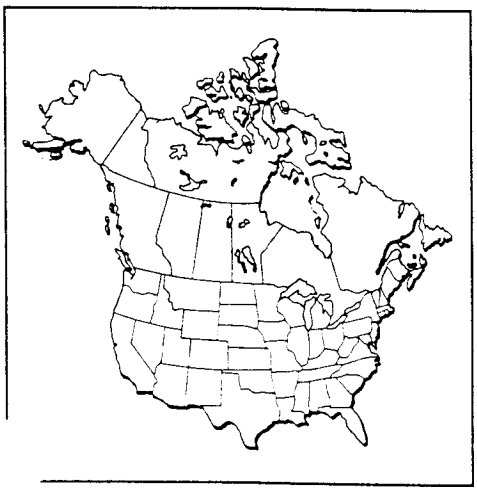
Managing Spruce-Fir Habitat for Lynx and Snowshoe Hares



Lynx are commonly found (shaded area) among the boreal forests of Alaska and Canada and the spruce, subalpine fir, and lodgepole pine forests in the mountains of the West.

By Gary M. Koehler and J. David Brittell

Long winters, deep snow, thin soils, and fires have helped shape the Engelmann spruce *(Picea engelmannii)*, subalpine fir *(Abies lasiocarpa)*, and lodgepole pine *(Pinus contorta)* forests in the mountains of the western United States.

Until recently, development of remote high-elevation forests has been discouraged by the high cost of timber harvesting, processing, and reforestation. Markets for firewood, fuel pellets, house logs, posts, and pulpwood are placing new demands on these forests and their wildlife. Legislative mandates and public concern require that wildlife values be considered along with management of other forest resources.

Lynx *(Lynx canadensis)*, commonly associated with the boreal forests of Alaska and Canada, are also found among the isolated spruce, subalpine fir, and lodgepole pine forests in the mountains of the West. Lynx, the only members of the cat family in North America adapted to the cold winters and deep snows of northern latitudes, occur above 4,000 feet in Washington, Idaho, and Montana, above 6,500 feet in Wyoming, and above 8,000 feet in Colorado and Utah. The low numbers and dispersed populations within the West make lynx vulnerable to overexploitation and habitat disruption. However, understanding their habitat and prey requirements and incorporating this into forest planning will help ensure a better position for lynx within some western forests.

We gathered information on lynx habitat and prey requirements during radio telemetry studies of lynx from 1980 to 1987 in north-central Washington (Koehler 1990). This information, together with findings from studies elsewhere, is presented as a guide to be integrated with forest and wildlife management objectives for high-elevation forests in the West. Where management for lynx is a concern, we offer suggestions for monitoring the population responses of lynx to habitat alterations.

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A Specialized Predator

Lynx are similar in appearance and size (15–25 pounds) to the bobcat *(Lynx rufus)*. However, lynx have longer tufts of fur on the tips of their ears, their tails are tipped with black rather than black-barred on the dorsal side, their legs are longer, and their feet are twice the size of those of the bobcat. The large feet and long legs permit lynx to move easily over the snow, enabling them to find a niche at high elevations where snow persists for much of the year.

Unlike other carnivores whose diets may be quite varied, lynx prey almost exclusively on snowshoe hares, *Lepus americanus* (More 1976, Koehler 1990). This dependence on hares as a primary food source has a major influence on the dynamics of lynx populations. In areas where or during periods when hares are abundant, lynx reproduction is high and densities are high; when or where hares are scarce, lynx productivity and densities are low (Brand and Keith 1979, Parker et al. 1983, Koehler 1990).

Conditions favoring snowshoe hares will benefit lynx. But lynx require a mosaic of forest conditions—early successional forests for hunting and

ing habitat for lynx is compatible ther forest uses.

mature forests for denning. Although fires, epidemics of forest disease, and logging may have negative short-term effects on lynx by eliminating cover for snowshoe hares and lynx, they may have long-term benefits as succession progresses and snowshoe hares become abundant.

Managing for Prey

Lynx prefer habitats where snowshoe hares are abundant (Saunders 1963, Koehler et al. 1979, Parker et al. 1983). During summer, when cover is plentiful and succulent forbs, grasses, and small shrubs are abundant, snowshoe hares have little difficulty surviving. But during winter, when snow covers low-growing plants, conditions become critical for hares and they must feed on shrubs and seedlings exposed above the snow surface. Small-diameter twigs and new growth han 0.4 inch in diameter) are pre- browse during winter, but diameter stems may be eaten when conditions become harsh and food is limited (Wolff 1980). Although willows and birches are the normal food of snowshoe hares in most areas during winter (Klein 1977, Wolff 1980, Litvaitis et al. 1985), conifers may be an important browse in other regions (Adams 1959, Conroy et al. 1979, Peitz and Tester 1983). In Washington, where young hardwoods are not readily available, hares feed almost exclusively on the tips of lodgepole pine seedlings (less than 1 inch in diameter) and bark of taller lodgepole pine trees (Koehler 1990). For browse, softwood and hardwood saplings and seedlings must be taller than the snow depth, yet short enough to be reached. Where snow depths reach 3–4 feet, trees must be 6–8 feet tall (Wolfe et al. 1982) and less than 0.4 inch in diameter (Wolff 1980, Koehler 1990).

Besides browse, hares need habitat that offer protection from predators and extreme cold. In fact, hares may select habitat where security and thermal cover is abundant even if browse is limited (Monthey 1986). Dense stands with 4,690 to 13,440 stems/acre provide for these needs (Brocke 1975, Wolff 1980, Litvaitis et al. 1985, Monthey 1986, Koehler 1990). Extremely dense stands (greater than 40,000 stems/acre) may be of little use to snowshoes if understory cover and browse is sparse (Adams 1959, Litvaitis et al. 1985). Likewise, stands with 1,052–2,954 stems/acre lack adequate thermal and security cover and would be of little use to hares (Brocke 1975, Koehler 1990). Conifer trees are essential as they offer more security and thermal cover than do hardwoods. Trees 11.5 feet tall would provide the needed thermal and security cover (Brocke 1975).

Habitat for snowshoe hares should be well dispersed among the areas to be managed for lynx. Forest managers must consider that hares may not recolonize clearcuts until 6–7 years after cutting, and that it may take 20–25 years for hare densities to reach their highest levels (Litvaitis et al. 1985), depending on site conditions and type of treatment. As stands become older (greater than 20–30 years old) and stem density declines, security cover and forage production diminishes (Brocke 1975, Koehler 1990).

Since home range areas of snowshoe hares are 20–25 acres (Adams 1959, Dolbeer and Clark 1975, Wolff 1980),

Burned and clearcut areas can provide favorable conditions for snowshoe hares and lynx once seedlings and saplings are established.

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units designated to provide habitat for hares should be 20–25 acres or larger. Dense stands of conifers should be interspersed with small areas of hardwoods and conifers for browse (Brocke 1975, Litvaitis et al. 1985). Logging and thinning units less than 40 acres in size encourage natural regeneration of the forest while offering hares forage and cover. During reforestation, it is important to maintain naturally occurring palatable trees and shrubs.

Managing for Denning

Although lynx need early successional forests for hunting, they need mature forests for denning. In Washington, denning sites were typified as lodgepole pine, spruce, and subalpine forests older then 200 years, with north and northeast aspects, mesic habitat associations, and a high density of down-fall logs (greater that 40 logs/150 feet lying 1–4 feet above ground, Koehler 1990). Downed logs and stumps provide cover for kittens and may be the most important component of denning habitat. Similar habitats are used for denning in Alaska and northern Canada. Although stands used as den sites may range from 1 to 5 acres in size, dispersed pockets of mature stands connected by travel corridors are needed to allow females to move their kittens toward more abundant prey or to avoid disturbances.

Lynx use both ends of the forest successional spectrum; young-aged stands where they hunt for snowshoe hares, and mature stands where they have their kittens

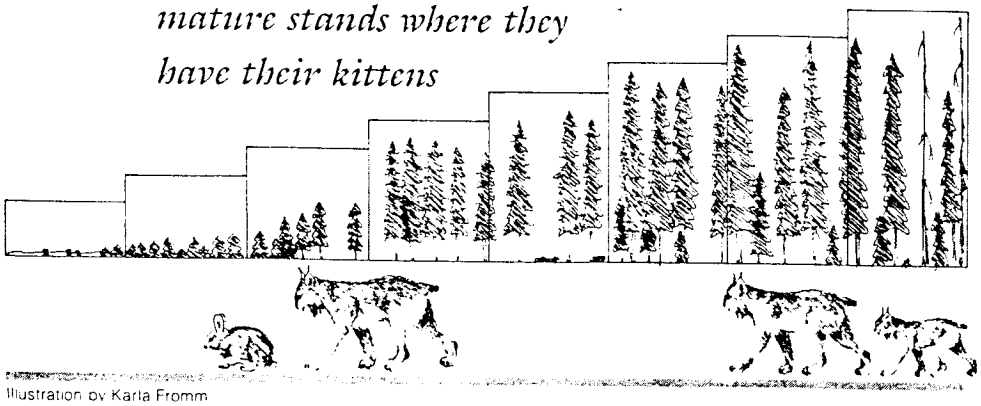

Illustration by Karla Fromm

Since mature forests support few snowshoe hares (Bailey et al. 1986, Koehler 1990), it is important that denning areas for lynx be close to prey habitat. One- to five-acre parcels may be adequate as den sites, but these pockets of mature forests must be connected by corridors of cover.

Managing for Cover

Like most wild felids, lynx require cover for security and for stalking prey. This need for cover is shown by their avoidance of large open areas. Typically, lynx do not cross openings wider than 300 feet; however, they do travel through silviculturally thinned stands with 180 trees/acre void of shrubs (Koehler 1990).

Although large openings are avoided by lynx, burned and clearcut areas can provide favorable conditions for snowshoes and lynx once seedlings and saplings become established. To minimize the effects openings may have as barriers to lynx movement, logging units should not be positioned near large meadows, burned areas, or recent clearcuts. Cover should be maintained along ridges and saddles, favored travel routes for lynx. The density of trees should be greater than 180 stems/acre and tree height should be at least 6 feet, particularly where snow depth is 2–3 feet. Clearcuts should be designed less than 300 feet wide so that lynx will cross them, or be irregular in shape with periodic constrictions less than 300 feet wide.

Fire and Forest Management

It is important to coordinate forest management activities to provide a temporal and spatial array of openings (which will mature to snowshoe hare habitat) and early successional and mature forest stands. With this in mind, forest managers should strive for a mixture of openings (natural and artificial) in stands of harvestable-sized timber while maintaining dispersed stands of mature forest.

Fires can play an important role in maintaining habitat for lynx (Fox 1978, Bailey et al. 1986, Quinn and Thompson 1987). Within wilderness and natural areas, wildfires and prescribed fires can provide the early successional forests lynx require. Small fires are less destructive than large fires and create the forest mosaic beneficial to lynx. As

succession progresses, a variety of fire sities and fire types will contribute to a temporal and spatial pattern of habitat for prey, with unburned areas becoming denning habitat.

For managed forests, recommendations include maintaining mature or old-growth stands for denning and scheduling clearcuts, stand thinning, and prescribed fires to provide a balance of successional stages on the landscape. Although clearcutting and thinning may reduce cover, they can also open the canopy to encourage understory plants beneficial to snowshoe hares. The effects that these activities have on snowshoe hares and lynx depends on timing and manner of treatment. Thinning and logging residue may require treatment to prevent competition for groundcover, shrubs, and seedlings, although some residue should remain as cover for small rodents, prey for lynx and other carnivores. Thinning stands early to maximize tree growth potential can be compatible with hare and lynx requirements provided stands are thinned before hares recolonize the area. Otherwise, thinning should be considered when stands are older than 30–40 years and are little used by hares. Both early and late thinning strategies may be required when integrating timber management objectives with lynx needs. Thinning schedules and size and position of openings may require modification in order to minimize hare depredation of plantation seedlings.

Managing forest diseases and pests requires ingenuity. Although disease and insects may increase fuel loads with increased risk of large, high-intensity fires, they can provide the deadfall needed for cover in denning habitat. As with fire and timber harvesting, disease and insects may contribute to an open forest canopy, encouraging understory shrubs and seedlings. With this in mind, managers of wilderness and natural areas should allow forest disease and pests to follow a more natural course or use fires to control epidemics. In multiple-use management areas where pesticides and herbicides are used, care must be taken to treat only infected areas in order to minimize large openings.

Lynx are vulnerable to overexploitation from trapping (Todd 1985, Bailey et al. 1986). Roads increase access for hunters and trappers, destroy habitat for prey, and disrupt lynx travel and hunting patterns. To mitigate these effects, roads should be kept to a minimum and main roads should be maintained to primitive standards. Lynx travel along roads with less than 50-foot rights-of-way where cover is present on both sides. Therefore, forbs, grasses, shrubs, and seedling trees growing along the edges of roadways should be maintained as cover for lynx and browse for snowshoe hares. Roads should be closed once timber harvest is complete, and physical barriers should be constructed and regulations enforced so that disturbance is minimized.

Monitoring Lynx Populations

Monitoring the response of lynx and hares to habitat alteration is essential, as it may signal a need for changes in forest management strategy. Pellet or track counts are useful techniques for monitoring snowshoe populations. Monitoring populations of the elusive lynx is more difficult.

Snow tracking can be a cost-effective method for monitoring lynx populations over time, but the reliability of this method depends on the observer's experience at identifying tracks, the effect of snow and lighting conditions on the ability to discern tracks, the speed at which the survey is conducted, and the influence of human activities on lynx movement. Where priorities call for managing habitat for lynx, radiotelemetry studies may be needed initially to establish lynx density estimates in order to relate the track count to lynx populations trends.

To minimize variations between track counts, surveys should be conducted several times each month along established routes and within a specified time after snowfall. Consistency of survey design is important, but it may be necessary to survey additional routes once habitat treatment begins, as these activities may alter lynx travel patterns. If rigorously conducted, number of tracks and estimated number of individuals encountered on each mile of survey line (transect, trail, or road) can provide managers with the

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Research biologist Tim Koehler holds anesthetized adult lynx. Note long tufts of fur at the tips of the ears and the large feet.

information needed to detect the response of lynx population to habitat manipulation.

Conclusion

Providing habitat for lynx is compatible with other forest resource uses and can be integrated into a forest management program. Prescribed fires, logging, and timber thinning can create the young-aged forests needed as habitat for the principal prey. However, mature forest stands must also be maintained as habitat for denning. The key to managing forests for lynx is to provide a temporal and spatial mosaic of forest age classes. Managing high-elevation forests in the West for both timber and lynx may result in increased management costs initially, but these could be offset by greater economic and ecological diversity. ■

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