

that consistently revealed animal tracks. As the study progressed, we decreased snow-tracking efforts in the Bechler sector after encountering little snowshoe hare sign, but increased efforts in the East sector, attempting to re-verify lynx first detected during winter 2001. During 2004, we focused nearly all winter effort there, attempting to document lynx numbers and their sex and age characteristics. We also completed 41 snowmobile-based surveys totaling 749 km, and six in aircraft totaling 693 km.

To detect lynx with hair snares, we used two approaches for establishing sets of hair sampling stations, called "transects," across the landscape (Figure 5, pg. 12). First, we deployed transects on a single, 14×14-mile grid (196 mi²) located on the east side of Yellowstone Lake, following the guidelines of the National Lynx Detection Protocol (NLDP), developed by the U.S. Forest Service in the late 1990s. Transects were spaced at 3.2-km intervals and consisted of five stations spaced at 100-m intervals. Stations contained a hair snare nailed to a tree 46 cm above the ground, with visual (aluminum pie plates) and scent lure attractors (beaver castor oil and other ingredients) hung from nearby tree limbs. Hair snares consisted of a 10×10-cm square of carpet containing nails inset to snag and hold animal hairs, such as those of cheek-rubbing lynx; a scent lure; and dried catnip, a common attractant for cats. Stations were deployed, and then checked twice at two-week intervals for visits by animals. Hairs were collected from the hair snare, the tree supporting (or trees growing near) the snare, or from the ground, and then stored in a vial with desiccant for subsequent identification based on visual (dissecting scope) exam of hair follicles or DNA-based techniques. All survey materials, including nails and flags, were removed from the field following the second check for hairs. The grid was deployed from early summer to early fall, 2001–2003. Because some of the transects occurred in remote areas and could not be maintained

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Conservation Challenges of Managing Lynx

by John R. Squires

YELLOWSTONE NATIONAL PARK is hallowed ground when it comes to wildlife in America.

The very word "Yellowstone" conjures up images of grizzly bears digging tubers, bands of elk dotting the landscape, and gray wolves pursuing elk along the Lamar River. However, Yellowstone also provides habitat to one of the rarest cats in the continental United States: the Canada lynx (*Lynx canadensis*). The image of lynx stalking the forests of Yellowstone is absent from most people's minds because the cat is rarely observed and its life history is poorly understood in and around the park.

In March 2000, the U.S. Fish and Wildlife Service (USFWS) listed *Lynx canadensis* as a threatened species in the contiguous U.S. under the Endangered Species Act. The USFWS concluded that management actions of federal agencies may threaten lynx or their habitat, and that inadequate regulatory processes were in place to address the species' needs. The listing of lynx as a threatened species requires that federal agencies consider how their management actions may impact lynx populations. This often places land managers in the difficult position of having to assess how their activities may impact lynx based on limited information concerning the species' ecology and management needs.

A fundamental need when managing lynx and other rare wildlife is to understand historical changes in a species' distribution. Biologists are far less concerned when a species' distribution is characterized by well-connected groups of individuals with expanding population numbers as compared to few individuals in highly fragmented groups. Thus, understanding any recent changes in the distribution of

lynx is important to their conservation. Accomplishing this task is difficult, given the cat's highly secretive nature, large home ranges (about 200 km² for males and 90 km² for females), and low densities (Squires and Laurion 2000). Biologists confront this difficult issue by applying several different research tools.

Archival and library research of lynx trapping records, observations, and museum specimens from the late 1800s to the present documented that lynx were present in 24 states. The greatest number of detections (>20 detections each) were in Idaho, Maine, Michigan, Minnesota, Montana, New York, Washington, Wisconsin, and Wyoming (McKelvey et al. 2000). Lynx were documented in 10 states as late as the 1990s. These results suggested a widely distributed population. However, recent snow-tracking and hair snagging studies indicate that lynx populations are fairly restricted in the western U.S. Western populations (areas with documented reproduction) are currently found in three regions: northwestern Montana, north-central Washington, and in the Greater Yellowstone Area (GYA).

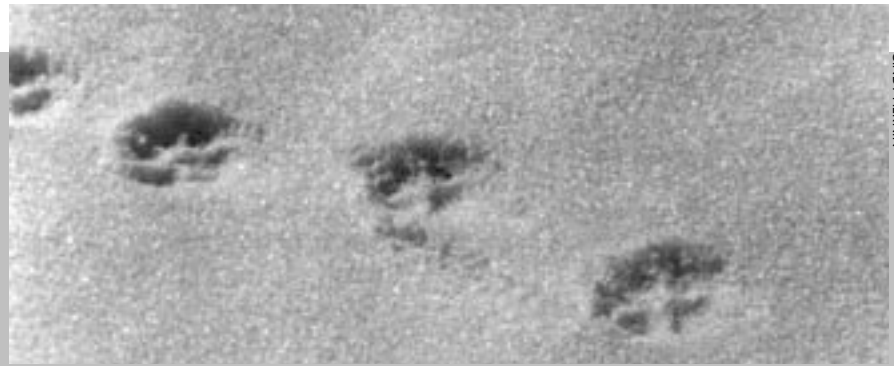
The GYA supports the southernmost, non-introduced population of lynx in the U.S. Lynx from Canada were recently reintroduced in Colorado, and some of the reintroduced females produced kittens last year. This bodes well for lynx in Colorado, but it is too early to tell whether the reintroduction will result in a persistent population. In the Midwest, biologists thought that lynx were extirpated from Minnesota by the 1990s, but recent sightings, DNA evidence (scats and hair samples), and radio-telemetry studies have documented that lynx are back in the northern portion of this state.

Hopefully, ongoing surveys throughout the region will document if lynx expand their range to neighboring Midwestern states. The easternmost population of lynx in the contiguous U.S. resides in northern Maine. Little is known regarding the number of individuals that are present in the native populations in the contiguous U.S. However, these populations may support few individuals (Aubry et al. 2000).

We know from basic principles of conservation biology that small, relatively isolated populations are generally at greater risk compared to large, contiguous populations. Thus, it is important to know how lynx populations interconnect. Genetic similarities among lynx from Alaska, Canada, and Montana suggest that individuals move throughout this northern region (Schwartz et al. 2002). This notion is supported by trap records indicating that lynx populations in the contiguous U.S. may be periodically augmented by animals from Canada (McKelvey 2000). However, we do not understand the extent of this potential augmentation.

The GYA is the only place in the contiguous U.S. that apparently supports a lynx population that is not immediately adjacent to the Canadian border. There are currently too few genetic samples or trap records from lynx in the GYA to rigorously evaluate the relationship of these animals to other populations. The GYA may be large enough to support a persistent population in relative isolation, or there may be interchange from populations in Montana and Canada.

Bob Oakleaf, of the Wyoming Game and Fish Department, first radio-collared a male lynx that became known as "George" in 1997. Oakleaf's goal was to shed light on the movements of lynx in the GYA and to better understand their habitat use patterns. In 2001, staff from the wildlife unit of the Rocky Mountain Research Station, located in Missoula, Montana,



Lynx tracks in Yellowstone near the Lake Hotel, winter 1973–74.

helped Oakleaf replace George's conventional collar with a satellite transmitter that could better document his movements throughout the region. In May 2002, George left his home range and traveled across the Wind River Range, the Teton Wilderness area, and Yellowstone National Park. He continued his northwesterly journey as far as the Henry's Lake Mountains on the Montana/Idaho border before returning in early autumn to his home range near Big Piney, Wyoming. His return route followed the same general route he had taken in early summer. George's summer-long trip was over 728 km in length!

Although George was only a single individual, his broad-scale movement demonstrated that lynx could traverse the entire GYA. The role that long-distance movements play in maintaining lynx in the GYA is unknown, but they may play an important role in maintaining a lynx population that is disjunct from the Canadian border.

Lack of basic ecological information is a major impediment to lynx conservation and recovery. Lynx differ from many other threatened or endangered species that have clear, well-defined management needs. For example, organo-chlorine pesticides caused eggshell thinning in peregrine falcons; banning the use of these chemicals was a clear management need. However, we know very little about the life history of lynx, including how human-caused actions may contribute to their rarity. We also know little regarding their broad-scale movements, habitat preferences, mortality factors, and

population trends. Ongoing research projects in Montana, Minnesota, Maine, and Colorado are beginning to address some of these key information gaps. Carnivore surveys, such as the recent effort led by Dr. Kerry Murphy in Yellowstone National Park, are also vitally important to further delineate the species' distribution. However, much additional work is needed before lynx can be conserved based on solid, empirical data. Thus, researchers and managers, working together, play key roles in providing the necessary research and management to ensure that lynx will continue to stalk the forests of Yellowstone National Park.

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