6 Wildlife Resources

The Clearwater subbasin is inhabited by approximately 340 terrestrial wildlife species (Appendix E). The list of wildlife species present in the subbasin is based upon GIS data for wildlife ranges from ICBEMP. Species present on the list can be year-round residents of the subbasin or transients who inhabit the subbasin for only small portions of their life cycle. Most of the species diversity in the subbasin results from the presence of over 200 bird species (Appendix E). In addition to birds, approximately 73 mammal, 13 amphibian, and 13 reptile species occur in the subbasin.

There are 37 species of concern in the Clearwater subbasin (Appendix F). These species are listed as threatened, endangered, candidate, sensitive, of concern, or of special concern by the United States Fish and Wildlife Service, the state of Idaho, the Bureau of Land Management, or the United States Forest Service Region 1. Six species have been recently extirpated or greatly reduced from their historic abundance in the Clearwater subbasin, and four species within the subbasin are considered endangered or threatened at the state or federal level.

Twelve species have been identified as focal wildlife species within the Clearwater subbasin. These species were chosen because of their ability to serve as indicators of larger communities, as representatives of larger wildlife guilds, as management species, or because of their own status as species of special concern. Many of the focal wildlife species are tracked by the Idaho Conservation Data Center and occurrences recorded by the CDC are incorporated below. The information presented contains reported occurrences, many of which have not been documented. For some species, the number of reported occurrences seems exceptionally high to scientists familiar with the species and the subbasin. For other species, the number of occurrences seems exceptionally low, perhaps due to a lack of reported sightings rather than a lack of species occurrence within the subbasin.

6.1 Species-Habitat Matrix

A species/habitat matrix intended to depict broad relationships between specific species and general vegetative cover types was developed as part of this analysis (Appendix E). This matrix displays all vertebrate species known to occur within the Clearwater subbasin and their relationship to major vegetative cover types. These data are displayed as square Km of habitat by vegetation type. Cover types include urban, agricultural land, foothills grassland, disturbed grassland, riparian nonforest, riparian forest, mountain meadows, shrubs, cottonwood, aspen and conifer, western hemlock, western red cedar/mixed mesic forest, subalpine fir, grand fir, lodgepole pine, ponderosa pine, Douglas-fir/mixed xeric forest, western larch, whitebark pine, burnt standing timber, water, barren land, and perennial ice or snow (cloud or cloud shadow). These cover types were derived by lumping GAP 2 cover values into larger groupings for analysis.

6.2 Species with Strong Relationships to Salmon

A wide variety of invertebrate and vertebrate predators and scavengers feed on salmon. Some species are not totally dependent upon salmon for their survival, but take advantage of it when availabile. Other species rely on the salmon seasonally as a primary food source. There are 137 wildlife species influenced by salmon abundance (Cederholm et al. 2001). These predator/scavenger-prey relationships are separated into five categories. *Strong-consistent*: salmon directly affect the distribution, viability, abundance, and population status of another species. Nine species have a strong-consistent relationship with salmon. Seven of the nine species are indigenous to Northern Idaho, and they include common mergansers, harlequin ducks, osprey, bald eagles, river otters, black bear, and grizzly bear. *Recurrent*: routine, occasional, and localized relationships. Fifty-eight species have a recurrent relationship. *Indirect*: secondary consumer relationships. Twenty-five species have an indirect relationship. *Rare*: a species diet consisting of usually less than 1% salmon. Sixty-five species have a rare relationship. *Unknown*: relationship may or may not exist, but there is no available data (Cederholm et al. 2001).

Cederholm et al. (2001) also separated the 137 species by the different salmon life cycle stage that each prey on. The stages of a salmon's lifecycle consists of spawning and egg incubation, freshwater rearing, seaward migration, ocean rearing, return migration, spawning, and finally the carcass stage (Lichatowich, 1999). Twenty-three species prey on salmon during the egg incubation stage. Some waterfowl, macroinvertebrates, and other fish such as char, trout, and juvenile salmon will eat salmon eggs. Forty-nine species prey on salmon during the freshwater rearing stage. Herons, other fish eating birds, and larger fish capitalize on the vulnerable fry and smolts heading downstream. Sixty-three species, such as sea lions, harbor seals, and orcas take advantage of the salmon during the saltwater, ocean rearing stage. While spawning, 16 species such as the black bear, grizzly bear, river otter, raccoon, and the bald eagle prey on salmon on their migration upstream. During the carcass stage, 83 species will eat dead salmon. Black bear, grizzly bear, river otters, raccoons, coyotes, bald eagles, ravens, gulls, and macroinvertebrates scavenge salmon during this post-spawning period (Cederholm et al. 2001).

Throughout their life salmon feed on a wide variety of prey, including many kinds of freshwater and marine invertebrates and fishes (Cederholm et al. 2001). After the adult salmon spawn and die, macroinvertebrates such as caddisflies, stoneflies, and midges are responsible for the breakdown of salmon carcasses. This process delivers much needed nitrogen and other nutrients to the water, sustains macroinvertebrate populations and provides energy for the long-term health of ecosystems (Bilby et al. 1996). Juvenile salmon are known to feed directly on salmon carcass flesh, salmon eggs, and aquatic macroinvertebrates that may have previously fed on salmon carcasses.

Salmon are important in the transport of energy and marine-derived nutrients between the ocean, estuaries, and freshwater environments in which they reproduce. The flow of nutrients such as carbon, nitrogen, and phosphorus back upstream by spawning salmon plays a vital role in determining the overall productivity of both watersheds and salmon runs, now and into the future (Wilson and Halupka 1995). Isotopic analyses indicate that trees and shrubs near spawning streams derive approximately 22 - 24% of their nitrogen from spawning salmon (Helfield and Naiman 1998). Ocean reared salmon ingest saltwater nutrients, migrate to their spawning grounds, and then die. The nutrients are spread to vegetation by decomposition or digestion. Decomposing salmon can be left at streamsides or carried inland. Digestion of salmon by predators can also occur by the stream or transported inland. Nutrients are transferred through the digestion process by urination and defecation to plants in the ecosystem (Weddell 1999). This fertilization process serves to enhance riparian production.

The United States Department of Energy has recently conducted a site management plan for bald eagles in the Hanford Reach area. Their studies have shown that changes in the eagles populations have generally corresponded to changes in the number of returning fall chinook salmon, a major fall and winter food source for eagles. The research on the Hanford Reach during the 1998-99 winter was consistent with reports from the upper Columbia River at

Rocky Reach Reservoir and Rock Island Reservoir, the Clearwater River in Idaho, and the lower Snake River and Columbia River areas of Oregon and Washington.

Other studies have revealed that in the recent past, the salmon – grizzly bear relationship was significant to both bears and trees in Pacific Northwest ecosystems. Chips of grizzly bear bones from museums specimens dating between the 1850s and the 1930s were examined, and 100% of the bone chips contained nitrogen, phosphorus, and carbon derived from the ocean. Salmon was evidently a large part of the bear's diet, and the nutrients which were transported to terrestrial vegetation by the bears and other predators was significant as a fertilizer. This natural fertilizer from the excretions of mammals is more readily absorbed and utilized by vegetation, and the phosphorus provided by excretions supplements the low levels of this nutrient in moist forests in which it tends to leach away. These findings support the philosophy of maintaining healthy forests through conservation of the processes and species that have sustained them in the past (Weddell 1999).

6.3 Focal Wildlife Species

Similar to selection of focal plant species described earlier, focal wildlife species were selected for detailed consideration in this assessment. The requirements of these focal species are such that if their basic needs are met, those of other species will also be met.

The fisher and wolverine were selected to represent small to mid-sized forest carnivores. The fisher is also considered an old growth forest obligate along with the northern goshawk. Fringed myotis was selected because of its dependance on interior forests and snags for roosting habitat. The flammulated owl and the white-headed woodpecker represent open ponderosa pine forest habitats. The black-backed woodpecker was selected to represent fire-dependant species. Three species were selected to represent those dependants on riparian and wetland habitats: harlequin duck, western toad, and Coeur d'Alene salamander. The Townsend's big-earred bat was selected to represent the unique habitats offered by caves, and the peregrine falcon represents cliff-dwelling species. The peregrine was also selected because it has only recently been removed from the Endangered Species Act list (USFWS 1999b).

6.3.1 Fisher

Life History

The fisher (*Martes pennanti*) is a solitary, territorial carnivore that preys upon birds and small mammals, and has been known to regularly kill porcupines (Powell 1993). The snowshoe hare is a common prey source, and deer and moose carcasses make a significant contribution to the diet (Powell and Zielinski 1994, Nez Perce National Forest 1998, Marshall et al. 1996, Powell 1993). Fishers inhabit mesic, coniferous forest between 3,500-6,000 feet elevation, although habitat preference changes with season, age, and sex (Marshall et al. 1996). Fishers avoid open ground (Buskirk et al. 1994; Powell 1993) and have a preference for structurally complex areas with multiple canopy layers, including understory shrubs and large amounts of woody debris (Nez Perce National Forest 1998, Marshall et al. 1996, Powell 1993). Ruggiero et al. (1994) concluded that riparian zones, high elevation old growth grand fir, and subalpine fir stands are important habitat components (Powell 1993). A study in the southern part of the subbasin by Jones and Garton (cited in Buskirk et al. 1994) found that fishers preferred old growth and mature forest stands in the summer, but in the winter had no preference for or against these habitat types. Home ranges are estimated at a mean of 40 km^2 for males and 15 km^2 for females (Ruggiero et al. 1994). According to GAP 2 data, the potential breeding habitat for the fisher comprises of approximately 14,888 square kilometers in the Clearwater subbasin (Figure 68).

Threats

Clearcutting and reductions of late successional forests have caused habitat fragmentation that threatens fisher conservation. Forest fragmentation isolates existing populations and limits colonization of unoccupied habitat (Ruggiero et al. 1994). Isolated or small populations are prone to extirpation following population fluctuations in their prey base, and may need to be augmented with fishers captured elsewhere (Ruggiero et al. 1994). Translocated fishers appear to be subject to predation, but mortality may be lower with summer reintroductions.

The value of fisher pelts continues to limit fisher populations (Powell 1993). Fishers are readily trapped and are frequently caught in traps set for other furbearers (e.g., bobcats, foxes, coyotes). This trapability may significantly affect populations where fishers are scarce. Overtrapping may bias populations toward young fishers, and the inability of yearling males to breed effectively may further delay recovery.

Limiting Factors

Fisher avoidance of open areas results in restricted movement between habitat patches and decreased colonization of unoccupied habitats. Lack of large, contiguous areas capable of containing multiple home ranges, and naturally slow reproductive rates limit fisher population growth. Most fisher populations require immigration to increase, and high survival and reproductive rates to be self-sustaining. Two important fisher habitat components are maternal den sites and resting sites, both requiring large diameter trees, snags and logs (Ruggiero et al. 1994).

The significance of competition between pine marten and fisher may be a limiting factor. Managing for both fisher and pine marten in the same area may not be as successful as managing exclusive areas for each species.

Historic/Current Distribution

Historically fishers were distributed throughout the forests of North America at the time of European settlement. Populations declined or were extirpated in much of North America between 1800 and 1940 due to habitat destruction from timber harvest and overtrapping (Groves et al. 1997b, Ruggiero et al. 1994, Powell 1993). Fishers from British Columbia were successfully reintroduced to northcentral Idaho in the early 1960s to help control the porcupine population (Groves et al. 1997b; Powell 1993), and there have been over 170 fisher occurrences documented in the Clearwater subbasin (Nez Perce National Forest 1998). In 2000 a fisher was sighted within the Nez Perce National Forest (Dixon 2001). Fisher populations remain low in the Pacific Northwest and the Northern Rockies in spite of habitat recovery programs, closed trapping seasons, and reintroduction programs that have reestablished the fisher in portions of its original range. Although population numbers are reduced, fishers are now distributed throughout most of their historical territory in the Clearwater drainage (Buskirk et al. 1994).

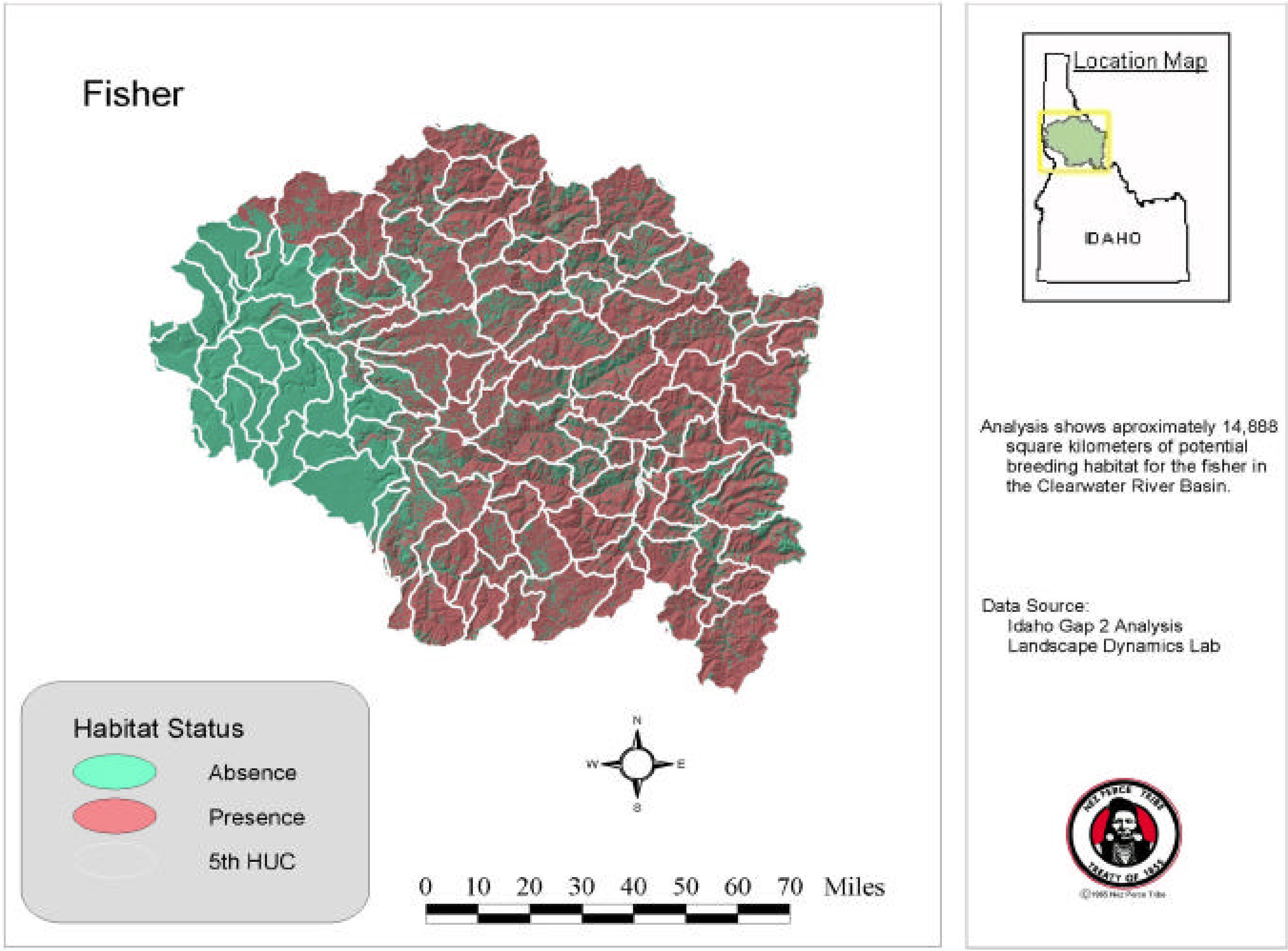

Figure 68. Potential breeding habitat for the fisher within the Clearwater subbasin

6.3.2 Wolverine

Life History

The wolverine (*Gulo gulo*) is an opportunistic scavenger that feeds predominantly on ungulate carrion, as well as small rodents, insects and vegetation (Copeland 1996). The skull of the wolverine is robust, and powerful dentition enables it to forage on frozen meat and bone. The wolverine is capable of killing large ungulates, but their presence in the diet is usually a result of carrion scavenging (Copeland 1996). In summer their diet is widely varied, and is dominated by ungulate carrion in the winter (Weaver 1993, Wisdom et al. 2000, Copeland 1996).

Den sites in Idaho were typically associated with large boulder talus, caves, rocks, or down logs. They were most commonly found on northerly aspects, in subalpine cirque basins with little overhead canopy cover, and above 8,000 ft elevation. The den entrances are located in soft snow near trees or rocks, with a vertical tunnel extending 1-5 meters to ground level (Copeland 1996). Females often access dens by burrowing through deep snow into the natural gaps between boulders (Csuti et al. 1997; Magoun and Copeland 1996; Wisdom et al. 2000; and Wolverine Foundation 2001). Lateral tunnels may extend for up to 50 meters along the ground surface (Copeland 1996).

Wolverines tend to travel widely and subsist on low quality and infrequent foods (Weaver 1993). Resident male wolverine home ranges in Idaho were larger than those exhibited by Alaska or Montana populations, with the average for Idaho being 588 mi^2. According to GAP 2 data, the potential breeding habitat for the wolverine comprises approximately 10,605 square kilometers in the Clearwater subbasin (Figure 69). Idaho wolverines tend to remain associated with their rearing area, and the presence of young are tolerated through maturity in the second year. The extended association of subadults and adults may be related to the highly dispersed nature of food resources and may account for the large home range sizes of resident females (Copeland 1996). Wolverines in Idaho are reported to prefer medium to scattered timber, and are usually associated with montane coniferous forests.

Habitat fragmentation and displacement by humans may have forced the wolverine into less desirable habitats than it historically occupied. Excessive hunter harvesting, loss of ungulate wintering areas, displacement of ungulate populations due to excessive timber harvest, and urbanization may all adversely affected wolverine populations (Copeland 1996). High road densities, timber harvesting, or housing development near subalpine habitats may reduce potential foraging habitat and kit rearing, along with increasing the probability of human-caused mortality (Copeland 1996). Forest alteration may isolate subpopulations, thereby increasing their susceptibility to extirpation (Copeland 1996). The reduction of wilderness "refugia" through human actions may be the greatest threat to local population viability (Copeland 1996). Providing large contiguous refuge areas of varied habitats may be the most important factor in protecting wolverines (Weaver 1993; Wisdom et al. 2000).

Limiting Factors

Denning sites need to have at least one meter deep snow cover throughout the denning period (Magoun and Copeland 1996). The characteristic of wolverine habitat most readily apparent is its isolation from the presence and influence of humans. This is demonstrated by their preference for higher elevation habitat during summer months. Protection of natal denning habitat from human disturbances is critical for the persistence of wolverines in Idaho (Copeland 1996). Aside from human-caused mortality, starvation and predation appear to be primary causes of death in weanlings. The role of more efficient carnivores as producers of carrion may

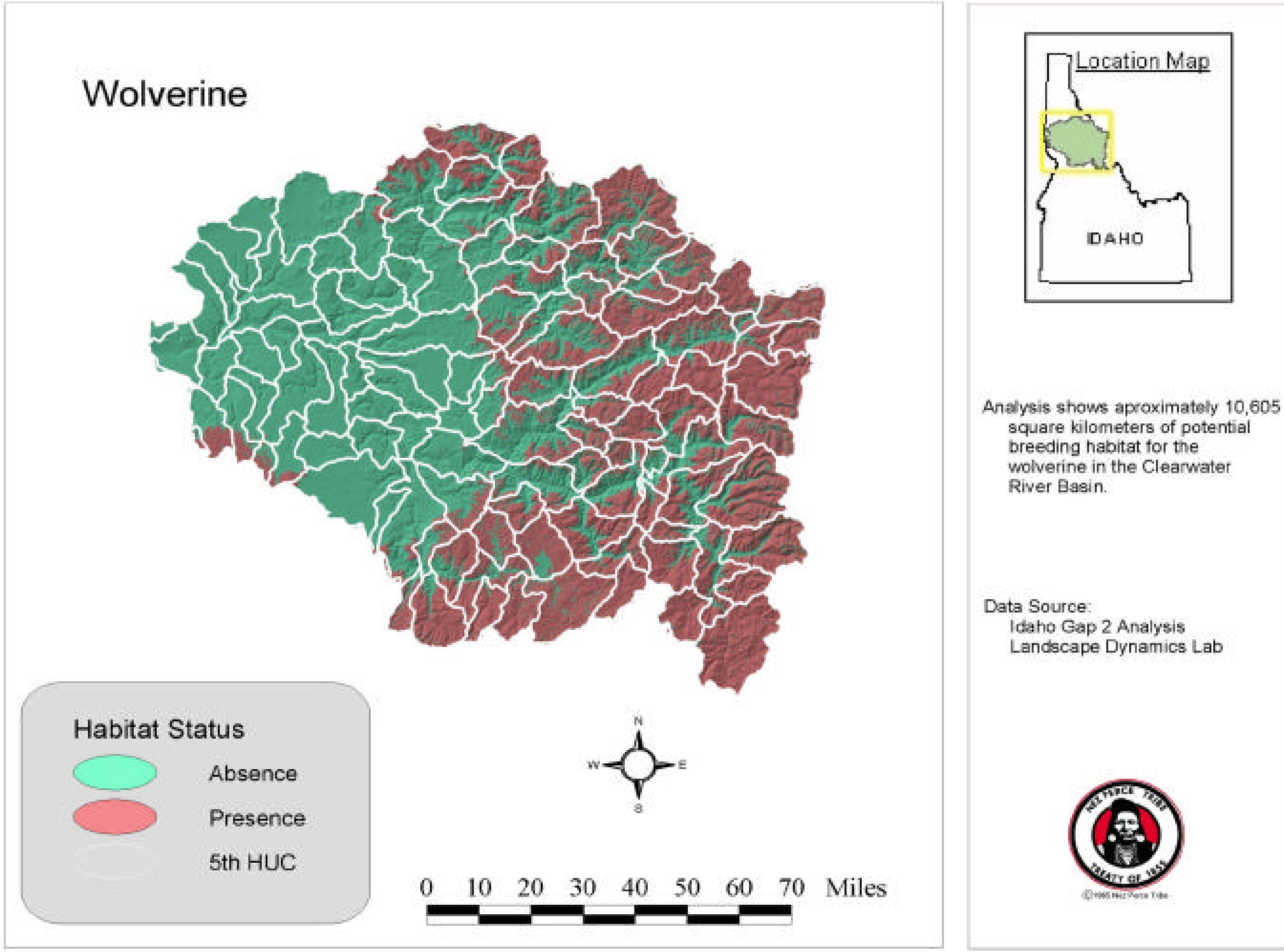

Figure 69. Potential breeding habitat for the wolverine within the Clearwater subbasin

be essential to wolverine survival in some areas, and systems lacking large predators such as gray wolves reduce the opportunities of carrion caches (Weaver 1993; Wolverine Foundation 2001). However, ungulate mortality from hunting and livestock losses on public grazing allotments also provide a carrion source (Copeland 1996). Both wolves and mountain lions may kill wolverines, and encounters may be more common when wolverines scavenge from other predators' kills.

Historic/Current Distribution

Historically the wolverine had a circumpolar distribution that extended south along the Sierra-Cascade axis, down through the Sierra Nevadas, and into the Rocky Mountains of Arizona and New Mexico. The wolverine has since been extirpated from the northern plains states east of Montana (Wolverine Foundation 2001). There is fossil evidence of extant representatives in Great Basin habitats of southern Idaho, but human encroachment may have forced the wolverine into its current distribution (Wolverine Foundation 2001). Present distribution of the wolverine in the western U.S. appears to constitute several peninsular extensions of Canadian populations, and only Idaho and Montana report populations of known extent (Wolverine Foundation 2001). In Idaho, wolverines are distributed from the state's northern border to the South Fork of the Boise River (Ruggiero et al. 1994). There have been forty-five wolverine observations reported to the CDC in the subbasin. A single set of tracks was recorded during 1990 near Mussleshell work center in the Clearwater National forest (Koehler 1990). In addition, there have been 12 reports of wolverine sign and 7 actual sightings within the Clearwater and Nez Perce National Forests between 1975 and 1995 (Dixon 2001). Records suggest very low wolverine densities in Idaho from the 1920s to 1950s (Wisdom et al. 2000). One third of wolverine reports have occurred since 1990 and mirror a general trend of increased sightings in Idaho since the 1960s (Edelmann and Copeland 1998).

6.3.3 Flammulated Owl

Life History

The flammulated owl (*Otus flammeolus*) is a small, nocturnal, insectivorous owl that preys on grasshoppers, moths, and beetles (Groves et al. 1997a, Nez Perce National Forest 1998). It is an obligate cavity nester (Reynolds 1989), and strongly associated with mid-elevation old growth ponderosa pine forests (Reynolds 1989; McCallum 1994). Home ranges vary between 6 and 24 ha, and some owl populations may be semicolonial (McCallum 1994). Habitat is characterized by open, multiple canopied, fire climax, old growth Ponderosa pine or Douglas-fir forests (Groves et al. 1997a). These habitats offer both suitable nesting cavities (usually excavated by northern flickers or pileated woodpeckers) and a high density of prey. Open forest is used for foraging while dense foliage is preferred for roosting. According to GAP 2 data, the potential breeding habitat for the flammulated owl comprises approximately 7,262 square kilometers in the Clearwater subbasin.

Threats

Late successional forest is preferred foraging and roosting habitat, and its loss would directly affect owl viability. Secondary roads can affect flammulated owls by increasing the likelihood of snags being removed for the use of fuel wood (Wisdom et al. 2000). Loss of winter habitat in Mexico, via massive harvest without reforestation, may be the single-most important factor in long-term survival of the flammulated owl (McCallum 1994).

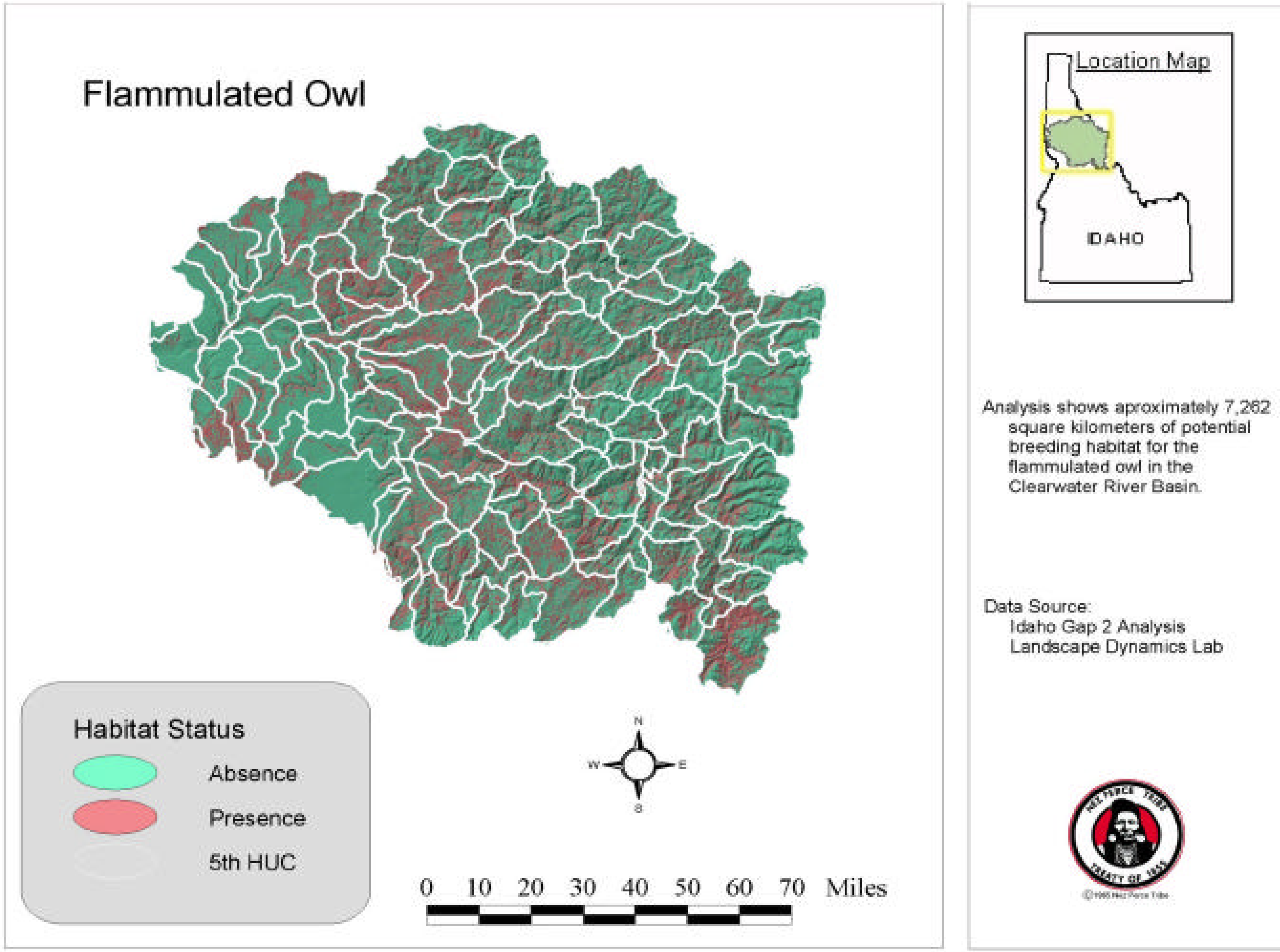

Figure 70. Potential breeding habitat for the flammulated owl within the Clearwater subbasin

Limiting Factors
Due to low fecundity and long life spans, the flammulated owl has an intrinsically low rate of natural population increase. Limited nest site availability and foraging habitat may hinder reproduction (McCallum 1994). Loss of old growth due to logging and firewood gathering in the *P. ponderosa* and *P. menziesii* cover types (Nez Perce National Forest 1998), as well as snag removal are limiting factors affecting (Wisdom et al. 2000; McCallum 1994). For breeding habitat, flammulated owls' dependence on nest cavities excavated by pileated woodpecker requires the well being of pileated woodpecker populations, and thus late successional forest habitat (McCallum 1994).

Some researchers have indicated that this owl may exhibit metapopulation or semi-colonial dynamics. Alteration of stand structure by removing large trees, hollow snags, or dense roosting vegetation, may be more deleterious than fragmentation for non-colonial populations. However, if the owl were found to be semi-colonial, fragmentation that hinders dispersal would exacerbate the effects of small population sizes.

Historic/Current Distribution
Flammulated owls are widely distributed but occur only in yellow pine forests (*Pinus ponderosa* and *P. jeffreyi*) from southern British Columbia in Canada through the highlands of Mexico and Guatemala. As a neotropical migrant, it occurs within the US in the breeding season and winters south of the border. Overall, its breeding range in the U.S. has probably remained constant throughout the last century (McCallum 1994). Approximately 61% of the original habitat is available for flammulated owl use in the Columbia River Basin and half of that likely retains the open understory characteristics of fire-climax forest. Current habitat is concentrated along the Clearwater River corridor (Nez Perce National Forest 1998). Columbia Basin wide, there is moderately or strongly declining habitat trends in nearly 70% of watersheds within the range of the flammulated owl (Wisdom et al. 2000).

Population trends are not known for flammulated owls in the Clearwater subbasin (Groves et al. 1997a), but between 1992 and 1998 there have been 15 personal accounts of heard or sighted observations of this species (Dixon 2001). Surveys have been conducted in the South Fork Canyon, Meadow Creek, Mill Creek, and Silver Creek ERUs in the Nez Perce National Forest, and flammulated owl has only been verified in the Granite Creek drainage (Nez Perce National Forest 1998). A site in the Nez Perce National Forest surveyed in 1992 had a population density of 0.25-0.98 owls/40 hectares (Groves et al. 1997a). Most vegetation plots associated with owl locations at this site were dominated by ponderosa pine and Douglas-fir (Groves et al. 1997a). In the study by Groves et al. (1997a), flammulated owls were not detected along the South Fork Clearwater River. The Idaho Conservation Data Center (CDC) records four reported occurrences of flammulated owl in the subbasin.

6.3.4 White-Headed Woodpecker
Life History
The white-headed woodpecker (*Picoides albolarvatus*) is a pine-loving species most commonly associated with mature pine and fir forests. This species was listed as sensitive due to the rate at which stands of these trees were being harvested (Engle and Harris 2001).

During the breeding season white-headed woodpeckers can be found between 4,000 to 9,000 feet, dropping to lower elevations in the winter. They forage on trunks and branches of coniferous trees, looking for bark-burrowing insects and their eggs. Common insectivorous food sources are ants, spiders, grubs and boring beetles. They also feed extensively on the seeds of pines. Early spring is the most critical time for foraging as pine seeds are largely depleted and it is still fairly cold for insect activity (Ligon 1973). In Nez Perce county white-headed woodpeckers were observed consuming pine seeds during the winter then switching to various insect species in the summer (Ligon 1973).

White-headed woodpeckers do not hammer at the bark like most woodpeckers, but instead use their beaks as a prybar to flake off layers of bark (Bent 1992). It is a primary cavity nester of soft, well decayed snags (due to their poor excavating abilities) with an average dbh of 30 inches (Marshall et al 1996). Nests are often built in ponderosa pine snags. Preferred habitat is in open canopy forests of mature trees or along the edge of wet meadows (Milne and Hejl 1989). Large diameter ponderosa pine trees are a habitat requirement for white-headed woodpeckers (Marshall et al. 1996). Bull et al. (1986) found that white-headed woodpeckers only used larger diameter (>25 cm dbh) ponderosa pine trees in ponderosa pine forest types for foraging. According to GAP 2 data, the potential breeding habitat for the white-headed woodpecker comprises of approximately 2,735 square kilometers in the Clearwater subbasin (Figure 71).

Threats

Habitat degradation due to logging and forest fragmentation is the major threat to white-headed woodpeckers (Engle and Harris 2001). The most important habitats are late-seral forests with large-diameter ponderosa pine snags (Wisdom et al. 2000). Road construction indirectly affects these woodpeckers, as roaded areas tend to have had snags reduced or eliminated. (Wisdom et al. 2000).

Limiting Factors

The white-headed woodpecker is strongly dependent upon large diameter, live ponderosa pines as a source of seeds for overwinter survival. It has very specific nesting preferences for snags with moderate decay (Engle and Harris 2001).

Historic/Current Distribution

There are eight recorded sightings in the IDFG CDC of white-headed woodpeckers in the Clearwater subbasin. Most of these sightings are 10-20 years old and could represent extirpated populations (Engle and Harris 2001). Current source habitats cover approximately the same amount of geographic area as they did historically, but many patches are now disjunct (Wisdom et al. 2000).

6.3.5 Black-Backed Woodpecker

Life History

Stands inhabited by black-backed woodpeckers (*Picoides arcticus*) are typically old growth lodgepole pine or recently burned forests with standing dead trees (Nez Perce National Forest 1998; Groves et al. 1997b). The species' diet contains large numbers of bark beetles and wood-boring beetle adults and larvae (Nez Perce National Forest 1998; Marshall et al. 1996). Foraging typically occurs on live or recently dead (<2 year) lodgepole pines (Bull et al. 1986). Nests are located in the body of dead or dying pine snags that have pronounced decay and are infested with beetles and beetle larvae (Bock and Bock 1974; Wisdom et al. 2000). Source habitats for black-backed woodpeckers include old subalpine fir, montane forests, and riparian woodlands, in addition to young stands of lodgepole pine (Wisdom et al. 2000). According to GAP 2 data, the potential breeding habitat for the black-backed woodpecker comprises approximately 16,419 square kilometers in the Clearwater subbasin (Figure 72).

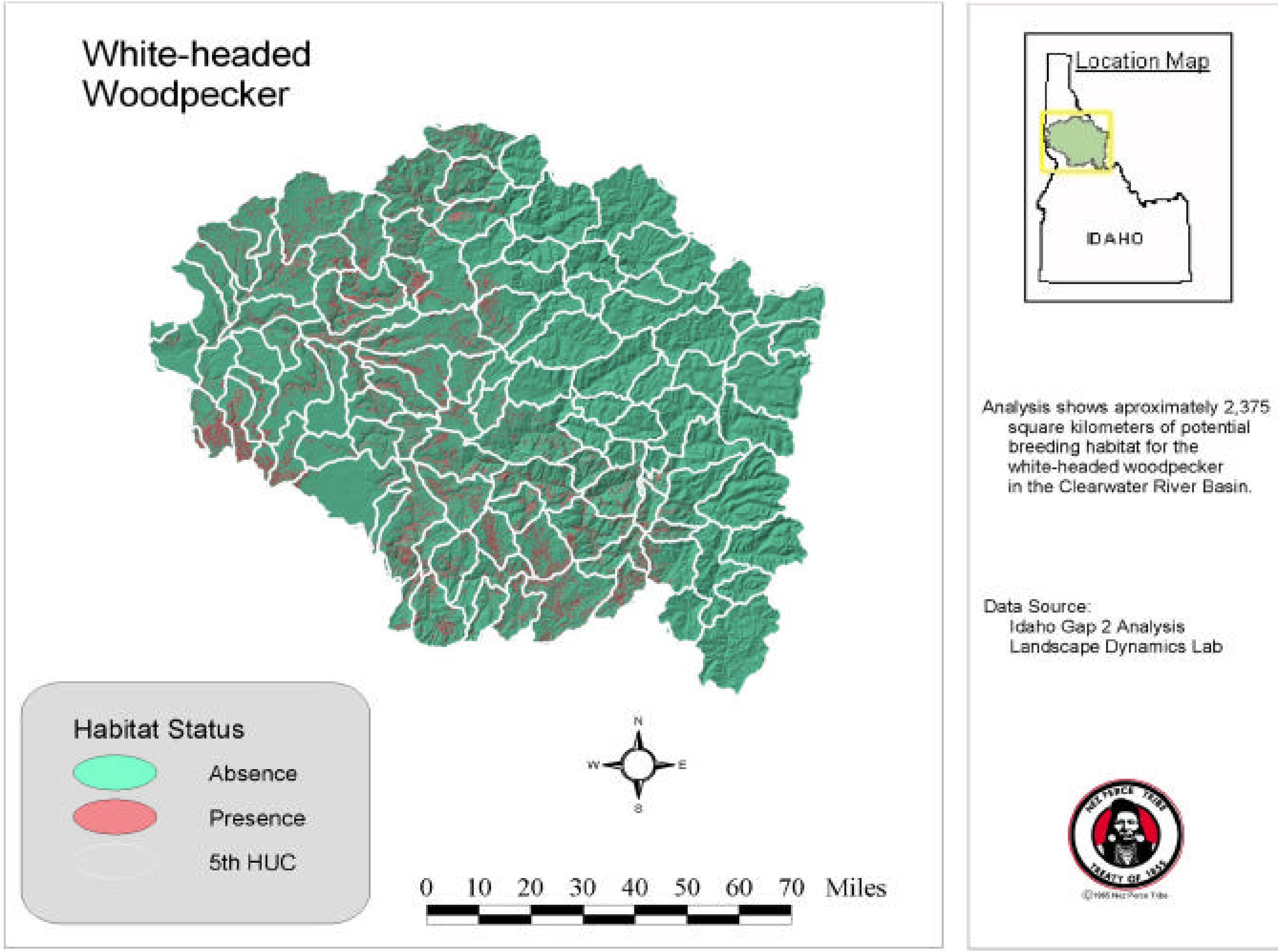

Figure 71. Potential breeding habitat for the white-headed woodpecker within the Clearwater subbasin

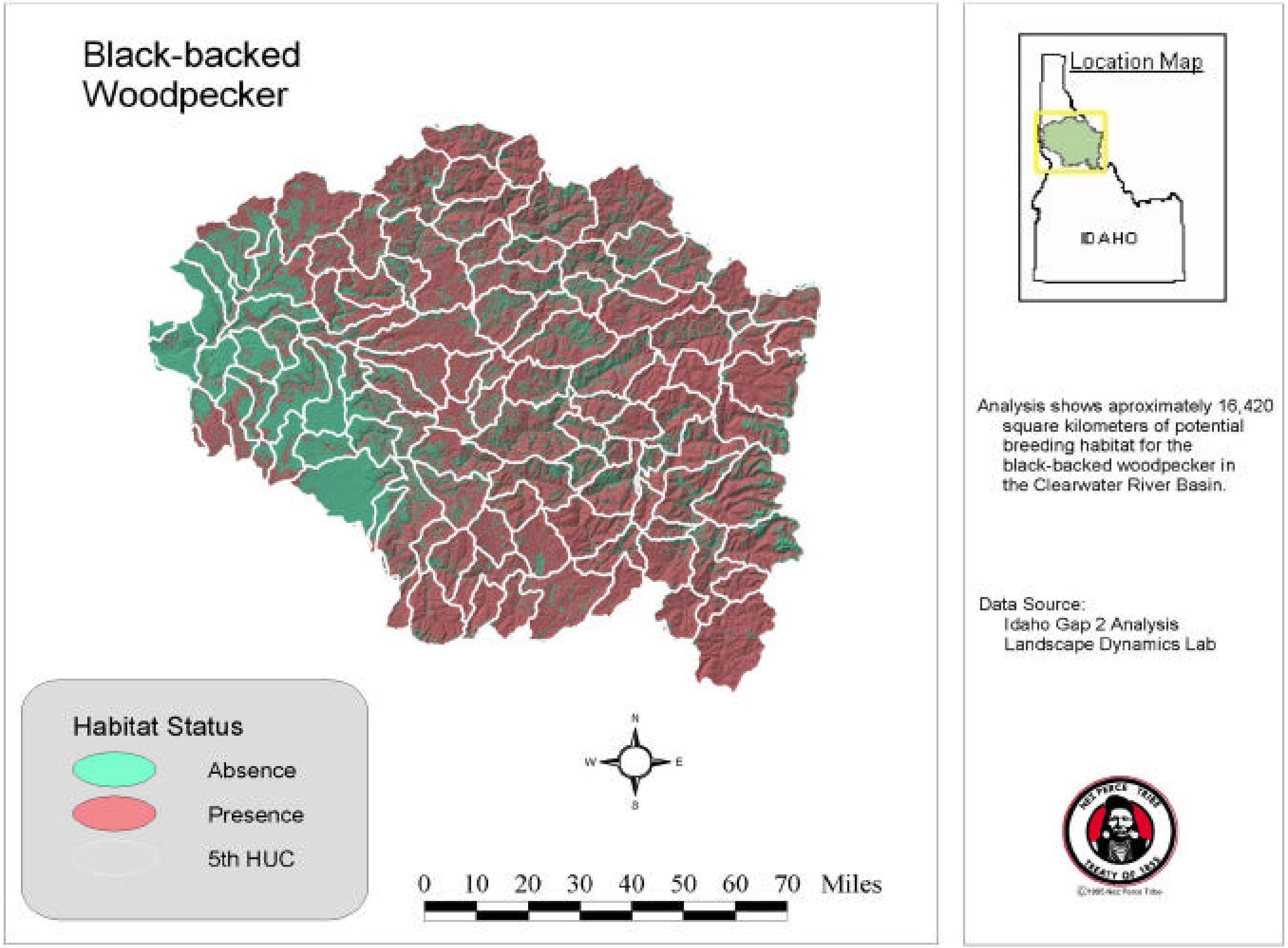

Figure 72. Potential breeding habitat for the black-backed woodpecker within the Clearwater subbasin

Threats

Recent fire suppression strategies have altered the pattern of beetle outbreaks and snag-producing fires. Salvage logging and removal of snags for firewood has decreased the occurrences of beetles in some areas, and roads have lead to increased ability to remove snags (Wisdom et al. 2000). Usurpation of nesting cavities by hairy woodpeckers and Lewis' woodpeckers causes stress and excessive energy costs in territorial competition (Wisdom et al. 2000).

Limiting Factors

Suppression of fires and post-fire logging as well as the threat of large, severe wildfires that reduce numbers of decaying snags serve as limiting factors for the black-backed woodpecker (Dixon and Saab 2000). Black-backed woodpeckers require habitats with dead or dying trees that contain adult beetles or their larvae (Nez Perce National Forest 1998). Research by Bull et al. (1986) indicates that this species requires recently dead (<5 years) small diameter trees for nesting (<50 cm DBH).

Historic/Current Distribution

The range of the black-backed woodpecker extends north to central Alaska, east to Newfoundland, south to New Hampshire and west to California (Bent 1992; Nez Perce National Forest 1998; Marshall et al. 1996). This species occurs throughout northern Idaho, where they are uncommon to rare (Burleigh 1972). Habitat for black-backed woodpeckers is primarily in the eastern portion of the subbasin and along the South Fork Clearwater River (Groves et al. 1997b). Black-backed woodpeckers have been documented in the Lochsa and Salmon drainages, as well as on the Clearwater, Payette, and Bitterroot National Forests, indicating that they are likely residents within the subbasin in low numbers (Clearwater National Forest 1998). Surveys conducted in the South Fork Clearwater River failed to find black-backed woodpeckers, but the species can be hard to detect (Nez Perce National Forest 1998). There has been one occurrence of the black-backed woodpecker in the subbasin reported to the CDC, and one reported sighting in 1995 up the East Fork Potlatch River (Dixon 2001).

6.3.6 Harlequin Duck

Life History

Harlequin ducks (*Histrionicus histrionicus*) winter in rough surf along the rocky arctic coasts of Siberia and Alaska and only come to Idaho in the summer to breed. According to GAP 2 data, the potential breeding habitat for the harlequin duck comprises approximately 2,580 square kilometers in the Clearwater subbasin (Figure 73). It has a shy, solitary nature and is found in rugged, inaccessible habitats. Occasionally nests have been found in tree cavities or in cliffs, but most often harlequins nest on the ground near turbulent mountain streams (Cassirer 1993). Average clutch size is 5 eggs, and the female incubates assiduously, with feeding breaks only once every 48 hours (Bellrose 1978). Nests were usually found in western red cedar-western hemlock riparian associations at elevations of 900 to 3,600 feet (Cassirer 1991). Much of the harlequin duck's diet is comprised of stream animals such as crustaceans, mollusks, insects, and fishes (Bellrose 1978).

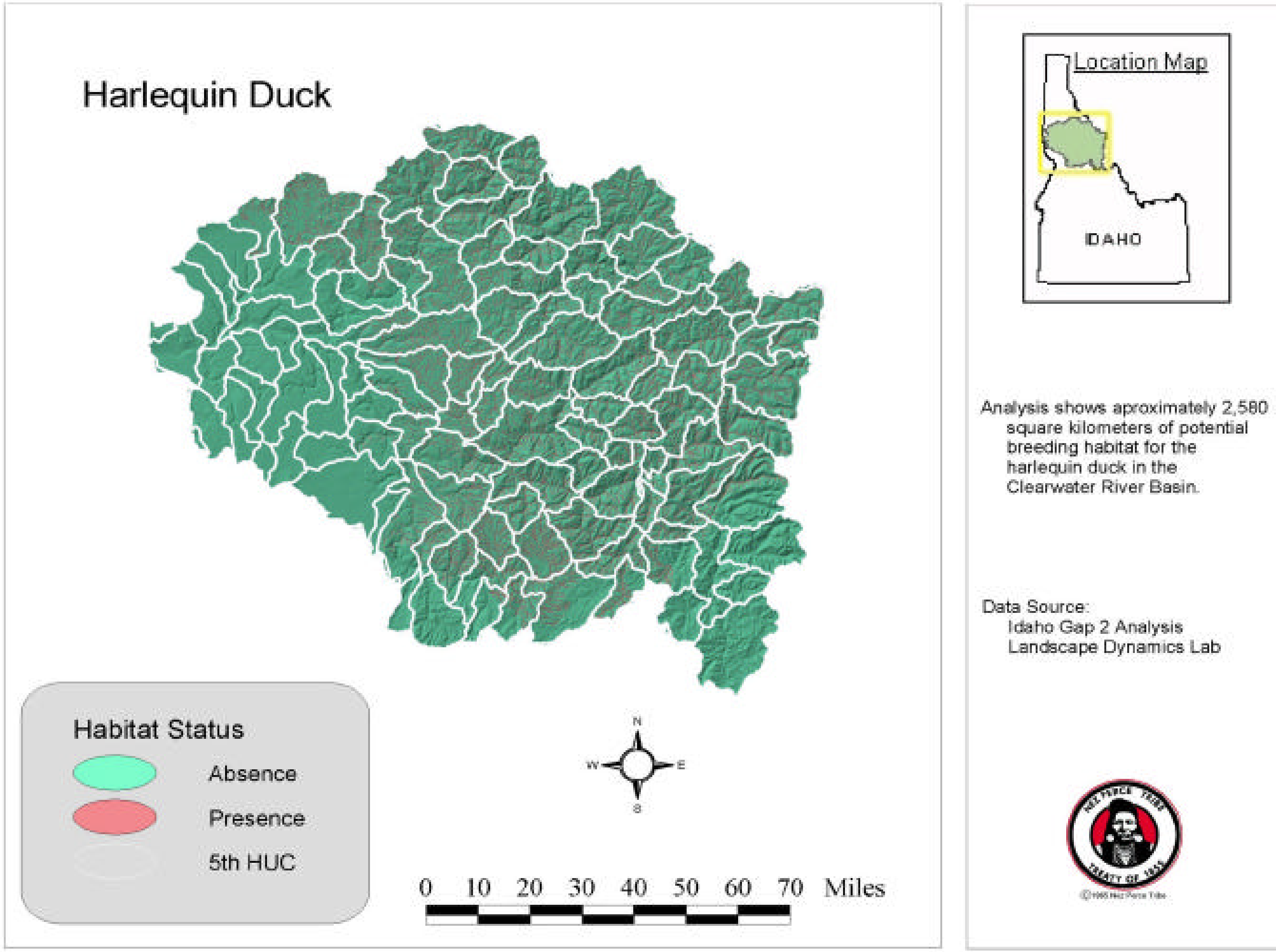

Figure 73. Potential breeding habitat for the harlequin duck within the Clearwater subbasin

Threats

Logging, road construction, destruction of riparian areas, mining, impoundment of breeding streams, and destruction of prey by pesticides have all had detrimental affects on the habitat and distribution of harlequin ducks. Disturbance by recreational anglers and hikers in breeding areas disrupts breeding activities. While incubating, female are very reluctant to leave the nest and hens are so intent that people have sometimes been able to touch them (Bellrose 1978). This nest loyalty can be detrimental in areas of high-intensity human activity.

Limiting Factors

Conservation of nesting and brood-rearing habitat along streams may be critical to harlequins' continued existence in Idaho (Cassirer 1991). Logjams and overhanging vegetation are important security cover along streams. Mid-stream loafing sites, shrubby streambank vegetation, and a stream gradient less than three degrees are important habitat components (Wallen and Groves 1989). Climatic conditions may severely impact recruitment if high spring runoffs wash out nests or make streams unnavigable for young chicks (Wallen and Groves 1989). Harlequins are very loyal to breeding and wintering sites and will return to the same drainages annually. They are relatively unproductive due to a high nonbreeding rate, and not all streams where breeding takes place produce broods every year. (Cassirer 1991). Much of the harlequin duck's habitat lies in remote areas and they have not been greatly affected by human activities (Bellrose 1978), but both breeding and wintering abundance appear to be declining in western North America (Engle and Harris 2001). Harlequin ducks in Idaho may be subject to local extirpation due to small breeding populations, and the declining harlequin populations worldwide limit their chances for recolonization of drainages once they have been eliminated (Engle and Harris 2001).

Historic/Current Distribution

The range of the harlequin duck is divided into two distinct and separate regions: eastern and western. The western population migrates from the Arctic Circle south through the Aleutian Islands down to northwest Wyoming, Idaho and central California. Harlequins are uncommon summer residents of Idaho, and surveys indicated that populations stayed the same between 1995 and 1996 for all of northern Idaho. During a 1987 – 1990 survey, Cassirer (1991) found that 73% of all harlequin ducks in Idaho are found between the Lochsa and Priest Rivers. There is an estimated 42-44 pairs in northern Idaho, and both the Lochsa and Selway river drainages have had confirmed sightings (Engle and Harris 2001).

Wallen and Groves (1989) found that within the Clearwater National Forest, harlequin ducks were observed on the Lochsa River, Kelly Creek, Hansen Meadow, Orogrande Creek, and Crooked Fork, but further studies need to be conducted on many other streams that contain good nesting habitat. There have been 6 Harlequin duck sightings reported at various locations throughout the Nez Perce National Forest between 1990 and 2001 (Dixon 2001).

6.3.7 Townsend's Big-eared Bat

Life History

Townsend's big-eared bats (*Corynorhinus townsendii*) are characterized by a horseshoe shaped lump on the nose and large rabbit-like ears. They are found in a wide variety of habitats including desert shrublands, high elevation coniferous forests, and riparian woodlands. According to GAP 2 data, the potential breeding habitat for Townsend's big-eared bats comprises approximately 5,337 square kilometers in the Clearwater subbasin (Figure 74).

These bats hunt along forest edges and are often found in association with mesic forests (Cassirer 1995). They emerge later in the evening than most bats, and tend to stay high above the ground until full dark. Townsend's feed 95% on moths and 5% on true bugs, and although some sources have observed *Corynorhinus* picking insects off of leaves, likely most prey is taken in flight (Verts and Carraway 1998).

They do not roost in crevices like many other species, but use caves and abandoned mine shafts as colonial day roosts and hibernacula (Wisdom et al. 2000). In the spring and early summer the females will form a maternity colony, while males remain solitary. Females will often return to the same maternity roost each year between March and April, and a single pup is born between May and July (Verts and Carraway 1998; USFS 1995). Townsend's big-eared bats are fairly sedentary and do not migrate long distances. In the winter they will hibernate singly or in small groups up to several dozen individuals (Verts and Carraway 1998). More than half of the autumn body weight can be lost during hibernation and rising out of torpor requires a large caloric output (USFS 1995). Frequent human disturbance that brings a bat out of its torpor state can drain winter energy reserves and lead to starvation (Wisdom et al. 2000).

Threats

Townsend's big-eared bats are extremely sensitive to human disturbance and will entirely abandon a roost site if disturbed. High visibility at colonial roosts has lead to purposeful killing of roosting bats. Negative folklore leads some to destroy bats and Townsend's have suffered high mortality and sometimes loss of entire colonies. Because of their patchy distribution and limited migration patterns, loss of a whole colony can have a significant impact on a region's bat population (Wisdom et al. 2000). Other disturbances or negative impacts to bat habitat include mining, logging, road construction, grazing, insecticides that destroy prey, and removal of old buildings.

Limiting Factors

Caves, abandoned buildings, and abandoned mine shafts are considered critical habitat for Townsend's big-eared bats (Verts and Carraway 1998). They have fairly specific roosting requirements preferring open, airy roosts with good air flow and moderate, stable temperatures. They also have a low reproductive rate and high juvenile mortality that hinders their ability to recolonize habitats once they have been extirpated.

Historic/Current Distribution

During the 1980s thousands of abandoned mines were closed resulting in unknown losses of established roosting sites, and current distribution of this species is patchy due to restrictive roosting requirements. In addition, many states funded eradication programs that destroyed bat colonies to protect the public from rabies outbreaks (USFS 1995). The current extent of suitable habitat is similar to historic distribution, but some habitat loss has occurred due to transitions from sagebrush to agriculture (Wisdom et al. 2000). An increase in human recreation and vandalism has caused widespread abandonment of caves by Townsend's big-eared bats. Between 1993 and 1994 Townsend's bats were captured at 5 of 12 netting sites at Craig Mountain, Idaho (Cassirer 1995), but there is only one occurrence of this species noted by the CDC in the Clearwater subbasin. There is one personal observation of a Townsend's big-eared bat recorded in 2000 near Dworshak resevoir (Dixon 2001).

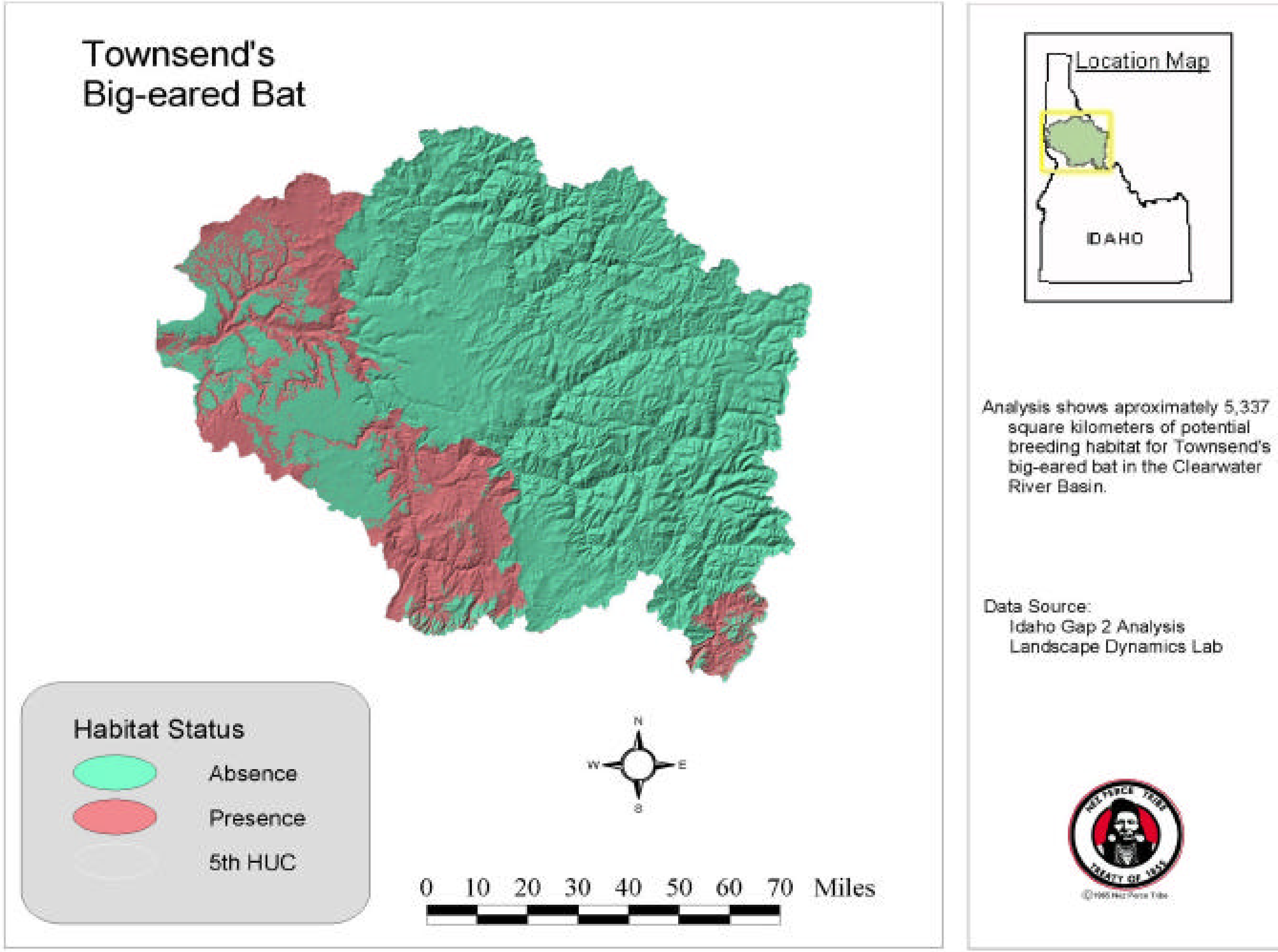

Figure 74. Potential breeding habitat for the Townsend's big-eared bat within the Clearwater subbasin

6.3.8 Fringed Myotis

Life History

The fringed myotis (*Myotis thysanodes*) is named for the fringe of short hairs along the free edge of the tail membrane. It can be found from low elevation deserts to coniferous forests, but appears to be most common in open woodlands (Cassirer 1995). The fringed myotis is gregarious and will form nursery colonies of several hundred individuals. Roosts may be located in buildings, caves or abandoned mines. According to GAP 2 data, the potential breeding habitat for the fringed myotis comprises approximately 1,243 square kilometers in the Clearwater subbasin (Figure 75).

The fringed myotis is a hovering gleaner that grabs its prey off of vegetation while in flight. Once considered a beetle specialist, recent studies have found that diet may be more a function of availability instead of selection. Common prey, in addition to beetles, may consist of moths, spiders, flies and leafhoppers (Verts and Carraway 1998). Although several authorities suggest that this species migrates in winter, the evidence seems largely circumstantial (Verts and Carraway 1998).

Threats

Human disturbance of roost sites, especially maternal colonies, through recreational caving and mine exploration has lead to permanent abandonment of some sites (Engle and Harris 2001). Loss of large diameter snag habitat through timber harvest, firewood cutting, and land conversion can also impact roost sites.

Limiting Factors

Large trees and snags are a critical habitat component for the fringed myotis (Engle and Harris 2001).

Historic/Current Distribution

Little data is available on the historic abundance of the fringed myotis in Idaho. There is one account of a fringed myotis being caught near Moscow, Idaho in 1967 (Larrison and Johnson 1981). Specimens were caught during mist netting at Craig Mountain, Idaho, during 1993 – 1994 and were seen using abandoned mines as roosts (Cassirer 1995). There is one occurrence in the Idaho Department of Fish and Game's CDC of a fringed myotis in northeastern Idaho County (Engle and Harris 2001), and one personal account of a fringed myotis sighting at a mine in 2001 (Dixon 2001).

6.3.9 Northern Goshawk

Life History

Northern Goshawks (*Accipiter gentilis*) are forest-dwelling raptors distributed across Canada, northwestern United States, and Mexico. They are usually quite silent except during the breeding season, when various screaming, shrieking, and wailing calls are uttered (Crocker-Bedford 1990). Goshawks initiate courtship behavior in late March or early April (Warren 1990), and it is thought that pair bonds are life long (Brown and Amadon 1968). Goshawks frequently use the same nest for more than one year (Reynolds and Wight 1978).

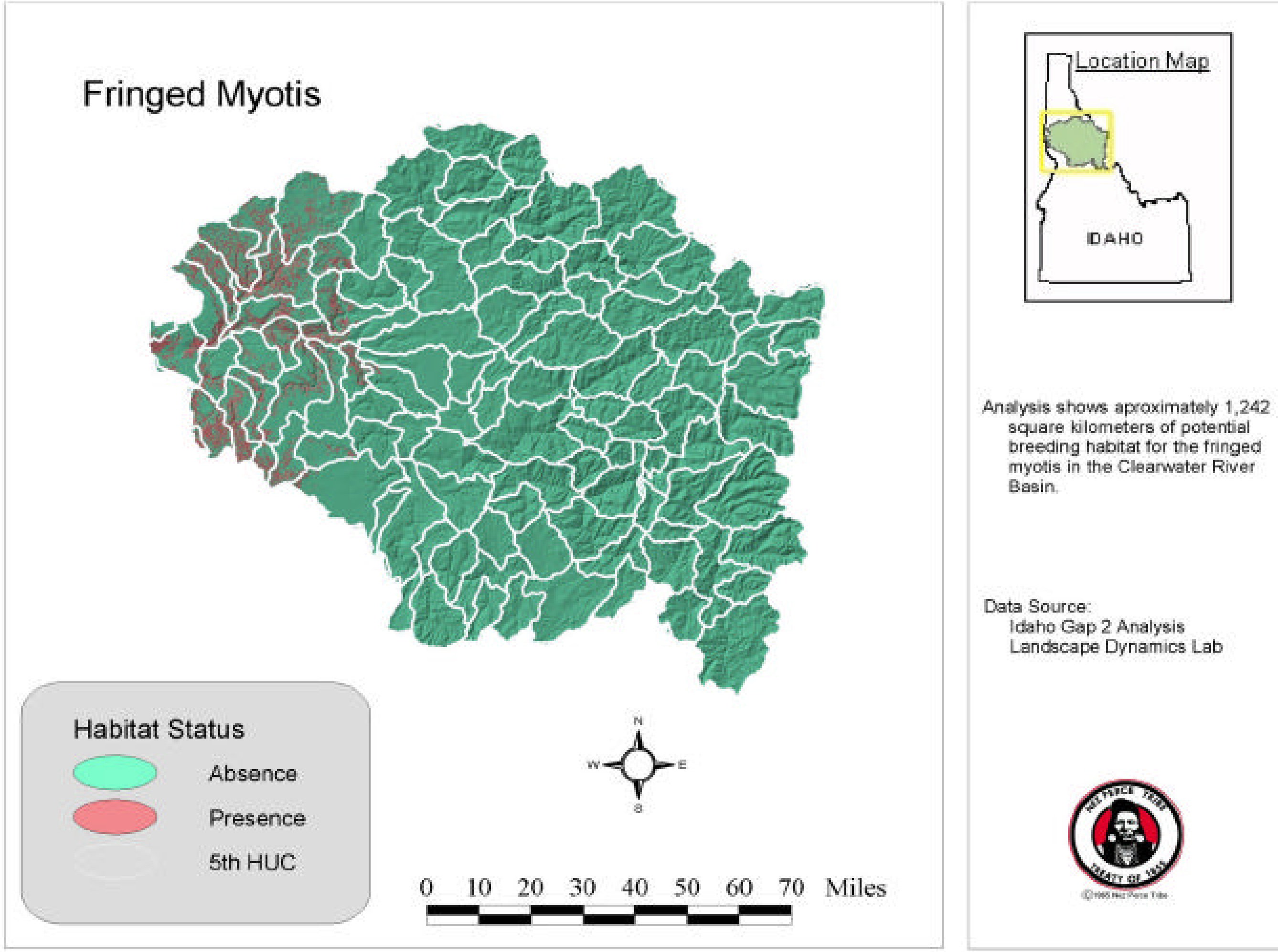

Figure 75. Potential breeding habitat for the fringed myotis within the Clearwater subbasin

Throughout its broad distribution, the goshawk varies in its preferred nesting habitat, but nearly all can be described as consisting of a combination of tall trees having intermediate to closed canopy coverage and small, open clearings for foraging (Johnsgard 1990). They will inhabit coniferous, deciduous or mixed forests (Reynolds et al. 1991). In Idaho, it is typically found in montane coniferous forest, but prefers mature or old growth timber stands for nesting (Nez Perce National Forest 1998). According to GAP 2 data, the potential breeding habitat for the northern goshawk comprises approximately 17,160 square kilometers in the Clearwater subbasin (Figure 76).

Goshawks' typical prey consists of tree squirrels, ground squirrels, snowshoe hares, and various bird species (Wisdom et al. 2000).

Threats

The northern goshawk has been negatively impacted by human activities such as timber harvesting, and disturbances during the nesting period (Reynolds 1983). Fire suppression, logging and grazing all reduce the complex canopy structures favored by goshawks (Wisdom et al. 2000).

Limiting Factors

Goshawks require quality habitats for prey that contain snags, downed logs, woody debris, large trees, herbaceous and shrubby understories, and a mixture of stand structural stages (Wisdom et al. 2000). Little is known about goshawk population dynamics, though it is thought that a large prey base plays an important role in nesting success (Wisdom et al. 2000).

Historic/Current Distribution

The northern goshawk's distribution is circumpolar (Knopf 1977). Year round range in North America extends from northern Alaska and Canada south to northern Mexico (Scott 1987). Goshawks are generally uncommon to rare throughout northern Idaho (Burleigh 1972), but have been recorded within the Nez Perce National Forest (Nez Perce National Forest 1998). During 2001, four goshawks were observed within the subbasin on Idaho State lands (Dixon 2001). A petition was filed with the Forest Service in 1991 to list the northern goshawk as threatened or endangered west of the 100th meridian, but the Service found that while the goshawk typically uses mature forest or larger trees for nesting, it appears to be a generalist in terms of the variety of types and age-classes of forest habitats it needs (USFWS 1998).

6.3.10 Peregrine Falcon

Life History

The peregrine falcon (*Falco peregrinus anatum*) has an almost worldwide distribution, with three subspecies recognized in North America (Brown and Amadon 1968): the Peale's falcon (*F. p. pealei*), the Arctic peregrine falcon (*F. p. tundrius*), and the American peregrine falcon (*F. p. anatum*). The American peregrine occurs throughout much of North America from the subarctic boreal forests of Alaska and Canada south to Mexico (USFWS 1999b).

Peregrine falcons generally reach breeding maturity at 2 years of age. The nest is often a scrape or depression dug in gravel on a cliff ledge. Rarely, peregrines will nest in a tree cavity or an old stick nest. Predominately they choose open shelves that are protected from above by rocky overhangs (Johnsgard 1990). According to GAP 2 data, the potential breeding habitat for the peregrine falcon comprises of approximately 5,728 square kilometers in the Clearwater subbasin (Figure 77).

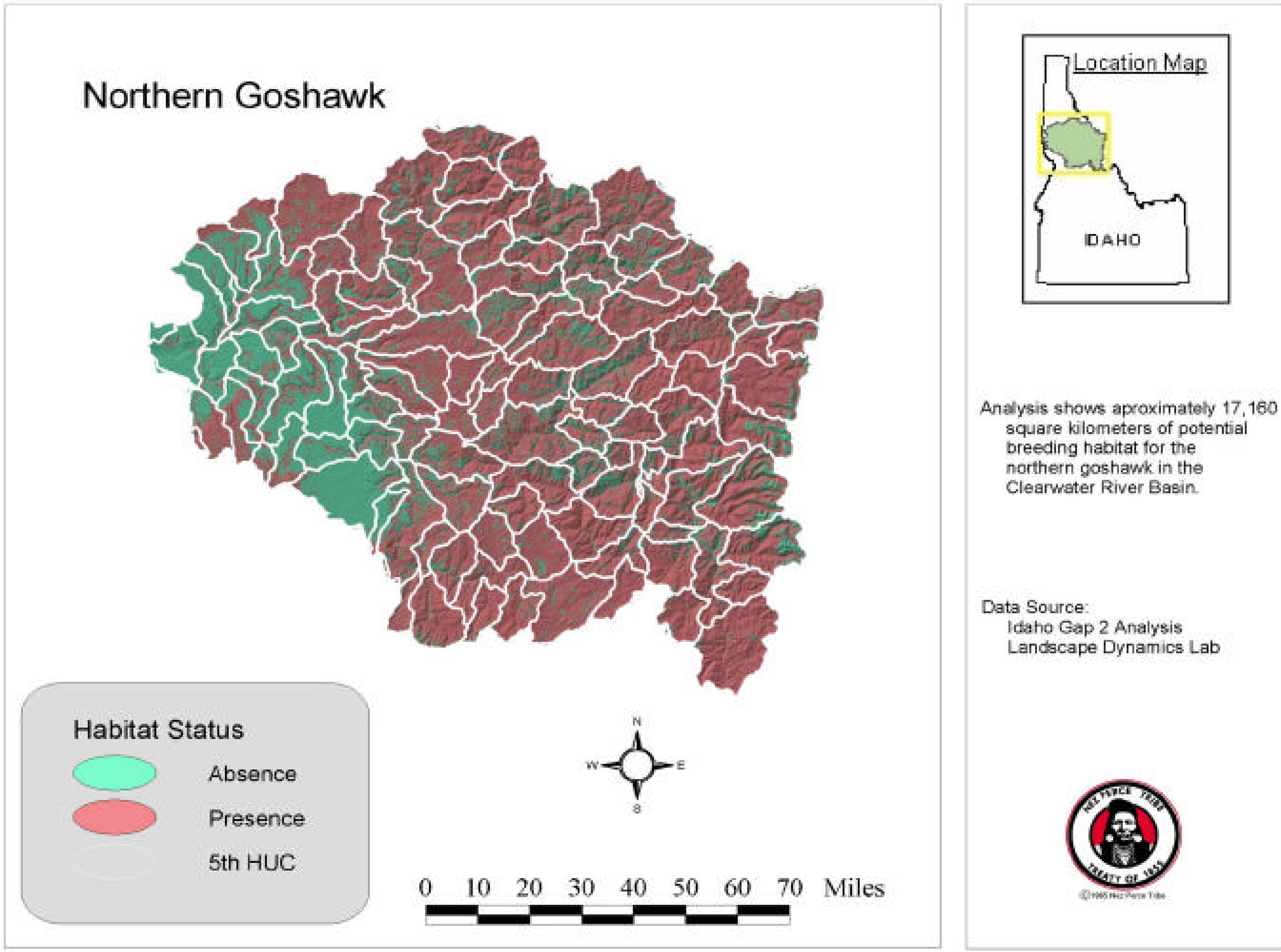

Figure 76. Potential breeding habitat for the northern goshawk within the Clearwater subbasin

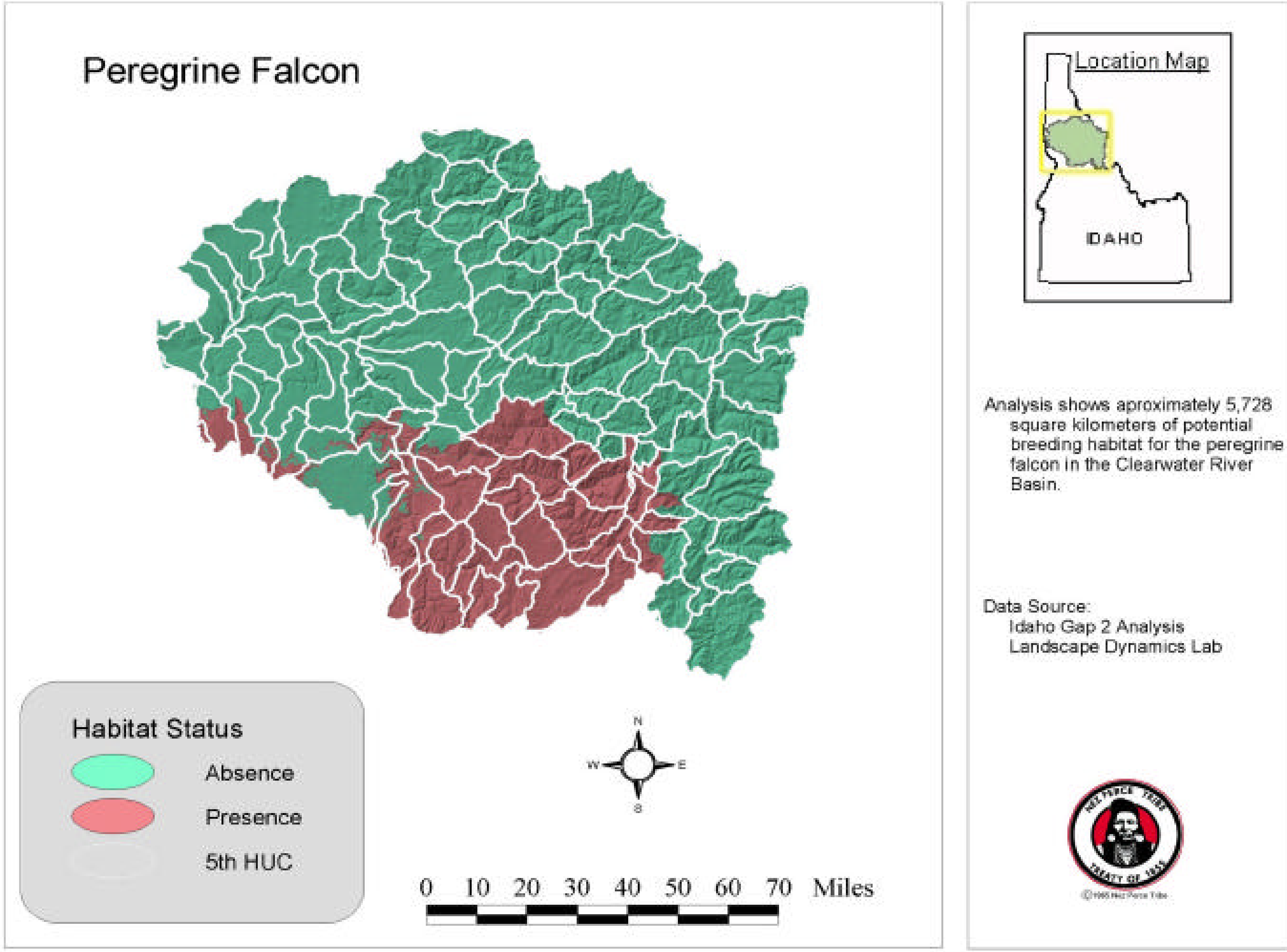

Figure 77. Potential breeding habitat for the peregrine falcon within the Clearwater subbasin

Unlike many other animals that cannot coexist with urbanization, some peregrines have readily accepted human-made structures as breeding habitat (USFWS 1984). Peregrine falcons primarily feed on songbirds, shorebirds, ducks, and in urban areas, starlings and pigeons (USFWS 1999b). The great majority of these prey are taken while in full flight, either being struck dead after a nearly vertical stoop or being seized in the air while fleeing (Johnsgard 1990). It has been estimated that the speed of a diving peregrine can be more than 200 miles per hour (USFWS 1999b).

Threats

Factors that may threaten the peregrine falcon include destruction of habitat, diseases such as Botulism and Trichomoniasis, and juvenile predation by raccoons and great horned owls. Other natural or humanmade factors such as shooting, egg collecting, disturbance by rock climbers, and climate changes also impair peregrine productivity (USFWS 1999b). Peregrine eggshell formation is compromised by pesticides such as DDT, which were once sprayed in wetland areas to control mosquitoes (Hickey and Anderson 1968).

Limiting Factors

Mortality for juvenile falcons is high due to inexperience in hunting, poor flying coordination, and a tendency to expend excessive amounts of energy on prey they can't catch (Snow 1972). Some peregrines are extremely sensitive to disturbance and will refuse to breed if humans have been anywhere near their eyries (Snow 1972).

Historic/Current Distribution

Peregrine falcons have never been very abundant. Studies in the 1930s and 1940s estimated about 500 breeding pairs of peregrines in the eastern U. S. and 1000 pairs in the western U. S. and Mexico (USFWS 1999b). The population declined precipitously in North America due to the extensive use of pesticides, which hindered eggshell formation and drastically reduced hatchling recruitment (USFWS 1984). Historically, peregrines nested in northern Idaho (USFS 1989), but they were essentially extirpated by 1974 (Bechard et al. 1987). In 1982, peregrine population restoration was initiated through the release of captive-produced young (Heinrich 1987). This effort was an extension of an existing national program begun in 1970 by the Peregrine Fund, Inc., in cooperation with state and federal agencies (Cade 1985). Within the Clearwater subbasin, one pair is known to nest in the Nez Perce National Forest (IDFG 2001a).

In 1970 the American and Arctic peregrine falcon subspecies were listed as endangered under the Endangered Species Conservation Act of 1969. A recovery program was initiated in the mid 1970s, and on August 25, 1999 the Service published the final rule to delist the peregrine falcon as no longer endangered or threatened (USFWS 1999b).

6.3.11 Western Toad

Life History

The western toad, or boreal toad (*Bufo boreas*) is largely terrestrial and will bury itself in loose soil or rodent burrows during the day. The toad emerges in the evening to feed on ants, spiders, sowbugs, earthworms, crayfish, and nearly any type of flying insect. Boreal toads can be found from dry grasslands to moist subalpine forests, but optimal habitat is found in humid areas with moderate undergrowth (Nussbaum et al 1983). According to GAP 2 data, the potential breeding habitat for the western toad comprises of approximately 20,024 square kilometers in the Clearwater subbasin (Figure 78). Breeding activity begins in June or July and sexually mature toads begin to congregate in groups of several hundred or more in shallow bodies of water. Females produce an average of 12,000 eggs per clutch, and lay them in two gelatinous strands. Even though they secrete toxins from their skin, mortality for young boreal toads is well over 99% due to predation by birds, garter snakes, and predacious insects (Nussbaum et al 1983).

Threats
The most significant diseases threatening the boreal toad are Chytrid fungus and Red-leg. Other possible threats include increased ultraviolet radiation and predation by ravens and crows (Engle and Harris 2001). Habitat loss and degradation due to water retention projects, nonnative species predation and competition, trout introductions, livestock grazing, timber harvesting and recreational uses have continued to negatively impact toad populations. The boreal toad is declining for unknown reasons, even in areas considered pristine habitat.

Limiting Factors
Boreal toads require unpolluted, pooled water for breeding, such as ponds, lake shallows, or slow moving sections of streams.

Historic/Current Distribution
Boreal toads occur from southern Alaska to New Mexico, and from California east to Colorado. Population trends in Idaho are difficult to track due to a lack of baseline information, but they are well distributed (Engle and Harris 2001). Asherin and Orme (1978) found the western toad to be very abundant along the lower Clearwater River and Dworshak reservoir, and Bowers and Nadeau (2000) conducted surveys in the Dworshak area and located western toads at 6 monitoring sites. The boreal toad occurred commonly at Craig Mountain, Idaho in 1993-94 and was well distributed throughout the study area (Cassirer 1995). Throughout their range the boreal toad has experienced population declines, often for unknown reasons, and similar reductions have been reported in states neighboring Idaho.

6.3.12 Coeur d'Alene Salamander

Life History
The Coeur d'Alene salamander (*Plethodon vandykei idahoensis*) is usually associated with seepages, splash zones and streamsides near talus, but may also be found in talus away from water if the site is located on a protected north-facing slope (Nussbaum et al. 1983). These salamanders can often be found under forest litter, bark or logs. The Coeur d'Alene salamander occurs in harsher and colder climates than other related salamanders because of their close association with spring water. According to GAP 2 data, the potential breeding habitat for the salamander comprises of approximately 2,027 square kilometers in the Clearwater subbasin (Figure 79). Seeps offer a stable habitat temperature and a high local humidity that allows Coeur d'Alene salamanders to extended foraging opportunities during cold or dry weather. *P. idahoensis* has been referred to as the most aquatic *Plethodon*, and they will enter water to avoid capture (Wilson and Larson 1988). They are mostly nocturnal and will forage at the edge of seeps or move away from the water zone if the surrounding area is saturated by rain.

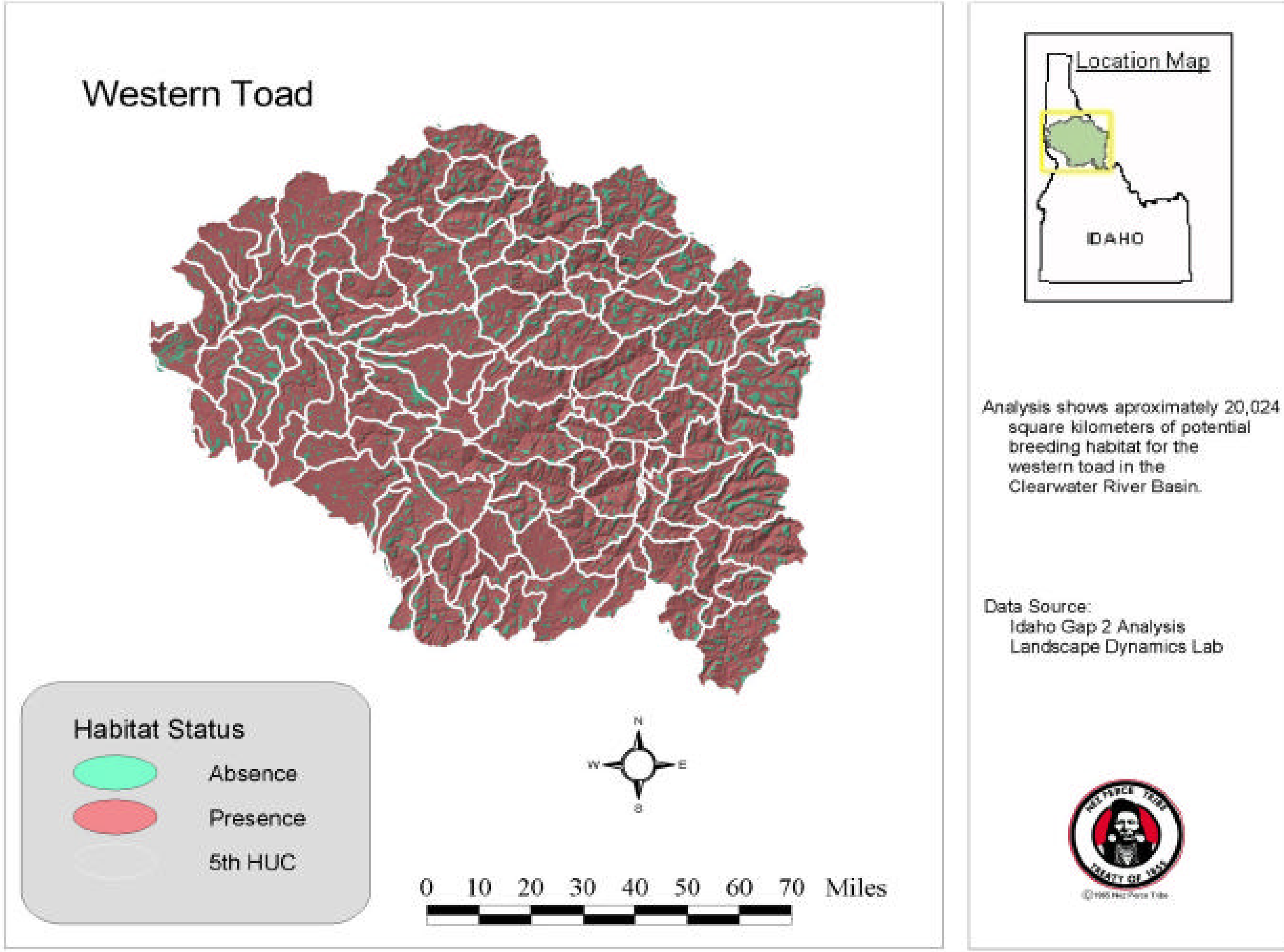

Figure 78. Potential breeding habitat for the western toad within the Clearwater subbasin

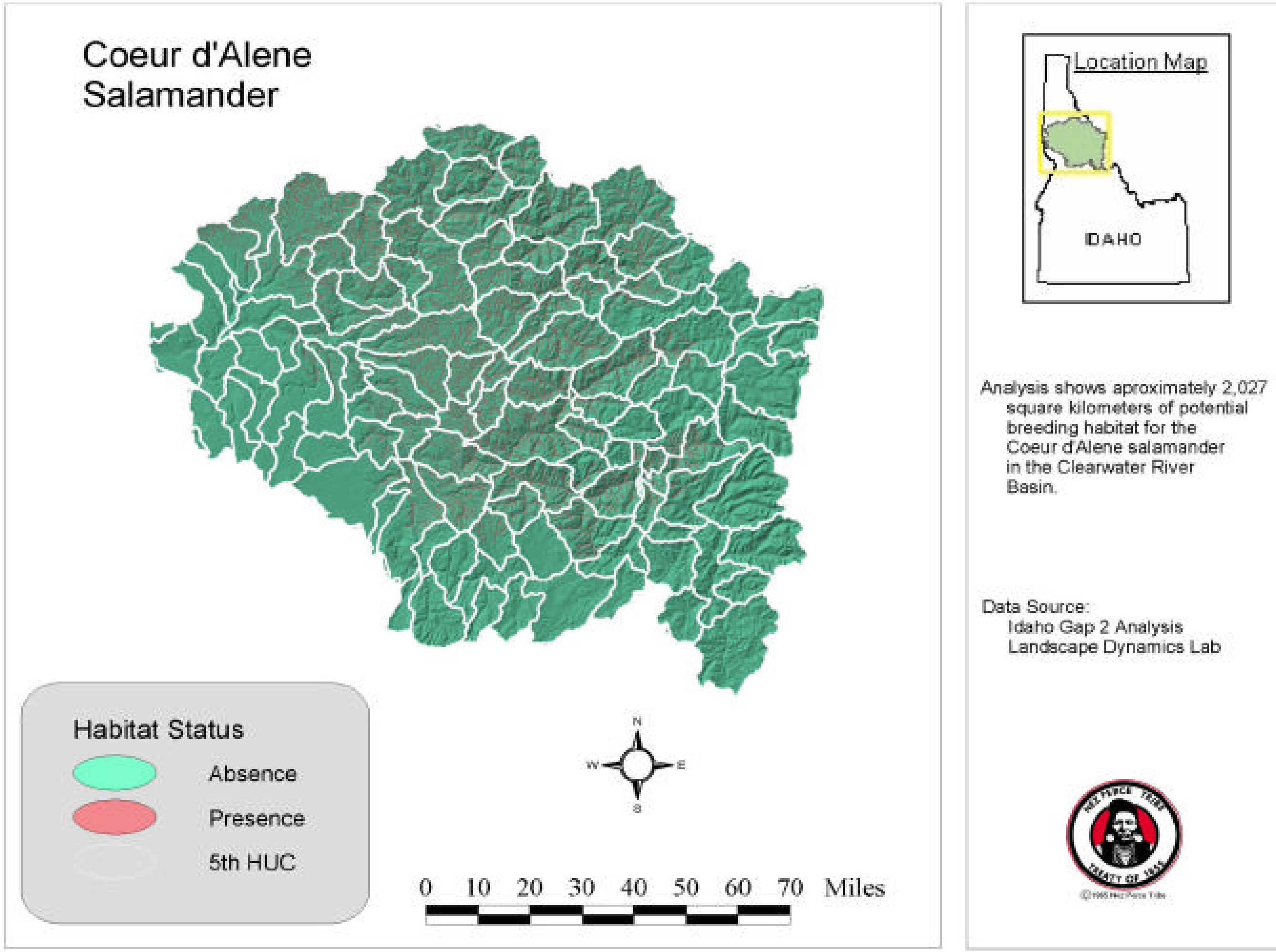

Figure 79. Potential breeding habitat for the Coeur d'Alene salamander within the Clearwater subbasin

The main prey species of *P. idahoensis* are aquatic insects such as Diptera (larvae and adults), and Collembola. These benthic insects are probably caught at the waters edge when they move onto dry land to molt (Wilson and Larson 1988). In northern Idaho this salamander emerges from hibernation in late March and is active through May. Salamanders not near water will retreat underground until mid-September, emerge during the autumn rains, and return to hibernation in late November. Females probably oviposit every other year and will lay eggs in the spring in a grape-like cluster. Brooding takes place throughout the summer and hatchlings emerge in the fall (Nussbaum et al. 1983).

Threats

Possible threats to *Plethodon idahoensis* are logging, road construction, water diversion or pollution, exotic species, fire, and illegal collection.

Limiting Factors

Restricted mobility and habitat fragmentation make this species susceptible to local extirpation and deleterious genetic effects (Engle and Harris 2001).

Historic/Current Distribution

The North Fork Clearwater drainage is the core distribution area for Coeur d'Alene salamanders in the Clearwater subbasin, and the Selway drainage is the southern limit of their known range. Many populations are small isolated communities with little genetic influx from other populations, and high temperatures and lack of moisture (Engle and Harris 2001) likely limit distribution. Nineteen of Idaho's 77 observed occurrences were documented prior to 1981. A single juvenile salamander was observed on Orogrande Creek in 2001 (Dixon 2001). In the most recent surveys, six of the previous occurrences had no observed *Plethodon* salamanders and their populations are considered unknown and possibly extirpated (Engle and Harris 2001).

6.4 Threatened & Endangered Species

6.4.1 Gray Wolf

Life History

The gray wolf (*Canis lupus*) is the largest member of the dog family (Mivart 1890), with adult males averaging 90 to 110 pounds and adult females, 80-90 pounds. Coloration is variable ranging from black to nearly white (Jimenez and Mack 1995). In most wolf populations, reproductive packs occupy exclusive territories, and nonbreeding lone animals live in the buffer zones between territories (Mech 1972). Most packs include a pair of breeding adults, pups and often yearling and/or extra adults (Murie 1944, Mech 1970). Wolf packs are highly organized and all members of the pack contribute to the raising of the pups (Mech 1970). Wolves become sexually mature at 22 months and the usual dispersal age is 9 to 28 months (Packard and Mech 1980). According to GAP 2 data, the potential breeding habitat for the gray wolf comprises approximately 17,903 square kilometers in the Clearwater subbasin (Figure 80).

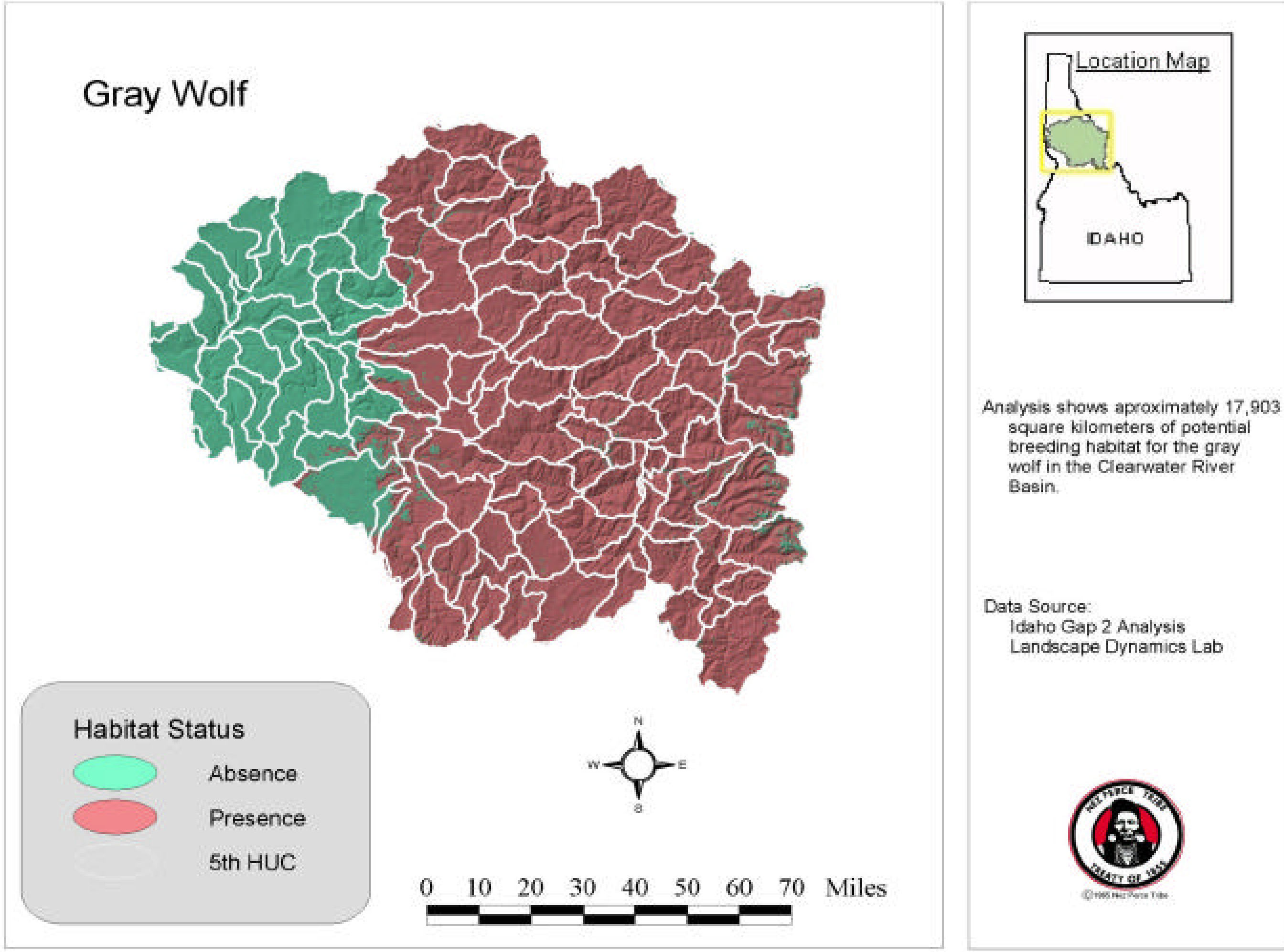

Figure 80. Potential breeding habitat for the gray wolf within the Clearwater subbasin

Dens are commonly located on southerly aspects of moderately steep slopes, usually about 400 yards from a water source (USFWS 1987). The wolf pack will usually move from the natal den to the first rendezvous site when the pups are 6-10 weeks of age. The first rendezvous site is usually within 1-6 miles from the den site (Carbyn 1974; Fritts and Mech 1981). Rendezvous sites include areas of meadow complexes and adjacent hillside timber, with surface water nearby. These rendezvous sites are characterized by matted meadow vegetation and a system of well used trails through the adjacent forest and across the meadow (Joslin 1967).

Threats

Threats for the gray wolf include canine diseases such as parvovirus, distemper and rabies, habitat loss and human predation (USFWS 1987).

Limiting Factors

Wolves require large home ranges with enough food to support a group of 5-8 pack members. Habitats must contain mesic meadows for denning, low occurrences of human interactions, and high quality habitats for big game prey species (Groves et al. 1997b; Nez Perce National Forest 1998).

Historic/Current Distribution

Wolves have occupied nearly all habitats in the Northern Hemisphere except for true deserts (Mech 1970). Wolf packs were first recorded in 1812 in the Clearwater River drainage and were distributed from the Canadian border south (USFWS 1987). The prairies and foothills of Idaho supported large herds of ungulates and buffalo that were hunted extensively by miners and pioneers. The vast herds of bison that supported the wolf population were decimated by 1890, and elk were all but eliminated by 1900. As the ungulates decreased, buffalo hunters began shooting wolves for their pelts (Hansen 1986). Until the early 1900s, gray wolves were common over much of the northwestern United States (Young and Goldman 1944), but by the 1930s federal and public control efforts essentially eliminated wolves from the west, including Idaho (Hansen 1986; Kaminski and Hansen 1984). The Secretary of the Interior federally listed wolves as an endangered species in 1973.

In the 1970s a recovery plan was developed for the Northern Rocky Mountain gray wolf. The plan recommended a combination of natural recolonization and the reintroduction of wolves to recover the populations in the greater Yellowstone ecosystem, central Idaho and northwest Montana. The identified goal of recovery would be to establish 10 breeding pairs in each of the recovery areas for three consecutive years. The plan recommended the use of the 10(j) section of the Endangered Species Act, which designated the reintroduced populations as experimental nonessential (USFWS 1994b). This meant that wolves could be managed to minimize conflicts and meet public concern (Mack and Laudon 1998).

In 1995-96, 35 gray wolves from Canada were released into central Idaho, forming the Central Idaho Wolf Recovery Area (CID), one of three recovery areas in the western United States. Each wolf was fitted with a radio collar so that biologist could monitor the status of the recolonizing population (Mack and Laudon 1998). In 1996, three pairs produced the first wolf litters born in Idaho for over 60 years (Mack and Laudon 1998). Currently 261 wolves are know to inhabit the CID, a 750% increase over the original 35 (Figure 81). These wolves inhabit 22 different packs, including five whose home range is partially contained by the Clearwater subbasin (USFWS et al. 2002). Four of these, the Marble Mountain, Bighole, Kelly Creek and Selway packs have established the home ranges mapped in Figure 82; the territory of the newly formed Gospel Hump pack has not yet been mapped. The Marble Mountain pack maintains a territory in the Marble Creek drainage in the Panhandle National Forest (Mack 2001), and a small portion of their most southeastern territory lies within the subbasin. The Kelly Creek wolf pack has produced pups since 1996. They have maintained a territory largely within the roadless areas of the Clearwater and Lolo national forests (Mack 2001). The Big Hole pack produced their first litter in 1998 and maintains a territory on the Idaho/Montana border. The Selway group produced their first litter in 1996. Their territory is within the Selway Bitterroot Wilderness, the Bitterroot and the Nez Perce National Forests and includes the high elevation mountainous country between the mainstem Salmon and Selway rivers. The Gospel Hump pack, one of four new packs formed in the CID in 2001, was formed by a female wolf from south of the Salmon River. The new pack, whose home range is in the Gospel hump wilderness of the South Fork AU, produced a litter of 7 in 2001 (USFWS et al. 2002).

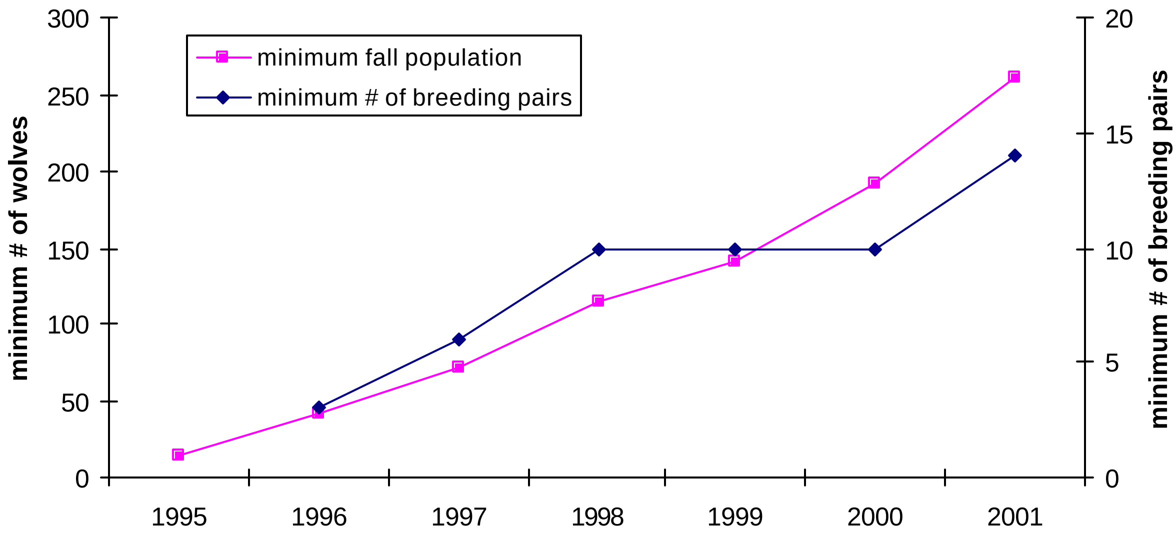

Figure 81. Minimum fall wolf population, Central Idaho Recovery Area (1995-2001)

6.4.2 Bald Eagle

Life History

The bald eagle (*Haliaectus leucocephalus*) is a large, powerful bird of prey. The sexes are alike with the entire head and tail colored white (Herrick 1933; Chura and Stewart 1967). Bald eagles are generalized predators and utilize a wide variety of prey items including fish, birds, mammals, and invertebrates (Hancock 1964). Fish are their most staple prey (Herrick 1934). Bald eagles are generally believed to mate for life (Bent 1937) and reach sexual maturity at 5 years of age (Johnsgard 1990). According to GAP 2 data, the potential breeding habitat for the bald eagle comprises approximately 8,074 square kilometers in the Clearwater subbasin (Figure 83). The timing of breeding and egg deposition varies throughout the birds' range and according to climate and latitude (Herrick 1934). Nest site preference includes areas with an open clear flight path to water, and may be built on the tallest tree in the stand (coniferous or deciduous) with an open view of the surrounding area, or on cliffs (Johnsgard 1990).

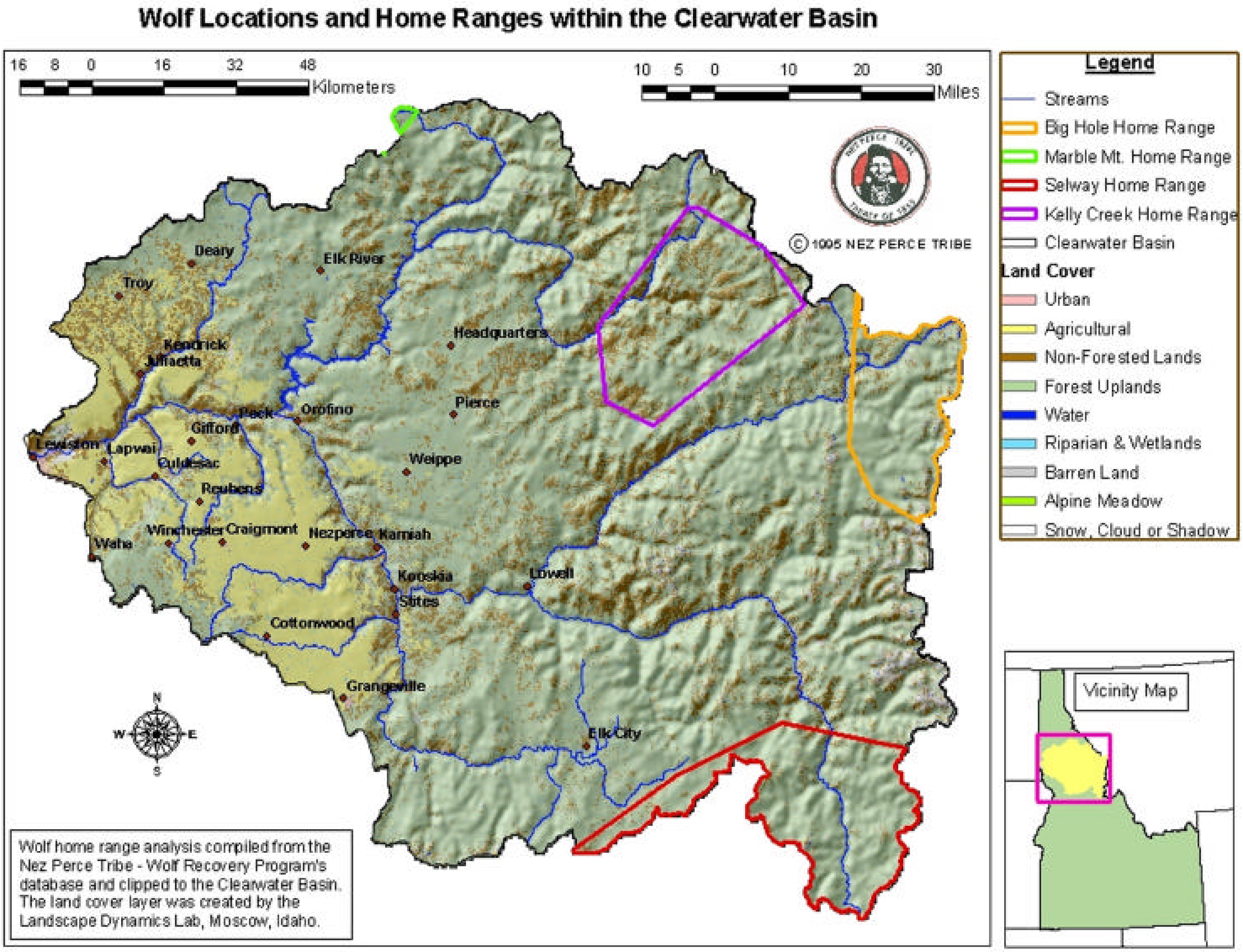

Figure 82. Home ranges for the established gray wolf packs within the Clearwater subbasin

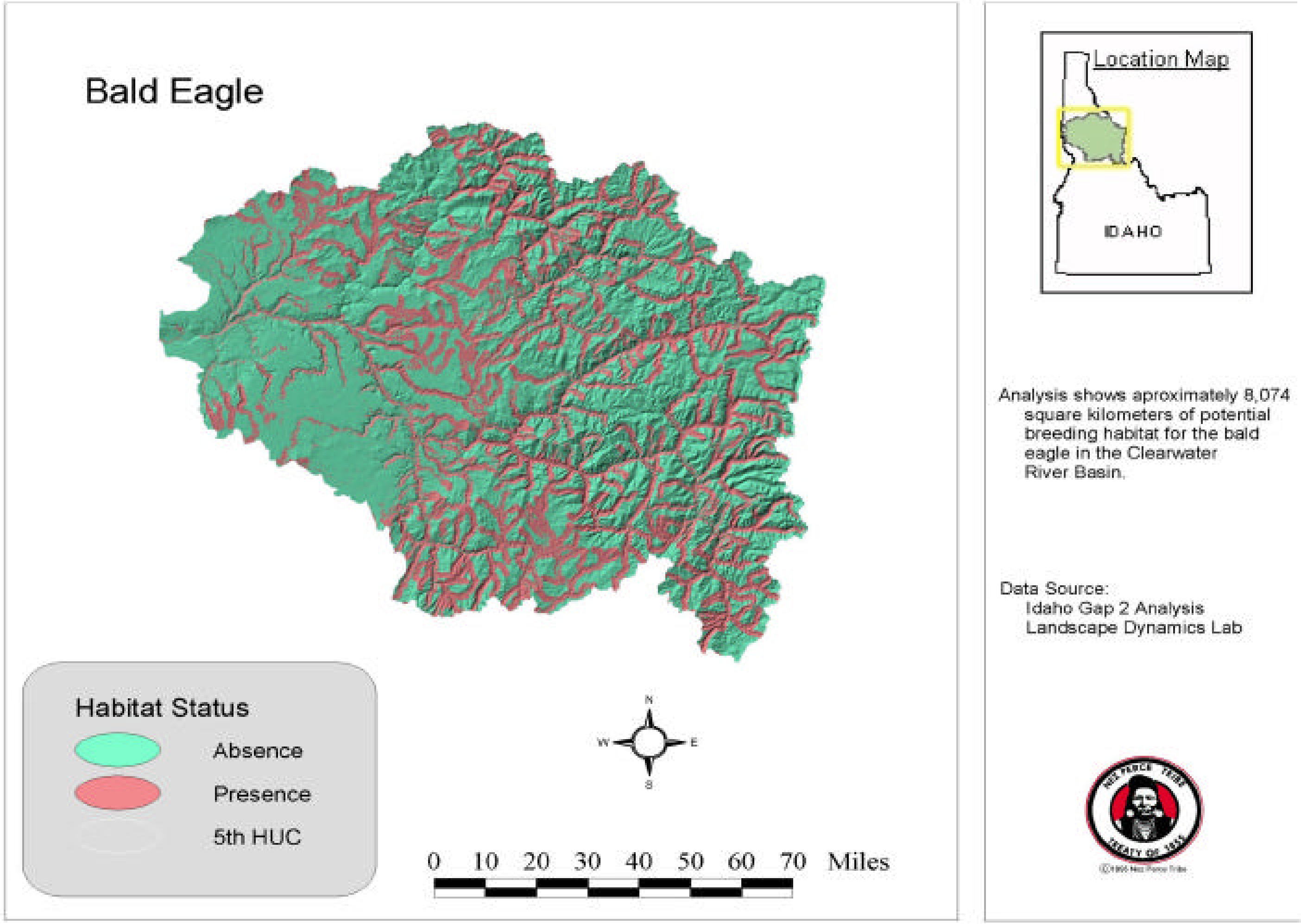

Figure 83. Potential breeding habitat for bald eagles within the Clearwater subbasin

Threats

Threats to the bald eagle include habitat loss due to human activities, human disturbance during the nesting season, pesticides which cause the reduction in hatchling success, and shooting eagles for sport or alleged depredation (Sprunt and Ligas 1966; Snow 1973).

Limiting Factors

The breeding habits of the bald eagle require an adequate supply of moderate to large-sized fish, nearby nesting sites, and a reasonable amount of freedom from disturbance during the nesting period.

Historic/Current Distribution

The range of the bald eagle extends from central Alaska and Canada to northern Mexico. When Europeans first arrived on the North American continent, bald eagles were prolific and widespread. The first major decline in population began in the mid- to late 1800s, which coincided with declines in waterfowl, shorebirds, and other major prey species. Direct eagle killing was also prevalent and coupled with the loss of nesting habitat reduced the number of bald eagles up to the 1940s (USFWS 1995). Shortly after WWII, the use of dichloro-diphenyl-trichloroethane (DDT) and other organochlorine compounds to control mosquitoes became widespread (USFWS 1995). DDT accumulated in bald eagles as they continuously ingested contaminated prey, and caused the loss of calcium, which is necessary for the formation of eggshells (USFWS 1995). The Bald Eagle Protection Act was passed in 1940 which prohibited the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. This increased awareness of the bald eagle's decline resulted in the partial recovery of the species in most areas of the country except Alaska.

By 1972 bald eagles south of the 40th parallel were listed as endangered and DDT was banned in the United States (USFWS 1986). In 1978, the Service listed the bald eagle throughout the lower 48 states as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (USFWS 1995). A recovery program was initiated in the mid 1970s, and in 1994 the Service published the proposed rule to reclassify the bald eagle from endangered to threatened in most of the lower 48 states (USFWS 1995). By 1999 the Service proposed to delist the bald eagle from the threatened and endangered list (USFWS 2000a).

The Clearwater subbasin is part of Bald Eagle Recovery Zone 15, which encompasses all of central Idaho. The recovery goal for Zone 15 is to provide secure habitat for at least six bald eagle nesting territories, with long-term occupation of at least four. Bald eagles nested in the Cold Springs area near Dworshak reservoir in 1999 and 2000 but no offspring were produced. The nest site went unoccupied during 2001 and 2002, although numerous mature bald eagles were sighted. It is thought that eagles may still be nesting in the area but no nests have been located (R. Davis, USACE, personal communication, June 2002). Winter counts of bald eagles were conducted for the Clearwater subbasin between 1980 and 2000 (Figure 84) by the Idaho Fish and Game, Nez Perce National Forest, and the USGS Forest and Rangeland Ecosystem Science Center. These counts show an upward trend in the number of sightings.

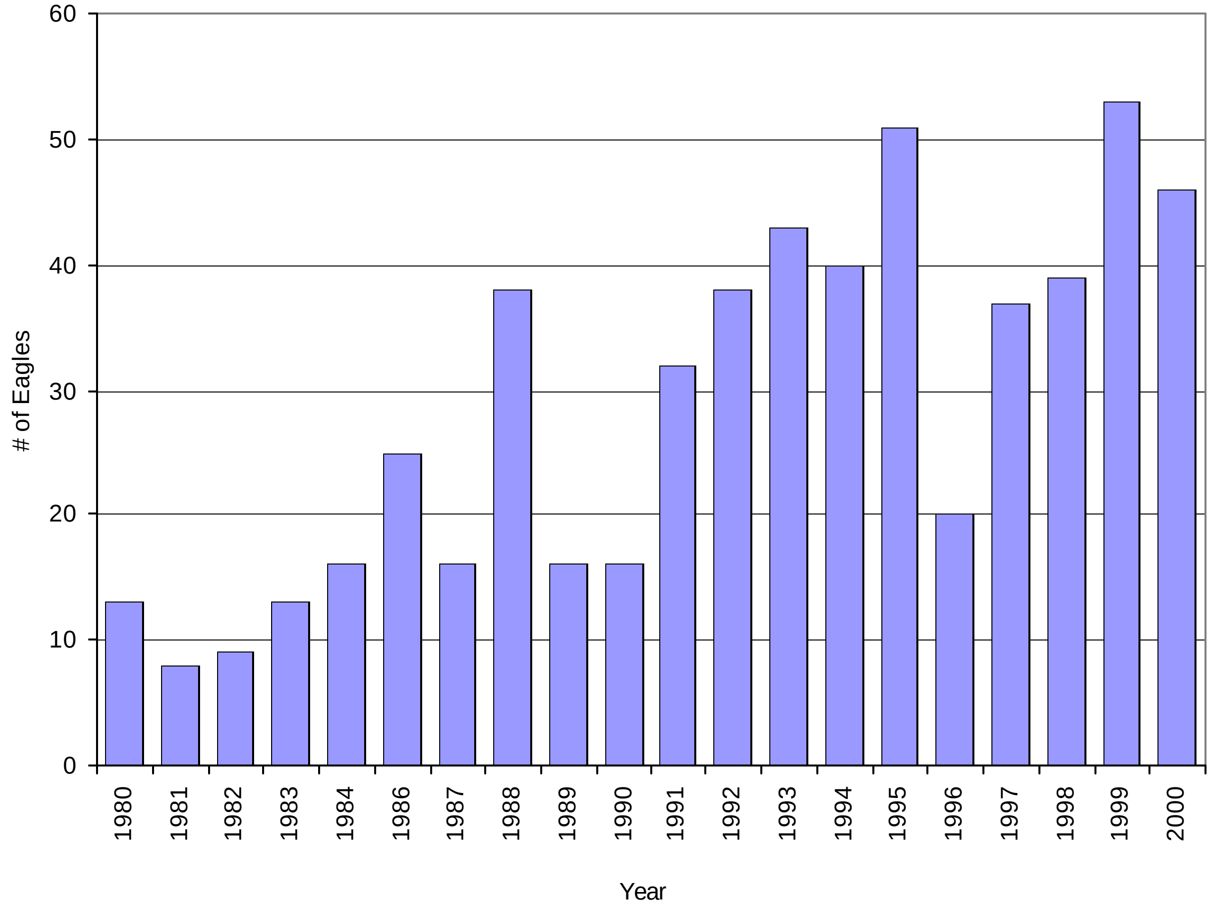

Figure 84. Number of bald eagles counted by year within the Clearwater subbasin

6.4.3 Lynx

Life History

Long legs and exceptionally large and densely furred feet make lynx (*Lynx canadensis*) well adapted to traveling in snow (Nowak 1991). They are suited to living in cold climates with deep snow and rely heavily on the snowshoe hare as a primary food source. Ten year Lynx population cycles that closely follow snowshoe hare population cycles have been well documented in the northern boreal forests of Canada. In the southern boreal forests, like those of the Clearwater subbasin, these population cycles are thought to be less defined or nonexistent (Ruggiero et al. 1999). This difference is thought to be at least partially due to a heavier reliance on alternative prey in the southern regions; grouse, ptarmigan, mice, red squirrels, and occasionally young ungulates, serve as alternatives to snowshoe hare for foraging lynx (Ruggiero et al. 1999).

In Idaho, lynx are often found above 4,000 feet in Englemann spruce, subalpine fir, and lodgepole pine forests. They require a mosaic habitat of early successional forests that contain high numbers of prey, and late successional forests that contain cover, especially windfalls, for kittens and denning. In addition, denning sites need to be within close proximity to hunting areas and have minimal human disturbance (Koehler and Aubry 1994).

Lynx select den sites in or near mature habitats dominated by large quantities of wind-felled trees. Dens are usually located within logs, stumps, or root balls of downed trees within mature or old growth forests. According to GAP 2 data, the potential breeding habitat for lynx comprises of approximately 15,958 square kilometers in the Clearwater subbasin (Figure 85).

Dense, young coniferous forests support the greatest year-round snowshoe hare populations and therefore provide the greatest hunting opportunities for lynx (Interagency Lynx Committee 1999). Young forests tend to have the highest availability of small diameter stems and branches, which provide showshoe hares with the greatest nutritional content. Snowshoe hare use was found to increase with the number of seedlings and samplings on the site (Scott and Yahne, 1989). Estimates of summer snowshoe hare densities in Montana indicate highest densities of 1.9 hares/ha in closed young forests (Ruggiero et al. 1999). Koehler (1991) found a mean of 15.8 hares/ha in Washington lodgepole pine forests < 25 years compared to 5.9 hares/ha found in lodgepole pine stands >80 years. Probably as a result of reduced cover and associated protection from predators, snowshoe hares have been shown to avoid very recently disturbed areas (Ruggiero et al. 1999). The role of brushy areas in canopy gaps of mature forests in supporting lynx prey species has not been adequately studied, but limited investigation indicates that these areas may be important in supporting both snowshoe hares and red squirrels, an important alternative prey species.

Threats

Snowshoe hare densities decline in response to reduced cover and thus extensive clearcutting and thining may be detrimental to lynx (Ruggiero et al. 1999). Roads and open areas have been demonstrated to inhibit lynx movement. Fragmentation of habitat and degradation of corridors for travel between denning and foraging habitats through, logging, agriculture, and road construction may negatively impact lynx populations (Ruggiero et al. 1999). Fire suppression and resultant ecological succession may reduce prey availability and lynx populations (Engle and Harris 2001, Ruggiero et al. 1999). Increased winter recreation may be causing displacement or mortality of lynx. Extensive snowmobile trails give coyotes and bobcats access to deep snow areas that were previously utilized by lynx (Engle and Harris 2001). Trappers have said that lynx are curious and tolerant of humans and although trapping of lynx is now illegal they are occasionally caught in traps meant for other species (Ruggiero et al. 1999).

Limiting Factors

Old growth forests are required for denning and dense early seral forests provide prime foraging areas (Nez Perce National Forest 1998). Density of coyotes appears to influence lynx habitat use more than the availability of snowshoe hare populations, because coyotes will compete for resources and have occasionally been known to kill young lynx (Ruggiero et al. 1999). Travel corridors are an important habitat feature because lynx will tend to avoid open areas larger than 300 feet wide (Koehler and Brittell 1990; Melquist and Davis 1997).

Historic/Current Distribution

Lynx harvest records in Idaho are available from 1934 to 1981, but they are considered unreliable due to the inclusion of “pale bobcats” as lynx. Overall, lynx numbers in the subbasin are reduced from historical levels. Populations never recovered from both regulated and unregulated exploitation in the 1970’s and 1980’s (Engle and Harris 2001).

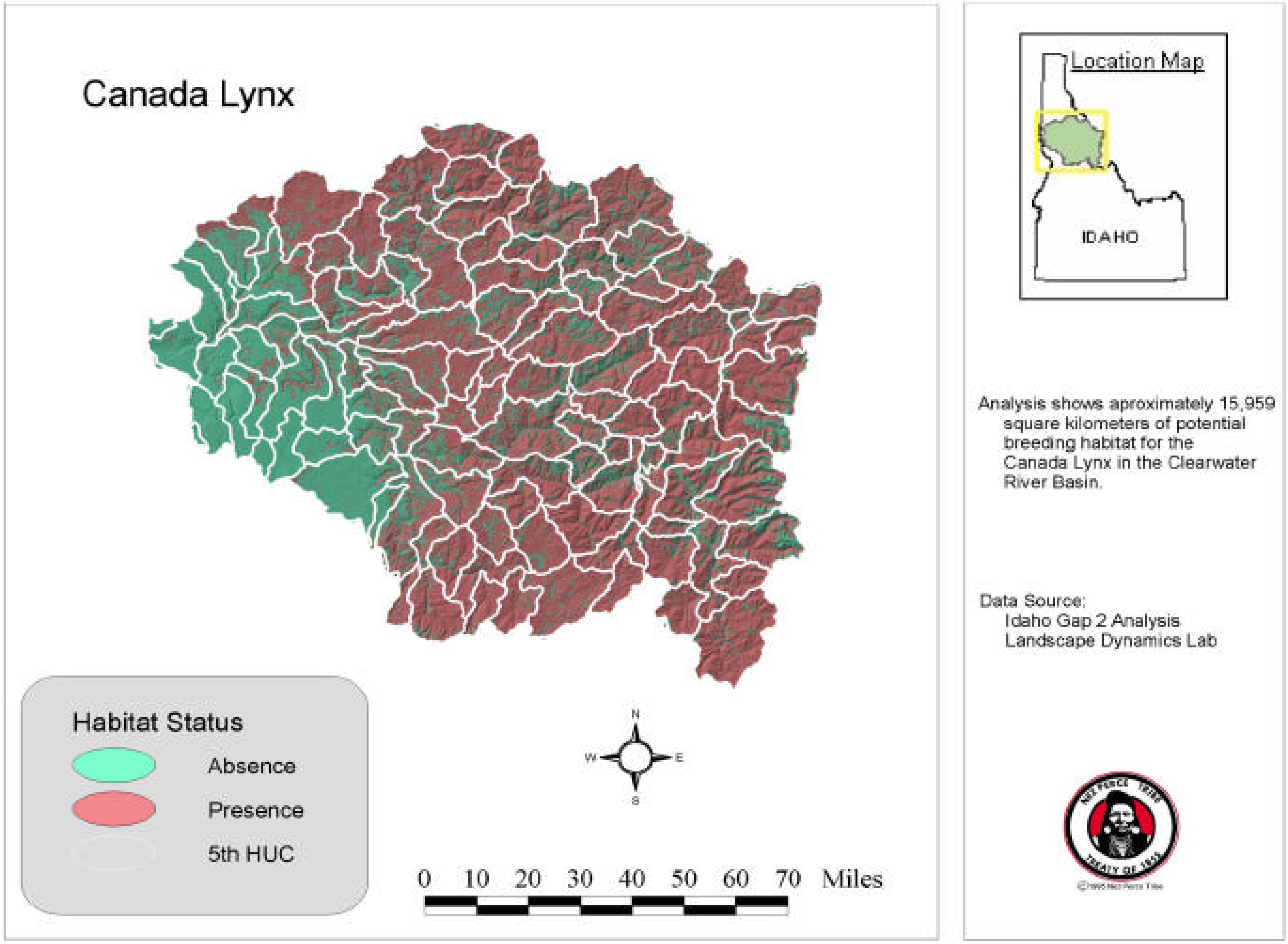

Figure 85. Potential breeding habitat for the lynx within the Clearwater subbasin

The lynx was unprotected in Idaho until 1977 when it was classified as a furbearer and hunting was limited to a shorter season. In 1996 the hunting season for lynx in Idaho was closed (Ruggiero et al. 1999). Lynx are rare in the Clearwater subbasin, but have been sporadically recorded. Little information on lynx populations exists, but there have been 39 reported occurrences to the CDC in the subbasin (Nez Perce National Forest 1998). One animal was trapped at Earthquake basin in 1991 and another was seen at Lightning Creek (Ruggiero et al. 1999). There was a single personal observation of a lynx recorded in 2001 (Dixon 2001).

6.4.4 Grizzly Bear

Life History

Grizzly bears (*Ursus arctos horribilis*) are omnivores that eat a wide variety of plant and animal matter. During the spring, grizzly bears will feed on grasses, forbs, roots, insects, carrion, berries and young ungulate calves. During the hyperphagic period in the fall, their main diet consists of high calorie foods such as fish, roots, pine nuts, and berries. Whitebark pine seeds, when present, can account for 40% of a grizzly bear's diet in the fall, and is directly related to post-hibernation survival, number of twins, and pre-hibernation health (Keane and Arno 2000). Primary foraging berry species include huckleberry, serviceberry, elderberry, buffaloberry, and mountain ash (USFWS 2000c). Biscuitroot is extremely important as a fall food source because it is almost 30% starch and easily digestible (Mattson 1997).

An adult male grizzly will weigh up to 600 pounds and females weigh 250 to 350 pounds before hibernation. After hibernation they will have lost 40 to 60 percent of their body weight. Grizzlies hibernate from October to April, with the cubs being born in January and nursing through the rest of the hibernation period. Optimal grizzly bear cover is composed of wooded areas interspersed with grasslands and meadows. Although timber is an important habitat component, grizzlies prefer more open shrub fields, wet meadows, ridges, and open grassy timbered sites (Snyder 1991). Home range for grizzly bears averages 100 square miles for a sow with cubs, 200 to 300 square miles for a male. GAP data depicting potential breeding area for the Clearwater subbasin is currently unavailable.

Threats

Human caused mortality is the major factor limiting the recovery of grizzly bears. Human caused deaths stem from human-bear wilderness encounters, poorly stored food, livestock-bear encounters, increased human occupation of grizzly habitat, illegal poaching, and mistaken identification by black bear hunters (Wisdom et al. 2000). Livestock grazing in the early 1900s increased due to the lush vegetation that followed the fires of 1910, 1919, and 1934. Most herbaceous grizzly foods are also livestock forage plants, and domestic livestock graze wet meadow areas much more efficiently and have greater impacts than grizzlies. The increased numbers of livestock also increased the chances of grizzlies being shot for preying upon livestock or encountering stockmen (Davis et al. 1986).

Anadromous fish and whitebark pine are important foods in the autumn and both have been significantly reduced from their historic abundance. Chinook salmon are particularly important, and current runs no longer provide a readily abundant food source (USFWS 2000c). Whitebark pine communities have been lost due to disease, insects, and succession, with distribution reduced 60-80% from historic levels (Keane and Arno 2000). Fire suppression has reduced the number of preferred grizzly forage species that are fire dependents. Roads have a negative impact on grizzly bears and increase the chance of human conflicts. Bears will avoid roads and underutilize otherwise high quality habitat. Grizzlies have a fairly low resiliency to human disturbance and populations take a long time to recover from losses.

Limiting Factors

Essential habitat components for the grizzly bear include space, isolation, sanitation, food, denning, vegetation types, and safety (USFWS 2000c). Lack of travel corridors limits habitat utilization by grizzly bears, isolates small populations, and reduces the likelihood of recolonization once a population has been extirpated (Wisdom et al. 2000). Grizzlies have a low reproductive rate and late maturation age which makes them susceptible to overharvesting (Snyder 1991).

Historic/Current Distribution

When Lewis and Clark came through the Bitterroot Mountains in the early 1800s grizzly bears were abundant. At least seven grizzlies were killed while they traveled along the Clearwater River, and three were taken near Kamiah, ID (USFWS 2000c). Grizzlies were thought to be common in the Clearwater drainage and the Selway-Bitterroot Mountains up to the turn of the century. During the early 1900s hunters and trappers killed 25 to 40 grizzlies annually in the Bitterroot Mountains. There were 9 accounts of grizzly sightings in the Selway and North Fork Clearwater drainages between 1937 and 1978 (Dixon 2001). Hunting, trapping, predator control programs, and the decline of anadromous fish runs led to the virtual extirpation of the species in the Bitterroots by the 1950s (USFWS 2000c). Grizzlies probably remained in the Lochsa drainage until 1946. The current extent of grizzly bear habitat is fairly similar to historic times, but it is largely unpopulated due to extirpation and a lack of connective travel corridors for recolonization.

6.5 Recently Extirpated or Diminished Species

Some populations of wildlife have been reduced in number or geographic extent since the arrival of Euramericans 200 years ago. Land uses, extensive hunting, and interactions with domestic livestock have all contributed to declines of some native species. Those species outlined in the following selections have been selected to represent some of the resource changes observed since 1800. This is not comprehensive list, but rather serves to illustrate some significant changes documented. Some species are considered economically important (bighorn sheep, mountain goat) while others represent lost habitat components (sharp-tailed grouse, mountain quail), or intolerance to human presence and disturbance (sandhill crane).

6.5.1 Bighorn Sheep

Life History

Bighorn sheep (*Ovis canadensis canadensis*) are an ecologically fragile species adapted to limited and increasingly fragmented habitats (Valdez and Krausman 1999). Gregarious and extremely loyal to their home range, bighorns typically inhabit river canyons, talus slopes, cliffs, open meadows, and clearcut or burned forests. The use of each habitat type varies seasonally and with requirements such as breeding, lambing, and thermal cover (Valdez and Krausman 1999). According to GAP 2 data, the potential breeding habitat for bighorn sheep comprises of approximately 1,794 square kilometers in the Clearwater subbasin (Figure 86).

Elevational migrations are common, and bighorns will follow the wave of new vegetation upward in the spring. Preferred climate is relatively warm and arid with cold, dry winters. Low annual snowfall is important for lamb survival. Bighorn sheep require 4-5% of their body weight in water each day, but may be able to get sufficient water from succulent plants in the spring and snow in the winter to not be limited by standing water sources (Valdez and Krausman 1999). Bighorns mainly eat grasses and forbs, though they will switch to shrubs depending on availability. Valdez and Krausman (1999) describe their diet as "cosmopolitan." Bighorn sheep tend to avoid tall or overhanging vegetation that blocks their view of predators.

Threats

Decimating factors for the bighorn include overgrazing by cattle and sheep, disease, uncontrolled hunting, competition with deer and elk, off-road vehicle use, introduced exotic species, and usurped water resources. Habitat loss and fragmentation stem from dams, canals, fence and road construction, logging, urban expansion, and mining (Valdez and Krausman 1999).

Limiting Factors

Bighorns are particularly susceptible to death during their first year of life. Early spring mortality is usually due to predation, disease, poor maternal nutrition, or human disturbance. Late summer mortality is usually due to starvation. Mountain lions commonly prey upon adult bighorns and coyotes are the major predator of bighorn lambs. Proximity to escape cover is important, and bighorns will usually remain within 800m of escape cover in all seasons. Habitats with poor escape cover have higher rates of lamb mortality (Valdez and Krausman 1999). Rugged mountain terrain with southern exposure and minimal snow pack is considered an important habitat feature. Critical snow depth is 12 to 18 inches for lambs, and bighorns in general tend to avoid snow deeper than 12 inches.

Salt and mineral licks are an important factor for Rocky Mountain bighorn sheep because their habitats are generally found on granitic soils that have a low mineral content. Major declines in some bighorn populations have been attributed to mineral deficiencies (Valdez and Krausman 1999).

Disease is an infrequent but major limiting factor. Die offs of greater than 50% are common and seem to result from a combination of stress and viral or bacterial infection (Valdez and Krausman 1999). Domestic sheep, goats, and exotic relatives of bighorn sheep are responsible for several recent catastrophic die offs. They also compete for range resources and cause genetic pollution of bighorn sheep by hybridizing (Smith et al. 1991). Inbreeding is a limiting factor that can be significant for the small isolated herds with a low rate of dispersal (Valdez and Krausman 1999). If a herd is to survive it needs to have a minimum of 125 members to remain genetically sound. This number can be reduced if there are migration corridors between herds to allow rams access to multiple populations (Smith et al. 1991). Natural barriers to bighorn migration can be swift water, dense vegetation, nontraversable cliffs, or sparsely vegetated valleys or plateaus. Humanmade barriers that inhibit travel include canals, fences, highways, and urban areas (Smith et al.1991).

Historic/Current Distribution

Humans and mountain sheep have coexisted in North America since human arrival, and bighorns were an important historical resource for Native Americans. Horns and bones were used to make tools and ornaments, hides were used for clothing, and the meat was an important protein source (Valdez and Krausman 1999). Reports by early explorers, trappers and settlers suggest that at one time bighorn sheep were one of the most abundant large animals in Idaho. Lewis and Clark noted that the local Indians told them that bighorns were present in large numbers in the Clearwater Mountains (Buechner 1960).

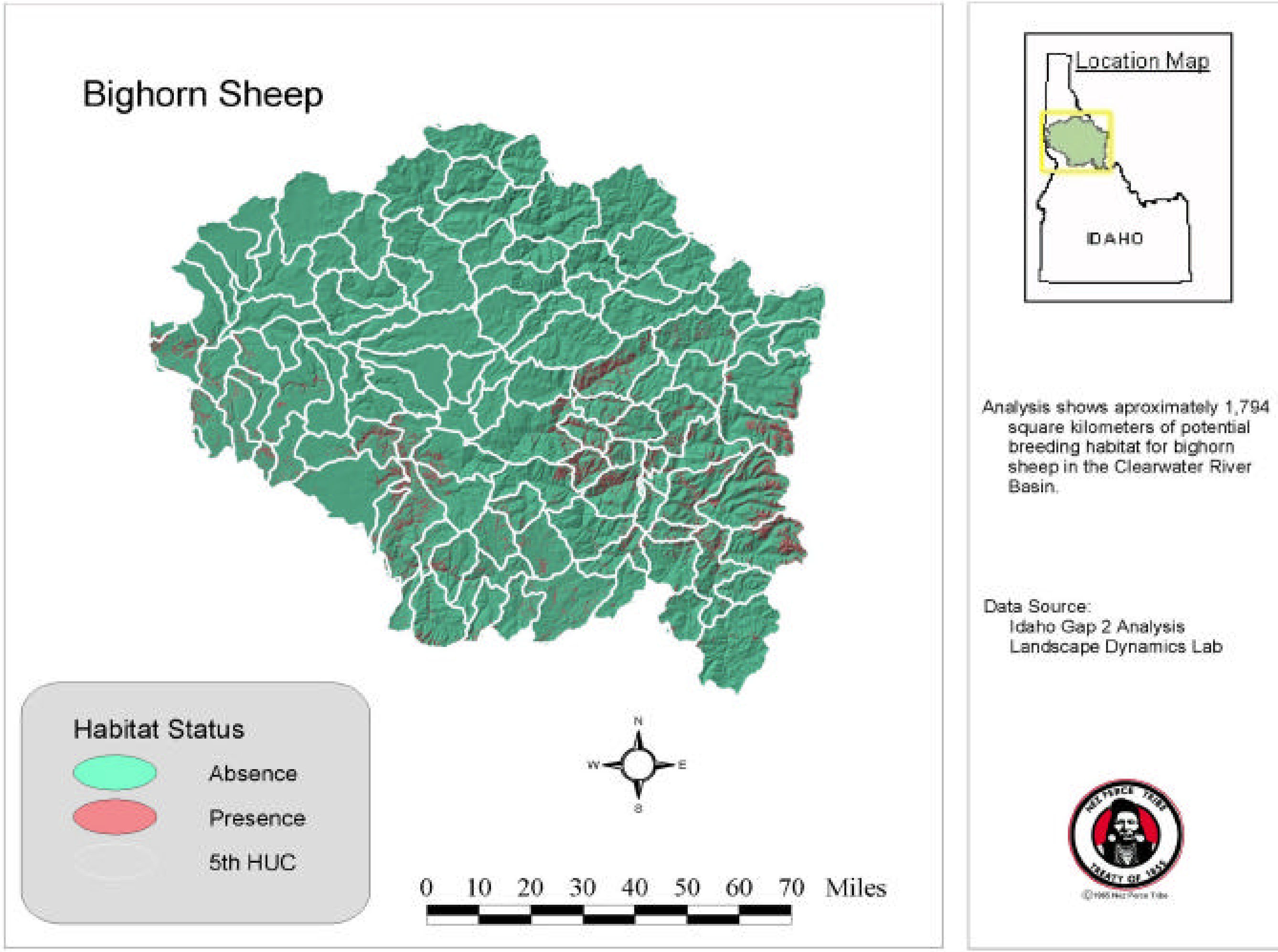

Figure 86. Potential breeding habitat for the bighorn sheep within the Clearwater subbasin

Rocky Mountain is the only race of bighorn sheep found in the Clearwater subbasin, and is greatly reduced in numbers and distribution from its historic range. Major declines in population occurred in the late 1800s and early 1900s. Overgrazing by cattle and sheep, disease, and uncontrolled hunting greatly reduced and often extirpated populations. Bighorns have increased since the 1900s due to a series of reintroductions, but much of their previous range is still unoccupied (Wisdom et al. 2000). Transplanting is necessary to stimulate new populations in unoccupied habitats because bighorn are extremely loyal to their territories and will not readily move into new ranges (Parker 1985).

Much of the bighorns' historic range is no longer suitable habitat because urbanization, cultivation, and fire suppression have permanently changed it. Native shrub and grasslands that were used as winter range have been converted to agriculture, and many of the important source habitats such as whitebark pine forests have gone through a successional transition to Engleman spruce-subalpine fir forests (Wisdom et al. 2000). These closed canopy forests offer a decrease in available forage and poor visibility for predator detection and are not preferred habitat. Some cliff areas and corridors between winter and summer ranges are currently inaccessible because bighorns will not cross through dense stands of closed timber (Wisdom et al. 2000).

6.5.2 Mountain Goat

Life History

Mountain goats (*Oreamnos americanus*) are indigenous to only three of the contiguous 48 states: Idaho, Montana, and Washington. They are usually found above timberline at elevations between 5,000 to 9,000 feet. Mountain goats did not experience the extensive population losses that most ungulate species did in the early 1900s because of their remote and relatively inaccessible habitats. In the last few decades though, many of Idaho's mountain goat populations have decreased. Some of this reduction was due to habitat fragmentation, but the main cause has been overharvest by hunters (Kuck 1985). Prior to 1960 only two years occurred in which annual goat harvests exceeded 100 animals, but in the late 1960s harvests reached a peak of 161 animals in two separate years. In 1985 tighter regulations were implemented and only 50 permits were issued (Kuck 1985).

Important habitat features include talus slopes, cliffs, and seasonal wetlands. Mountain goats show no preference for particular cover types as long as they occur on or near steep talus slopes or cliffs. According to GAP 2 data, the potential breeding habitat for the mountain goat comprises of approximately 7,104 square kilometers in the Clearwater subbasin (Figure 87). Grasses and sedges comprise most of the diet, along with lichens, mosses, ferns and shrubs (Wisdom et al. 2000). Goats ensure high winter survival rates by remaining in small groups to reduce competition for limited winter foods. Mountain lions, wolves, bobcats and grizzly bears prey upon mature mountain goats, and very young kids are preyed upon by golden eagles (Wisdom et al. 2000).

Threats

Human disturbance can disrupt mountain goats and cause displacement from source habitats. Low flying aircraft, road blasting and sonic booms cause defensive behavior, avoidance, and signs of stress. A mountain goat herd repeatedly exposed to human disturbance showed a decrease in reproduction and kid survival (Wisdom et al. 2000). Habitat fragmentation, hunting pressure, mining, and timber harvest may all have significant effects on mountain goat herds. Roads increase mortality by collision deaths and both legal and illegal hunting. Adult mountain goats are highly susceptible to hunting mortality and herds are slow to recover (Wisdom et al. 2000). Small herd size reduces competition for limited resources but increases the possible deleterious effects of inbreeding. Recent fire suppression practices have decreased the number of high mountain meadows and grasslands. In addition, lack of fire has allowed open migration corridors between critical habitat features to become dominated by coniferous forest that mountain goats will not travel through (Tesky 1993).

Limiting Factors

Mountain goats are specialized cliff dwellers. This reduces the amount of competition from other ungulate browsers, but restricts their distribution and numbers. Distance to cliffs is the most important factor determining goat distribution, and they make little use of forage more than 1,300 feet from cliffs (Tesky 1993). Salt licks are a very important habitat feature, and peak use of licks occurs in spring or early summer (Tesky 1993). The general limiting factor and cause of mortality in mountain goats, and especially young goats, is the lack of suitable forage during the winter when weather increases susceptibility to predation, parasites, disease, and accidents (Tesky 1993). Unlike other ungulates, mountain goat reproduction rates do not increase to offset losses by hunters, and the production of kids declines as the herd declines (Kuck 1985).

Historic/Current Distribution

The Region One U. S. Forest Service wildlife census of 1942 estimated the mountain goat populations of the Clearwater National Forest at 400 animals, and the Nez Perce National Forest at 110 animals (Rust 1946).

Based on Idaho Department of Fish and Game estimates, the number of mountain goats in the subbasin in 1985 was approximately 510 animals (Kuck 1985). Herds in both the Clearwater and Lochsa drainages have decreased noticeably since the 1950s, but other introduced herds have held the overall total at stable numbers. Native populations in Idaho have decreased due to a lack of new genetic stock, while introduced populations are stable or increasing (Wisdom et al. 2000).

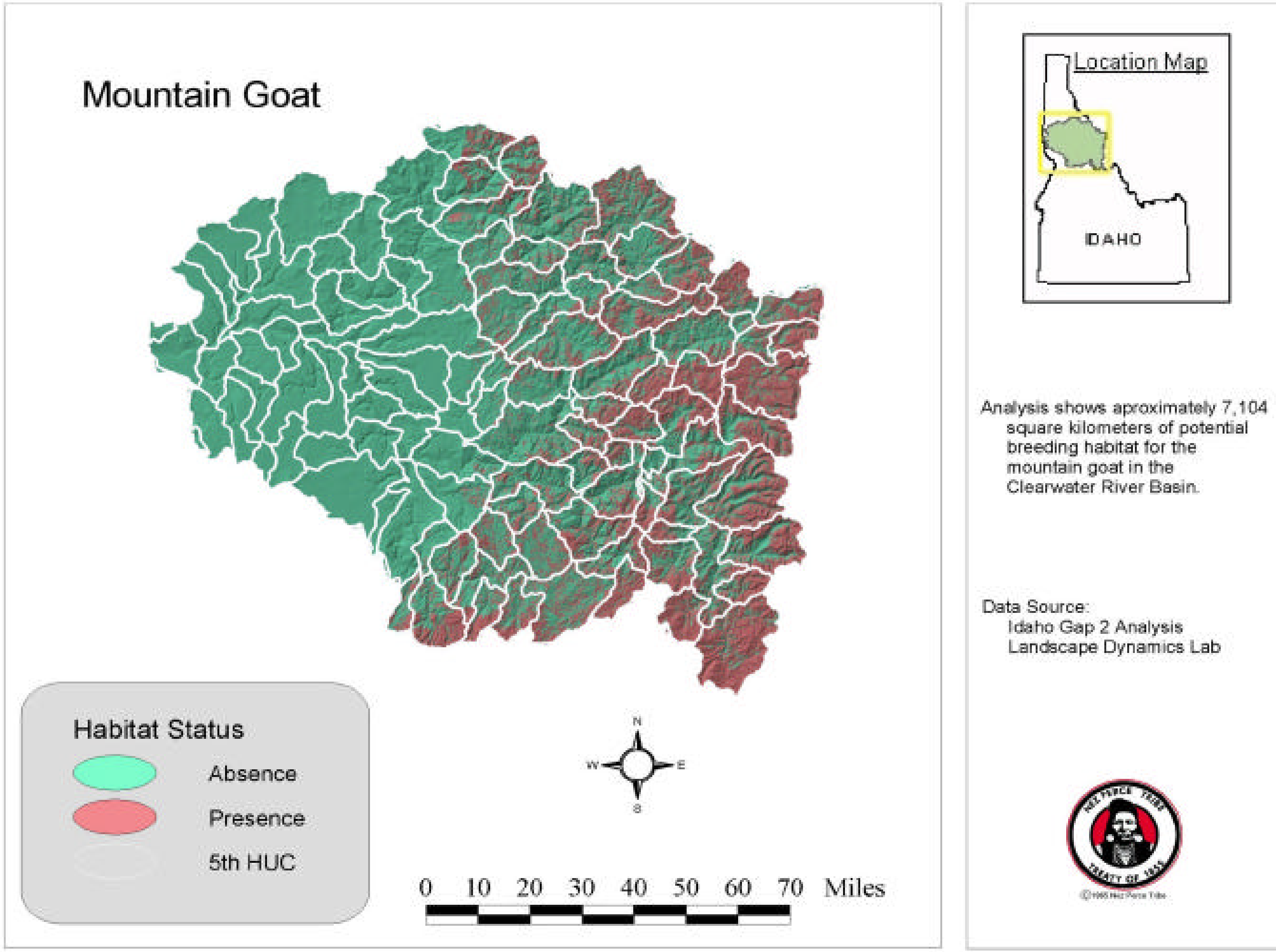

Figure 87. Potential breeding habitat for the mountain goat within the Clearwater subbasin

6.5.3 Bison

Life History

The American bison (*Bison bison*) is a gregarious bovine, and was historically widespread across North America. Early explorers told of three separate varieties: mountain bison, wood bison, and plains bison, but the distinction is thought to have been no more than a climatic or geographical variation (Garretson 1938). Classification still remains a matter of debate. The "mountain" buffalo was the variety of bison found in Idaho, Oregon, and Washington. These are characterized as being smaller, more active, more timid, and covered with a darker, silkier hair than the plains bison (Thomas 1991).

Most bison are migratory, and movements are both seasonal and altitudinal. Historically, bison would migrate southward as much as 200 miles to reach winter range. Bison thrive in open grasslands and meadows, and will use forested areas for shade and escape cover from insects (Tesky 1995). Grasses and sedges are preferred grazing forage where available, but if those species are absent bison will utilize browse (Tesky 1995).

Winterkill bison carcasses (where present) are an important food source for grizzly bears upon emergence from hibernation in the spring. GAP data depicting potential breeding area for the Clearwater subbasin is currently unavailable.

Threats

Anthrax outbreaks cause sporadic mortality in northern bison herds, and they are also susceptible to tuberculosis and brucellosis infections. The transmission of these diseases is aggravated by the gregarious nature of bison. In the past, when large herds roamed the prairies, wildfires killed hundreds of bison (Tesky 1995). The main predators of bison are gray wolf, grizzly bear, and coyote.

Limiting Factors

The basic requirements of bison are water, space, and approximately 30 lbs of forage every day, but additional influences are shelter from insects, spring weather conditions, and intensity of fall snowstorms (Tesky 1995). It is believed that severe winters, disease, and hunting pressure caused the bison's decline and disappearance.

Historic/Current Distribution

Historically, bison were widespread in North America from Alaska and western California across the United Sates and into northern New Mexico. Before European settlement, bison occurred in grasslands, semideserts, and boreal forests (Tesky 1995). Lewis and Clark traveled through Idaho in 1805 and made no reference to bison being in the Clearwater drainage. There are few reports of mountain buffalo in the northwest after the 1840s and 50s due to disease, hunting and sever weather (Thomas 1991). No evidence exists that the American bison ever occurred in the subbasin, and it is currently extirpated in the Clearwater subbasin.

6.5.4 Sharp-tailed Grouse

Life History

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) occupy mesic grasslands and shrub-steppe habitats, and their home range is usually restricted to within .75 mi of dancing grounds (Wisdom et al. 2000). Columbian sharp-tailed grouse winter almost exclusively in mountain shrub and riparian cover types where water birch and black hawthorn are present for escape cover. Sharp-tails will form coveys in the winter, and then break into small groups or individuals in the summer. Summer foods consist of insects, grasses and forbs, while winter foods are mainly hawthorn, serviceberry, and chokecherry (Marks and Marks 1988).

Threats

Loss of habitat has occurred due to farming, grazing, brush control by fire and herbicides, and severe fragmentation. As populations declined, Columbian sharp-tailed grouse were reduced to small isolated populations with little genetic variation.

Limiting Factors

Nesting/brooding cover at least ten inches tall is considered a critical habitat requirement. GAP data depicting potential breeding area for the Clearwater subbasin is currently unavailable. Chicks depend heavily on insects as a food source during the first few weeks of life, and sufficient insect populations are necessary to ensure good chick recruitment. Stream drainages that contain berries and forbs year-round are important feeding sites in the late summer and during droughts (Hays et al. 1998).

Historic/Current Distribution

The historic range of Columbian sharp-tailed grouse extended from British Columbia down to northeastern California, and east to Colorado and Utah. All six of the subspecies of sharp-tailed grouse have drastically declined throughout North America, and the Columbian subspecies is the rarest. Sharp-tails were plentiful when early explorers came west, and Lewis and Clark were the first to describe the Columbian subspecies (Hays et al. 1998). Sharp-tailed grouse were extirpated from much of their historic range by the 1920s. Agricultural practices in the late 1800s initially benefited sharp-tails, but continued conversion of grasslands to croplands and increased human settlement contributed to population decline (Hays et al. 1998). Columbian sharp-tailed grouse were historically associated with the Camas Prairie, but they have since been extirpated in the Clearwater subbasin. They currently occupy less than 10% of their historic range (Engle and Harris 2001).

6.5.5 Mountain Quail

Life History

The mountain quail (*Oreortyx pictus*) is a secretive bird and most often found in areas of steep terrain with dense shrubs (Heekin and Reese 1995; Wisdom et al. 2000). Winter habitat of mountain quail typically consists of mixed brush or riparian shrubs, and chokecherry, serviceberry, and rose are important habitat components (Wisdom et al. 2000). Diet consists of bulbs, succulent greens, conifer seeds, fruits from various shrubs, and insects (Johnsgard 1973; Wisdom et al. 2000). During the breeding season mountain quail utilize riparian/shrub, conifer/shrub and mountain shrub communities (Heekin and Reese 1995). Nests are usually well concealed, often placed under pine branches, at the base of trees, beside boulders, or in dense shrubby or herbaceous vegetation (Johnsgard 1973). Male mountain quail take an active part in brood rearing and will perform distraction displays to protect the nesting female, or may form a brood patch and incubate eggs if the female is killed. There is little evidence that more than one brood is produced in a year, but pairs may attempt to nest a second or third time if they are initially unsuccessful. Occasionally mountain quail will hybridize with California quail (Johnsgard 1973). According to GAP 2 data, the potential breeding habitat for mountain quail comprises approximately 3,313 square kilometers in the Clearwater subbasin (Figure 88).

Threats

Water impoundments, grazing, residential development and intense agricultural activities can alter the extent, composition, and structure of mountain quail habitat (Wisdom et al. 2000). Fire suppression, logging activities, and the loss of riparian shrub habitat to water impoundment have reduced the amount of shrub dominated habitat favored by mountain quail (Wisdom et al. 2000). Human encroachment negatively affects nesting/brood- rearing pairs, and domestic dogs and cats are effective predators of quail (Wisdom et al. 2000). Competition with chukar can possibly displace mountain quail (Engle and Harris 2001).

Limiting Factors

In unusually dry years, little or no nesting occurs, and coveys will be comprised entirely of adults (Johnsgard 1973). Nests are primarily located within 200-300 yards of water since chicks require water soon after hatching (Johnsgard 1973; Wisdom et al. 2000).

Historic/Current Distribution

The initial mountain quail population of Idaho may have stemmed from an introduction effort in British Columbia during 1880 (Johnsgard 1973). Mountain quail populations have been declining in the intermountain west for the past several decades, and the Idaho population has experienced the same pattern of decline since the 1930s (Heekin and Reese 1995). Populations have undergone broad regional and local extinctions in Idaho as a result of anthropogenic changes to key aspects of their habitat (Engle and Harris 2001). Populations occur in Idaho along the Snake, Boise, Clearwater and Salmon Rivers, in spite of hydroelectric impoundments along the Columbia River tributaries that have flooded thousands of acres of low-elevation mountain quail winter habitat. Remaining habitat areas are fragmented and populations often exist in isolated islands (Wisdom et al. 2000).

The mountain quail is susceptible to local extirpation, and due to a lack of data its status within the subbasin is unknown. Heekin (University of Idaho, personal communication, January 30, 1996) notes that in the mid-part of the century, mountain quail occurred as far east as the interior of the Selway-Bitterroot Wilderness, and as late as the 1970s they were still present along the Selway River near Fenn Ranger Station. Within the Idaho Fish and Game Conservation Data Center there are 13 mountain quail sightings recorded in the Clearwater subbasin, the last record was entered in 1997. Between 1961 and 1998 there have been 18 observations of mountain quail near the North Fork Clearwater drainage (Dixon 2001).

6.5.6 Sandhill Crane

Life History

Six subspecies have been attributed to the sandhill crane (*Grus canadensis*) species. The greater sandhill crane, (*G. c. tabida*), is the largest of the subspecies and occurs in Idaho. The greater sandhill crane historically occupied the Clearwater subbasin but birds had been absent for many decades until 2002 when two pairs were confirmed on the Weippe Prairie.Despite the return of these birds, suitable nesting areas remain currently unoccupied in the Clearwater (Lewis 1977). GAP data depicting potential breeding area for the Clearwater subbasin is currently unavailable.

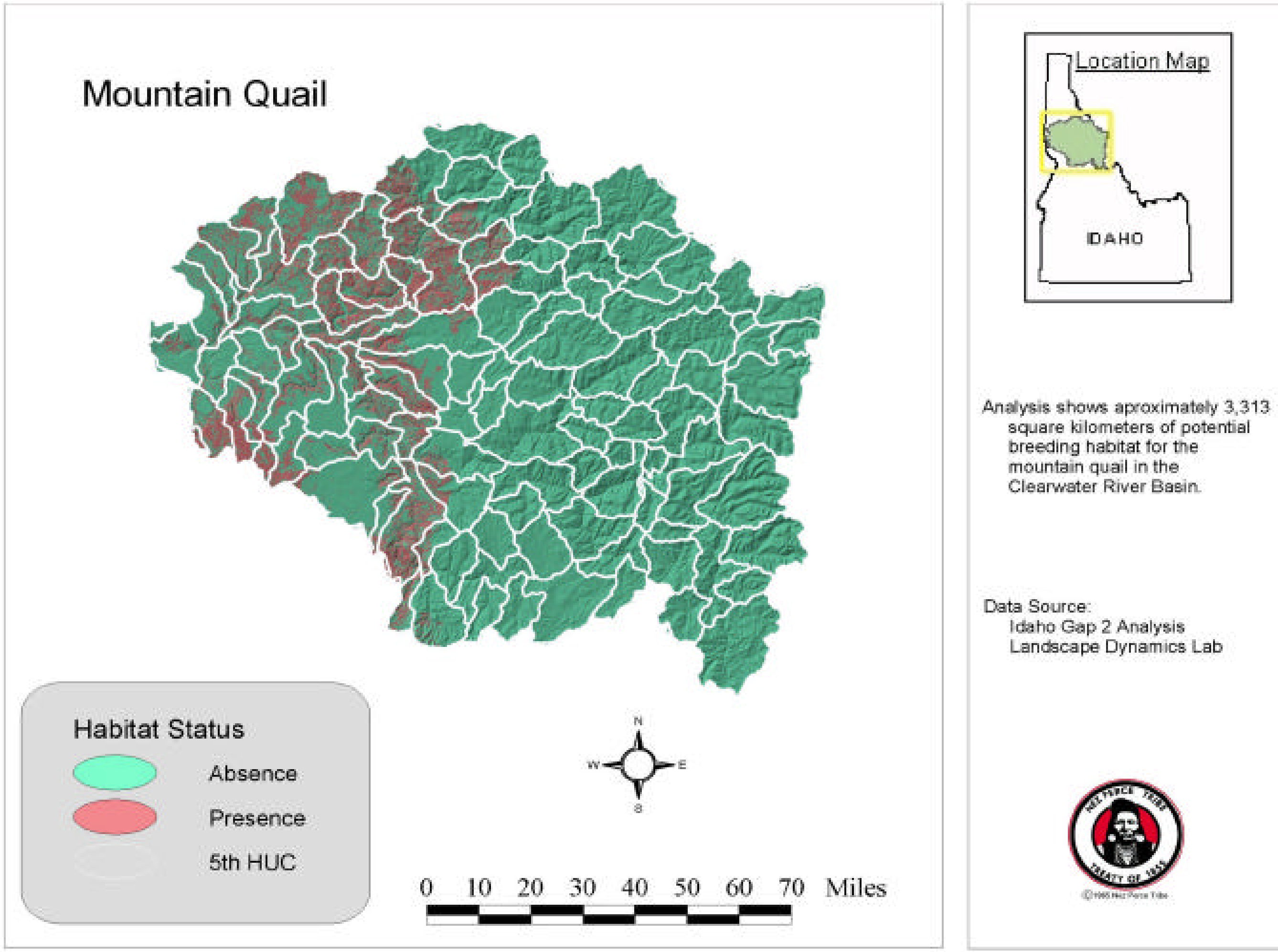

Figure 88. Potential breeding habitat for the mountain quail within the Clearwater subbasin

Sandhill cranes are omnivorous, feeding on a wide variety of plant materials (including waste grains) and small vertebrates and invertebrates, both on land and in shallow wetlands. Cranes tend to select remote and isolated wetlands for nesting, but in agricultural areas, they prefer nesting close to cultivated fields. The size of nesting territories varies widely within the breeding range, and breeding territories in Idaho average 17 ha. (Cranes 2001). The breeding grounds of the Rocky Mountain population of greater sandhill cranes are in west-central Montana, central and eastern Idaho, northeastern Utah, western Wyoming, and northwestern Colorado, while the main wintering grounds are in the middle Rio Grande valley of New Mexico (Cranes 2001). Habitats along migration routes tend to be open marshes and riparian wetlands near agricultural areas, while wintering habitats include riparian wetlands, wet meadows, and pastures.

Threats

The destruction and degradation of habitats, especially wintering grounds, breeding grounds, and migration stopovers, comprise the most important current threat to the greater sandhill crane (Cranes 2001). The habitats of the Rocky Mountain population are increasingly affected by residential and commercial development, changing agricultural practices, drainage of wetlands, water diversions, oil and gas exploration, development, and other land use changes (Cranes 2001). The population may now be declining due to the effects of regional drought, poor survival of chicks, and increased hunting pressure (Cranes 2001). Lead and mycotoxin poisoning, abnormal predation pressures, and collisions with fences, vehicles, and utility lines have been shown to negatively impact some populations of sandhill cranes (Cranes 2001).

Limiting Factors

Key habitat features are wet meadows for feeding, and roosting areas (Lewis 1977). Loss of suitable roosting habitat has caused high concentrations of migrating cranes, increasing the risks associated with disease (Cranes 2001). Isolation from human activity is important in nest site selection, and nest abandonment caused by human disturbance has been reported (Armbruster 1987).

Historic/Current Distribution

The sandhill crane was extirpated from the Clearwater subbasin since the mid 1900's but two pairs have been documented on the Weippe Prairie during 2002 and 2003. These birds have occupied the prairie during the spring and summer but nesting has not been documented (Rita Dixon, IDFG, Pers. Comm. 10-14-03).A small population currently exists in southeastern Idaho during the breeding season. The Rocky Mountain population of greater sandhill cranes had been more abundant prior to European settlement. Hunting, agricultural expansion, drainage of wetlands, and other habitat changes in the 18th and 19th centuries led to the extirpation of the greater sandhill crane from many parts of its breeding range, and the Rocky Mountain population reached an historic low of 150-200 breeding pairs in the 1940s (Cranes 2001). They have recovered dramatically, but may now be declining due to the effects of drought, poor chick survivorship, and hunting pressure. The western Rocky Mountain population is currently slightly declining, and has been estimated at 18,000-21,500 animals throughout its range (Cranes 2001).

6.6 Culturally or Economically Important Species

Many wildlife species can be considered important economically or culturally. Human use of such species adds to our cultural, economic, and spiritual well being. A complete discussion of all such species within the Clearwater subbasin is outside the scope of this document. The

Clearwater Terrestrial Subcommittee of the Clearwater Policy Advisory Committee decided to include elk to represent the culturally and economically important species within the subbasin. Elk have always been, and continue to be, important to the human inhabitants of the subbasin.

6.6.1 Elk

Life History

Elk (*Cervus elaphus*) are a significant wildlife component in the subbasin, both for recreational and economic reasons. Elk are found throughout the Clearwater subbasin although fewer animals are located in the southwestern quarter due to heavy agricultural land uses. They are an important game species for both subsistence and trophy hunting opportunities.

Elk habitat consists of summer and winter range. Generally, winter range is located at lower elevations than summer range and has less snow cover. Approximately 42.5% of the Clearwater subbasin has been classified as winter range (Rocky Mountain Elk Foundation 1999). Most of this winter range lies in the bottoms of major river drainages at lower elevations (Figure 89). During winter, cow elk seem to prefer shrub habitats compared to bull elk, which use more open timber types (Unsworth et al. 1998). Older bulls also tend to use higher elevation benches or ridgetop sites with heavier snowfall compared to habitat used by younger bulls and cows (Unsworth et al. 1998).

High quality forage is an important component of elk winter range. The kinds of plant material eaten by elk include grasses, forbs, and the tips of twigs from some woody vegetation (Csuti et al. 1997). Availability of different forage components varies throughout the subbasin. Areas located farther up the drainages consist largely of open or closed forests and shrub fields while lower down in the drainage wintering areas have fewer shrubs available and more grass species. On the Craig Mountain Wildlife Area within Snake River drainage Johnson (1986) found that winter diets of elk was comprised largely of bunchgrasses (88.8%) followed by forbs (9.6%) and shrubs (1.4%). Similar patterns of forage utilization may be expected within the Lower Clearwater, South Fork Clearwater, and Lower North Fork Assessment Units, which have a high proportion of their winter range in canyon grassland and open conifer forest communities.

Within the Lochsa, Selway, and Upper North Fork Assessment Units, shrub fields and conifer forests provide a higher proportion of winter forage than grassland sites. Species such as redstem ceonothus, serviceberry (*Amelanchior alnifolia*), maple, bitter cherry, and syringa provide much of the winter forage available to elk (Leege 1979).

The majority of the Clearwater subbasin is considered summer range for elk (Rocky Mountain Elk Foundation 1999). Summer range overlaps with wintering areas, but animals tend to move to higher elevations as the snow melts and additional forage becomes available. Approximately 8% of the Clearwater is considered unsuitable as elk summer range, largely due to conflicts with agricultural land uses and the proximity of human population centers. All of the unsuitable area lies within the Lower Clearwater Assessment Unit (Figure 90).

Important habitat components on spring, summer, and fall range include foraging sites, cover, calving areas, and security areas. Summer habitat use is influenced by disturbance factors such as roads. Unsworth et al. (1998) found that elk in roaded areas had increased use of closed-canopy cover types compared to elk in non-roaded areas, which had increased use of open canopy forest types. Older bulls in particular tend to prefer timbered cover types (Unsworth et al. 1998). This research suggests that security areas free from disturbance may be an important factor in habitat use of elk in the Clearwater subbasin.

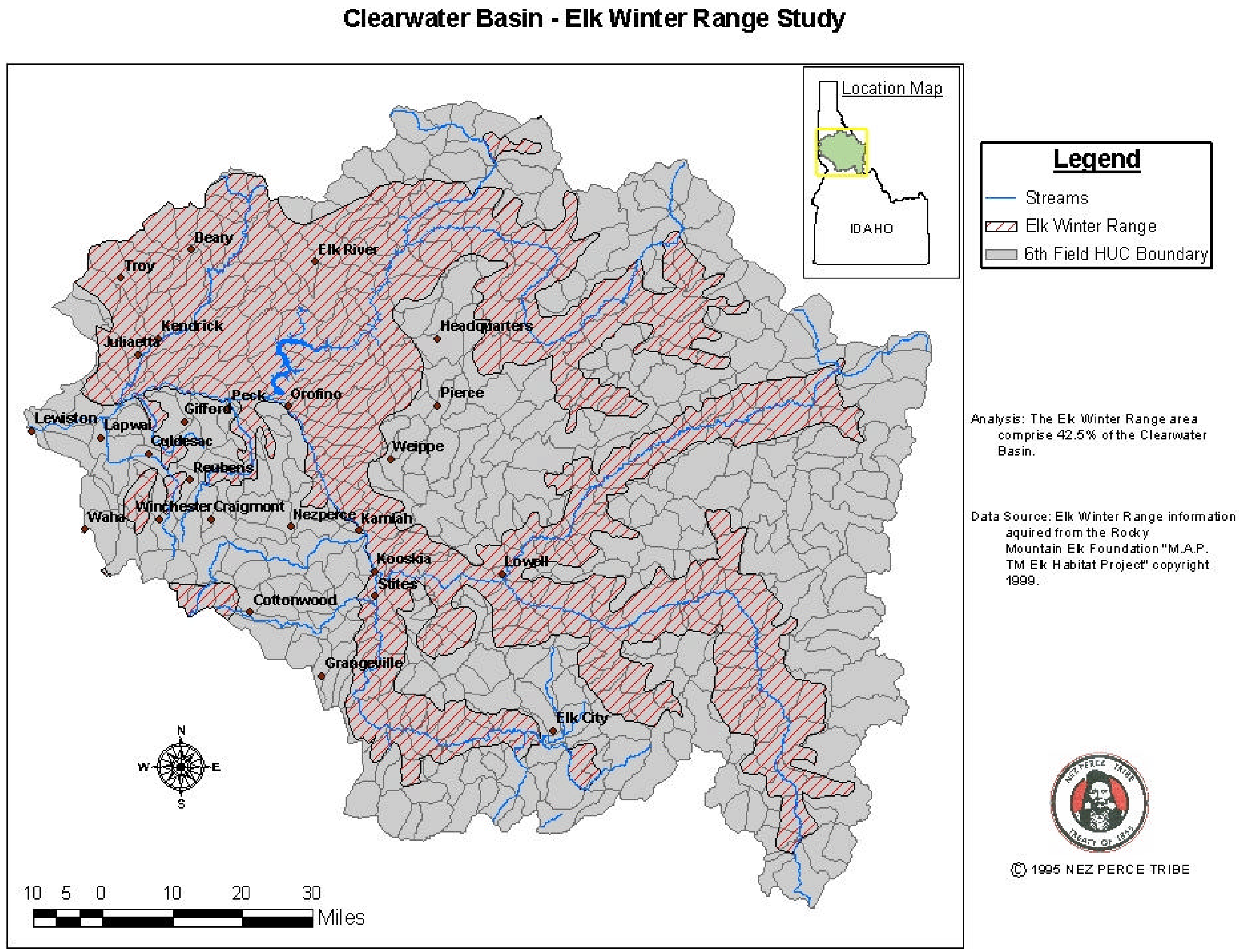

Figure 89. Elk winter range within the Clearwater subbasin (RMEF 1999)

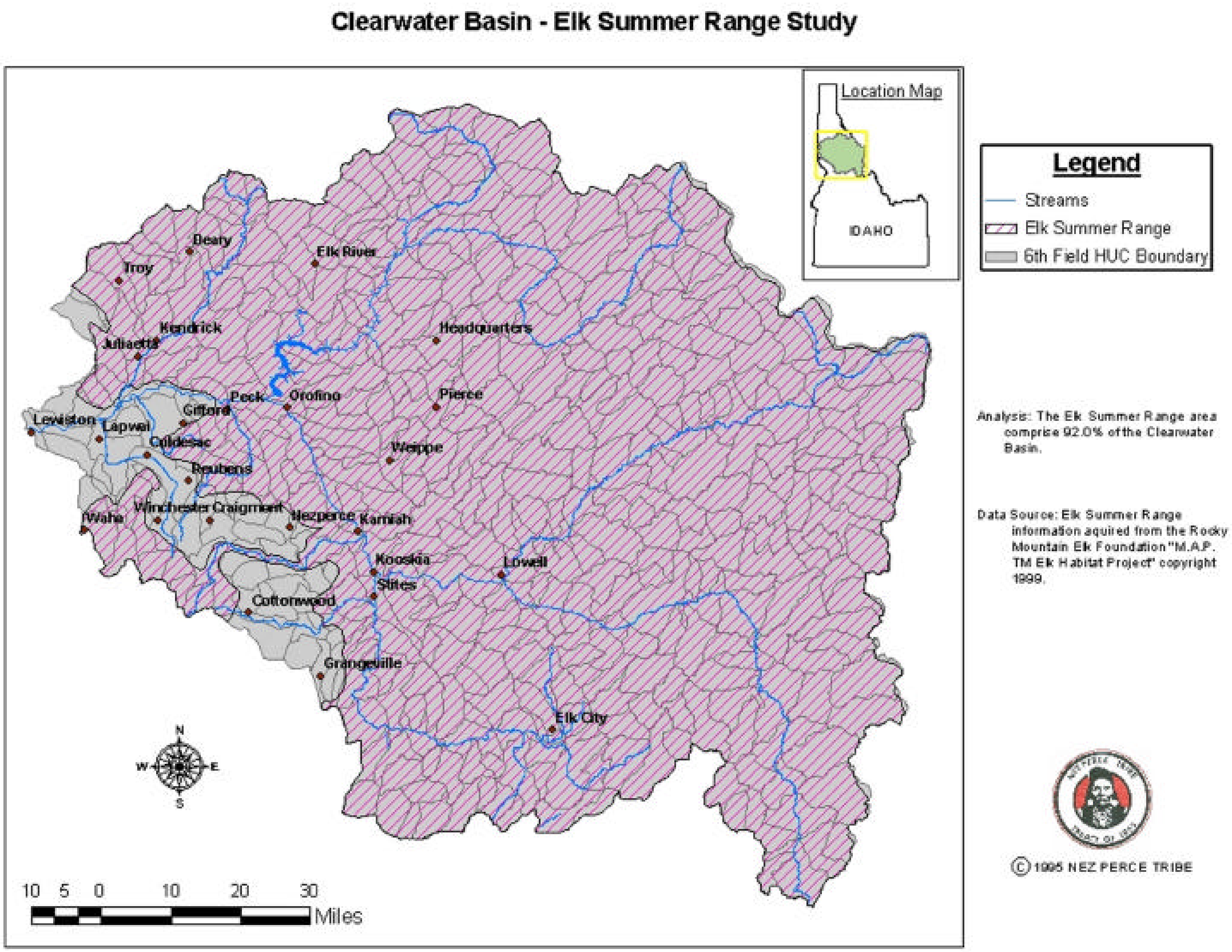

Figure 90. Elk summer range within the Clearwater subbasin

Threats

Early seral communities or shrub fields provide high quality forage on both summer and winter range. The large-scale fires that occurred early in this century to the benefit of elk habitat have been followed by nearly 50 years of fire suppression and forest succession. This has resulted in widespread habitat change as early seral stands have been replaced by closed canopy, more densely forested habitats (see Figure 46), smaller forest patches are replaced by larger less diverse homogeneous stands, and winter range shrub fields become senescent and less palatable (Leege 1969, 1979). Thick, decadent shrub fields also provide excellent cover for ambush predators such as black bear and cougar (S. Nadeau, Idaho Department of Fish and Game, personal communication, October 2001). Predation on elk calves has contributed to low cow/calf ratios within the Lochsa AU and other areas of the Clearwater subbasin. The amount of early seral vegetation in the North Fork Clearwater has declined from a historic average of 35-45 percent to approximately 14 percent (Clearwater National Forest Files 1999, cited in Servheen and Bomar 2000).

The availability and quality of low elevation winter range is a concern within the Clearwater subbasin. Many of the low elevation sites are inhabited by people, contain major highways, or have been significantly altered due to cheatgrass and noxious weeds. Noxious weeds have already infested a minimum 4.38% of elk winter range within the subbasin (Figure 91). Spotted knapweed and yellow starthistle are of particular concern because of their aggressive habits and ability to readily colonize new areas by dispersing along road corridors. Palatability of these species is poor and they displace native species that elk prefer. Cheatgrass is also an issue on winter range because it an unreliable food source (Roberts 1991). During drought periods it produces significantly less forage than native bunchgrasses so elk that are already stressed by poor summer forage due to drought then reach wintering areas with less available forage. In good years, cheatgrass can, however, provide palatable forage for big game species.

Livestock can negatively impact elk by competing for forage, altering habitat use patterns, and creating soil disturbance, which increases noxious weed invasions. The timing, duration, and intensity of livestock grazing can all influence the magnitude and direction (positive or negative) of change to plant populations and elk habitat values (Mackie 1978). The presence of livestock can also directly influence elk movement and habitat use because elk tend to avoid livestock if possible (Mackie 1978). Interspecific interaction can also occur between livestock, elk and deer species inhabiting sympatric range. Currently, approximately 35.9% of the subbasin is used for commercial livestock grazing (Figure 92).

Human habitation and land use is a limiting factor for elk within the Clearwater subbasin, particularly within the Lower Clearwater AU. Most of the human population resides within the Lower Clearwater (Figure 93). A combination of housing and road density with land use patterns result in poor habitat quality for elk. In addition, conflicts between agricultural production and elk depredation has resulted in historic removal (harvest) of elk within management units 8 and 8A (S. Nadeau, Idaho Department of Fish and Game, personal communication, October 2001). Concentrations of people also limit elk habitat values as a result of disturbance, land conversion, increased noxious weeds, and mortality from vehicle collisions, and domestic dogs.

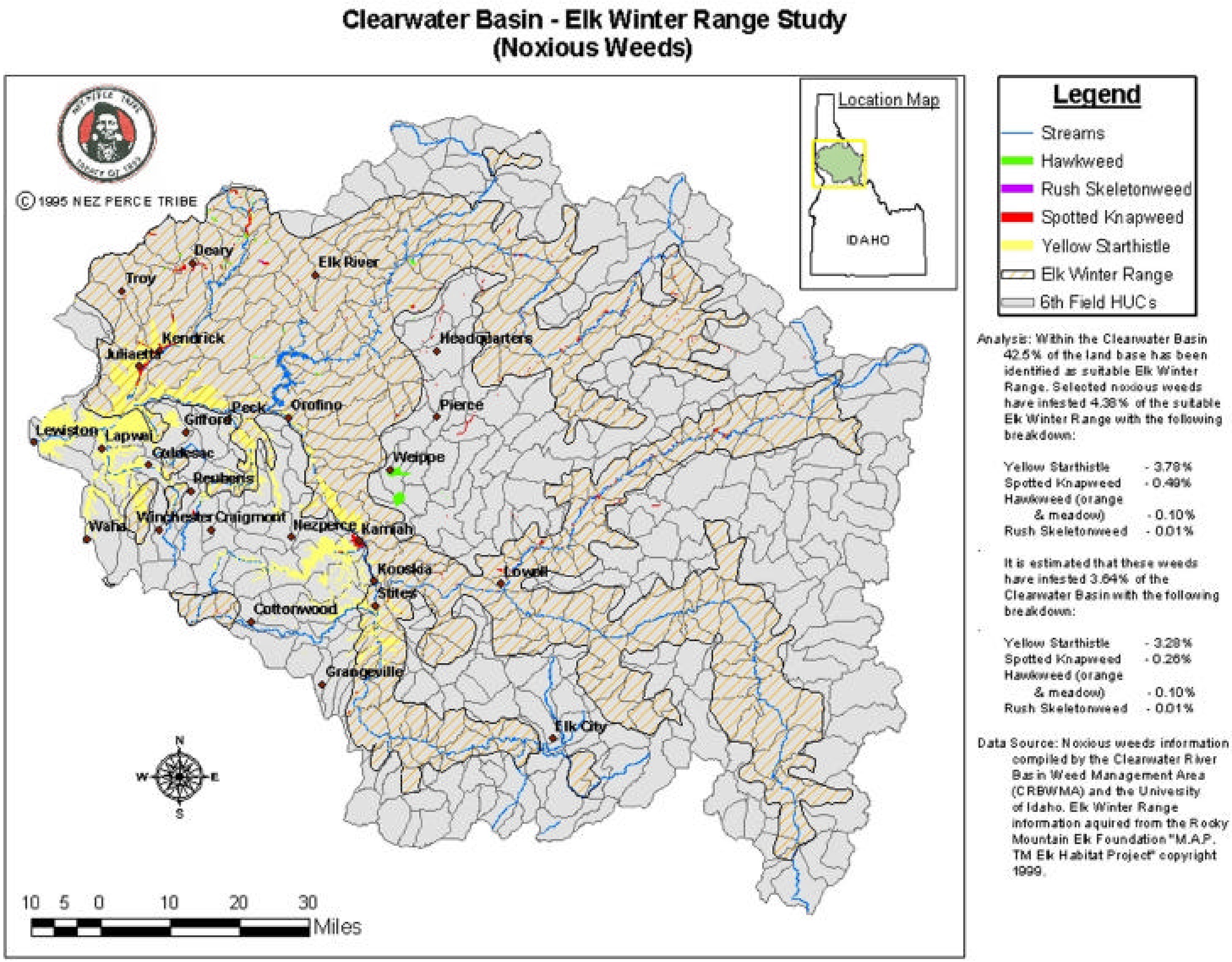

Figure 91. Relationship of selected noxious weed species to elk winter range within the Clearwater subbasin

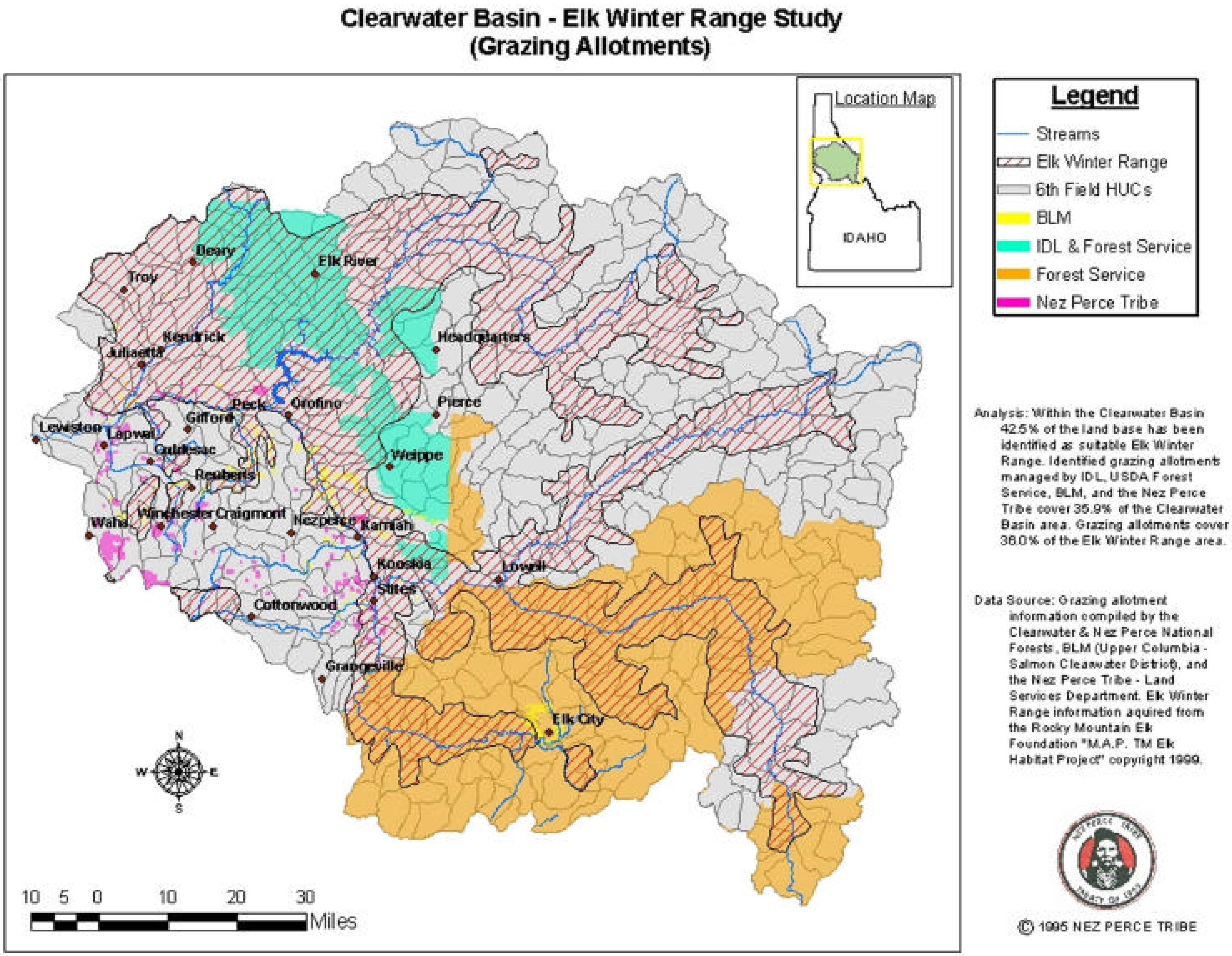

Figure 92. Spatial relationship of active livestock allotments and elk winter range within the Clearwater subbasin

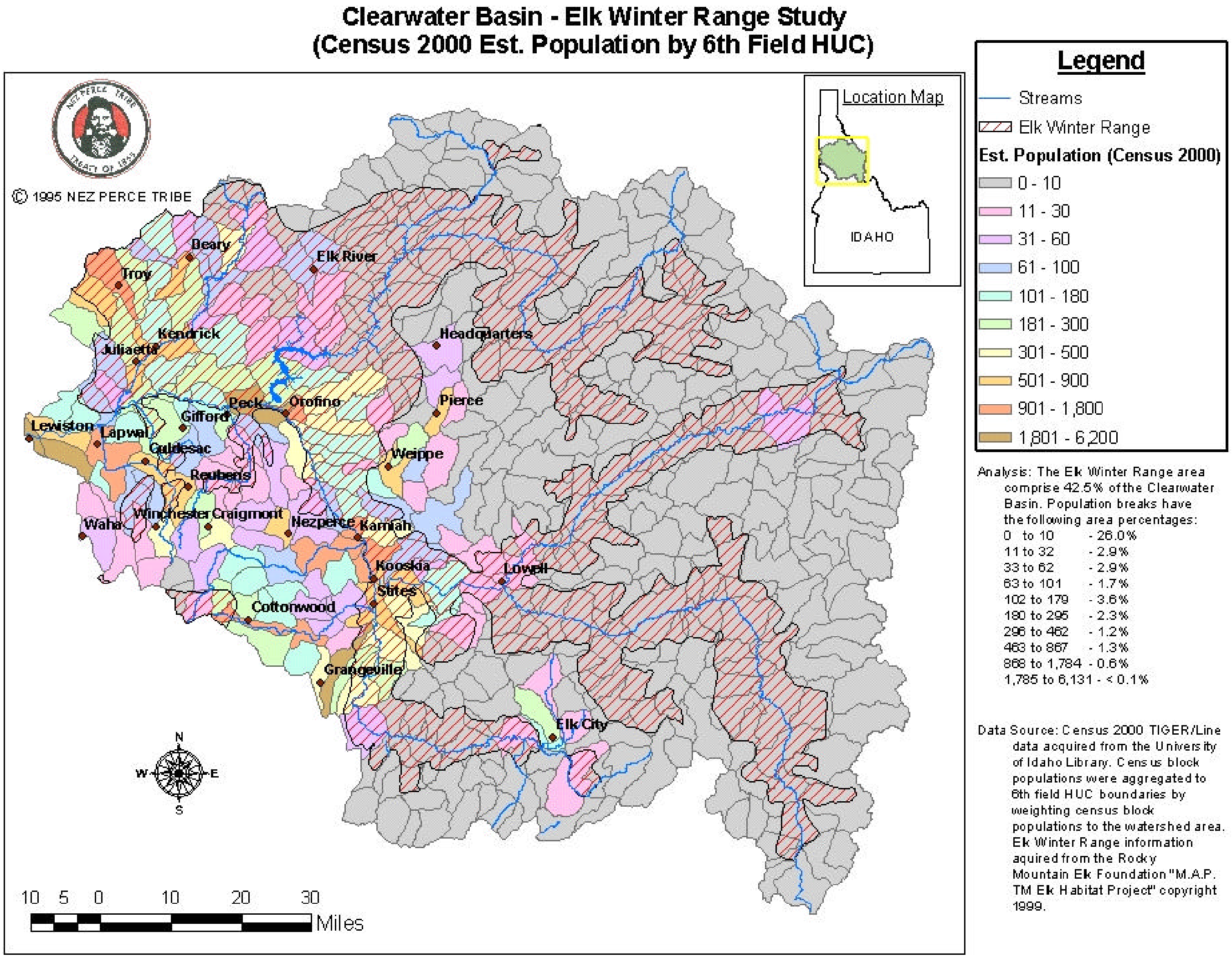

Figure 93. Spatial relationship of human population density to elk winter range within the Clearwater subbasin

Land management activities also contribute to limiting factors for elk in the Clearwater subbasin. Habitat fragmentation due to road construction, mining, and development has contributed to lowered habitat values in some areas of the subbasin. High road densities within the Lower North Fork, South Fork, and Lolo-Middle Fork AUs are of particular concern (See Figure 35). The following discussion explains the negative impacts of open roads on elk within the Clearwater subbasin.

Roads and Habitat Use

Due to vehicular traffic, habitat adjacent to forest roads is avoided by elk (Hieb 1976; Perry and Overly 1977; Lyon 1979; Rost and Bailey 1979). Even though habitat near roads is not denied to elk, it is not fully used (Lyon 1983). The width of the area avoided by elk has been reported as 0.25-1.8 miles, depending on the amount and kind of traffic, quality of the road, and density of cover adjacent to the road (Thomas and Toweill 1982). Roads themselves are not to blame since closed roads are often used as travel corridors for elk (Marcum 1979) as well as a variety of other species. The amount of traffic is the limiting factor in determining how much elk use will occur (Leege 1984) in habitat adjacent to roads.

Heavily used forest roads have a much greater effect on elk use of habitat than do primitive roads (Marcum 1979; Perry and Overly 1977; Leege 1984). However, there is some indication that elk respond less to constant non-stopping vehicle traffic than to slow vehicles which periodically stop (Ward 1976; Leege 1984) and disturb wildlife. Disturbance from traffic during the critical wintering period can impact winter survival rates. Perhaps more significant is the avoidance of wintering habitat adjacent to open roads.

Roads and Hunting Pressure

Hunted elk avoid open roads and select habitats as far as possible from the nearest open road (Irwin and Peek 1979; Unsworth et al. 1998). Despite the fact that elk densities adjacent to open roads are reduced, the harvest rate on elk remaining is much higher because of high hunter densities (Daneke 1980). Those elk that remain in areas with open roads are three times more likely to be killed (Hurley and Sargent 1991). In one study, nearly twice as many elk were killed within a quarter mile of open roads as any subsequent quarter mile interval (Daneke 1980). Road density and pattern, including off-road travel, are important in determining the security an area provides to elk during the hunting season (Basile and Lonner 1979).

Bull elk vulnerability has been documented to be at its highest in areas with open roads, reduced in areas with closed roads, and lowest in roadless areas (Leptich and Zager 1991; Unsworth and Kuck 1991). In the Coeur d'Alene River drainage, it was found that access-associated mortality rates had a marked effect on the age structure of bull elk populations. In roaded areas, essentially no bulls lived beyond 5.5 years of age (Leptich and Zager 1991).

Roads and Disturbance

Roads and associated disturbances have been presumed to be the primary agent driving elk distribution across seasons and landscapes (Leege 1984; Lyon 1979). Study results have indicated that expanding road systems and/or increasing traffic volumes, negatively affect elk distribution (Rost and Bailey 1979). A reduction in elk movement due to decreased vehicular traffic and human harassment may benefit the survivability of elk and the recruitment of calves. Reduced movements suggest that elk expend less energy (Cole et al. 1997) and the potential benefits of reduced energy expenditure include increased fat reserves, increased survival rate and increased productivity (Cole et al. 1997). Elk herds within the region have shown signs of decline. The potential to increase habitat use by closing roads is one way to help improve area elk herds.

When roads are built, elk security is lost and access management cannot completely mitigate that loss (Leptich and Zager 1991). Security areas are areas elk retreat to for safety when disturbance on their usual range is increased (Leege 1984). Such would occur during hunting season or any other human intrusion. The value of a secure area depends on the distance from open roads and the amount of cover available. Secure areas must be at least 250 continuous acres that are more than 2 miles from open roads (Leege 1984). Road closures either permanent or temporary will effectively increase security for hunted elk; but a more productive consideration involves prevention of habitat fragmentation (Lyon and Canfield 1991).

Road Densities

Road density varies within the Clearwater subbasin with the highest densities reached within commercial timber harvest areas within the Lower North Fork, Upper North Fork, and Lolo/Middle Fork AUs (refer to Figure 36). Isolated areas of high road density also occur near Grangeville, Elk City and along the Lochsa near Powell. Nearly all winter range areas have some level of open road density (Figure 94).

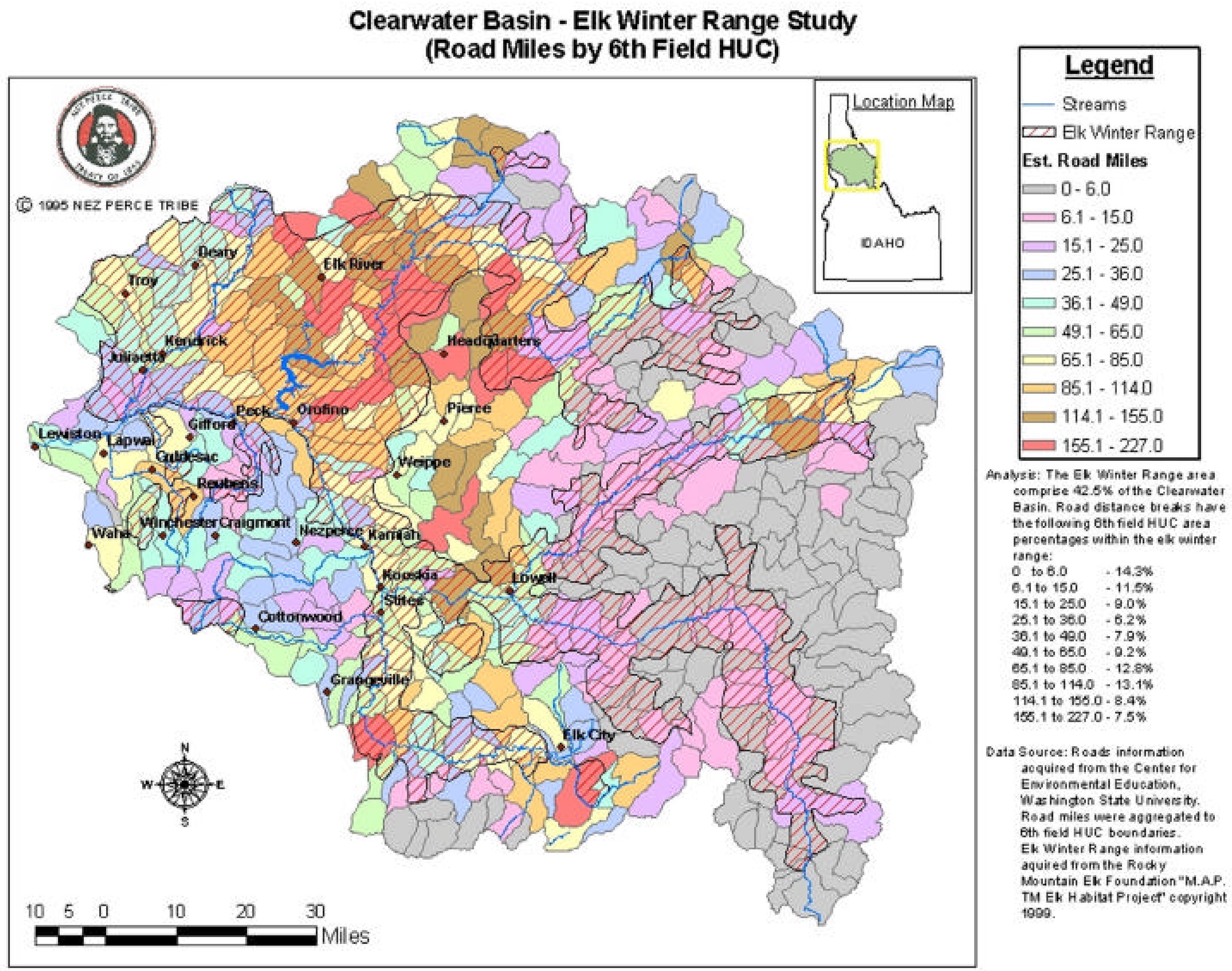

Figure 94. Relationship of localized road miles to elk winter range within the Clearwater subbasin

Limiting Factors

Poor nutritional quality of forage is a threat to the Clearwater elk herd. Changes in nutritional quality has resulted from fire suppression, succession, livestock grazing, noxious weed invasions, and land conversions. Loss of early seral plant communities due to fire suppression is of particular concern. Shrub fields are becoming decadent and too tall for effective foraging. A lack of selenium may also threaten elk nutrition within the Lochsa AU (S. Nadeau, Idaho Department of Fish and Game, personal communication, October 2001). The encroachment of noxious weeds onto low elevation winter range is also contributing to poor forage quality within the subbasin. Many noxious weeds are unpalatable while others provide unreliable or seasonally restricted food supplies. Forage removal by domestic livestock can also impact the availability and quality of forage for elk on both summer and winter range.

Poor recruitment threatens the long-term survival of elk within the Clearwater subbasin. Cow:calf ratios have consistently declined over the last decade (Idaho Department of Fish and Game, unpublished data). The direct cause of these declines is unclear but is likely due to poor condition of cows, low calf weights, and/or high predation rates.

Predation by black bears (*Ursus americanus*), cougars (*Puma concolor*), coyotes (*Canis latrans*), wolves, and humans can all threaten elk populations. Black bear, coyotes, and cougar tend to predate young animals while wolves prey on young, old, and/or injured animals. Habitat conditions can contribute to high predation rates. Dense shrub stands can provide good cover for black bear and other predators, while habitat fragmentation can contribute to high hunter success because security areas are limited.

Humans illegally harvest all types of elk, but regulated harvest is largely limited to adult males. Poaching is a significant problem within the subbasin with estimates of illegal take ranging as high as 50% that of legal harvest (S. Nadeau, Idaho Department of Fish and Game, personal communication, October 2001). Losses from wounding and escapement during fall hunting season are also a concern. Predation rates by humans increase near roads (Daneke 1980).

Severe winter weather has the potential to limit elk numbers. Cold temperatures and heavy snowfall can decrease winter survival rates and increase vulnerability to predation. Poor quality forage, human disturbance and/or habitat fragmentation can acerbate such conditions. Significant die-off events have occurred within the Clearwater subbasin in 1948-49 and 1996-97.

The Clearwater elk herd does not appear to be threatened by major disease occurrences. The herd is free of brucellosis and no evidence of chronic wasting disease has been found (S. Nadeau, Idaho Department of Fish and Game, personal communication, October 2001).

Historic/Current Distribution

The elk populations in the subbasin have change dramatically over time (Space 1964). Archaeological evidence from digs in the Clearwater subbasin suggests that elk have inhabited this area for more than 10,000 years (Clearwater National Forest 1999). In the late 1800s and early 1900s, elk abundance and distribution in the Clearwater was slim and scattered. The already scattered and sometimes sparse populations were impacted in the 1860s when thousands of gold miners took advantage of the unlimited hunting in some areas (Clearwater National Forest 1999).

Several extensive wildfires between 1910 and 1934 removed expanses of overstory and opened up a large forage area. Portions of the area were declared a wildlife reserve, allowing the elk to respond to this increase in forage. The subbasin's elk population grew to over 36,000 elk (U.S. Department of Agriculture 2000). By 1935, elk were becoming so plentiful, that the Clearwater Forest grazing report stated that elk were depleting their winter range. Although there is no documentation, forest personnel suspect that the elk population reached its peak in 1948. The severe winter of 1948-1949 greatly reduced the population size and since then hunting pressure has kept the population below the suspected 1948 peak (Space 1964).

From 1954 to1957 the Idaho State Fish and Game Department conducted a Game and Range study of the Clearwater that indicated a significant increase in the population (Space 1964). In 1976 hunting restrictions were enacted that only permitted bull hunting (U.S. Department of Agriculture 2000b). This allowed for an increase in population that continued for about 15 years (U.S. Department of Agriculture 2000b), until the subbasin's elk population declined in the 1990s (U.S. Department of Agriculture 2000b). In 1997, a significant drop occurred in the elk populations within certain parts of the subbasin when deep snow covered elk winter range (U.S. Department of Agriculture 2000).

Recent data (Figure 95) shows the Clearwater elk populations are in decline within some management units (Idaho Department of Fish and Game, unpublished data). Elk numbers within Lolo management units 10 and 12 show a particularly significant decline from approximately 15,270 animals in 1989 to approximately 7,745 animals in 1997-98. Elk numbers within the Selway units 16A and 17 also show a slight downward trend. Elk numbers within the Dworshak unit 10A and Elk City units 15 and 16 appear to be relatively stable over the last 12 years (Figure 95). Calf:cow ratios have consistently declined in all units over the last 10-15 years. The greatest declines have been observed in management units 10, 10A, and 12 (Dworshak and Lolo). Reasons for these declines are unclear but may be related to changes in forage quality, predation, declining security cover, human disturbance, and/or hunting pressures.

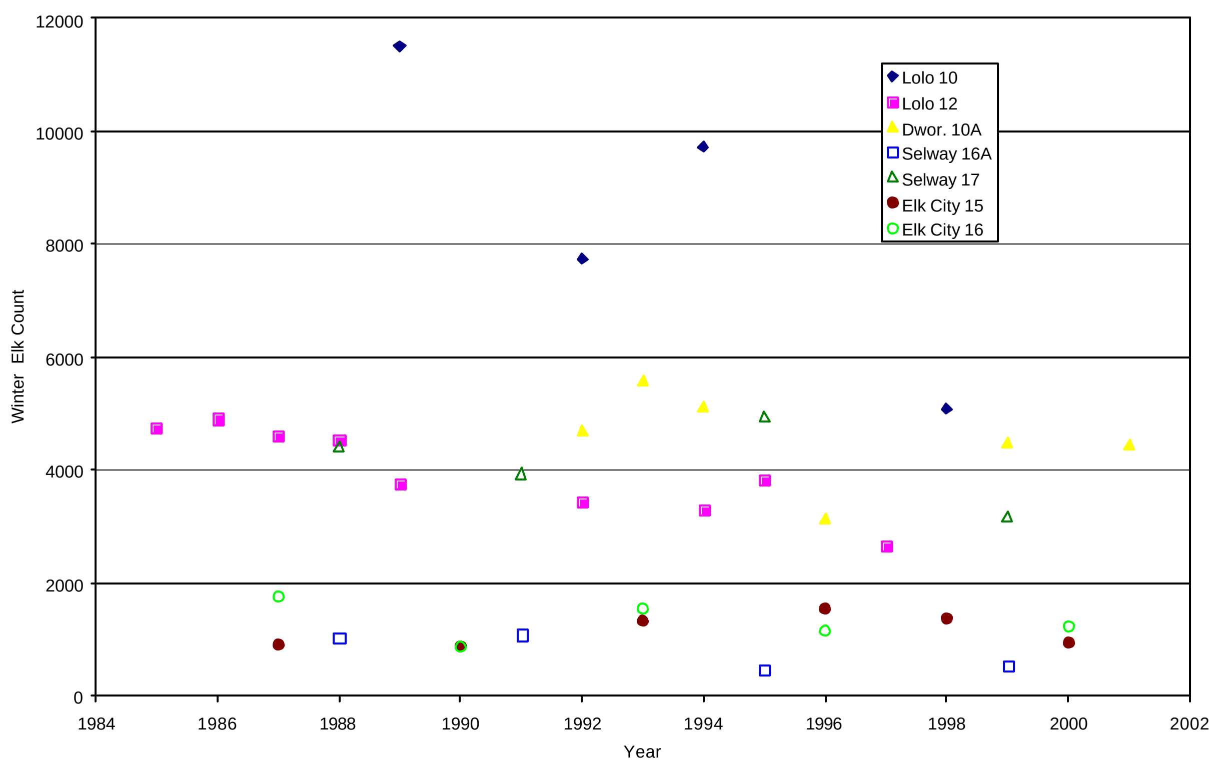

Figure 95. Winter elk counts displayed by IDFG management units for 1984-2001

6.7 Terrestrial Species Limiting Factors

6.7.1 Habitat loss, destruction, or modification

Habitat loss, destruction, or modification is the single most pervasive limiting factor for terrestrial species throughout the Clearwater subbasin, and affects nearly every focal species within the drainage. Key factors that contribute to the alteration of habitats include grazing, agriculture, mining, urban sprawl, fire suppression, logging, forest fragmentation, human construction projects, erosion, and noxious weeds.

Grazing impacts can be detrimental to riparian areas, grasslands, and fragile communities such as wet meadows. Cattle spend 20-30% more time in riparian areas than elsewhere on their range because of the abundant forage, availability of water, and protection from the elements, magnifying their impacts on these habitats (Knutson and Naef 1997). Livestock grazing can cause soil compaction, alter stream and habitat structure, distort bird and small mammal species composition, reduce big game forage, distribute noxious weeds, transmit diseases to wildlife, modify forest tree species composition, and reduce the abundance of fine fuels that once carried low-intensity fires through forests quickly. The historic grazing pressures imposed by native ungulates were light, and the herds moved through an area without causing excessive compaction or habitat alteration. Terrestrial species most susceptible to grazing impacts include Clearwater phlox, Jessica's aster, Palouse goldenweed, spacious monkeyflower, broadfruit mariposa lily, Spalding's catchfly, Macfarlane's four o'clock, water howellia, Ute ladies' tresses, huckleberry, camas, lomatium, western toad, bighorn sheep, northern goshawk, mountain quail, elk, and sharp-tailed grouse.

Agricultural practices have greatly changed the historic grasslands and prairies of the Clearwater subbasin. The vast ranges of fescue and *Agropyron* bunchgrasses that once dominated the lowland areas of the subbasin have been almost completely converted to agricultural use. Removal of native perennial grass cover has left the soil vulnerable to erosion by wind and water, altered hydrologic regimes, and aided grassland colonization by annual grasses and noxious weeds (Quigley and Arbelbide 1997; Black et al. 1997). The massive loss of prairie grasslands, has contributed to the decline of many species such as Ute ladies' tresses, Spalding's catchfly, broadfruit mariposa lily, Palouse goldenweed, Jessica's aster, camas, lomatium, lynx, elk and mountain quail, and led to the extirpation of the sharp-tailed grouse and sandhill crane from the subbasin (Deeble 2000).

The continuing growth of human populations and cities, characterized as "urban sprawl," has steadily encroached upon wildlife habitats. Increasing development results in habitat fragmentation, higher road densities, and loss of wildlife security. Low elevation big game winter range is particularly vulnerable to urban encroachment. Long-term capability of the habitat to support big game and other wildlife species is permanently reduced. Humans living in previously wild areas also result in significant predation on native fauna by pets, particularly free-ranging cats. Cats can kill large numbers of small animals, impacting both the populations of these species and their predators (Knutson and Naef 1997). Free-ranging dogs chase deer and elk and can cause stress and habitat avoidance in other wildlife species. A large percentage of the terrestrial focal species within the Clearwater subbasin are hindered by habitat fragmentation due to growing human populations. The impacts of urban sprawl are far reaching and affect such species as Spalding's catchfly, water howellia, Ute ladies' tresses, Clearwater phlox, Jessica's aster, Palouse goldenweed, camas, lomatium, fisher, wolverine, white-headed woodpecker, Townsend's big-eared bat, fringed myotis, gray wolf, elk, mountain goat, grizzly bear, bighorn sheep, sharp-tailed grouse, mountain quail, and sandhill crane.

As human populations continue to grow, so do public works such as roads, dams, water canals, fences, and power lines. These projects reduce the availability of wildlife habitat in the subbasin and result in fragmentation between habitat patches. Canals formed of steep, sloping, concrete walls form a barrier between isolated wildlife populations, habitat patches, migration corridors, and changing seasonal wildlife resources. Fences cause mortality in young ungulates that cannot cross high-strung barbed wire, and either get tangled in the strands, or get separated from the herd. Many bird species have difficulty avoiding and navigating around power lines, especially at night or when pursuing prey.

More than 65 species of terrestrial vertebrates in the interior Columbia River Basin are negatively affected by road-associated factors (Wisdom et al. 2000). Increasing road densities can reduce big game habitat effectiveness, increase vulnerability to harvest, facilitate firewood cutting and commercial harvest of large trees and snags, aid in the spread of noxious weeds, and encourage the spread of species into otherwise unsuitable habitat. For instance, coyotes have been shown to negatively affect lynx populations through competition for prey where roads allow coyotes access to areas where they would otherwise be excluded by snow depths. Populations of reptiles that use roads for thermal regulation, wide-ranging forest carnivores, and migrating amphibians are particularly vulnerable to road mortality.

Roads are commonly constructed parallel to stream and river courses for scenic reasons and ease of construction. This results in the removal of riparian vegetation and alters the development of meanders, side channels, and attached wetlands that provide important habitat for aquatic wildlife. Reductions in the size, quality, and connectivity of riparian habitats in the Clearwater subbasin have reduced their ability to support wildlife populations and to protect aquatic habitats. Of past and existing dams in the Clearwater subbasin, Dworshak Dam has had by far the greatest impact to wildlife resources. The single greatest impact of the Dworshak project is the loss of approximately 15,000 acres of deer and elk winter range due to water inundation (U.S. Army Corps of Engineers 1975). The flooded habitat once had high potential for supporting animals during adverse winter weather conditions (Norberg and Trout 1958). Species in the subbasin that have been impacted by human construction and public works include Macfarlane's four o'clock, salmon-flower desert-parsley, water howellia, wolverine, flammulated owl, white-headed woodpecker, black-backed woodpecker, harlequin duck, Townsend's big-eared bat, fringed myotis, western toad, Coeur d'Alene salamander, gray wolf, lynx, elk, mountain goat, grizzly bear, bighorn sheep, and mountain quail.

Fire management strategies of the past few decades have significantly changed the successional processes within the Clearwater subbasin. In the continued absence of fire, shade-tolerant fir species have become dominant as the canopy becomes dense enough that shade-intolerant ponderosa pine seedlings cannot compete, causing a shift from early and late successional forests to a prevalence of mid-seral forests (Johnson et al. 1994). The amount of early-seral habitat in the subbasin was probably widespread after the occurrence of huge fires in 1910 and 1919, but has been steadily declining since. The resulting reductions in early-seral forage have lowered the suitability of the subbasin to support many grazing and browsing wildlife species, and reductions in early successional stage dependent prey have reduced the suitability of the subbasin to certain dependent predators (Wisdom et al. 2000). Ongoing fire suppression has raised the tree density and fuel loads above historic levels, and increased the likelihood that when fire does occur, it will be an intense, stand replacing fire. In addition, these higher stand densities have increased the forests' susceptibility to insects and disease (Quigley and Arbelbide 1997).

This decline in multi-stage forests has probably reduced the suitability of the subbasin for ponderosa pine dependents and many other species, including huckleberry, flammulated owl, fisher, wolverine, gray wolf, lynx, white-headed woodpecker, black-backed woodpecker, northern goshawk, grizzly bear, bighorn sheep, mountain goat, mountain quail, and elk.

Timber harvest in the Clearwater subbasin has been primarily responsible for the reduction in mature forest types, multi-layered forest structure, and old growth ponderosa pine forests (Quigley and Arbelbide 1997). Local hydrologic features such as seeps and springs are important habitat features for many plant and wildlife species, and these features are modified or eradicated by extensive logging. Large, old trees, snags, logs, and downed wood are structural elements, common in mature forests, with significant importance to wildlife. The prevalence of these elements has been reduced in the region through the removal of older trees that might soon die and create snags, salvage harvest, fire wood collection, and the reduction of insect-infested trees that serve as food sources for insectivorous species (Wisdom et al. 2000). Clearcut logging leaves large, open tracts of exposed ground that many wildlife species will avoid, thereby causing habitat fragmentation and underutilization of resources.

Logging practices outside of the subbasin affect focal wildlife species that migrate seasonally to other locations. Loss of winter habitat in Mexico, via massive harvest without reforestation, may be the single-most important factor in long-term survival of the flammulated owl (McCallum 1994). Many species are sensitive to human disturbance and will abandon nests or territories due to logging activity, and siltation of streams caused by logging degrades wildlife habitat. The mountain moonwort, crenulate moonwort, water howellia, flammulated owl, fisher, wolverine, gray wolf, lynx, white-headed woodpecker, black-backed woodpecker, fringed myotis, northern goshawk, grizzly bear, bighorn sheep, and mountain goat have all been impacted or reduced by timber harvest practices within the subbasin.

Mining and ore extraction has been an historically significant industry within the Clearwater subbasin. The mining history of the subbasin included periods of intense placer, dredge, and hydraulic mining, in addition to draglines, drag shovels, and hand operations (Paradis et al. 1999, Staley 1940). Impacts of these operations often directly affect streams by way of siltation and stream channel diversion, and reduce the habitat quality for wildlife. In the 1860s thousands of gold miners took advantage of the unlimited hunting resources of the Clearwater drainage, and hunting pressures and disturbances had significant impacts on local species. Old mine shafts within the subbasin are critical habitat features for many bats, and resuming mining activities causes permanent abandonment of the roost and possible loss of the colony. Even though the number of prospectors has decreased, large mining operations continue to degrade habitats. Species negatively impacted by mining include Macfarlane's four o'clock, bighorn sheep, mountain goat, harlequin duck, Coeur d'Alene salamander, Townsend's big-eared bat, and fringed myotis.

Erosion and structural breakdown of fragile soils has led to the degradation of many wildlife habitats by allowing the establishment of nonnative and noxious weedy species throughout the Clearwater subbasin. The introduction of nonnative plant and animal species has reduced the drainage's ability to support native species. Erosion often occurs from livestock directly accessing streams, livestock pastures lacking protective wood and perennial grass cover, loss of vegetation along stream channels, or land disturbance events such as timber harvest, mining, fire, road construction, and agricultural tilling. Many noxious weeds are aggressive annual species that colonize new disturbances quickly and outcompete the perennial native species for available resources. Noxious weed invasions onto rangelands have drastically reduced forage production, forage quality, plant and animal species diversity, and habitat suitability. Nonnative wildlife often hybridizes with local native species, creating offspring that are less fit for survival and introducing genetic diseases. Species susceptible to erosion and invasive nonnative species impacts include Jessica's aster, Palouse goldenweed, spacious monkeyflower, Spalding's catchfly, broadfruit mariposa lily, water howellia, Ute ladies' tresses, Macfarlane's four o'clock, western toad, bighorn sheep, mountain goat, northern goshawk, mountain quail, elk, sandhill crane, and sharp-tailed grouse.

6.7.2 Human disturbance, presence, and activities

Human disturbance, presence, and activities often have significant repercussions for the focal species within the Clearwater subbasin. Scientific collection, recreation, vandalism, and various forms of hunting all have far reaching effects that reduce or restrict the populations of plant and wildlife species.

Many scientists collect rare and unique species of flora and fauna within the Clearwater subbasin, and occasionally species are overharvested or do not rebound from such disturbance. Species that have been negatively impacted by scientific collection include Clearwater phlox, Jessica's aster, Spalding's catchfly, Macfarlane's four o'clock, Townsend's big-eared bat, peregrine falcon, western toad, and Coeur d'Alene salamander.

Recreational disturbances within wildlife habitats have increased as the human population has continued to grow throughout the Clearwater subbasin. Activities such as hiking, mountain biking, angling, boating, bird watching, edible plant collection, cave exploration, rock climbing, and operating off-road vehicles such as snowmobiles, ATV's, and motorcycles, can cause the unintentional eradication of plant and wildlife communities. Some species are extremely sensitive to human disturbance, and even a low frequency of encounters can cause whole communities to abandon critical habitat features. Terrestrial focal species within the subbasin that are particularly intolerant of human contact are Palouse goldenweed, wolverine, harlequin duck, Townsend's big-eared bat, fringed myotis, northern goshawk, peregrine falcon. ESA listed, and culturally important or extirpated species sensitive to human disturbance include Spalding's catchfly, water howellia, Ute ladies' tresses, gray wolf, lynx, grizzly bear, bald eagle, bighorn sheep, mountain goat, mountain quail, elk, and sandhill crane.

Vandalism and destructive acts aimed at wildlife are often the product of superstition, negative folklore, and fear. The two species particularly susceptible to vandalism within the subbasin are Townsend's big-eared bat and the fringed myotis.

Hunting and trapping, for subsistence or sport, have been practiced in the subbasin throughout history. Indigenous peoples have put some form of hunting pressure on the subbasin's wildlife for thousands of years, but as wildlife habitat quality declines and the human populations continue to rise, the impacts to wildlife communities are increasing. In the 1860s large numbers of gold miners flooded into the subbasin and the unregulated hunting, for sport and subsistence, had serious impacts to wildlife. Many species were greatly reduced by this period of overharvest. In the 1900s, ranchers and public agents promoted eradication programs that destroyed many predatory wildlife species to protect the public from disease or attacks, and support livestock interests. Currently, hunting seasons limit excessive harvesting of intensively hunted species, but poaching, misidentification, and unforeseen population fluctuations continue to alter viability and composition of some wildlife communities. Some species within the subbasin are particularly vulnerable to trapping and hunting due to curiosity, trapability, inability to rebound from losses, high poaching rates, and a lack of refugia to avoid hunters. These sensitive species are fisher, wolverine, peregrine falcon, Townsend's big-eared bat, fringed myotis, gray wolf, bald eagle, lynx, grizzly bear, bighorn sheep, mountain goat, bison, elk, and sandhill crane.

Wisdom et al. (2000) found roads to be detrimental to >70% of the 91 species of wildlife reviewed. The development and use of roads affect ecosystems and the wildlife dependent on them in numerous ways. Roads eliminate habitat through their development; they fragment habitat, compact soils, disturb and destroy organic layers, and cause higher rates of erosion or mass wasting. Car and truck traffic associated with roads becomes a vector for the spread of noxious weeds, injures and kill animals through collisions, minimizes or limits the use of adjacent habitat by ungulates, results in an increased harvest rate on the remaining animals, and creates a loss of security for ungulates that cannot be completely mitigated through access management. Numerous studies have documented the impacts roads can have on the behavior, movement, and mortality of animals (Trombulak and Frissell 2000; Ercelawn 1999; Hieb 1976; Perry and Overly 1977; Lyon 1979; Rost and Bailey 1979; Witmer and deCalesta 1985).

6.7.3 Intensive application of herbicides, pesticides, and chemicals

Intensive application of herbicides, pesticides, and chemicals often has deleterious effects on nonintended species of plants and wildlife. Species within the Clearwater subbasin can be directly affected by these chemicals through pesticide/herbicide drift from aerial spraying, contamination of water sources, and habitat loss. An indirect affect to wildlife is the reduction of prey bases that many wildlife species feed on. Cumulative effects are spread throughout a system when predators accumulate toxic doses of a poison through the consumption of contaminated prey. Terrestrial focal species subject to losses by herbicide or pesticide application include Palouse goldenweed, harlequin duck, peregrine falcon, Townsend's big-eared bat, fringed myotis, and Coeur d'Alene salamander. Threatened and Endangered plant and animal species whose declines may be partially attributable to herbicide and pesticide application include Spalding's catchfly, Macfarlane's four o'clock, Ute ladies' tresses and bald eagle.

6.7.4 Disease and parasite

Infestation by disease or parasites is a common limiting factor of many plant and wildlife species within the Clearwater subbasin. While some species may have low-intensity infestations that reduce viability without killing the host, other species have cyclic, reoccurring infestations that can cause massive die-offs and eliminate whole communities. Species that are vectors for a disease but are not affected themselves, may still be negatively impacted if the disease is perceived to be a danger to humans. Species within the Clearwater subbasin that have a history of disease and/ or parasite outbreaks include Clearwater phlox, Jessica's aster, salmon-flowered desert-parsley, Spalding's catchfly, Macfarlane's four o'clock, Townsend's big-eared bat, peregrine falcon, western toad, gray wolf, bighorn sheep, mountain goat, and bison.

6.7.5 Critical habitat or specialized needs/aversions

Critical habitat or specialized needs/aversions can be unique characteristics critical to a life phase, or factors that cause a species to avoid otherwise suitable habitat. Home range requirements, extreme range loyalty, avoidance of landscape features, reproduction habitat features, and feeding habitat characteristics all define critical habitat for a particular species, and may limit that species' abundance if absent. Some terrestrial focal species within the subbasin can be characterized as "generalists" and can survive in a wide variety of habitat types, but many have specialized criteria or sensitivities that limit their suitable habitat types. These specialized terrestrial focal species include Clearwater phlox, spacious monkeyflower, salmon-flowered desert-parsley, mountain moonwort, crenulate moonwort, fisher, wolverine, flammulated owl, white-headed woodpecker, black-backed woodpecker, harlequin duck, Townsend's big-eared bat, fringed myotis, peregrine falcon, and Coeur d'Alene salamander. Lynx, grizzly bear and water howellia are threatened and endangered species with specialized requirements. Specialized culturally important or extirpated species include huckleberry, camas, bighorn sheep, mountain goat, sharp-tailed grouse, mountain quail and sandhill crane.

6.7.6 Limited or specialized reproductive capabilities

Limited or specialized reproductive capabilities can greatly reduce a community's ability to rebound from loss, adapt to habitat changes, or recolonize disjunct habitats. Some species have intrinsically low birth and maturation rates that hinder their ability to respond quickly to changing environments and resources. Other species have such high neonatal or juvenile mortality rates that their populations grow very little over time, and are highly susceptible to extirpation if mature breeding adults are lost. Climate, weather, human disturbance, maternal nutritional level, nest usurpation, excessive predation on young, availability of prey or forage, stress, habitat quality, and cyclic patterns of population change all affect reproductive success and recruitment. There are several terrestrial focal species within the Clearwater subbasin that exhibit limited reproductive capability: broadfruit mariposa lily, fisher, flammulated owl, black-backed woodpecker, harlequin duck, Townsend's big-eared bat, goshawk, peregrine falcon, and western toad. Limited reproductive capacity may have also been a factor in reductions in populations of water howellia, lynx, grizzly bear, bald eagle, bighorn sheep, mountain goat, mountain quail and sandhill crane.

6.7.7 Interspecies competition and selective predation

Competition among native species can often severely limit the viability of a plant or wildlife community. Some species continuously compete for the same resources, such as sunlight, pollinators, prey, territory, and quality habitat features, or are targeted by specialized predators. This intense struggle results in stress, increased energy output to guard territories, loss of fitness, and higher risk of predation to young. Excessive loss of fitness can limit a population and reduce community health. Terrestrial focal species subject to high levels of interspecies competition or predation are fisher, wolverine, black-backed woodpecker, western toad, and peregrine falcon. Macfarlane's four o'clock, huckleberry, lynx, bighorn sheep, mountain quail, sandhill crane, and elk are Threatened, Endangered, recently extirpated, dimininished or culturally important species susceptible to high levels of interspecies competition or predation.

6.7.8 Herbivory susceptibility

Herbivory susceptibility is a limiting factor for species that focus all of their reproductive energy into the production of a single fruiting body. Large seed heads are highly palatable and likely to be consumed by herbivores and browsers, but the widespread distribution of the individual plants helps to distribute herbivory impacts. If a susceptible community is intensively grazed due to poor livestock rotation or severe weather limiting herbivore dispersal, it may eliminate reproduction and recruitment for an entire year. The broadfruit mariposa lily is the only species within the Clearwater subbasin known to be limited by herbivory of fruiting bodies.

6.7.9 Obligate relationships

Obligate relationships are formed by the resources available and the needs of different species. Many species are dependent upon the health of another plant or wildlife community to provide a resource or critical habitat feature that cannot be otherwise utilized, and the management of each must reflect these relationships. Keystone species have complex obligate relationships, and are therefore critical to ecosystem health. The anadromous salmonids are an example of keystone species within the subbasin. Reductions in the anadromous salmon runs within the Clearwater subbasin have limited the system's ability to support many of the wildlife populations that current habitat could otherwise maintain. Wildlife derive nutrition from salmon through direct consumption in the form of predation, parasitism, or scavenging of spawning fish, carcasses, eggs, or fry. Carcass decomposition, and the particulate and dissolved organic matter released by spawning fish, deliver nutrients to plants, which in turn, also provide sustenance to wildlife (Cederholm et al. 2001). Wildlife species have been identified that have a strong consistent relationship with salmon, and three of these, the harlequin duck, grizzly bear, and bald eagle, occur presently or historically in the Clearwater subbasin (Cederholm et al. 2001).

Examples of simple obligate relationships are pollination, providing carcasses for scavengers, specialized prey base, excavating snags for secondary nesting species, or forming symbiotic fungal dependencies. In addition, some species form an obligate relationship among its collective communities, (termed a metapopulation), which is a regional grouping of interdependent populations affected by recurrent extinctions and linked by recolonization (Shelly and Gamon 1996). Many small communities of the same species need to be maintained to supply a recolonization source in the event of localized extirpation or destruction of an individual population. This is particularly important for species tied to disturbance or volatile habitats. Terrestrial focal species limited by their obligate relationships are mountain moonwort, crenulate moonwort, wolverine, flammulated owl, and harlequin duck. Endangered and Threatened species thought to be limited by their obligate relationships include Macfarlane's four o'clock, water howellia, lynx, grizzly bear, and bald eagle.

6.7.10 Natural disaster

Natural disaster events can be an opportunity for some plants and wildlife in the subbasin to gain an advantage over other less resilient species. Many plants and wildlife have become so specialized that they are dependent upon occasional flood, fire, drought, cold, or general mass disturbance periods to create reproduction, feeding, nesting, or rearing opportunities. Flooding induces seed establishment of important riparian species, and fire creates snags and dead wood, and causes some conifer cones to dispense seeds. Many seeds need specific wet-dry or hot-cold cycles to induce germination. Plants and wildlife within the subbasin that have become dependent, and therefore limited, by their tie to natural disasters are water howellia, huckleberry, white-headed woodpecker, black-backed woodpecker, and lynx.

6.7.11 Sensitivities to climate and environmental changes

Sensitivities to climate and environmental changes such as increased pollution, declining water quality, prolonged drought, poor seasonal forage production, and extreme seasonal temperatures, can limit dispersal, survival of offspring, reproductive success, overwinter health, and general fitness of many species. Some terrestrial focal species within the subbasin are very intolerant of habitat fluctuations and are easily extirpated if extreme changes occur. The terrestrial focal species most sensitive to climate extremes or have experienced large die-offs due to environmental shifts are Clearwater phlox, harlequin duck, Townsend's big-eared bat, western toad, and Coeur d'Alene salamander. Other species sensitive to environmental shifts include water howellia, huckleberry, bighorn sheep, mountain goat, bison, mountain quail, sandhill crane, and elk.

6.7.12 Small endemic populations

Small endemic populations are subject to extirpation by inbreeding depression, genetic drift, isolation from the larger population, lack of travel corridors between regional populations or resources, loss of genetic variability, and a poor survival rate for transplanted individuals. Isolated and endemic populations can be created by various factors such as forest fragmentation, construction of barriers such as roads, water impoundments, or fences, large die-offs that fragment a species' distribution, diminishing resources, habitat destruction, loss of critical habitat features, extreme separation of suitable habitats, limited mobility or dispersal ability, or extreme loyalty to home range. Many terrestrial focal species within the Clearwater subbasin are currently declining or have been extirpated due to small, isolated populations and deleterious genetic effects. These species are Clearwater phlox, Jessica's aster, Palouse goldenweed, broadfruit mariposa lily, crenulate moonwort, fisher, wolverine, harlequin duck, Townsend's big-eared bat, and Coeur d'Alene salamander. Spalding's catchfly, Macfarlane's four o'clock, Ute ladies' tresses, water howellia, lynx, grizzly bear, bighorn sheep, mountain goat, sharp-tailed grouse, and mountain quail are Threatened, Endangered, Extirpated or Diminished species that have been impacted by the effects of small or isolated populations.

6.7.13 Global or regional limitations

Global or regional limitations can reduce a species that inhabits the Clearwater subbasin seasonally but travels outside the drainage in other times of the year. Many migrant populations are declining due to global or national limiting factors such as habitat destruction, climate changes, or pollution that are effecting the worldwide distribution of a species. Terrestrial focal and Threatened species species at risk from global limiting factors are flammulated owl, harlequin duck, lynx, and bald eagle.

6.7.14 Other reasons

Unknown reasons for declining plant and wildlife communities are still being studied for many species. Some historic community locations are on private property and unavailable for current surveys, or some species may be responding negatively to unknown environmental variables in addition to well documented factors. Species that are declining for unknown reasons are spacious monkeyflower, salmon-flowered desert-parsley, western toad, harlequin duck, lynx, mountain quail, and elk. A summary of focal plant species (Table 38) and wildlife species (Table 39) affected by each limiting factor are listed below.

Table 38. Limiting factors of focal,Threatened and Endangered, and culturally or economically important plant species within the Clearwater subbasin

LIMITING FACTORS	Phlox	Aster	Goldenweed	Monkeyflower	Dst Parsley	Lily	Mt. Mnwort	Cr. Mnwort	Catchfly	4 O'Clock	Howellia	Ute L's tress	Huckleberry	Camas	Lomatium
Habitat loss/ destruction/ modification															
Grazing		x	x	x		x			x	x	x	x	x	x	x
Agriculture		x	x			x			x			x		x	x
Urban sprawl	x	x	x						x		x	x		x	x
Human construction projects	x				x					x	x				
Fire suppression													x		
Logging/forest fragmentation							x	x			x				
Mining										x					
Erosion/ noxious weeds		x	x	x		x			x	x	x	x			x
Human disturbance															
Scientific collection	x	x							x	x	x				
Recreation			x						x		x	x			
Vandalism															
Hunting/Trapping/Poaching															
Herbicides/ Pesticides			x						x	x		x			x
Disease/ parasites	x	x			x				x	x					
Critical habitat or specialized needs/aversions	x			x	x		x	x			x		x	x	
Limited/ specialized reproductive capabilities						x					x				
Native species competition/selective predation										x			x		
Herbivory susceptibility						x									
Obligate relationships							x			x	x				
Subject to/ dependent on natural disasters											x		x		
Climatic/ environmental conditions	x			x			x	x			x		x	x	
Small endemic populations subject to extirpation	x	x	x			x		x	x	x	x	x			
Global or regional limitations	x									x					
Unknown/questionable cause of decline				x	x										

Table Name	Common Name	Scientific Name
Phlox	Clearwater phlox	*Phlox idahonis*
Aster	Jessica's aster	*Aster jessicae*
Goldenweed	Palouse goldenweed	*Haplopappus liatriformis*
Monkeyflower	Spacious monkeyflower	*Mimulus ampliatus*
Dst Parsley	Salmon-flowered desert-parsley	*Lomatium salmoniflorum*
Lily	Broadfruit mariposa lily	*Calochortus nitidus*
Mt. Mnwort	Mountain moonwort	*Botrychium montanum*

Table Name	Common Name	Scientific Name
Catchfly	Spalding's catchfly	*Silene spaldingii*
4 O'Clock	MacFarlane's four o'clock	*Mirabilis macfarlanei*
Howellia	Water howellia	*Howellia aquatilis*
Ute L's tress	Ute ladies' tressess	*Spiranthes diluvialis*
Huckleberry	Big huckleberry	*Vaccinium membranaceum*
Camas	Camas	*Camassia quamash*
Lomatium	Lomatium	*Lomatium spp.*

Table 39. Limiting factors of focal, Threatened and Endangered, recently extirpated or diminished, and culturally or economically important wildlife species within the Clearwater subbasin

LIMITING FACTORS	Fisher	Wolverine	F. Owl	W-H wdpker	B-B wdpker	Duck	Big-ear bat	Myotis	Goshawk	Peregrine	Toad	Salamander	Wolf	Bald eagle	Lynx	Grizzly	Bighorn	Mt. Goat	Bison	Grouse	Mt. Quail
Habitat loss/ destruction/ modification																					
Grazing									x		x						x			x	x
Agriculture															x					x	x
Urban sprawl	x	x		x			x	x					x			x	x	x		x	x
Human construction projects	x		x	x	x	x	x	x			x	x	x		x	x	x	x			x
Fire suppression	x	x	x	x	x				x				x		x	x	x	x			x
Logging/ forest fragmentation	x	x	x	x	x			x	x				x		x	x	x	x			
Mining						x	x	x				x					x	x			
Erosion/ noxious weeds									x		x						x	x		x	x
Human disturbance																					
Scientific collection							x			x	x	x									
Recreation		x				x	x	x	x	x			x	x	x	x	x	x			x
Vandalism							x	x													
Hunting/ Trapping/ Poaching	x	x					x	x		x			x	x	x	x	x	x	x		
Herbicides/ Pesticides						x	x	x		x		x		x						x	
Disease/ parasites							x			x	x		x				x	x	x		
Critical habitat or specialized needs / aversions	x	x	x	x	x	x	x	x		x		x			x	x	x	x		x	x
Limited/ specialized reproductive capabilities	x		x		x	x	x		x	x	x			x	x	x	x	x			x
Native species competition / selective predation	x	x			x					x	x				x		x				x
Herbivory susceptibility		x	x			x								x	x	x					
Obligate relationships																					
Subject to/ dependent on natural disasters				x	x										x						
Climatic/ environmental conditions						x	x				x	x					x	x	x		x
Small endemic populations subject to extirpation	x	x				x	x					x			x	x	x	x		x	x
Global or regional limitations			x			x									x						
Unknown / questionable cause of decline						x					x				x						x

Wildlife Species

Table Name	Common Name	Scientific Name
Fisher	Fisher	*Martes pennanti*
Wolverine	Wolverine	*Gulo gulo*
F. Owl	Flammulated owl	*Otus flammeolus*
W-H wdpker	White-headed woodpecker	*Picoides albolarvatus*
B-B wdpker	Black-backed woodpeckers	*Picoides arcticus*
Duck	Harlequin duck	*Histrionicus histrionicus*
Big-ear bat	Townsend's big-eared bat	*Corynorhinus townsendii*
Myotis	Fringed myotis	*Myotis thysanodes*
Goshawk	Northern goshawk	*Accipiter gentilis*
Peregrine	Peregrine falcon	*Falco peregrinus anatum*
Toad	Western or Boreal toad	*Bufo boreas*
Salamander	Coeur d'Alene salamander	*Plethodon vandykei idahoensis*
Wolf	Gray wolf	*Canis lupus*
Bald eagle	Bald eagle	*Haliaectus leucocephalus*
Lynx	Lynx	*Lynx canadensis*
Grizzly	Grizzly bear	*Ursus arctos horribilis*
Bighorn	Bighorn sheep	*Ovis canadensis canadensis*
Mt. Goat	Mountain goat	*Oreamnos americanus*
Bison	American bison	*Bison bison*
Grouse	Columbian sharp-tailed grouse	*Tympanuchus phasianellus colu*
Mt. Quail	Mountain quail	*Oreortyx pictus*
SH Crane	Greater sandhill crane	*Grus canadensis tabida*
Elk	Elk	*Cervus elaphus*