/or adjacent to the Refuge. (Also relates to Goals H).

Rationale: Only one amphibian species is known to occur on Tetlin Refuge. Increased sightings of malformed frogs throughout North America raised concerns about possible exposure to environmental contaminants. Collecting baseline data within the Alaska Highway corridor and at remote sites will allow the Refuge to compare trends over time and bolster current statewide efforts.

A.15 Objective: Within 10 years of the Plan's approval, work with partners to develop and implement strategies for the inventory of terrestrial invertebrates on the Tetlin

Refuge including, but not limited to, bark beetles and forest defoliators, and incorporate them into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goals B, C, E, F, and K).

Rationale: The importance of insects and other invertebrates in the function of forest ecosystems has been long recognized. However, additional information is needed to more fully understand and quantify their role in the boreal forest and establish a baseline for measuring changes in species diversity and population density over time.

A.16 Objective: Continue to implement and update existing cooperative management plans for refuge resources (e.g., Mentasta Caribou Management Plan), and develop new plans with appropriate partners. (Also relates to Goals B, E, F, G, and K).

Rationale: Tetlin Refuge will continue to develop good working relationships with adjacent landowners and agencies. Such relationships allow for better management across boundaries of locally important wildlife species.

A.17 Objective: Within five years of the Plan's approval and in cooperation with Wrangell-St. Elias National Park and Preserve and Alaska Department of Fish and Game, investigate the importance of refuge lands to the local Dall's sheep population. (Also relates to Goal G, B, and K).

Rationale: Adjacent to and south of Tetlin Refuge, the Wrangell-St. Elias National Park and Preserve contains one of the largest concentrations of Dall's sheep in North America. A small portion of that population is found in the extreme southwestern portion of Tetlin Refuge, in the Mentasta Mountains. This effort will help document the contribution of refuge lands to the population as a whole. These cooperative efforts with other conservation units help keep the data accurate and lend support to ecosystem integrity rather than management by borders.

A.18 Objective: Fully implement the law enforcement recommendations from the Deployment Model developed by the International Association of Chiefs of Police (IACP). Increase law enforcement staffing to the recommended level of 2.4 full-time equivalents (FTEs) to increase visitor protection and resource protection patrols. Also increase cooperative work with both the State of Alaska and U.S. Customs and Border Protection. Fully implement recommendations within 10 years of the Plan's approval. (Also relates to Goals C, D, G, and J).

Rationale: A review of refuge law enforcement capabilities conducted in 2004 recommended strategies for improving visitor safety and compliance with existing rules and regulations. For Tetlin Refuge, these strategies involve commitments beyond current funding and staffing; we estimate 10 years as a reasonable time frame for implementing the approved deployment model.

A.19 Objective: Improve compliance with rules and regulations to protect and conserve refuge resources by improving public knowledge and understanding of applicable rules and regulations. (Also relates to Goals C, D, G, and J).

Rationale: Violations are not always intentional and often are simply due to misunderstandings, misinformation, or lack of knowledge. By improving public knowledge and understanding of various rules and regulations, the public will have a more enjoyable and safe refuge experience. To accomplish this objective, refuge environmental education activities will include law enforcement information and will incorporate efforts to contact and educate refuge visitors and users about applicable refuge rules and regulations. Implementation of this objective is dependent upon the completion of objective A.18.

B. Conserve plant populations and habitats representative of the natural diversity of the Upper Tanana Valley and the boreal forest ecosystem.

B.1 Objective: Within two years of the Plan's approval, create a landcover map of vegetation communities in the Upper Tanana Valley using satellite imagery. (Also relates to Goals A, C, E, F, G, and H).

Rationale: Satellite imagery will be used to generate a vegetation/habitat map. Many species such as moose, caribou, brown bear, black bear, wolves, wolverines, and migratory birds are not confined within the administrative boundaries of the Refuge. Vegetation maps are extremely beneficial for wildlife monitoring, wildfire modeling, recreation planning, and biological research; the Refuge needs both the current distribution of habitats and a cost-effective way to monitor changes in those habitats.

B.2 Objective: Within one year of completion of the refuge landcover map (Objective B.1), develop applicable data crosswalks to fire fuels classification systems including the National Fire Danger Rating System, Canadian Forest Fire Danger Rating System, Canadian Forest Fire Behavior Prediction System, and the National Fire Fuel Laboratory system. (Also relates to Goal E.)

Rationale: Datasets will provide base inputs for short and long-term fire behavior modeling using existing predictive software. These fire behavior models are used to develop fuels mitigation plans, prescribed fire plans, hazard fuel treatment plans, Wildland Fire Situation Analyses, and Wildland Fire Implementation Plans.

B.3 Objective: Within five years of the Plan's approval, complete the development of terrestrial and aquatic invasive species inventory and monitoring strategies and incorporate them into the Wildlife Inventory and Monitoring Plan and the Habitat Management Plan. (Also relates to Goals A, C, E, F, G, and H).

Rationale: The Alaska Highway is a corridor for the spread of invasive species; several species of invasive plants have already been documented. Continued development in the highway corridor and construction projects such as the proposed natural gas pipeline will increase the potential for establishment of invasive species. Increased float plane and boat access and disturbance by fire and flooding may also increase the spread of invasive species to remote parts of the Refuge. Non-native plants and animals transplanted to new areas can compete with native species, impact fisheries, and significantly alter existing ecosystems. This plan will help with early detection and eradication of invasive species on and adjacent to refuge lands.

B.4 Objective: Document fire progression on active refuge fires. (Also relates to Goal E).

Rationale: Fire progression data can be used to validate and refine fire spread models and improve future predictions of spread.

B.5 Objective: Within five years of the Plan's approval, initiate research into the effects of development on the natural diversity of the fish and wildlife resources and their habitats on the Refuge. (Also relates to Goals A, C, E, F, G, H, K and L).

Rationale: The Refuge will develop academic and non-governmental partnerships to evaluate human impacts on the natural diversity of the Upper Tanana Valley. Recently, several major transportation and pipeline projects have been proposed in or adjacent to the Refuge. Potential impacts of these activities are varied. For example, vehicular traffic (including aircraft and snowmobiles) can impact wildlife through direct mortality or by inhibiting their movements. Public use and access associated with roads and other linear features increases the likelihood of brown and black bear mortalities due to defense of life and property. Wildfire suppression and residential development are some of the other potential disturbances in the area. The Refuge needs more information to address the cumulative effects of these activities, to forecast how they will likely change in the near future, and to mitigate the impacts.

B.6 Objective: At five year intervals or after a significant disturbance, develop and implement strategies to monitor landscape changes of both vegetation and physical features. (Also relates to Goals A, C, E, F, G, and H).

Rationale: The Refuge will monitor landscape-level changes in vegetation (e.g., as a result of fire, insect outbreak) and physical features (e.g., rivers, roads) using tools such as satellite imagery. This technology provides an extremely cost-effective and reasonably accurate method for assessing vegetation and wildlife habitat change over time, updating refuge landcover maps, assessing the long-term effects of climate change, and assessing the effectiveness of various fire management decisions.

B.7 Objective: Within two years of a fire's occurrence on the Refuge, develop a fire severity map if sufficient data are available. (Also relates to Goal F.)

Rationale: Severity estimates in conjunction with vegetative change can be used to estimate post-fire erosion potential, predict the susceptibility of a burned area to invasion by non-native species, and provide a baseline for future habitat research within a burned area.

B.8 Objective: Within five years of funding, complete an inventory of plants across all refuge habitat types. (Also relates to Goals E, F, and G).

Rationale: Tetlin Refuge has an obligation to protect natural plant diversity. Previous inventories have begun to document the variety of plants on Tetlin Refuge, including surveys of lichens and bryophytes. Voucher specimens from these inventories are housed in the refuge herbarium and associated database. Completing this inventory

will provide important baseline information against which to compare changes over time, including documenting the presence of rare or endangered plant species. The database and voucher specimen collection also provide a valuable resource for teaching and as a reference collection.

B.9 Objective: Within one year of funding, initiate research into the impacts of snowmobile use on vegetation and hydrology in relation to snow depth on Tetlin Refuge. (Also relates to Goals A and H).

Rationale: Under certain conditions, snowmobiles may significantly alter soil temperature regimes and insulating properties through compaction (Wanek 1971, Wanek and Schumacher 1975). Consequently, the survival of some plants may be jeopardized due to deep freezing. This, coupled with physical damage and erosion caused by direct contact with the machines, could produce significant changes in natural vegetation. Snowmobile trails in some areas have also been shown to alter hydrology (Manning 1979). This information will help the Refuge manage critical habitats potentially affected by snowmobile activities.

B.10 Objective: Within 10 years of the Plan's approval, archive existing biological and abiotic information into relational databases that will be compatible with the Refuge's Geographic Information System (GIS). (Also relates to Goals A, C, D, E, F, G, and H).

Rationale: GIS can be a powerful tool for assembling, storing, manipulating, and displaying geographically referenced information. For example, information on refuge fish populations currently resides in file folders and various electronic files. Assembling this information into relational databases that are compatible with the Refuge's GIS will make this information readily accessible to more users, minimize duplication of effort, and maximize GIS implementation as a management tool.

B.11 Objective: Continue to convert all historic aerial photography of the Refuge into geo-referenced, orthorectified digital images. (Also relates to Goals D, E, F, and H).

Rationale: Historic aerial photography is a valuable asset to managers and researchers monitoring changes in resources caused by natural or anthropogenic disturbances. Due to the extensive and frequent coverage, aerial photography is exceptionally valuable, including from a strictly historic perspective. Digital reproduction will help preserve the data in the event the original photography is damaged or lost.

C. Recognizing the position of Tetlin Refuge along three major flyways, conserve migratory birds and their habitats to fulfill our international responsibilities under the Migratory Bird Treaty Act.

C.1 Objective: Continue contributions to regional, national, and international efforts to monitor long-term trends in relative population size and distribution of landbirds that occur in Alaska. (Also relates to Goals B, G and K).

Rationale: Policy (Service Manual 601 FW 3) dictates that each refuge should consider their contribution to the biological integrity, diversity, and environmental health at multiple landscape scales. Tetlin Refuge has a comprehensive landbird

monitoring program that uses various survey methods to gather data on species occurrence, relative abundance, seasonal distribution, migration, and population trend. This integrated effort contributes to the long-term understanding of landbirds both on the Refuge and across the boreal forest.

C.2 Objective: In cooperation with partners in Alaska and the Yukon, continue to monitor landbirds during fall migration to document population trend and productivity. (Also relates to Goal K).

Rationale: The Refuge maintains a fall migration monitoring station in collaboration with a network of stations across Alaska and the Yukon. Migration monitoring is especially useful for tracking changes in populations of bird species that occur in remote roadless areas. Capturing and banding landbirds during migration provides information on sex, age, and condition not usually available from other survey methods. This data contributes to baseline and long-term information on species composition, relative abundance, demographics, and seasonal patterns of migration.

C.3 Objective: Determine annual abundance and productivity of waterfowl across a range of habitat types in the Upper Tanana Valley. (Also relates to Goals B, E, F, G, and H).

Rationale: Tetlin Refuge was set aside in part for its unique waterfowl values and has one of the highest densities of breeding waterfowl found in Alaska; between 35,000 and 65,000 ducklings are produced annually. Recent changes to the Migratory Bird Treaty Act have established a spring and summer migratory bird subsistence hunt with limited regulations that have the potential to affect the conservation of this group of species. The data collected during this effort can identify habitats important for nesting and brood rearing, and provide baseline data that can be use to assess localized impacts of subsistence harvest.

C.4 Objective: Continue to monitor breeding population occupancy and productivity, habitat use, and food habits of raptors in Game Management Unit 12. (Also relates to Goals B and E).

Rationale: Raptors are an important part of the natural diversity that the Refuge is mandated to conserve under ANILCA and, because they are at the top of complex food webs, raptors serve as an excellent gauge of environmental health and quality. The Tetlin-Northway Flats area provides habitat for the largest concentration of nesting ospreys in Alaska. The Upper Tanana Valley also supports an increasing population of peregrine falcons, which were removed from the Endangered Species List in 1999. Current efforts monitor the breeding status, productivity, and relative abundance of raptors, and the importance of lake, river, wetland and cliff nesting habitats within Tetlin Refuge and Game Management Unit 12.

C.5 Objective: Continue at five-year intervals to determine the distribution, abundance, and productivity of trumpeter swans in the Upper Tanana Valley. (Also relates to Goals E, G, H, and K).

Rationale: Tetlin Refuge provides important habitat for migrating swans during spring and fall. The Upper Tanana Valley also has a rapidly expanding breeding population of trumpeter swans. The Refuge presently conducts late fall productivity surveys every five years in conjunction with a statewide effort. Our survey contributes to the regional management of the species, identifies critical nesting and staging areas, and helps document the contribution of refuge lands to the population as a whole.

C.6 Objective: Within one year of funding, initiate a study of sandhill cranes to estimate population size, timing of migration, and important staging areas within the Upper Tanana Valley. (Also relates to Goals B, G, and H).

Rationale: During spring and fall migration, up to one-half of the mid-continent population of sandhill cranes (approximately 200,000 birds) passes through the Tanana River Valley. Recent changes to the Migratory Bird Treaty Act have established a spring and summer migratory bird subsistence hunt with limited regulations that have the potential to affect the conservation of this population.

C.7 Objective: Within two years of funding, replicate the 1979 study of wetland habitat and water quality as related to waterfowl use in the Scottie-Desper Creek area. (Also relates to Goals B, G, and H).

Rationale: Water is an extremely important resource on Tetlin Refuge, and the Scottie-Desper Creek area has been identified as an important waterfowl nesting and production area. This area was studied in 1979 to evaluate waterfowl habitat in the Scottie-Desper Creek wetlands. There is a unique opportunity to replicate this earlier work and document changes over time in an important area.

C.8 Objective: Within one year of funding, initiate a study to compare nesting success, productivity, and availability of high-quality peregrine falcon habitat between nest sites along rivers and those within the Alaska Highway corridor. (Also relates to Goal B and H).

Rationale: The peregrine falcon was removed from the Endangered Species List in 1999, and the population has rebounded in the Upper Tanana Valley, as it has elsewhere in North America. In the last decade, numerous new nesting sites have been established along the Alaska Highway corridor in road cuts and rock quarries. Our monitoring efforts have detected vastly differing rates of success and productivity between nests in these artificial sites and those in naturally formed cliffs along the Tanana River. A unique opportunity exists to identify habitat components important to increased nest success and productivity.

C.9 Objective: Within five years of the Plan's approval, establish monitoring strategies to determine the distribution and migration timing for shorebirds, gulls, terns and allied species. Incorporate these strategies into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goal G and H).

Rationale: Some 26 species of shorebirds occur on Tetlin Refuge, many of which are migrants passing between wintering and breeding grounds. Little is known about the

distribution and migration timing of these species on the Refuge and surrounding areas. Recent changes to the Migratory Bird Treaty Act have established a spring and summer migratory bird subsistence hunt with limited regulations that has the potential to impact conservation of these species. Monitoring is needed to acquire information on distribution and relative abundance, and to measure potential effects of subsistence harvest.

C.10 Objective: In cooperation with Boreal Partners in Flight, continue to develop and implement population monitoring surveys for owls in the Upper Tanana Valley and incorporate the data into the revised Wildlife Inventory and Monitoring Plan. (Also relates to Goals G and K).

Rationale: This effort contributes to larger scale projects to monitor owls in Alaska and the Yukon. The current monitoring effort documents the breeding status and relative abundance of boreal, great horned, and great gray owls on Tetlin Refuge and the Upper Tanana Valley. Recent changes to the Migratory Bird Treaty Act have established a spring and summer subsistence hunt for great horned owls with limited regulations that have the potential to impact the conservation of local populations.

C.11 Objective: Continue to collaborate with a local rehabilitation program for short-term care and release of injured raptors and other birds. (Also relates to Goals I, K and L).

Rationale: The Refuge currently collaborates with local individuals for the care and transport of injured raptors and other birds. This program demonstrates the Refuge's commitment to wildlife and its trust resources, and provides excellent outreach opportunities.

D. Contribute to the protection and preservation of the cultural heritage and natural history of the Upper Tanana Valley.

D.1 Objective: Continue to cooperate with Native entities, other agencies, and universities to enhance and develop programs to work with elders and other knowledge bearers to capture traditional knowledge relating to the cultural and natural history of Tetlin Refuge. *Rationale:* By utilizing the traditional ecological knowledge of the tradition bearers, two things are accomplished. The traditions which were here-to-fore transmitted verbally will be documented for future generations, thus ensuring that the culture continue and baseline knowledge about flora and fauna and events on refuge lands will be available to compare and contrast current distribution, health, status, and events.

D.2 Objective: Continue to cooperate with Native entities and other agencies to increase training and educational opportunities for local residents in the fields of natural and cultural resources to fill technical and professional positions on the Refuge and elsewhere. (Also relates to Goal G).

Rationale: By augmenting traditional knowledge with educational and training programs necessary for meeting position requirements, we can assist local residents in becoming qualified to fill technical and professional positions in the field of natural and cultural resources.

D.3 Objective: Within two years of funding, begin to identify, document, map and research cultural resources in at least three of four critical archaeological areas. (Also supports Goal E).

Rationale: Identifying, documenting, and mapping cultural resources within Tetlin Refuge is required by the National Historic Preservation Act and Service policy. It is critical to do it while there are still elders who possess in-depth knowledge of cultural resources. Additional information is needed to protect cultural resources from fire, fire management activities, recreational use, and other activities occurring on the Refuge. Accurate maps of cultural information are critical for identifying potential threats and prioritizing the protection of these resources. Further, the Refuge has a key role in introducing visitors who enter the State by motor vehicle to Native culture in our interpretive programs and exhibits at the visitors' center.

D.4 Objective: Update, in cooperation with Native groups and other local entities, the 1996 Cultural Resource Guide for Tetlin Refuge by 2011 (15 years after it was completed). The document should include a comprehensive overview and management plan to research, interpret, and protect cultural resources on refuge lands to maximize benefits to all concerned.

Rationale: Elders with the most in-depth knowledge are passing away at a rapid pace and it is critical we gain all the knowledge that they can impart to us for our use in making management decisions and insuring good stewardship of cultural resources. Local people have an interest in cultural resources and refuge projects affecting those resources. It is the obligation and legal responsibility of Tetlin Refuge to consult with others regarding the information we are seeking and the projects we are conducting, and to share the outcomes and products of these efforts. Updating this plan will allow the refuge staff to better understand where they should concentrate inventory and survey efforts.

E. Integrate fire management with other refuge programs so that it can efficiently support refuge habitat goals and objectives as well as provide an appropriate level of wildland fire protection for human life, private property, and identified cultural and natural resources.

E.1 Objective: Within five years of Plan's approval, inventory and map structures and other cultural resources in and around the Refuge at risk from wildland fire and/or fire management activities. (Also relates to Goal D.)

Rationale: Effective planning for prescribed and wildland fire requires identification of any sites that may require protection during the course of the incident. By locating sites prior to an incident occurring, many last minute tactical changes can be avoided and incident management safety and effectiveness can be increased.

E.2 Objective: Within five years of approval of the Plan, and in cooperation with the affected communities and landowners, develop individual mitigation plans for communities and other sites identified as being at risk from wildland fire originating on the Refuge. (Also relates to Goal D.)

Rationale: Pre-suppression efforts such as fuelbreaks, thinning, and homeowner awareness programs can significantly reduce the risk of damage due to a wildland fire originating on the Refuge and can result in considerable suppression cost savings.

E.3 Objective: Within 10 years of the Plan's approval, assess the effectiveness of thinned fuelbreaks in the Upper Tanana Valley and monitor long-term changes in thinned fuels and any unanticipated consequences of thinning such as insect infestation or invasive species spread. (Also relates to Goal B.)

Rationale: There are few data to support the effectiveness and desirability of shaded fuel breaks in interior Alaska. In spite of this, most community protection projects to date have employed this method. To increase the efficiency and effectiveness of future efforts, an analysis is required.

E.4 Objective: Within 10 years of the Plan's approval, evaluate weather data from the current refuge weather system and determine whether additional stations will significantly improve the system's predictive capability. (Also relates to Goal F.)

Rationale: Some evidence reveals that existing weather stations poorly represent actual conditions in the southeast corner of the Refuge. An additional permanent Remote Automated Weather Station (RAWS) or the incorporation of data from Beaver Creek, YT, Canada, may significantly improve our ability to predict the behavior of fires in that portion of the Refuge.

E.5 Objective: Within two years of the Plan's approval, revise the Refuge Fire Management Plan (TNWR 2001) to reflect changes in the revised Comprehensive Plan, in national fire policy, and to reflect the best available knowledge and experience regarding use of natural and prescribed fire as tools for habitat management.

Rationale: The current Refuge Fire Management Plan (TNWR 2001) requires numerous revisions regarding smoke management, prescribed fire, wildland fire use, monitoring, and strategic outlook.

E.6 Objective: In collaboration with local partners, annually assess the Alaska Interagency Wildland Fire Management Plan (AWFCG 1998) Management Option boundaries within the Refuge, and submit necessary change recommendations to the Alaska Wildland Fire Coordinating Group.

Rationale: Changes in land status, improvements and use patterns, and fire history affect how management options should best be deployed across the landscape. Annual assessment will ensure options reflect current needs.

E.7 Objective: Within two years of the Plan's approval, update GIS data relevant to fire management and have data readily available on a portable external hard drive to be used by Refuge fire personnel and by incident management teams during fires.

Rationale: Ready access to current spatial data can speed the planning process during a fire incident and facilitate efficient and safe management operations.

F. Through partnerships with agencies and institutions in the United States and Canada, continue to coordinate research and monitoring efforts to expand our understanding of the underlying ecological mechanisms related to fire and how these mechanisms effect change in vegetation and animal populations within the Upper Tanana Valley and the boreal forest ecosystem.

F.1 Objective: Within one year of funding, fully implement the designated National Wildlife Refuge System *Fulfilling the Promises* Land Management Research Demonstration Area (LMRDA) for the boreal forest ecosystem. (Also relates to Goals A, B, C, D, E, G, and H).

Rationale: Goal WH18 in the U.S. Fish and Wildlife Service's strategic plan entitled *Fulfilling the Promises* specifies the designation of Land Management Research Demonstration Areas to facilitate the development, testing, teaching, publishing, and demonstration of management techniques (USFWS 1999). Tetlin Refuge is one of only two LMRDAs established in Alaska and the only one accessible through the road system. Under the LMRDA program, Tetlin Refuge will monitor a selection of animal, plant, and physical elements essential to understanding the ecology and dynamics of fire across the boreal forest.

F.2 Objective: Within two years of funding and in cooperation with the science community (e.g., universities, research stations, and other agencies), initiate cooperative research projects to expand our understanding of the underlying ecological mechanisms related to fire and how these mechanisms affect change in vegetation and animal populations by using these data to identify relations among various environmental processes in the boreal forest ecosystem. (Also relates to Goals A, B, C, E, G, H, and K).

Rationale: As the LMRDA-designated refuge for the boreal forest ecosystem, Tetlin Refuge will provide opportunities for scientific research. Despite public use, proximity to development, and being road-accessible, Tetlin Refuge sustains a relatively high degree of ecological integrity. We will develop the Refuge into a designated center for research on boreal forest ecology and management. The funds and expertise needed to develop this program will be achieved though collaborative partnerships with other agencies and universities.

F.3 Objective: Within two years of funding, initiate a program that establishes Tetlin Refuge as a regional, interagency training facility for management and monitoring in the boreal forest ecosystem. (Also relates to Goals A, B, C, E, G, H, and K).

Rationale: As the LMRDA-designated refuge for the boreal forest ecosystem, Tetlin Refuge will work to provide opportunities for land management training in boreal forest ecology and management. Training opportunities in Alaska are limited, and the costs of travel are often prohibitive; Tetlin Refuge is one of only two refuges in Alaska easily accessible by road. Managers in the boreal forest ecosystem must cooperatively use every opportunity to provide training opportunities. Cooperative interagency training will build camaraderie and familiarity across agencies, improving communications and operational capabilities.

F.4 Objective: Within two years of funding, develop inventory and monitoring strategies to assess the effects of fire on moose and caribou habitat quality and incorporate the strategies into the revised Wildlife Inventory and Monitoring Plan and Habitat Management Plan. (Also relates to Goals A, B, C, E and G).

Rationale: Both moose and caribou are locally important to subsistence users, and it is important to quantify and monitor the availability of quality habitat for both species. It is also generally agreed that both moose and caribou habitat and population dynamics are affected to some extent by fire. The character of these relationships in the Upper Tanana Valley, however, remains unclear. The amount, species, and quality of forage regrowth after fire depend on several factors. The composition of the pre-fire community and time of year, and also fire intensity, size, and burn patterns are all important to monitor. This information will assist the Refuge in managing moose and caribou populations and fire.

F.5 Objective: Within five years of the Plan's approval, initiate long-term studies of small mammal distribution and relative abundance in relation to fire severity. (Also relates to Goal A, B, and E).

Rationale: Periodic fire is one of the primary natural forces that form the mosaic of habitats present on Tetlin Refuge. Vegetation regrowth after fire often affects forage availability and the distribution of animals. The amount, species, and quality of vegetative regrowth after fire depend on several factors. Fire severity can affect the rate of vegetative succession and post-fire regrowth. Small mammals (primarily lemmings and voles) are an important prey item for many mammalian and avian predators. Although fire has been shown to be beneficial for some species of small mammals, little is known about how small mammals respond over time to a range of fire severity within various vegetation types.

F.6 Objective: Within two years of funding, initiate a study to investigate the relationship between berry production and fire severity. (Also relates Goals B, E, and G).

Rationale: Wild berries are an important component of annual subsistence harvest and Native culture. Berries have also been shown to be seasonally important to many migratory birds, some furbearers, small mammals, and bears. Fire severity can affect the rate of vegetative succession and post-fire establishment of berry producing plants. This study will provide a better understanding of the relationships between fire severity and the distribution, abundance, and annual fruit production following fire.

F.7 Objective: Within five years of the Plan's approval, evaluate distributions of furbearer populations, including but not limited to, wolverine, red fox, marten, mink, weasel, and lynx, in relation to fire severity. (Also relates to Goals A, B, E, and G).

Rationale: Furbearers are a significant component of the Refuge's natural diversity; they have subsistence, cultural, and economic value to local residents. In the boreal forest, a range of post-fire seral stages provide habitat requisites for furbearers. Fire severity can affect the rate of vegetative succession and post-fire recolonization of

many species. New technology that employs remote sensing provides estimates of fire severity at the landscape scale. This effort will improve our understanding of the short-term and long-term response of furbearers to fire.

G. Provide subsistence opportunities for rural residents, compatible with other refuge purposes.

G.1 Objective: As a continuing commitment, regularly attend meetings, provide information regarding the status of subsistence resources and their use, and comment on proposals related to subsistence management within Tetlin Refuge to maintain a respectful dialogue with refuge resource stakeholders and subsistence users. (Also relates to Goals A, B, C, E, F, and H).

Rationale: The Refuge is mandated by ANILCA to provide the opportunity for continued subsistence uses by local residents, when compatible with other refuge purposes. However, it is essential that affected parties work cooperatively towards common subsistence goals.

G.2 Objective: Within two years of the Plan's approval, determine the total annual harvest of migratory bird species within the Upper Tanana Valley with sufficient accuracy and precision to ensure long-term conservation. (Also relates to Goals A, C, and H).

Rationale: The Refuge lies within a major migration corridor that channels birds through the Upper Tanana Valley each spring and fall. A recent amendment to the Migratory Bird Treaty Act established a spring and summer migratory bird subsistence hunt that has the potential to impact the conservation of many species. A cornerstone of the amendment was that no new tradition of hunting would be established and the current level of harvest would remain the same. However, the new regulations include an expansive species list, including shorebirds, cranes, and owls, and a prolonged season with no bag limits. Moreover, residents of many Upper Tanana and Copper River Valley communities are eligible to participate in this hunt. An estimate of harvest is needed to ensure long-term conservation and to monitor the level of harvest on trust species.

G.3 Objective: Continue outreach efforts within the communities of Dot Lake, Mentasta, Northway, Tanacross, Tetlin, and Tok, including programs, activities, and partnerships that develop understanding and appreciation of resource threats and user conflicts, and promote conservation of fish, wildlife, and their habitats. (Also relates to Goals A, B, C, E, G, H, and K).

Rationale: The Refuge's primary purpose is to conserve fish and wildlife populations and habitats in their natural diversity. With over 200 vertebrate species and 300 species of vascular plants, an effective strategy for ensuring long-term conservation of these resources will rely on partnerships with local communities, tribal representatives, and other organizations. By working with a team-building focus, communicating with those who have a stake in the conservation and preservation of the cultural and natural resources located on refuge lands, a platform for cooperation and

consensus building will be laid. Further, trust will develop, which can be relied upon when more difficult issues directly pertaining to subsistence may arise.

G.4 Objective: Within 10 years of the Plan's approval and in cooperation with ADF&G, assess the accuracy and reliability of current harvest monitoring strategies for mammals within the Refuge, and, where appropriate, develop and initiate a statistically valid harvest survey. (Also relates to Goals A, C, and K).

Rationale: In GMU 12, there is a sealing or reporting requirement for the harvest of species such as moose, caribou, wolf, and bear. However, the reliability of monitoring harvest from this information is unknown. Furthermore, there are currently no harvest reporting requirements for species such as marten, muskrat, fox, or hare. Past efforts to monitor subsistence harvest have predominately focused on Native villages. However, many individuals participating in local hunts reside outside such communities. Given budget constraints, a complete census of all households is unlikely. The development of a statistically valid household survey representative of actual use may provide a more accurate assessment of harvest trends.

G.5 Objective: Within three years of the Plan's approval, develop educational materials addressing mortality and displacement of wildlife by wildfires. (Also relates to Goal A, B, C, E, and G).

Rationale: Longstanding concerns about the effects of wildland fire on subsistence opportunities have been voiced by local users. The unprecedented 2004 fire season may have reinforced the perception of some local subsistence users that large fires negatively affect harvest opportunities. Outreach efforts will provide the results of studies examining post-fire distribution of wildlife and information on current fire management goals and objectives.

G.6 Objective: Within 10 years of the Plan's approval, map the seasonal distribution and intensity of subsistence activities on Tetlin Refuge.

Rationale: To effectively provide continued subsistence opportunities and manage for healthy populations of fish, wildlife, and plants, it is necessary for the Refuge to identify the intensity and distribution of subsistence activities across the Refuge. The majority of information relating to the location and intensity of subsistence activities was gathered in the late 1980s and early 1990s and does not reflect more recent changes in subsistence lifestyles, demographics, bag limits, or hunting seasons and is becoming less useful for making management decisions. Updated information will assist with management of natural resources and identify potential areas of user conflict.

H. Maintain the integrity and environmental health of waters and aquatic habitats within the upper Tanana River drainage.

H.1 Objective: Continue to support the USFWS Water Resources Branch in their efforts to secure refuge instream water rights and monitor long-term water flow and quality. (Also relates to Goals A, B, C, F, and G).

Rationale: The Water Resources Branch plans to monitor up to six stream gages for five years, including periodic water quality sampling up to five times annually. Once this work is completed, the Refuge will continue to maintain stream gages at selected sites and conduct periodic water quality sampling contingent on funding. Stream flow and water quality data will enhance habitat and biological monitoring projects and will be especially useful in studies of fire effects, waterfowl, swans, shorebirds, other waterbirds, raptors, moose, and small mammals.

H.2 Objective: In cooperation with the Natural Resources Conservation Service, continue to measure monthly snow courses during winter. (Also relates to Goals A, B, E, F, G, and K).

Rationale: The amount, duration, and water content of snow on the Refuge can affect a variety of factors, including distribution and over-winter survival of wildlife, timing of spring bird migration, spring flooding and nutrient input to lakes, and the timing and probability of fire the following spring. These data are used to annually produce stream flow forecasts for the Tanana drainage.

H.3 Objective: Within five years of the Plan's approval, replicate and expand water parameter sampling of refuge wetlands and lake resources. (Also relates to Goals A, B, C, E, F and G).

Rationale: One purpose of Tetlin Refuge is to ensure water quality and quantity necessary for the conservation of fish, wildlife, and their habitats. Water parameters on several refuge wetlands, streams, rivers, and lakes were sampled from 1984 to 1992. Replicating these efforts will allow the Refuge to make comparisons over time, and expanding the inventory will be useful in studies of fire effects, waterfowl, swans, shorebirds, other waterbirds, raptors, moose and small mammals.

H.4 Objective: Within two years of funding, seek collaboration with Water Resources Branch to initiate a monitoring program for refuge waters that includes investigating anthropogenic influences on water quality. (Also related to Goals A, B, C, E, F, G, and K).

Rationale: One purpose of Tetlin Refuge is to ensure water quality and quantity necessary for the conservation of fish, wildlife, and their habitats. Little is known about pollution affecting waters within the Refuge. Increasing development and human activities on the Refuge and other adjacent lands have the potential to cause impacts to water quality. Improper waste disposal, motor boats, and snowmobiles are some of the known sources of pollution within the Refuge. Other sources of contaminants include non-renewable resource extraction, long-range atmospheric deposition, and/or past management practices. Environmental contaminants can travel from other areas in the world and accumulate in the Arctic. Arctic and sub-arctic environments are especially vulnerable to the long-range air and water transport of containments because once chemicals reach colder climates, less volatilization occurs. Gathering data will help the Refuge compare changes over time and assess the impacts from pollution and contamination sources on and near the Refuge.

H.5 Objective: Within five years of funding, develop a water budget and hydrologic models for the upper Tanana Watershed. (Also relates to Goals A, B, C, E, F, and G).

Rationale: A water budget tracks the input, storage, movement and output of water within a basin. Changes due to fire, climatic change, development, and water or land use practices can result in changes to the water budget. Developing water budgets and hydrologic models will increase our knowledge base, provide a valuable tool to guide future research, and assist us in making informed management decisions.

H.6 Objective: Within 10 years of the Plan's approval, work with partners to develop and implement strategies for the inventory of aquatic invertebrates in some refuge streams and lakes. (Also relates to Goals B, C, E, F, and K).

Rationale: The ecologic importance of aquatic invertebrates in the function of aquatic systems has been long recognized. They are also important biological indicators of the biological health, ecological and physical changes, and contaminants in aquatic environments. Additional information is needed to more fully understand and quantify their role in refuge streams and lakes, and to establish a baseline for measuring changes in species diversity and population density over time.

I. Enhance understanding and appreciation of Tetlin Refuge's purposes, special values, and management goals, and promote stewardship of natural and cultural resources through comprehensive environmental education and interpretation programs and visitor services facilities.

I.1 Objective: In cooperation with interagency and community partners, Tetlin Refuge will continue to play a key role in the development of the Tok Interagency Alaska Public Lands Information Center (Tok APLIC). Refuge staff will participate in project support, building and site design, and all aspects of interpretation from conception through construction. (Also relates to Goal L).

Rationale: Since conception of the Tok APLIC in 2001, Tetlin Refuge has been a key partner with the Alaska Department of Transportation and Public Facilities (ADOTPF) and the Department of Economic and Community Development in building public support, interpretive concept planning, and facilities design.

I.2 Objective: Administer and maintain the Tok APLIC as part of the Refuge's continuing commitment to providing quality visitor services.

Rationale: As part of the cooperative agreement with ADOTPF, the Refuge will be responsible for administration and maintenance of the Tok APLIC. Based on predicted increases in visitation along the Alaska Highway (Bowker 2001, Bowker et al. 1999), this facility could serve over 100,000 people a year.

I.3 Objective: Continue developing creative and effective curricula that target key resource issues and experiential educational opportunities for all ages and work with educators and parents towards implementation.

Rationale: Tetlin Refuge has been very successful in developing original resource curricula for target audiences and has worked effectively with the local school district to implement these programs. The Refuge would like to expand it efforts with experiential, resource-based education.

I.4 Objective: Construct well-designed outdoor settings for education and interpretive programs in conjunction with the Tok APLIC and Deadman Lake campground for use with school groups, local residents, and visitors.

Rationale: The Tok APLIC could reach 80,000 people each year with its education and interpretive programs. Many topics associated with the main interpretive theme should be conveyed in an outdoor setting rather than through costly interior exhibits.

I.5 Objective: Through revision of the Tetlin Refuge Public Use Management Plan (USFWS 1997a; now called a Visitor Services Plan) and in conjunction with development of the Tok APLIC, redirect the focus and design of the Tetlin Refuge Visitor Center toward interpretation of the unique aspects of Tetlin Refuge and other refuges in Alaska.

Rationale: The original exhibits at the Tetlin Refuge Visitor Center were designed and constructed in 1989. They are dated, worn, deteriorated, malfunctioning, and in need of replacement. To compliment the themes of migration, the Borderlands region, and the National Wildlife Refuge System to be featured at the new Tok APLIC, the Refuge will develop new exhibits for the Tetlin Refuge Visitor Center that focus on the unique aspects of Tetlin Refuge and refuges in Alaska based on these same themes. This concept would be based upon the complete visitor experience provided by State and Federal agencies throughout the Upper Tanana Valley.

I.6 Objective: For each refuge interpretive and environmental education program, develop reliable methods to assess the degree to which each program enhances understanding and appreciation of refuge purposes, special values, and management goals. Program target goals and evaluation tools will be developed and implemented within five years of the Plan's approval.

Rationale: To develop high-quality interpretive and environmental education programs, the Refuge must have means for assessing the effectiveness of each program and identifying areas where programs can be improved.

I.7 Objective: Within five years of the Plan's approval, at least 80 percent of Upper Tanana Valley kindergarten through 12th grade students and those in alternative learning programs will have an opportunity to participate in at least one environmental education program focusing on key refuge resource conservation issues.

Rationale: During the 2003-2004 school year, 60 percent of Upper Tanana Valley kindergarten through 12th grade students participated in at least one of the Refuge's environmental education programs. The goal of the environmental education program is to promote understanding of key refuge resources, promote stewardship and instill responsible, environmentally conscious behavior.

I.8 Objective: Continue with and maximize long-term partnerships with community organizations and volunteers to help meet the educational goals and objectives of the Refuge. Increase partnership contributions to educational projects by 10 percent within three years of the Plan's approval.

Rationale: In the past, Tetlin Refuge has been successful with education and interpretive projects made possible through partnerships that contribute resources, time, and funding. The Refuge is interested in sustaining and developing new partnerships with long-term commitments.

I.9 Objective: Re-evaluate and update at least one refuge outreach tool every six months.

Rationale: Currently, the Refuge utilizes a variety of communication tools (e.g., Internet site, electronic newsletter, printed newspaper articles, audio-visual programs, brochures, kiosk panels, etc.). These tools allow the Refuge to provide the public with more accurate and up-to-date information, but only if they are periodically evaluated, updated, and consistently distributed.

I.10 Objective: Increase the Refuge's capacity to utilize skilled volunteers to supplement seasonal staffing.

Rationale: Current facilities for seasonal staff are inadequate or absent in key locations. New facilities are needed to accommodate additional volunteers or facilities hosts.

I.11 Objective: Establish a permanent refuge program to annually provide one high school level field research course related to priority refuge resource issues.

Rationale: An eight-week high school credit course, offered each summer since 1997, is one of the Refuge's most effective education programs. High school students learn about priority resource issues through extensive research and field work. The continued operation of this significant program is tenuous and uncertain due to intermittent annual grant funding.

I.12 Objective: Continue and expand education, interpretive, and wildlife-dependent recreation programs at refuge campgrounds to accommodate larger school and visitor groups in a comfortable outdoor classroom setting within eight years of the Plan's approval.

Rationale: Deadman Lake Campground is a primary location for many outdoor education and interpretation programs. To avoid program cancellation due to inclement weather, temporary structures are erected but they have limited capacity and use. The Refuge would like to create a comfortable outdoor setting for larger groups to engage in classroom activities.

I.13 Objective: In cooperation with local village organizations, create opportunities to educate youth in traditional subsistence ways related to fish, wildlife, and plants of the Refuge. Native park rangers and the lead educator from the Refuge will initiate plans

with at least one local village council for a summer program within three years of the Plan's approval (also relates to Goal D).

Rationale: The Refuge can play an important role in perpetuating the continued use of subsistence resources by providing educational settings on the Refuge where elders can teach traditional uses of refuge resources to interested youth.

I.14 Objective: Through partnerships with neighboring conservation units, regional learning institutes, and State universities, develop an integrated multi-site approach to college-level courses.

Rationale: The proximity of Tetlin Refuge to Wrangell-St. Elias National Park and Preserve and Federal and territorial parks in Yukon, Canada, creates a unique opportunity for comparative multi-site field investigations of land features, habitats and wildlife.

I.15 Objective: Upgrade the Tetlin Refuge Visitor Center to reduce the noise, pollution, and cost of operation by 50 percent within five years of completing the Plan.

Rationale: The Tetlin Refuge Visitor Center is located in a remote area and is powered by a diesel generator that requires significant amounts of staff time to operate and maintain. The generator contributes a noticeable amount of background noise that degrades the quality of the visitor experience and produces more pollution than newer technologies. Improvements and upgrades are needed to reduce operational costs and impacts and to compensate for reduced funding and maintenance staffing.

I.16 Objective: Increase visitation to the Tetlin Refuge Visitor Center by 10 percent within three years of the Plan's approval.

Rationale: Visitation to the Tetlin Refuge Visitor Center is far below capacity of this facility. The Refuge needs to take effective measures to increase visitation at the Tetlin Refuge Visitor Center to educate and inform as many summer visitors as possible.

I.17 Objective: Within three years of the Plan's approval, and in cooperation with ADOTPF, develop strategies consistent with Service policies and guidelines to standardize refuge signage and develop a schedule for revising, repairing, and replacing refuge signs. These strategies will be incorporated into the Refuge Visitor Services Plan.

Rationale: Current refuge signage is incomplete and may be ineffective. Better and more consistent signage will improve visitor information and safety along the Alaska Highway and at refuge facilities.

I.18 Objective: Develop and implement a program to provide refuge visitors an understanding of wildlife-viewing opportunities available on the Refuge and throughout Alaska within eight years of completing the Plan.

Rationale: Wildlife viewing is a primary activity for people who travel to Alaska. Often visitors' wildlife viewing expectations are not realistic, particularly when it comes to the likelihood of seeing the charismatic mega-fauna throughout Alaska. Located at the gateway to Alaska, Tetlin Refuge can have a great impact on wildlife-viewing education to enhance the visitors' Alaska wildlife-viewing experience.

I.19 Objective: Upgrade inventory and selection at the Alaska Natural History Association's (ANHA) sales outlets to offer visitors and residents popular educational materials relating to refuge resources. Increase sales revenues by 15 percent within five years of the Plan's approval to generate more funding for refuge education and outreach programs.

Rationale: Educational materials provided through the ANHA sales outlet help facilitate public appreciation and understanding for refuge resources. Expanding selection and inventory at the sales outlet will increase sales revenues that can be used to fund outreach programs.

J. Provide compatible wildlife-dependent recreation opportunities for people to explore, enjoy, and learn about the dynamic landscape and natural diversity of Tetlin Refuge.

J.1 Objective: Develop and implement strategies within five years of funding that provide wildlife-dependent recreational opportunities at the Seaton Roadhouse site, accommodating use by local residents and visitors.

Rationale: The 25-acre site in the vicinity of the former Seaton Roadhouse has more potential for offering a variety of wildlife-dependent recreational opportunities than any other site on the Refuge. This site is one of the few highway-accessible upland areas of the Refuge. This area offers great opportunities for interpretation, wildlife viewing, photography and recreational hiking. The plan for this site will include a 1.5-mile interpretive trail, handicap wildlife viewing platform, kiosk, and parking area.

J.2 Objective: Increase accessibility for visitors with limited mobility to extend their visit and enjoy wildlife-dependent recreation at Tetlin Refuge.

Rationale: A number of facilities at Deadman Lake, including restrooms, boardwalks, and a boat dock, are now available for people with limited mobility. Overnight facilities that comply with the Americans with Disabilities Act (ADA) are needed at Deadman Lake and other locations to take full advantage of existing ADA facilities and to maximize recreational opportunities.

J.3 Objective: Conduct maintenance on established trailheads, trails, and boat launches annually or as needed for continued public access to the Refuge.

Rationale: Current facilities must meet or exceed minimum Service standards to maintain opportunities for safe and enjoyable wildlife-dependent public use of the Refuge.

J.4 Objective: Continue to provide and expand education, interpretive, and wildlife-dependent recreation programs with associated facilities at Hidden Lake Trail.

Rationale: This one-mile trail leading through the boreal forest to a lake stocked with rainbow trout was rehabilitated in 2004 to improve hiking conditions. The trail goes through several different habitats, and good wildlife viewing opportunities for beaver and moose exist around the lake.

J.5 Objective: As an ongoing commitment, provide better information relating to refuge access from the Alaska Highway for compatible wildlife-dependent public uses with information updated every five years.

Rationale: Currently, there are several easements that offer limited access to areas within the Refuge. Due to the complex land ownership pattern along the Alaska Highway, detailed access information is critical for public participation in recreational and subsistence activities. Strategic lands have been identified in the Tetlin Refuge Land Protection Plan (USFWS 2001a) for public easement or acquisition from willing landowners.

J.6 Objective: Continue to provide backcountry canoeing opportunities that allow the public to explore and enjoy wetland and riverine habitats significant to Tetlin Refuge.

Rationale: Canoe travel facilitates a wide variety of compatible public uses and is one of the best ways to experience Tetlin Refuge. Visitor information on canoeing opportunities is limited. Improvements to several areas on and off the Refuge would encourage canoeing on the Refuge.

J.7 Objective: Continue to provide opportunities for multi-day backcountry trips within the Refuge that allow the public to experience and explore the dynamic landscape and wildlife of the Refuge in solitude. A range of opportunities will incorporate various methods of access.

Rationale: A number of visitors and local residents who desire this type of refuge experience. The mode of access (floatplane, snowmachine, canoe), although limiting, will shape the desired experience.

K. Enhance stewardship of natural resources through strong local, State, tribal, national, and international partnerships.

Refuge management direction aimed toward this goal is accomplished through the following objectives: A.3, A.6, A.9, A.14, A.15, A.16, B.2, B.3, C.1, C.2, C.5, C.10, C.11, E.6, F.2, F.3, G.3, G.4, H.2, and H.4.

L. Improve collaboration and communication with and support for local resource users and the communities of the Upper Tanana Valley through development of a "Good Neighbor Policy" that is sensitive to social, political, cultural, and economic needs within the local area.

L.1 Objective: Improve the Refuge's ability to manage day-to-day operations and respond to critical management situations by working with local communities to establish

staffed satellite facilities and necessary equipment near the village of Northway within five years of the Plan's approval.

Rationale: While Tok provides the services needed for year-round refuge operations, the distance from other facilities along the Alaska Highway and the Refuge itself present logistical problems and added cost, especially during the busy summer work season. A satellite facility would provide a cost-effective solution to these problems. At the same time, this approach would strengthen ties between the Refuge and the community of Northway and provide added economic benefit.

L.2 Objective: Cooperate with the Alaska Division of Forestry, the Alaska Fire Service, and local tribal governments to facilitate the training of cultural resource advisors for local communities within two years of the Plan's approval.

Rationale: To avoid the loss or destruction of valuable cultural resources, known sites need to be identified and prioritized as part of the Refuge Fire Management Plan (TNWR 2001) and in any prescribed burn plans prior to fire ignitions. Knowledgeable and experienced local residents should provide input into these plans, and are also needed to provide recommendations during fire suppression activities. During the 2004 fire season, many sites were identified as they were being threatened by fires. Testimony to this effect was also heard at the 2005 Refuge Cultural Resources Summit. Summit participants suggested having cultural resource advisors from each affected community provide on-the-ground recommendations and technical advice to fire crews.

L.3 Objective: Work with area communities to increase grants and other funding sources for projects that benefit refuge resources and local economies.

Rationale: The Refuge has limited capability to fund cooperative projects alone. By increasing the amount of grant monies available to local communities, the Refuge could more easily accomplish these projects through matching funds.

L.4 Objective: Within two years of completing this Plan, develop formal partnership agreements, such as memoranda of understanding or agreement, with local tribes and community organizations including, but not limited to, the village councils of Northway, Tetlin, and Tanacross, the Tok Lion's Club, and the Tok Chamber of Commerce.

Rationale: Through the Fish and Wildlife Service's strategic plan (USFWS 1999), the Service has identified partnerships with states, tribes, and nonprofit organizations, and formal agreements with the business community as a necessary strategy in building broad support for the Service and national wildlife refuges. Tetlin Refuge is actively involved with a number of State, local, and tribal partners. Establishing formal agreements with these and other partners will further build the mutual relationship between the Refuge, as a visitor attraction, and local communities in providing visitor services.

L.5 Objective: Develop three creative incentives to encourage refuge staff to participate in community groups and activities within one year of the Plan's approval.

Rationale: The refuge staff is involved in many community functions. Increasing the level of employee involvement with Upper Tanana Valley communities will build relationships, foster support for refuge objectives, and result in a less contentious environment when politically sensitive and/or controversial issues need resolution.

L.6 Objective: Within five years of the Plan's completion, the Refuge will establish the necessary protocols for formal consultation with the tribal governments of the Upper Tanana Valley.

Rationale: Regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications is mandated by Executive Order 13175. It is critical that the Refuge develop protocols necessary to comply with the directive and strengthening government-to-government relationships. Further, it will serve to enhance cooperative efforts by showing respect to the authority of the tribal councils.

L.7 Objective: Tetlin Refuge will work toward the preservation, display, and interpretation of cultural resources by meeting annually, or more frequently if needed, with tribal entities to initiate and continue development of a cultural center.

Rationale: The Refuge, as an auxiliary supporter, is prepared to assist efforts made by local Native tribes to build a cultural learning center where cultural activities may be shared and practiced for cultural edification and/or economic development. A cultural center would contribute to the enhancement of Tok as the "gateway to Alaska" with a rich cultural history and contemporary cultural presence. It would be complimentary to the proposed world class visitors' center, which the Refuge is also an active participant in establishing.

2.2 Process Used to Develop Alternatives

Alternatives represent different options for future actions. They are sets of objectives and strategies that provide different ways to respond to issues, management concerns, and opportunities identified during the planning process. They take an interdisciplinary approach to problem-solving—they consider the physical, biological, economic, and social effects of the potential actions. The purposes of the Refuge and the Refuge System mission provide focus for actions that could be considered.

All alternatives are treated equally. They provide a basis for comparing impacts and helping managers make better decisions. Any reasonable alternative would contribute to the mission of the Refuge System. A reasonable alternative achieves, in large part, the agency's defined purpose and need and addresses significant issues.

The alternatives described later in this chapter were developed not only to respond to the purposes, issues, and goals of the Refuge, but to comply with National Environmental Policy Act (NEPA), ANILCA, and other pertinent laws (and regulations and directives implementing those laws).

As discussed in chapter 1, issues of oncern to the public were identified from responses to planning updates, at public scoping meetings, and through other public outreach. Each alternative developed meets refuge goals and responds to these issues. Each major issue, activity, and management concern was evaluated and addressed in each alternative.

NEPA directs that we develop a range of alternatives that includes all reasonable alternatives. NEPA also directs that alternatives that were eliminated from detailed study (section 2.3) be discussed briefly to explain the reasons for their elimination (40 CFR 1502.14[a]).

Each alternative is responsive to the laws and regulations governing management of the National Wildlife Refuge System, to the mission and goals of the Service and the Refuge System, and to the purposes for which the Refuge was established. Alternatives B and C would embrace the regional management direction presented in chapter 3.

Although these considerations limited the range of potential alternatives, all inputs into the planning process were considered to achieve a reasonable range of alternatives. The alternatives incorporate differing approaches to resolving issues and accomplishing refuge goals.

Refuge and planning staff, the regional director, and the regional chief of the National Wildlife Refuge System discussed issues developed during scoping and alternate ways of addressing those issues. They decided that three alternatives would address the issues and provide the necessary range as required by NEPA.

2.3 Alternatives and Actions Considered but Eliminated from Detailed Study

Actions and strategies considered in preliminary alternatives, but subsequently eliminated from detailed consideration are discussed below.

2.3.1 Recommending Rivers for Inclusion in the National Wild and Scenic Rivers System

As a result of concerns expressed by the State of Alaska and subsequent analysis of those concerns by the Service, alternatives that would have recommended Congress consider rivers for inclusion in the National Wild and Scenic Rivers system were considered but eliminated from detailed consideration. In compliance with Section 304(g) of ANILCA, special values of the Refuge—including river-related values—are discussed in this Plan (see chapter 4); however, recommendations for designations are not included in the alternatives. Current and proposed management direction may provide adequate protection for all river-related values.

2.3.2 Recommending Lands for Wilderness Designation

For the same reasons described in the previous section, alternatives that would have recommended Congress consider areas of the Refuge for inclusion in the National Wilderness Preservation System were eliminated from detailed consideration. In compliance with Section 304(g) of ANILCA, special values of the Refuge—including wilderness values—are discussed in this plan (see chapter 4); however, recommendations for designation are not included in the alternatives. Current and proposed management direction may provide adequate protection for wilderness values.

2.4 Management Actions Common to All Alternatives

These management actions are either already occurring and will continue, or are currently in the process of being implemented and will be carried forward as part of this Plan. In general, these actions address common issues, concerns, and refuge needs and have one logically and mutually supported course of action for addressing them.

Fisheries Management-Tetlin Refuge provides important habitat for a number of fish species, many of which are important subsistence resources. Recent radio telemetry studies of humpback whitefish and traditional cultural knowledge studies in the Upper Tanana Valley have highlighted the importance of accurate life history information related to these fisheries and their management

(Brown 2003). Work will continue with ADF&G, Native entities, and others to gather additional life history information about whitefish and other important fisheries within the Refuge as outlined in the Tetlin Refuge Fisheries Management Plan (USFWS 1990).

All management alternatives would allow the ADF&G to continue periodic restocking of rainbow trout at Hidden Lake for enhancement of highway-accessible fishing opportunities. This ADF&G project is a put, grow, and take fishery with stocking schedules and numbers determined through the Alaska Statewide Stocking Plan (ADF&G 2007). Although rainbow trout are not native to the Upper Tanana Region, there is minimal risk of the trout escaping the lake and becoming established on the Refuge. Hidden Lake is an isolated waterbody that did not support natural fish populations and the ADF&G stocking program includes provisions to safeguard against potential escapement of stocked fish and establishment of rainbow trout populations outside of the stocked lake. ADF&G has stocked other lakes in the Region with rainbow trout for many years, and there has been no documented escapement or establishment of trout populations in non-stocked waters.

Migratory Bird Management-In 2001, the Migratory Bird Co-management Council proposed amendments to the International Migratory Bird Treaty Act that were adopted. Subsequently, liberalized regulations were passed for the subsistence use of migratory birds and their eggs (presently 92 species). In light of these changes, more accurate and extensive baseline population and harvest information will be gathered to ensure healthy populations are maintained, to continue providing for subsistence opportunities, and to fulfill the Service's obligation in meeting the requirements of the International Migratory Bird Treaty Act.

Invasive Species-Invasive plants and other non-native species represent a relatively new and growing threat to the environmental integrity of the Upper Tanana Valley. Proximity of the refuge boundary to the Alaska Highway allows visitor access to the Refuge through trails and streams. These visitors may provide the means of spreading invasive plant species into refuge lands through their clothing, vehicles, and recreational gear. Other non-native species such as mammals and insects may be expanding their range due to potential changes in climate that may allow them to thrive on refuge lands. A program has been initiated to detect and monitor invasive plant species along the Alaska Highway. This program will be expanded to include direction for preventing, controlling and eradicating invasive species within and adjacent to the Refuge.

Environmental Contaminants-Past development and construction activities—primarily associated with World War II era military facilities such as the Alaska Highway, Northway (Staging Field) Airfield, Canol Pipeline, and the Haines to Fairbanks Pipeline (used by the Army to transport petroleum products from 1954 to 1973)—within and adjacent to Tetlin Refuge have introduced a variety of contaminants into the Upper Tanana Valley and the Refuge itself. Petroleum hydrocarbons are the primary contaminants of concern at these former military sites. Concerns have also been raised regarding reported past use of herbicides along the pipeline corridor; however, sampling in 2005 did not detect persistent residues. Another known contaminant site on the Refuge is the former Seaton Roadhouse, which included a gas station and automotive repair shop. Contaminants cleanup at this site will be required under all management alternatives.

Current and future planned activities also have the potential to create additional sources of contamination, including spills or development activities outside of refuge boundaries. The Service's Environmental Contaminants Program is completing an assessment of known contaminant threats on the Refuge, and, in the future, could work with the Refuge to document

baseline environmental conditions and establish a plan for long-term monitoring as developments occur within or adjacent to the Refuge.

Public Use Facilities and Access-Each of the three alternatives proposed in this Plan would provide a wide variety of wildlife-dependent public use opportunities and related facilities. The thresholds to maintain compatibility with refuge purposes; specific actions to provide visitor experiences; design, location and size of proposed facilities; and other details to implement management direction will be spelled out through a revision of the 1997 Tetlin Refuge Public Use Management Plan (USFWS 1997a). The revised document will be a Visitor Services Plan for Tetlin Refuge.

To improve visitor services throughout the Upper Tanana Valley and further the mission of the U.S. Fish and Wildlife Service, work will continue with the Alaska Public Lands Information Center (APLIC), the Alaska Department of Transportation and Public Facilities, other agencies, tribes, and partners to finalize plans and begin construction of an interagency visitor center in Tok.

Once completed, this interagency visitor center will provide interpretive exhibits and presentations that will address the natural, cultural, political, and economic history of State and Federal lands, and public recreation resources available. Specific interpretive displays and presentations will describe attributes of the Borderlands Region and Tetlin National Wildlife Refuge.

An area for trip planning will be available, with a library and collection of maps and land status resources available that can assist users in determining where they might like to go and what they can expect to see and do. Visitor contact stations will be provided where visitors can ask questions and get assistance. The Tok APLIC will include parking, an outdoor rest area, interpretive trails, and a theater to accommodate visitors from several tour buses at once, and provide a location for community events.

Subsistence Uses-Providing for continued subsistence opportunities is one purpose of Tetlin Refuge. The Service will increase efforts to monitor fish, wildlife, and plant populations, and their harvest to ensure these uses remain compatible with other refuge purposes. The alternatives considered in this Plan propose maintaining or increasing opportunities for access to subsistence resources within the Refuge.

Recreational Uses-Wildlife observation and photography, environmental education, interpretation, and recreational fishing and hunting are the six wildlife-dependent priority public uses identified in the 1997 Refuge System Improvement Act. The Act specifies these uses should be encouraged where compatible with refuge purposes. Regardless of the alternative selected, the recreational opportunities that currently exist will continue to be provided. These include existing opportunities described under Public Use Facilities and Access (section 2.5.3) and various outreach programs described in the Refuge Public Use Management Plan (USFWS 1997a).

2.5 Alternative A – Current Management (No Action)

Alternative A, the "current management alternative," describes current and future management of the Refuge, assuming present actions and initiatives are carried forward. It provides the baseline against which to compare the other two alternatives and is required by the NEPA.

2.5.1 General Management Direction

Under Alternative A, management of the Refuge would continue to follow the 1987 Tetlin Refuge Conservation Plan (USFWS 1987a) and Record of Decision (USFWS 1987b) as amended by the Refuge Public Use Management Plan (USFWS 1997a) and the Tetlin Refuge Fire Management Plan (TNWR 2001). In addition to actions described previously under Management Actions Common to All Alternatives, Alternative A (Current Management) would include the following:

- Wildlife-dependent public uses and related facilities–Continue or increase existing opportunities for public use of the Refuge that are compatible with the conservation of fish, wildlife, plants, and their habitats. Facilities would be upgraded, and new facilities constructed, to promote day-use and interpretive opportunities along the Alaska Highway.
- Fire Management–Continue to protect resources and property, and to meet habitat management objectives by targeting a fixed number of acres to be treated annually through a variety of fire management techniques, including prescribed burning, suppression, thinning, and wildland fire use according to direction provided through existing refuge plans (USFWS 1987a, TNWR 2001).
- Fisheries Management–Reintroduce and introduce fish throughout the Refuge to restore native populations and provide additional recreational opportunities. Manage stocks of Arctic grayling and northern pike to provide trophy recreational fishing opportunities.

2.5.1.1 Management Categories

Three management categories would continue to be applied to lands within Tetlin Refuge. Approximately 1,700 acres, which form a buffer strip along the Alaska Highway from the Tetlin Refuge Visitor Center to the Alaska-Yukon border, would remain classified under Intensive Management as outlined in the original 1987 Plan. Approximately 40 acres at the Seaton Roadhouse site have been reclassified from Minimal Management to Moderate Management to allow for development of additional facilities and increased wildlife-dependent public use opportunities, allowing for implementation of direction approved in the 1997 Public Use Management Plan (USFWS 1997a). The 682,604 acres administered by Tetlin Refuge would fall into three management categories as follows: Minimal (approximately 564,300 acres or 82.7 percent of refuge-administered lands); Moderate (approximately 116,600 acres or 17.1 percent), and Intensive (approximately 1,700 acres or less than one percent) (see Figure 2-1).

Figure 2-1. Management Categories – Alternatives A (Current Management), B (Preferred) and C.

2.5.2 Management Direction by Program

2.5.2.1 Visitor Services and Public Use Management

Under Alternative A, we would coordinate, to varying degrees, with a number of other agencies and partners to provide a wide range of wildlife-dependent opportunities for the public throughout the Upper Tanana Valley. These include opportunities for environmental education, interpretation, wildlife observation, wildlife photography, fishing, hunting, and trapping. The Refuge would continue to focus on developing and improving these opportunities as described in the original 1987 Plan. While most efforts would be coordinated with other agencies and partners, these efforts would remain largely informal and focused primarily on opportunities available through Tetlin Refuge and its facilities.

2.5.2.2 Public Use Facilities and Access

Currently a number of facilities and points of access to the Refuge are available that provide both subsistence and wildlife-dependent recreational opportunities to the public. Alternative A (Current Management) would maintain existing facilities and access, with improvements and new opportunities provided according to management direction in the original 1987 Conservation Plan.

Visitor Centers and Kiosks. In addition to management direction common to all alternatives relating to the Tok APLIC, the Refuge would continue to operate and maintain the Tetlin Refuge Visitor Center near the Alaska-Yukon border and existing interpretive kiosks at trailheads, campgrounds, and other strategic locations along the Alaska Highway.

Interpretive Pullouts. Under Alternative A (Current Management), existing pullouts along the Alaska Highway would continue to provide opportunities for highway travelers to stop and enjoy scenic vistas of the Upper Tanana Valley during their trip and to learn about Tetlin Refuge, the area's natural processes and resources, and the people who live with and depend upon them.

Development of the Seaton Roadhouse Site. Following direction from the original 1987 Comprehensive Conservation Plan, development and facilities at the Seaton Roadhouse site would include rehabilitation of the one-mile abandoned section of the Alaska Highway leading to the site, development of an associated parking area with adequate space to accommodate a level of use proportionate with development at the site, and construction of a short interpretive trail (less than two miles in length) with a wheelchair-accessible wildlife-viewing platform.

Campgrounds. Tetlin Refuge would continue to administer and maintain the Deadman Lake and Lakeview campgrounds along the Alaska Highway through a long-term lease with the State of Alaska. Both campgrounds are in need of some site rehabilitation, basic maintenance, and various repairs. The Service would work to meet or exceed basic standards, which include fully graveled and leveled parking areas free of overhanging brush and other obstructions or safety hazards, a fully functional picnic table and fire ring with grating, clean and fully functional waste facilities, and posted written information regarding campground rules, precautions, and etiquette.

Additional public use facilities would also be constructed at both campgrounds. These facilities would be designed to provide additional wildlife-dependent recreational opportunities for both campground guests and for other day-use visitors. Examples of potential facilities include boardwalks, wildlife viewing blinds, and small boat docks.

River and Trailhead Access. Currently the Refuge maintains one public boat launch and parking area at the Chisana River Bridge near Northway. Although not on refuge lands, this boat launch is an ANSCA 17(b) easement reserved for public access to the Chisana River and Tetlin Refuge. Alternative A (Current Management) would ensure this boat launch continues to provide public access to the Chisana River and the Refuge.

Through the original 1987 Comprehensive Plan (USFWS 1987a) and the 2001 Tetlin Refuge Land Protection Plan (USFWS 2001a), private lands were identified that could provide additional public access to the Refuge. These sites were prioritized and under all alternatives; the Service will continue working with willing landowners to acquire public access easements across these lands and to buy lands from willing sellers to permanently secure public access to these areas within the Refuge.

Canoe Routes. Currently there are no official or designated canoe routes within the Refuge, but several rivers and streams have been repeatedly floated with canoes and provide recreational and subsistence opportunities for the public (refer to Affected Environment sections 4.3.8 and 4.5 for a more details). Under Alternative A (Current Management), the Service will make some basic information available to the public explaining where these opportunities can be found, along with information about the Refuge, appropriate Leave-No-Trace camping practices for the backcountry, and basic safety information.

Trails. Through the 1987 Plan, management direction was developed to provide an interpretive hiking trail near the Tetlin Refuge Visitor Center. Under all alternatives, this short half-mile, interpretive trail would be maintained to provide additional wildlife-dependent recreational opportunities to the public. Currently maintained trails within the Refuge include a one-mile hiking trail from mile 1240 of the Alaska Highway to Hidden Lake, a quarter-mile interpretive trail at the Deadman Lake campground, and the longer Airs Hill trail near the Alaska-Yukon border. Following direction from the 1987 Plan and 1997 Public Use Management Plan, minimal maintenance and signing would be used on trails within the Refuge.

Cabins. Currently three administrative cabins at Jatahmund Lake, American Wellesley Lake and Nabesna River are maintained and made available for public use when not needed for refuge projects or programs. These cabins will continue to be made available through a first-come-first-served reservation system. A more detailed discussion of how cabins are managed within the Refuge can be found in the Common Management Direction section.

2.5.2.3 Fire Management

Alternative A (Current Management) would continue to protect resources and property through a variety of fire management techniques, including fire suppression, wildland fire use, prescribed fire, and thinning around structures and sites as outlined in the original 1987 Comprehensive Plan (USFWS 1987a) and the 2001 Tetlin Refuge Fire Management Plan (TNWR 2001) (see Figure 2-2). These plans target a fixed number of acres to be burned annually to achieve waterfowl and moose management objectives. Under this alternative, we would continue to conduct suppression activities according to the Alaska Interagency Wildland Fire Management Plan (AWFCG 1998) and the Tetlin Refuge Fire Management Plan (TNWR 2001). The location and distribution of the four AIWFMP fire management options would remain essentially unchanged, but small areas may be reclassified to better meet management objectives.

Figure 2-2. Fire management option-Alternative A (Current Management).

General Fire. The Alaska Department of Natural Resources, Division of Forestry would continue to initiate and coordinate suppression of fires in the Upper Tanana Valley, including those on refuge lands. Tetlin Refuge would continue to maintain personnel and equipment in Tok with secondary fire suppression capabilities. Individual treatment plans for prescribed fire, mechanical thinning, and other habitat management activities would continue to be developed annually per the Refuge Fire Management Plan (TNWR 2001). An average of 7,500 refuge acres per year would be targeted for burning by natural and prescribed fire.

Protection of Property. Approximately 450 acres of refuge lands per year would be targeted for prescribed burning to establish and maintain a fuel break (approximately 13 miles long by one mile wide) designed to protect private lands and property in the vicinity of Northway from wildland fires originating on the Refuge (see Figure 2-2).

2.5.2.4 Habitat Management

Prescribed fire would be used to "improve" approximately 400 acres of habitat annually for waterfowl and moose.

2.5.2.5 Fisheries Management

This alternative would continue management direction from the 1987 Comprehensive Plan for the reintroduction of lake trout and chum salmon populations as appropriate. In cooperation with ADF&G, selected populations of Arctic grayling and northern pike would be managed to provide trophy recreational fishing opportunities; up to three additional lakes within Moderate or Intensive Management areas along the Alaska Highway would be stocked and periodically restocked to provide recreational fishing opportunities similar to those found at Hidden Lake. See section 2.4 for additional discussion of why Hidden Lake stocking was permitted. Specific strategies for evaluating and selecting areas for reintroduction, trophy management, and put-and-take fisheries would continue to be included in, and updated through, the Refuge Fisheries Management Plan (USFWS 1990).

2.5.2.6 Funding and Personnel Requirements

Current funding and staff requirements are discussed in the Affected Environment chapter (chapter 4, section 4.6) of this Plan. To implement the additional actions discussed as part of this alternative, additional funding and staffing would be required (see Table 2-1). Construction of new facilities and road, additional maintenance needs, potential replacement of equipment, and full funding of existing programs (replacing grants and other outside funding) would be needed to implement to alternative. As a result, we anticipate a minimum annual budget of $2.5 million, and an additional $8.9 million for new facilities and road construction will be required to implement actions common to all alternatives and those actions which would also occur under Alternative B and Alternative C. Additional costs for implementing actions specific to Alternative A (Current Management), and which vary by alternative, are discussed in the following text.

Refuge fire staffing is currently inadequate to conduct moderate-to-high complexity burns without outside assistance. Although this can be mitigated to some extent by ordering regional or interagency resources, narrow prescription windows and extended travel times can complicate burn planning and significantly increase costs. Resources may need to be in place a week or more before ignition commences to guarantee availability when suitable burning conditions occur.

Also, the prescribed fires characteristic of this alternative frequently require a helicopter, either for aerial ignition or for access to remote sites. Typically, suitable burning conditions coincide with the peak fire season, resulting in limited availability of aircraft. Due in large part to these impediments, the Refuge has been unable to conduct the level of prescribed burning outlined in the 1987 Plan. To effectively implement this management direction, the Refuge would require 1.5 full-time equivalent positions (FTEs) to assist with writing prescribed burn plans, fill key operational positions during the burn, and perform the required post-burn monitoring. Additional annual transportation (including annual helicopter contracts) and equipment costs would range from $60,000 to $130,000 depending upon the number and size of burns completed.

Table 2-1. Additional budget and staffing needs for Alternative A

Needs	Description
Staff	GS-5 forestry technician/firefighter; 0.5 FTE temporary seasonal
	GS-7 biologist/fire fuels specialist; 1 FTE full-time permanent
	GS-5 fisheries technician; 0.5 FTE temporary seasonal
	GS-9 biologist/fisheries specialist; 1 FTE full-time permanent
Estimated increase in annual operations costs	$98,000-$168,000*
Total estimated additional costs from Alternative A (Current Management) over 15 years	$3.4-$4.4 million

* This figure includes 50,000 to 100,000 dollars for annual helicopter contract to support the fire program, 10,000 to 30,000 dollars in additional costs for fire program, 10,000 dollars overhead for each additional FTE, and 8,000 dollars to support the fisheries work.

Currently the Fairbanks Fisheries Research Office and the Alaska Department of Fish and Game conduct all fisheries related work within the Refuge. Neither of these offices possesses the staffing or budget necessary to fully implement the fisheries management direction in this alternative. We estimate 1.5 FTEs would be required to conduct inventory and monitoring related to reintroductions and stocking of fish populations throughout the Refuge. Transportation costs for restocking and monitoring of remote lakes within the Refuge would be approximately $8,000 annually.

2.6 Alternative B

2.6.1 General Management Direction

Although most of the general management direction described in Alternative A would continue, some specific directions and actions occurring under current management would be altered or not pursued under this alternative. Management direction that differs from Alternative A (Current Management) is summarized in subsequent text.

- Wildlife-dependent public uses and related facilities-Alternative B would increase existing opportunities for public use of the Refuge as long as they are compatible with refuge purposes and Service mandates. Facilities would be upgraded, new facilities constructed, and access improved to promote day-use near the Alaska Highway and to provide additional backcountry opportunities.
- Fire Management-Alternative B would continue to manage fire using a variety of tools, including suppression, wildland fire use, prescribed fire, non-fire fuels treatments, and emergency rehabilitation and restoration. The emphasis in Alternative B would shift from suppression and landscape-scale prescribed burning based on fixed annual acreage targets to Fire Use and fuels reduction treatments designed to increase the number of acres that can be burned safely under a Wildland Fire Use strategy. In addition, prescribed fire may be used to achieve specific management objectives related to habitat maintenance and restoration, the Land Management and Research Demonstration Program, and environmental education.
- Fisheries Management-Manage all fisheries within their historic distribution and population cycles to maintain natural diversity and stability of ecosystems within the Refuge.

2.6.1.1 Management Categories

The acreages within each of the three management categories will remain the same as in Alternative A (see Figure 2-1). Several changes would be made to the management direction for these three categories with substantial changes reflected in Table 2-5 (see section 2-10).

2.6.2 Management Direction by Program

The actions in this alternative are in addition to those actions common to all alternatives (see previous discussion). Much of the management direction in Alternative A would continue, especially with respect to public uses. In general, this alternative would augment the existing public use program through additional opportunities and facilities for wildlife-dependent public uses. This alternative would also change existing refuge management direction for prescribed fire and fisheries resources.

2.6.2.1 Visitor Services and Public Use Management

This alternative would seek formal recognition of Tok as a "Gateway Community." Under the Gateway Community concept, we would recognize the role of Tok in providing essential services that make public use and administration of Tetlin Refuge possible. The Service would seek partnerships consistent with promoting the Borderlands Region and Tetlin Refuge as a destination for summer travelers. Establishing Tok as a destination would encourage extended visitation to the area, increased visitation to the Refuge, and increased participation in activities and events throughout the Upper Tanana Valley. The Service would actively seek cooperative agreements with local communities, tribal governments, and refuge partners to enhance the number and quality of environmental education, interpretation, and recreational opportunities available off-refuge. These agreements would provide opportunities that support or are in conjunction with refuge programs.

2.6.2.2 Public Use Facilities and Access

Visitor Centers and Kiosks. This alternative would implement the actions under Alternative A (Current Management).

Interpretive Pullout. In addition to Alternative A (Current Management), additional signs would be posted to make each pullout more visible. Many travelers use interpretive pullouts to stop, enjoy the scenery, and often make a snack or meal. However, there are no restrooms or trash facilities at most pullouts and conditions can become unsanitary and unsightly. This alternative would require working with the Alaska Department of Transportation and Public Facilities to construct restroom and trash facilities at the most easily accessible and heavily used pullouts and seeking partners willing to participate in a cooperative agreement for the maintenance of all highway pullouts between Tok and the Alaska-Yukon border.

Development of the Seaton Roadhouse Site. In addition to management direction under Alternative A (Current Management), additional and longer hiking trails (less than 10 miles in length) would be constructed to provide more wildlife viewing and wildlife photography opportunities in the summer and additional subsistence opportunities. In areas furthest from the parking area, campsites would be established to provide a quieter and more primitive experience than at Deadman or Lakeview campgrounds. In addition to the wheelchair accessible wildlife viewing platform proposed in Alternative A (Current Management), trail segments closest to the parking area would be barrier-free to accommodate visitors who require a wheelchair or have limited mobility.

Campgrounds. This alternative would allow recreational facilities and upgrades to existing campsites as described under Alternative A (Current Management). Also, the access roads (totaling just over two miles in length) from the Alaska Highway would be upgraded within six years to improve access and allow for a longer season of use. Poor road conditions due to improper drainage and a roadbed of native materials (glacial till/loess) result in a late opening (end of May) of the campgrounds and sustained problems throughout the season. During the spring thaw and rainy periods, road conditions deteriorate rapidly, making travel difficult and unsafe. Use of heavy recreational vehicles and large trucks quickly damage the roadbeds. Extending the season of use for these campgrounds is not possible without major improvements to prevent costly damage and repairs.

The campgrounds would continue to provide the same number of overnight camping opportunities at any given time, but increased day-use would be possible through additional facilities. Consistent with the visitor services role of the Refuge described previously, the Refuge would cooperate with other communities, tribal governments, or partners to encourage development of additional campsites and campground facilities outside the Refuge that provide additional camping opportunity.

The Refuge would implement a voluntary donation program at each campground on a trial basis, which would include visitor information regarding use of donations. If basic campground amenities such as potable water can be provided in the future, a mandatory fee program would be implemented. The Refuge will abandon any fee collection that proves not cost effective to administer (using criteria from the Federal Lands Recreation Enhancement Act) or that significantly diminishes participation in campground interpretive and educational programs.

River and Trailhead Access. In addition to actions under Alternative A (Current Management) the marking and signing of existing refuge access points would be improved. Most points of access to primitive backcountry trails within the Refuge are currently not marked and are difficult to locate. This situation often discourages the public from using these access points and creates the potential for unintentional trespass violations.

Currently the Chisana River boat launch does not provide reliable river access. The Chisana River continually silts in the launch and continual maintenance is required to provide safe and easy access. Under this alternative, the boat launch would be modified to reduce or eliminate this problem and provide more consistent access. Similar to management direction for interpretive pullouts along the Alaska Highway, we would work with partners to establish cooperative agreements for the maintenance of these sites, and potentially other popular boat launches that also provide public access to the Refuge.

Canoe Routes. Under Alternative B, canoe routes would be established within the Refuge. Public launches, take-out areas, portages, and points of interest would be signed and marked on maps available to the public. Combined with visitor information described in Alternative A (current management), this alternative is intended to make traveling through these areas easier and add to the visitor experience, knowledge, and appreciation of Tetlin Refuge and its purposes. Routes would most likely be established on easily accessible waterways of low to moderate technical difficulty and moderate to high wildlife observation potential (e.g., Scottie and Desper creeks) to provide quality opportunities for visitors with a broad range of skills and abilities.

Trails. In addition to the trails at the Seaton Roadhouse site, the Tetlin Refuge Visitor Center, Deadman Lake Campground, and Hidden Lake, there are other existing trails within the Refuge that are not maintained. Most of these trails pass through low, wetland areas and are used only during winter by snowmobile or dogsled. Other non-maintained trails provide opportunities to experience the Refuge on horseback or on foot during the summer. Under this alternative, these trails would be marked and some trails would be cleared of deadfalls and brush to make travel easier and safer while preserving their primitive character. These primitive trails would receive only minimal maintenance with improvements or realignments only for resource protection.

Cabins. Public outreach would be conducted to encourage use of the three administrative cabins during times that do not conflict with refuge needs. This redistribution of use would be intended to avoid scheduling conflicts and would allow continued public use while ensuring availability for refuge operations under the existing cabin reservation system. Under Alternative B, if additional public outreach is unsuccessful in eliminating schedule conflicts, public use of these administrative cabins would be restricted during certain times of the year.

2.6.2.3 Fire Management

Alternative B would continue to manage fire using a variety of tools, including suppression, wildland fire use, prescribed fire, thinning and other non-fire fuel treatments, and emergency rehabilitation and restoration. The emphasis under Alternative B would shift from suppression and landscape-scale prescribed burning based on fixed annual acreage targets to Wildland Fire Use and fuels reduction treatments designed to increase the number of acres that can be burned safely under a Fire Use strategy. In addition, prescribed fire may be used to achieve specific management objectives related to habitat maintenance and restoration, the Land Management and Research Demonstration Program, and environmental education.

General Fire. The Alaska Department of Natural Resources, Division of Forestry would continue to coordinate suppression of fires in the Upper Tanana Valley, including those on refuge lands. Tetlin Refuge would continue to maintain personnel and equipment in Tok with secondary fire suppression capabilities, and would work with landowners, native groups, the Division of Forestry and the Bureau of Land Management's Alaska Fire Service (AFS) to help provide the Upper Tanana Valley with integrated and effective fire management.

Protection of Property. Under Alternative B, suppression activities would continue to be conducted according to the Alaska Interagency Wildland Fire Management Plan (AWFCG 1998) and the Tetlin Refuge Fire Management Plan (TNWR 2001), but allowances would be made for significant changes in location and distribution of the four AIWFMP fire management options to accomplish management goals (see Figure 2-3). The concept of a continuous 13-mile-long fuel break along the northern edge of the Refuge would be abandoned in favor of localized fuels treatments. In addition, the Refuge would explore the possibility of staging a Type VI Engine module in the community of Northway.

2.6.2.4 Habitat Management

Alternative B would place much more emphasis on the use of wildland fire to maintain ecological diversity and achieve management objectives than either Alternative A (Current Management) or Alternative C. Wildland Fire Use would be permitted on all Refuge lands falling within the AIWFMP Limited fire management option and within the Modified fire management option after the conversion date. Prescribed fire, mechanical and chemical treatments, natural fire, and fire suppression would continue to be used as management tools under all alternatives, but under Alternative B the concept of annual prescribed burning acreage targets to improve wildlife habitats would be abandoned. Use of prescribed fire as a habitat management tool would be based on individual treatment plans designed to achieve specific management objectives.

2.6.2.5 Fisheries Management

Fisheries management under this alternative differs from Alternative A (Current Management). Under Alternative B, the management intent for larger fish to provide trophy recreational fishing opportunities will be dropped and the Refuge will be managed consistent with the Service's Policy on Maintaining Biological Integrity, Diversity, and Environmental Health of the National Wildlife Refuge System (Service Manual 601 FW 3) to ensure native species are managed in their natural diversity and abundance. The Refuge will work with the State of Alaska to conserve fish populations, recognizing that populations may experience fluctuations in abundance because of environmental factors and may require management actions for conservation purposes.

Although the Refuge will be managed to maintain the genetic variability of wild, native fish stocks under this alternative, the Refuge would allow ADF&G to continue to periodically restock Hidden Lake with rainbow trout to enhance fishing opportunities, as described in section 2.4 Management Actions Common to All Alternatives. Unlike Alternative A, this alternative would allow no additional stocking of non-native fish. The Fisheries Management Plan (USFWS 1990) for the Refuge, completed in 1990 in cooperation with ADF&G, guides Service fisheries management activities on Tetlin Refuge. Scheduled for revision in 2011, it will provide more specific guidance for management of Refuge fishery resources and use opportunities.

Figure 2-3. Fire management option-Alternative B (Preferred Alternative).

2.6.2.6 Funding and Personnel Requirements

As with Alternative A (Current Management) implementing this alternative would require additional funding and staffing (see Table 2-2). However, the change in fisheries and prescribed fire management direction would offset much of the additional staffing costs when comparing Alternative A (Current Management) and Alternative B. The majority of the increased cost under Alternative B would be from one-time public use facilities construction and associated maintenance.

Improving the campground access roads, upgrading and improving the Chisana River boat launch, and constructing additional and longer hiking trails at the Seaton Roadhouse site would cost $3.6 to $3.9 million (rough estimate based on replacement costs for comparable facilities identified in Tetlin Refuge Real Property Inventory and Maintenance Management System; nearly $2 million of estimate would be required for road improvements). In addition, it is estimated 1.5 FTEs and $30,000-$35,000 would be required annually to administer and maintain these and other facilities.

Table 2-2. Additional budget and staffing needs for Alternative B

Needs	Description
Staff	WG-7 maintenance worker; 0.5 FTE temporary seasonal
	GS-9 recreational planner; 1 FTE Full-time permanent
	GS-5 forestry technician/ firefighter; 0.5 FTE temporary seasonal
	GS-7 forestry technician/ firefighter; 0.75 FTE permanent seasonal
Estimated one-time facilities construction	$3.6-$3.9 million
Estimated annual operations increase	$83,000-$101,000*
Total Estimated Cost 15 year Plan	$6.6-$7.2 million

* This estimate include 10,000 dollars overhead for each FTE, 25,000 to 38,000 dollars for one engine module and 30-35K for public use facilities maintenance.

The cost of hiring fire fighters and maintaining fire suppression equipment needed for improved response times would most likely be shared between the Village of Northway, Tetlin Refuge, the Bureau of Land Management Alaska Fire Service, and the Alaska Department of Natural Resources, Division of Forestry. An estimated minimum of 1.5 FTEs and an annual operating budget of $50,000 would be required to maintain a basic engine module. The primary function of this module would be to provide enhanced wildland fire suppression for Tetlin Refuge, so the Refuge would likely pay one-half to two-thirds of this cost.

2.7 Alternative C

2.7.1 General Management Direction

Although most of the general management direction described in Alternative A (especially with respect to public use) would continue, some specific directions and actions occurring under current management would be altered or not pursued under Alternative C. Management direction in this alternative that differs from the other alternatives is summarized in the following text.

- Wildlife-dependent public uses and related facilities- Increase existing opportunities for public use of the Refuge that is compatible with the conservation of fish, wildlife, plants, and their habitats. Existing access areas and facilities would be upgraded and expanded, and new facilities constructed along the Alaska Highway and in the backcountry to promote increased day-use and extended stays within the Refuge.
- Fire Management- Continue to protect resources and property through a variety of fire management techniques, including prescribed burning, natural fire, and thinning around structures and sites. However, aggressive suppression of most wildland fires will be the primary method of protecting resources and property within and adjacent to the Refuge.
- Fisheries Management- As with Alternative B (Preferred Alternative), manage all fisheries within their historic distribution and population cycles to maintain natural diversity and stability of ecosystems within the Refuge.

2.7.1.1 Management Categories

The acreages within each of the three management categories will remain the same as in Alternative A (see Figure 2-1). Several changes would be made to the management direction for these three categories with substantial changes reflected in Table 2-5 (see section 2-10).

2.7.2 Management Direction by Program

The actions under Alternative C are in addition to those actions common to all alternatives (see section 2.4). Much of the management direction in Alternative A (Current Management) would continue, especially with respect to public uses. In general, this alternative would augment the existing public use program through additional opportunities for wildlife-dependent public uses. However, through this alternative the location, duration and types of public use opportunities provided would differ. This alternative would also change existing refuge management direction for prescribed fire and fisheries management.

2.7.2.1 Visitor Services and Public Use Management

This alternative would build upon the "Gateway Community" concept under Alternative B (Preferred Alternative) but would also establish Tetlin Refuge as a leader in the interpretation of the Upper Tanana Valley and its history. This would be accomplished by expanding existing refuge interpretive programs and establishing partnerships to expand educational and interpretive programs throughout the Upper Tanana Valley.

2.7.2.2 Public Use Facilities and Access

Visitor Centers and Kiosks. In addition to actions under Alternative A (Current Management), additional interpretive kiosks would be constructed at selected pullouts along the Alaska Highway. These kiosks would supplement existing interpretive panels, provide travel information, and identify public use activities and access throughout the Upper Tanana Valley, including Tetlin Refuge, and would reduce the information role of the Tetlin Refuge Visitor Center and the planned Tok APLIC visitor center.

Construction of the planned visitor center, additional kiosks, and interpretive pullouts along the Alaska Highway would take priority over the establishment of other public use facilities within the Refuge such as trails, cabins, canoe routes, or camping areas

Interpretive Pullouts. In addition to actions proposed under Alternative B (Preferred Alternative), interpretive/recreational structures would be constructed at pullouts along the Alaska Highway as part of Alternative C. The structures would be used to increase wildlife viewing, wildlife photography, and environmental education and interpretation in a safe and structured manner.

Development of the Seaton Roadhouse Site. In addition to management direction under Alternative B (Preferred Alternative), greater recreational and subsistence opportunities would be provided through additional and longer hiking trails (greater than 10 miles in length). These longer trails would be designed to intersect with other more primitive existing backcountry trails in and around the Refuge. These longer, more primitive backcountry trails would be usable year-round for hiking, and in winter months for a variety of existing compatible uses such as cross-country skiing, snowmobiling, dogsledding, and skijouring. To minimize environmental impacts and cost, these trails would be located in drier upland areas that minimize soil and vegetation impacts and eliminate the need for extensive and expensive hardening or boardwalks associated with trail construction in lowland or wetland areas.

Campgrounds. In addition to Alternative A (Current Management) and access road improvements described in Alternative B (Preferred Alternative), campground facilities would be upgraded to include potable water, a sewage dump station, and electricity. Overnight camping opportunities would be increased over the next six years through the construction of three to six additional campsites—primarily for large recreational vehicles at the Deadman Lake Campground. These new sites would provide full service hookups for recreational vehicles. In order to offset the additional maintenance and administrative costs at these two campgrounds, the Refuge would initiate a campsite fee program. The daily fee would be similar to that currently charged for campground use at similar State and Federal facilities in the upper Tanana and Fortymile river valleys.

River and Trailhead Access. In addition to actions under Alternative B (Preferred Alternative), parking areas would be established at existing points of access, and access to undeveloped boat launches and trails would be improved. Better marking or signing of boat launches and trails would resolve part of the refuge access issue, but many sites would still lack enough space to park more than one vehicle, and none have enough room to turn a truck and trailer around. In order to facilitate public access to the Refuge, adequate and safe parking would be provided under this alternative.

Canoe Routes. In addition to establishing canoe routes as proposed under Alternative B (Preferred Alternative), Alternative C would locate and mark several desirable campsites along each route. These campsites would be selected based upon their resistance to trampling and erosion, and their proximity to known cultural or historic sites, private lands and sensitive wildlife areas. To the extent possible, campsites would be located a day's traveling distance from one another. Portages would be located using criteria similar to those used in selecting campsites. Portages would be marked, cleared, and maintained as needed to improve the ease of public access, provided added public safety; and to protect refuge resources.

Trails. This alternative would utilize existing and newly constructed trails (including those associated with the Seaton Roadhouse site) to create an interconnected system linking trails within the Refuge to each other and with trails in adjacent areas such as the Wrangell-St. Elias National Park and Preserve. In addition to trail maintenance and marking proposed under Alternative B (Preferred

Alternative), several new trails would be constructed, marked, and maintained under Alternative C. Trails would vary in their design and location to facilitate additional opportunities for various wildlife-dependent public uses. These new trails would allow hiking, horseback riding, dogsledding, snowmobiling, and other compatible forms of transportation for access to infrequently used or otherwise inaccessible areas of the Refuge. While some trails may be suitable only for winter travel or for only the most experienced backcountry traveler, attempts would be made to accommodate a wide variety of user groups, skill levels, seasons of use, and visitor experiences through an interconnected system of trails, including single and multiple use trails with varying degrees of improvement, difficulty, and length.

Cabins. In addition to Alternative B (Preferred Alternative), one or more new public use cabins would be constructed within the Refuge to provide facilities, public use opportunities, and visitor experiences similar to those found at the three existing administrative cabins. So long as there are not conflicts with Refuge needs, the three administrative cabins would remain available for public use. Currently the three administrative cabins are only accessible year-round by airplane or by snowmachine during periods of adequate snow cover. One is also accessible during ice-free periods by boat. Under this alternative, the first new cabin constructed would be accessible by trail from the Alaska Highway year-round and by a variety of means including dogsled, horseback or on foot. Depending upon demand and use of refuge trails and administrative cabins, and associated impacts to refuge resources, additional public use cabins could be constructed in the future. Public use of refuge administrative cabins would continue to be made available on a first-come, first-served basis through the refuge reservation system with any new public use cabins either incorporated into the same system or available through the national reservation system according to what works best based on public and refuge needs.

2.7.2.3 Fire Management

Under this alternative, prescribed fire, wildland fire use, suppression, and non-fire fuel treatments would continue to be used as management tools for protecting resources and property, but the concept of using prescribed fire to establish and maintain a continuous 13-mile-long fire fuel break would be abandoned. Instead, aggressive fire suppression would be used to reduce the overall threat from wildfire. Suppression activities would continue to be conducted according to the Alaska Interagency Wildland Fire Management Plan (AWFCG 1998) and the Tetlin Refuge Fire Management Plan (TNWR 2001), but the number of acres under the Full Suppression Option would be greatly increased, especially adjacent to private lands, the Yukon border, and the Alaska Highway.

General Fire. As under Alternative B (Preferred Alternative), the Refuge would work with the Tok Area Alaska Department of Natural Resources, Division of Forestry to integrate the refuge radio system into the fire dispatch system that serves the Upper Tanana Valley.

Protection of Property. Under this alternative, Limited Suppression Option acres on refuge managed lands would be reduced from 588,000 to approximately 193,000 acres; the Modified Suppression buffer will be moved southward, and Full Suppression acres would increase from 45,000 acres to approximately 266,000 acres (see Figure 2-4). Actual acreages and boundaries would be determined in accordance with Alaska Interagency Wildland Fire Management Plan (AWFCG 1998) guidance and would be subject to annual modification. As a result of these changes, a larger percentage of refuge fires would receive an initial attack suppression response than in Alternative A.

Figure 2-4. Fire management option-Alternative C.

Similar to Alternative B (Preferred Alternative), we would work with Alaska Division of Forestry and the Alaska Fire Service to reduce initial attack wildfire suppression response times and increase suppression capabilities for the Refuge, the Northway area, and properties east along the Alaska Highway to Port Alcan at the Alaska-Yukon border. Under this alternative initial attack capabilities would be increased above those described under Alternative B (Preferred Alternative) in proportion to the amount of refuge lands reclassified into the Full Suppression Option.

2.7.2.4 Habitat Management

This alternative would place much less emphasis on the use of wildland fire to maintain ecological diversity and achieve management objectives than either Alternative A (Current Management) or Alternative B (Preferred Alternative). Prescribed burning, wildland fire use, and suppression would continue to be used as management tools, but the concepts of allowing wildland fires to burn large portions of the Refuge to achieve management objectives or annual prescribed burning acreage targets to improve wildlife habitats would be abandoned. Prescribed burning would be minimal, and the acres burned would vary from year to year to achieve specific management objectives. Due to the increased acreage managed under the Full and Modified suppression options as previously discussed, this alternative would reduce the amount of land within the Refuge on which wildfire could be allowed to burn.

2.7.2.5 Fisheries Management

Fisheries management under this alternative would be the same as under Alternative B (Preferred Alternative).

2.7.2.6 Funding and Personnel Requirements

As with Alternatives A (Current Management) and B (Preferred Alternative), implementing this alternative would require additional funding and staffing (see Table 2-3). When compared with Alternative B, some additional costs would be offset by campsite user fees used to upgrade, maintain, and administer the Deadman and Lakeview campgrounds. However, the increased fire suppression capabilities proposed under this alternative make it the most expensive in terms of refuge funding and personnel requirements.

Improving the campground access roads, constructing kiosks and other structures at selected interpretive pullouts along the Alaska Highway, upgrading and improving the Chisana River boat launch, constructing additional trails and parking access, and constructing at least one new public use cabin would cost $4.6 to $4.9 million (rough estimate based on replacement costs for comparable facilities identified in Tetlin Refuge Real Property Inventory and Maintenance Management System; nearly $2 million of estimate would be required for road improvements). It is also estimated 1.5 FTEs and $35,000 to $40,000 would be required annually to administer and maintain these new facilities. These estimates do not reflect campground maintenance costs, which were included in Alternative B (Preferred Alternative). Those costs would be offset by campground user fees under this alternative.

Due to the increased number of acres under the Full Suppression Option as part of Alternative C, we estimate 2.5 FTEs would be needed to provide adequate initial attack capabilities. Based upon historic wildfire statistics for Alaska and Canada, three percent of all boreal forest fires escape initial attack and become large fires, which are the most costly to suppress. The 27 wildfires within the Refuge over the past 15 years burned an average of 4,500 acres annually. Based on average suppression costs of $32 per acre, this alternative would require an estimated additional $144,000 to suppress one large (4,500-acre) fire and an additional $80,000 per year for operations and initial attack on an average of two small fires per year.

Table 2- 3. Additional budget and staffing needs for Alternative C

Needs	Description
Staff	WG-7 maintenance worker; 0.75 FTE temporary seasonal
	GS-9 recreational planner; 1 FTE Full-time permanent
	GS-5 forestry technician/ firefighter; 0.5 FTE temporary seasonal
	GS-5 forestry technician/ firefighter; 0.5 FTE temporary seasonal
	GS-7 forestry technician/ firefighter; 0.75 FTE permanent seasonal
	GS-9 forester/ fire behavior and fuels specialist; 1 FTE permanent full-time
Estimated one-time facilities construction	$4.6-$4.9 million
Estimated annual operations increase	$304,000-$309,000*
Total Estimated Cost 15 year Plan	$12.0-$12.3 million

* This estimate includes 10,000 dollars in overhead for each FTE (45,000 dollars), 224,000 dollars for fire suppression and 35,000 to 40,000 dollars in public facilities maintenance.

2.8 Summary Comparison of the Alternatives

The following table compares the alternatives by major topics.

Table 2-4. Comparison of the alternatives

Issue	Alternative A (Current Management)	Alternative B (Preferred Alternative)	Alternative C
Visitor services role of the Refuge in the Upper Tanana Valley	Coordinate with partners to maintain Tetlin Refuge as a key participant and provider of natural resource-related environmental education, interpretation, and recreation in the Upper Tanana Valley.	In addition to Alternative A, work to establish Tok as a Gateway Community to recognize its role in providing essential services to refuge visitors and employees. Forge cooperative agreements with local communities, tribes, and partners that enable the Refuge to provide additional opportunities for environmental education, interpretation, and recreation off-refuge and in conjunction with other non-refuge programs and activities.	In addition to Alternative B, Tetlin Refuge would become a leader in the interpretation of the Upper Tanana Valley's natural history and a key supporter of education and interpretation relating to the region's history and cultures.

Issue	Alternative A (Current Management)	Alternative B (Preferred Alternative)	Alternative C
Public use facilities & access *Interpretive facilities along the Alaska Highway*	*Visitor Centers and Kiosks*–In cooperation with interagency partners, operate and maintain Refuge Visitor Center near Alaska–Canada border and proposed Alaska Public Lands Information Center in Tok. Maintain kiosks at strategic locations (e.g., trailheads and campgrounds).	*Visitor Centers and Kiosks*–Same as Alternative A.	*Visitor Centers and Kiosks*–As a priority, and in addition to Alternative A, construct additional kiosks at selected pullouts along the Alaska Highway.
	Interpretive Pullouts–Maintain existing pullouts and interpretive panels.	*Interpretive Pullouts*–Work with ADOTPF and other partners to establish a cooperative agreement for maintenance, additional signing, and upgrading of selected pullouts to include restrooms and trash containers.	*Interpretive Pullouts*–As a priority, and in addition to Alternative B, construct additional interpretive/recreational structures (e.g., wildlife viewing platforms, photography blinds, kiosks) at selected pullouts.
	Development of the Seaton Roadhouse Site–Implement existing plans to rehabilitate the access road, construct parking areas, and build a short interpretive hiking trail (less than two miles in length) with some barrier-free access.	*Development of the Seaton Roadhouse Site*–In addition to Alternative A, construct additional and longer trails (greater than 10 miles in length) to provide barrier-free access and opportunities for hiking and primitive camping.	*Development of the Seaton Roadhouse Site*–In addition to Alternative B, extend some hiking trails approximately 15 to 20 miles to intersect with other undesignated trails in the Refuge and the Upper Tanana Valley.
Campgrounds	Rehabilitate Lakeview and Deadman Lake campgrounds to meet minimum standards (as defined in this Plan). Build additional facilities (e.g., boardwalks, wildlife viewing blinds, boat docks) to provide	In addition to Alternative A, improve campground access roads to provide a longer season of use. Retain current number of campsites, but cooperate with others to provide additional camping opportunities	Same as Alternative B except establish a fee system to provide full service campgrounds with electricity, potable water, sewage dump stations, additional campsites, and hard-surface roads for year-round access.

Issue	Alternative A (Current Management)	Alternative B (Preferred Alternative)	Alternative C
	additional short-term recreation opportunities.	outside the Refuge. Implement a voluntary campsite donation program.	
River and trailhead access	Continue maintenance of existing trailheads and boat launches. Work with willing landowners to provide access to other selected locations and rivers within the Refuge.	In addition to Alternative A, sign undeveloped trailheads and refuge access points. Work with partners and local communities to sign, improve, and maintain existing boat launches that provide public access to the Refuge.	In addition to Alternative B, establish parking areas and improve access to undeveloped boat launches, trails, and other points of access to the refuge along the Alaska Highway.
Canoe routes	Provide information to the public about existing opportunities on informal non-designated routes.	In addition to Alternative A, formally establish suitable canoe routes within the Refuge and provide maps and educational information for the public.	In addition to Alternative B, sign suitable/desirable camping locations and mark and maintain established portages.
Trails	*Interpretive trails*–In addition to the Seaton Roadhouse site (see previous description), maintain existing trails accessible from the Alaska Highway.	*Interpretive trails*– Same as Alternative A.	*Interpretive trails*– Same as Alternative A.

Issue	Alternative A (Current Management)	Alternative B (Preferred Alternative)	Alternative C
	Recreational trails– Continue to maintain existing hiking trails.	*Recreational trails*–In addition to Alternative A and development of the Seaton Roadhouse site (see previous description), mark or improve other existing trails not primarily used for hiking (i.e., dogsledding, trapping, snowmachining, horse-back riding). Provide visitors with additional information about these and other trails in the Upper Tanana Valley, including Tetlin Refuge.	*Recreational trails*–In addition to Alternative B, construct new trails and mark additional routes for a variety of year-round existing compatible uses.
Cabins	Continue to allow public use of existing administrative cabins whenever they are not being used for refuge-based operations.	In addition to Alternative A, use a variety of outreach methods to encourage public use during periods that do not conflict with refuge operations.	Construct public use cabins within the Refuge to provide more options for access on a year-round basis.
Management of fire to protect resources and property	Use a combination of prescribed burning (on a fixed number of acres based on local fire history), wildland fire use and suppression to provide an 8,000-acre fuel break between the southern, uninhabited portion of the Refuge and the northern, inhabited portion of the Refuge.	Emphasize wildland fire use and prescribed burning (on varying acreages based on specific project objectives, e.g., fuels reduction, habitat protection, or fire effects research) and suppression to reduce the potential for large-scale wildfires and to maintain long-term ecological health of lands managed by the Refuge.	Use suppression as the primary tool to protect resources and property throughout the Refuge. Small-scale prescribed burns will be used to meet specific fuel reduction objectives near resources or properties at risk.
	Maintain the secondary suppression capabilities of the Refuge in Tok.	Work with ADNR Div. of Forestry, Alaska Fire Service, and other partners to reduce initial attack response times and improve suppression capabilities for the	Similar to Alternative B, but with additional capabilities to support aggressive initial attack of all fires within the Refuge.

Issue	Alternative A (Current Management)	Alternative B (Preferred Alternative)	Alternative C
		Refuge and surrounding properties and to integrate the refuge radio system into the Upper Tanana Valley fire dispatch system.	
Habitat management	Use prescribed fire (on a fixed number of acres based on local fire history) and wildland fire use to maintain and enhance habitat for particular wildlife species.	Use wildland fire as the primary tool to maintain and enhance habitat. In general, prescribed fire would be used to maintain or enhance habitat for a particular wildlife species only when identified as a specific project proposal.	Fire will not be used to maintain or enhance habitat for wildlife species.
Fisheries management	Work with ADF&G to reintroduce populations to selected waters throughout the refuge, manage populations in eastern part of the Refuge to provide trophy recreational fishing opportunities, and develop more put-and-take fisheries within the Refuge along the Alaska Highway.	Manage all native fisheries to maintain self-sustaining, healthy populations that contribute to the natural diversity of the Upper Tanana Valley. Determine historic distribution of fish species within the Upper Tanana Valley prior to development of any reintroduction plans or proposals.	Same as Alternative B.

2.9 Common Management Policies and Guidelines

The management policies and guidelines described in Chapter 3 were developed as common management direction for national wildlife refuges in the Alaska Region of the Fish and Wildlife Service. These policies and guidelines are essentially the same for all of the refuges in this region.

Management of refuges in Alaska is governed by Federal laws (i.e., the National Wildlife Refuge System Administration Act of 1966 [Refuge Administration Act] as amended by the National Wildlife Refuge System Improvement Act of 1997 [Refuge Improvement Act; 16 U.S.C. 668dd] and the Alaska National Interest Lands Conservation Act of 1980 [ANILCA]), by regulations implementing these laws, by intergovernmental treaties, by Service policy, and by principles of sound resource management. These factors establish standards for resource management or limit the range of potential activities that may be allowed on refuges. When the management direction or details of the direction are specific to or modified for application to Tetlin Refuge, it is so noted.

Under either of the action alternatives (B or C—alternatives representing a change), management of the Refuge would comply with the direction described in chapter 3. As a result, the action alternatives share a set of common management policies and guidelines. This direction provides a common base upon which each of the alternatives is built and represents the typical level of management necessary to comply with existing law, regulation, and policy.

2.10 Comparison of Old and New Policies and Guidelines

2.10.1 Changes in Potential Activities by Management Category

There are some changes in management direction between the new regional management direction (chapter 3 and Table 3-2) that would apply to Alternatives B and C and the current management direction that applies to Alternative A. Management direction under Alternative A is from the 1987 Tetlin Conservation Plan (USFWS 1987a) and Record of Decision (USFWS 1987b). Direct comparison of the management direction in Table 3-2 with a similar table in the 1987 Conservation Plan is difficult because the organization of the tables and level of detail provided for various categories of actions are quite different. For example, the original plan discussed more activities and facilities related to fisheries management than does this document. On the other hand, the original plan had very little discussion of non-fisheries management facilities, while Table 3-2 has several pages describing facilities that are allowed in different categories. Table 2-5 displays the *major* differences between the 1987 and 2007 management guidance. Wording differences that do not change actual management intent are not displayed. A detailed comparison of the specific wording from the original Conservation Plan (as modified) with the new direction in Table 2-5 is included in the planning record.

As described in section 2.5.1, the 1987 Tetlin Conservation Plan placed refuge lands in three management categories: Minimal, Moderate, and Intensive. This Revised Comprehensive Conservation Plan describes management direction for the three categories which are identified in all three of the management alternatives described for Tetlin Refuge in this document. Other refuge lands could be assigned to the other management categories, but such designations would require Congressional action and future plan amendments or revisions would be necessary.

Table 2-5 compares the activities, uses, and facilities by management category between the current management from the 1987 Comprehensive Plan (Alternative A) and management proposed in the revised Comprehensive Conservation Plan (Alternatives B and C). If a specific management category is not identified, the direction applies to all three categories.

Table 2-5. Differences between current management direction from the 1987 Tetlin Conservation Plan (Alternative A) and new management direction proposed in this draft Plan (Alternatives B and C)

Activity	Alternative A- Current Management from the 1987 Tetlin Conservation Plan	Alternatives B (Preferred Alternative) and Alternative C- Revised Tetlin Conservation Plan	Comments/ Clarification
Introduction of species not naturally occurring within a watershed	May be permitted on a case-by-case basis under any management category.	Not allowed under any management category; except State of Alaska will be allowed to continue restocking of Hidden Lake.	Revised plan adopts Service's statewide direction which reflects current Service policy (Service Manual 601 FW 3).

Activity	Alternative A- Current Management from the 1987 Tetlin Conservation Plan	Alternatives B (Preferred Alternative) and Alternative C- Revised Tetlin Conservation Plan	Comments/ Clarification
Constructed and maintained airstrips	No new construction allowed on lands under any management category, except subject to Title XI of ANILCA.	May be allowed on lands under Intensive or Moderate Management.	Revised plan adopts Service's statewide direction.
Boat launches/Docks	No permanent sites permitted on lands under Minimal Management.	May be allowed on lands under Minimal Management.	Refer to more detailed discussion under each alternative.
Visitor Contact Facilities (includes a variety of staffed and unstaffed structures where the public can obtain information)	Not allowed on lands under Moderate or Minimal Management.	May be allowed consistent with Moderate and Minimal management direction.	Refer to more detailed discussion under each alternative.
Off-road vehicles (all-terrain vehicles)	Permitted only on designated routes or areas on lands under Minimal Management.	Not allowed on lands under Minimal Management.	
Commercial timber and firewood harvest	Not permitted on lands under Minimal Management.	May be authorized on lands under Minimal Management (when necessary to reduce fuels loads as identified in approved Refuge Fire Management Plan and to meet refuge management objectives).	Revised plan adopts Service's statewide direction.