CARNIVORE SCENT STATION SURVEY

AND

WINTER TRACK INDICES

NOTE: This survey is organized and coordinated by the Forest Wildlife Populations and Research Group, 1201 E. Hwy 2, Grand Rapids, MN 55744. Results are presented at this location in the book because of the statewide nature of the data.

CARNIVORE SCENT STATION SURVEY SUMMARY, 2009

John Erb, Minnesota Department of Natural Resources, Forest Wildlife Research Group

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on these populations. However, many carnivores are highly secretive, difficult to repeatedly capture, and naturally occur at low to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g., mark-recapture, distance sampling, etc.). Hence, indices of relative abundance are often used to monitor such populations over time (Sargeant et al. 1998, 2003, Hochachka et al. 2000, Wilson and Delahay 2001, Conn et al. 2004).

In the early 1970's, the U.S. Fish and Wildlife Service initiated a carnivore survey designed primarily to monitor trends in coyote populations in the western U.S. (Linhart and Knowlton 1975). In 1975, the Minnesota DNR began to utilize similar survey methodology to monitor population trends for numerous terrestrial carnivores within the state. This year marks the 34th anniversary of the carnivore scent station survey.

METHODS

Scent station survey routes are composed of tracking stations (0.9 m diameter circle) of sifted soil with a fatty-acid scent tab placed in the middle. Scent stations are spaced at 0.5 km intervals on alternating sides of a road or trail. During the initial years (1975-82), survey routes were 23.7 km long, with 50 stations per route. Stations were checked for presence/absence of tracks on 4 consecutive nights (old tracks removed each night), and the mean number of station visits per night was the basis for subsequent analysis. Starting in 1983, following suggestions by Roughton and Sweeny (1982), design changes were made whereby routes were shortened to 4.3 km, 10 stations/route (still with 0.5 km spacing between stations), and routes were surveyed only once on the day following route placement. The shorter routes and fewer checks allowed for an increase in the number and geographic distribution of survey routes. In either case, the design can be considered two-stage cluster sampling.

Survey routes were selected non-randomly, but with the intent of maintaining a minimum 5 km separation between routes, and encompassing the variety of habitat conditions within the work area of each survey participant. Most survey routes are placed on secondary (unpaved) roads/trails, and are completed from September through October. Survey results are currently stratified based on 3 'habitat zones' within the state (forest, farmland, and transition).

Track presence/absence is recorded at each station, and track indices are computed as the percentage of scent stations visited by each species. Confidence intervals (95%) are computed using bootstrap methods (percentile method; Thompson et al. 1998). For each of 1000 replicates, survey routes are randomly re-sampled according to observed zone-specific route sample sizes, and station visitation rates are computed for each replicate sample of routes. Replicates are ranked according to the magnitude of the calculated index, and the 25th and 975th values constitute the lower and upper bounds of the confidence interval.

RESULTS AND DISCUSSION

A total of 282 routes were completed this year (Figure 1). There were 2,666 operable scent stations examined on the 282 4.3 km routes. Route density varied from 1 route per 564 km^2 in the Forest zone to 1 route per 1,238 km^2 in the Farmland zone (Figure 1).

Statewide, route visitation rates (% of routes with detection) were highest for red fox (42%), followed by skunk (38%), raccoon (34%), domestic cat (32%), coyote (22%), and dog (18%). Regionally, route visitation rates were as follows: red fox – Farmland (FA) 29%, Transition (TR) 31%, Forest (FO) 52%; coyote – FA 29%, TR 30%, FO 14%; skunk – FA 56%, TR 39%, FO 31%; raccoon – FA 69%, TR 36%, FO 19%; domestic cat – FA 55%, TR 45%, FO 16%; and dog – FA 36%, TR 25%, FO 8%.

Figures 2-5 show station visitation indices (% of stations visited) from the survey's inception through the current year. Although the survey is largely intended to document long-term trends in populations, confidence intervals improve interpretation of the significance of annual changes. Based on the presence/absence of confidence interval overlap, there were no statistically significant changes from last year. However, there was a 'notable' decline in the farmland coyote index (Figure 2), as well as a notable increase if the forest zone red fox index (Figure 4). Bobcat indices reached their highest level, though confidence intervals are large (Figure 5).

Red fox indices remain highest in the zone with the lowest coyote index (i.e., Forest zone), an area where coyotes are likely limited by wolves. Point estimates for the red fox index in the Farmland and Transition zones remain well below their long-term average (Figures 2 and 3), likely a combined result of increasing coyote numbers and habitat alteration. Wolf indices have not changed appreciably in the last 5 years.

ACKNOWLEDGEMENTS

I wish to thank all of the cooperators who participated in the 2009 survey: DNR Division of Wildlife staff; Superior National Forest Aurora District; Agassiz, Rydell, Sherberne, and Tamarac National Wildlife Refuges; USFWS Detroit Lakes and Morris Wetland Management Districts; 1854 Treaty Authority, White Earth and Red Lake Tribal Resource Departments; Vermillion Community College; Cass County Land Department; Marshall County Central High School; and Richard Nelles and Tom Stuber.

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2009 Scent Station Specifics

Zone	Routes Completed	Route Density	Station Nights
Farmland	55	1/1,238 km^2	530
Transition	80	1/822 km^2	733
Forest	147	1/564 km^2	1,403
Totals	282	1/769 km^2	2,666

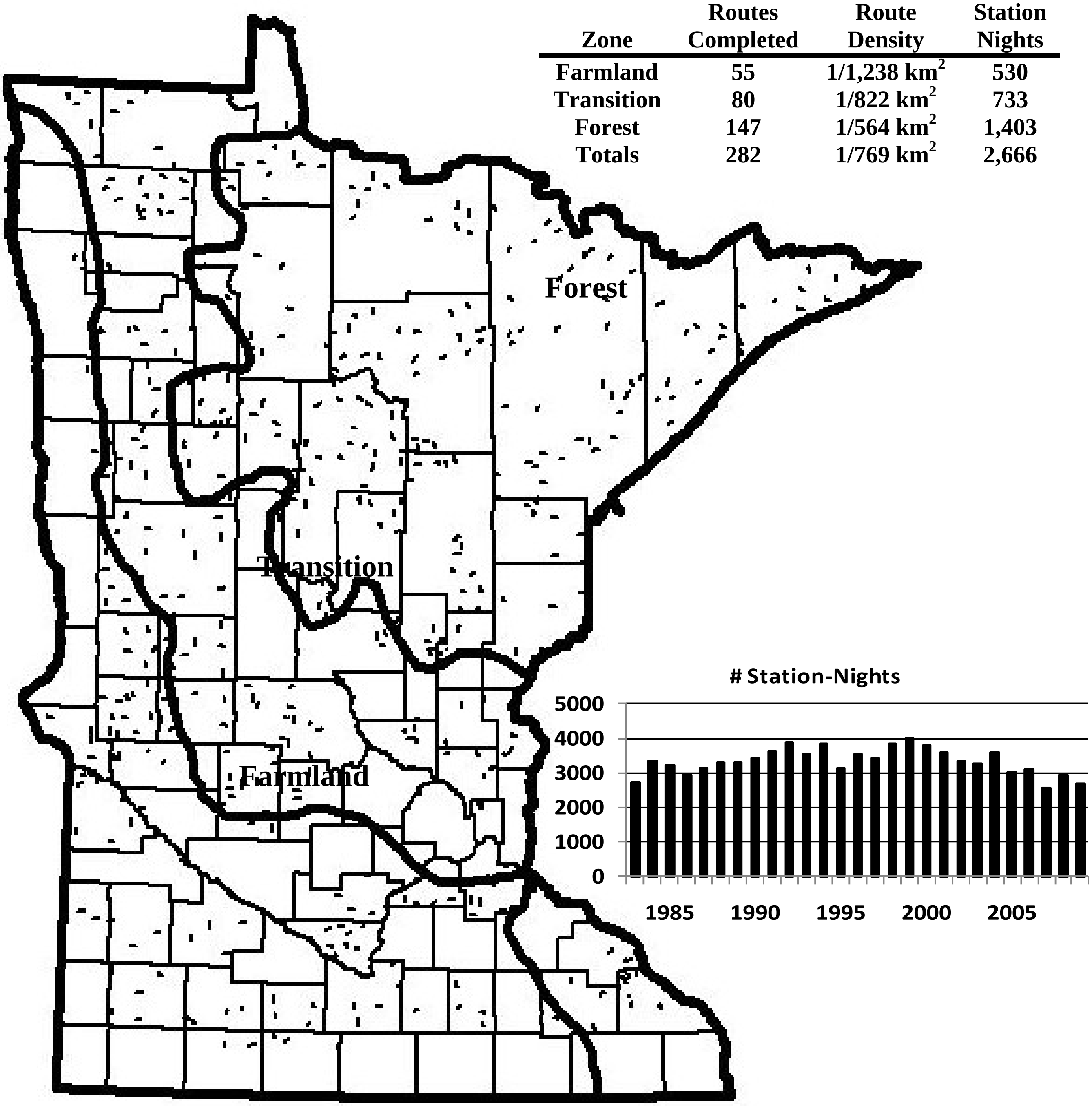

Figure 1. Locations of scent station routes. Insets show 2009 route specifics and the number of station-nights per year since 1983.

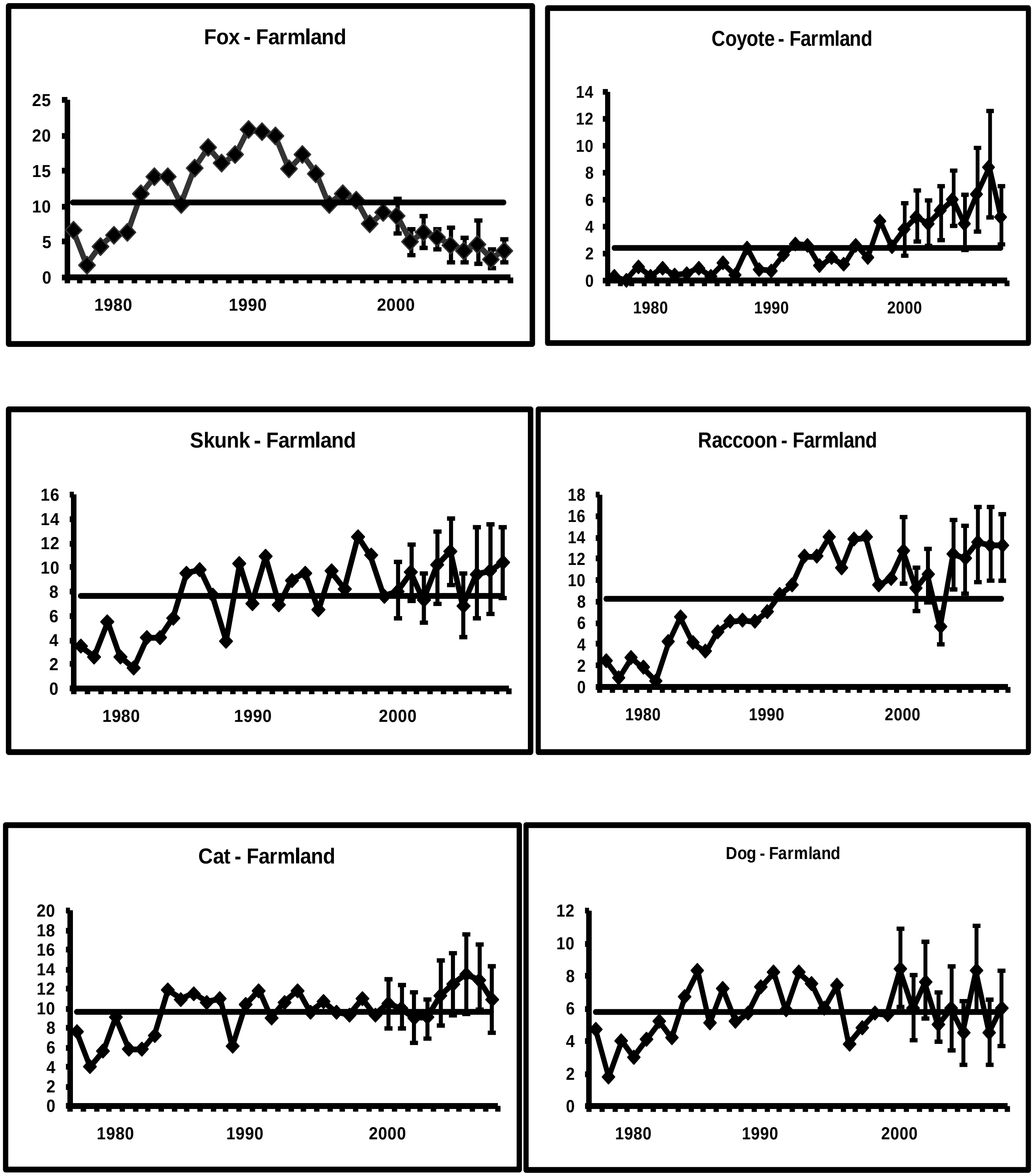

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2009. Horizontal line represents long-term mean.

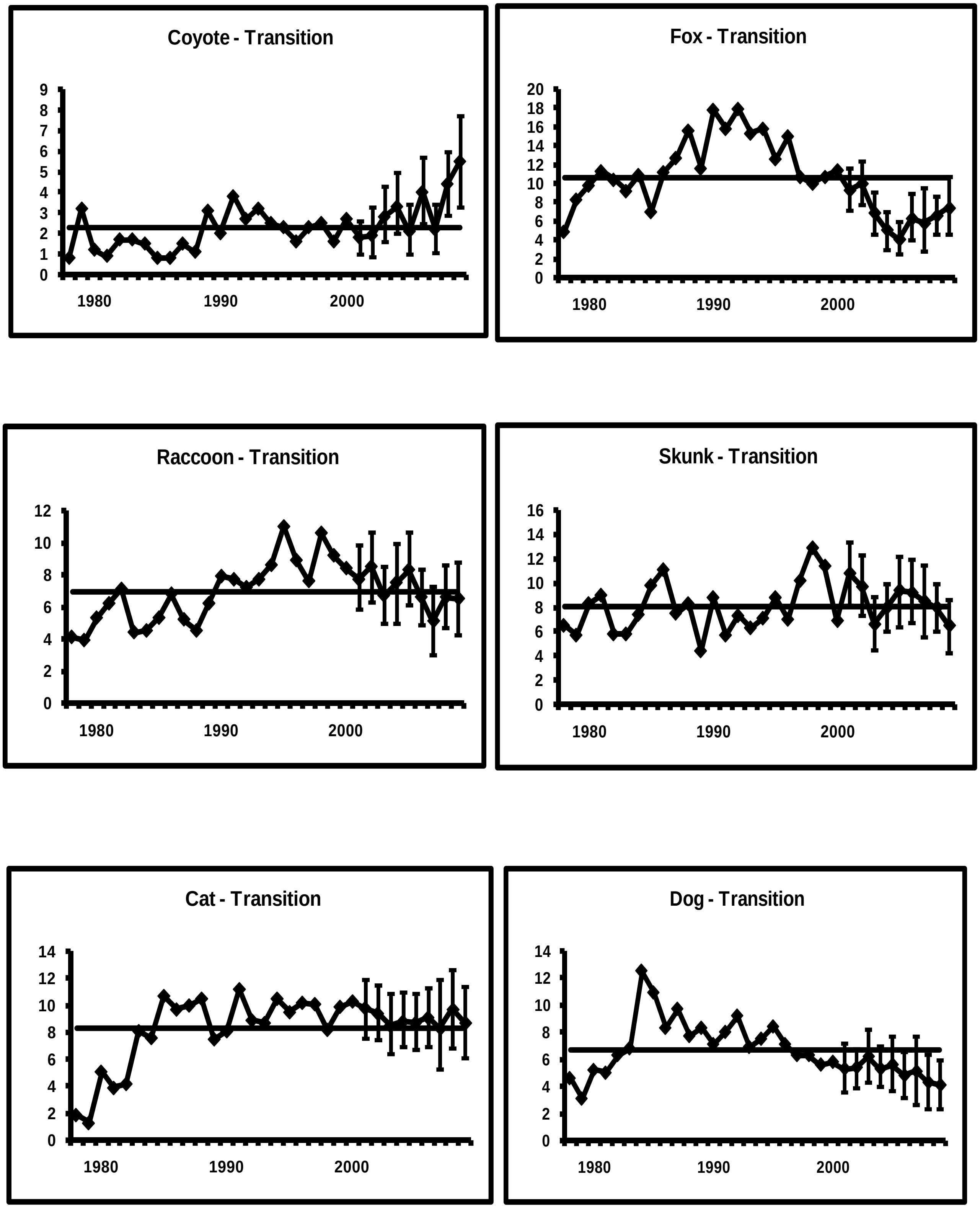

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2009. Horizontal line represents long-term mean.

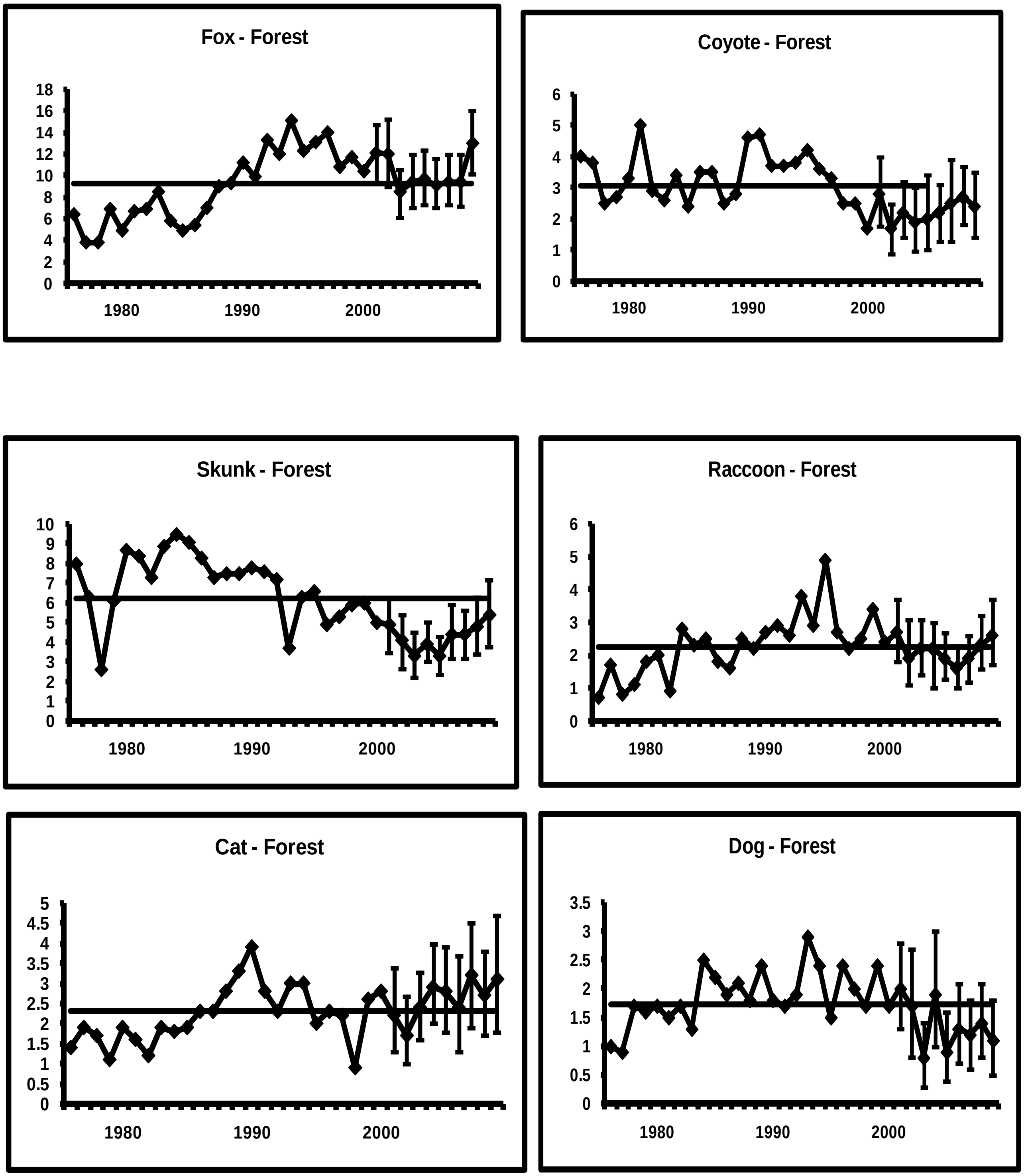

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2009. Horizontal line represents long-term mean.

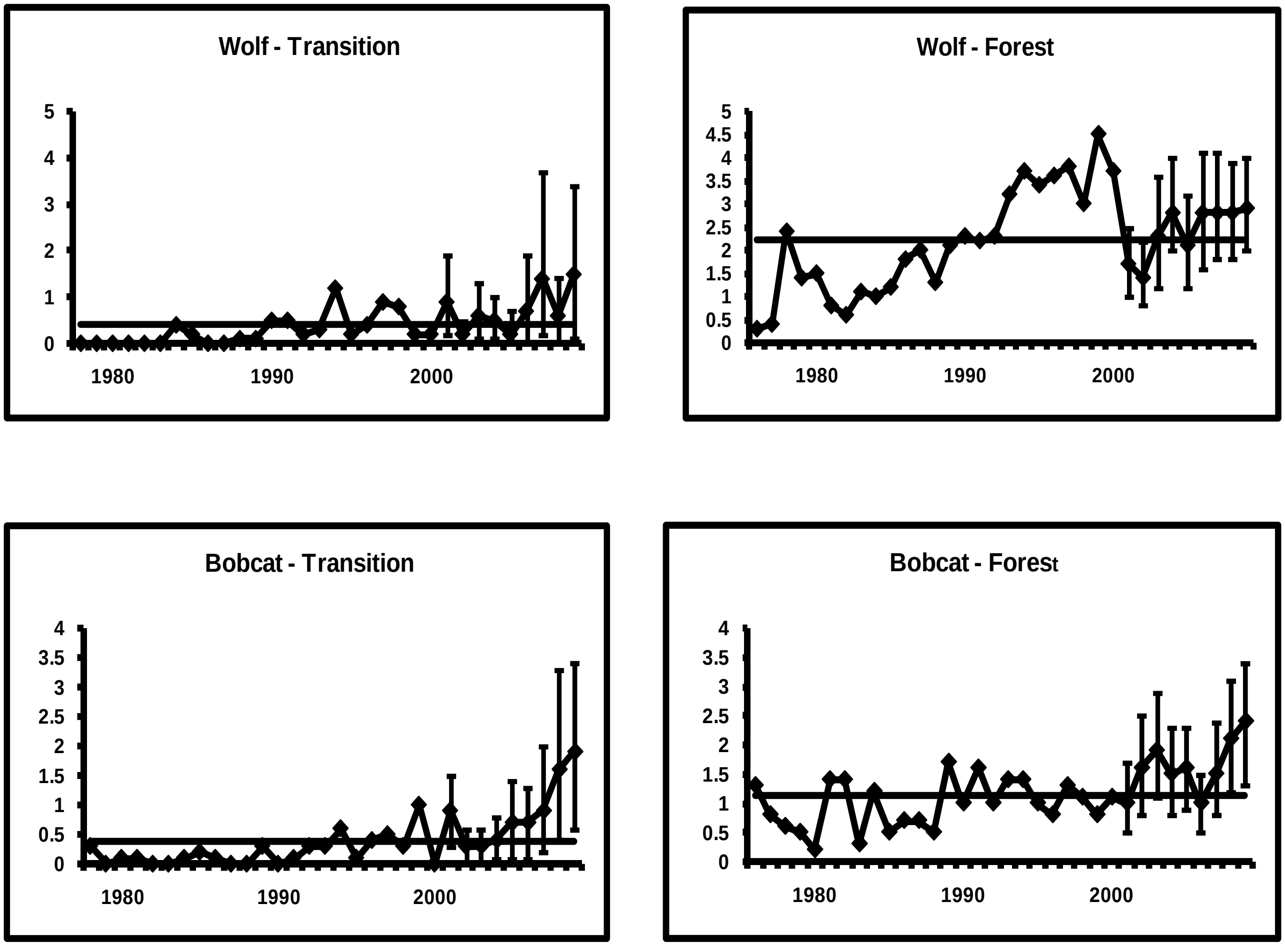

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2009. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2009

John Erb, Forest Wildlife Populations and Research Group, DNR

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on these populations. However, many carnivores are highly secretive, difficult to repeatedly capture, and naturally occur at low to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g., mark-recapture, distance sampling, etc.). Hence, indices of relative abundance are often used to monitor such populations over time (Hochachka et al. 2000, Wilson and Delahay 2001, Conn et al. 2004).

In winter, tracks of carnivores are readily observable following snowfall. Starting in 1991, Minnesota initiated a carnivore snow track survey in the northern portion of the State. The survey's primary objective is to use a harvest-independent method to monitor distribution and population trends of fisher (*Martes pennanti*) and marten (*Martes americana*), two species for which no other survey data was available. Because sign of other carnivores is readily detectable in snow, participants also record tracks for other selected species. After 3 years of evaluating survey logistics, the survey became operational in 1994.

METHODS

Presently, 58 track survey routes are distributed across the northern portion of the state (Figure 1). Each route is 10 miles long and follows secondary roads or trails. Route locations were subjectively determined based on availability of suitable roads/trails, but were chosen, where possible, to represent the varying forest habitat conditions in northern Minnesota. For data recording, each 10-mile route is divided into 20 0.5-mile segments.

Each route is surveyed once following a fresh snow typically from December through mid-February, and track counts are recorded for each 0.5-mile segment. When it is obvious the same animal crossed the road multiple times <u>within</u> a 0.5-mile segment, the animal is only recorded once. If it is obvious that an animal ran along the road and entered multiple 0.5 mile segments (which often occurs with canids), it's tracks are recorded in all segments, but circled to denote it was the same animal. While such duplicate tracks are not included in calculation of track indices (see below), recording data in this manner allows for future analysis of animal activity in relation to survey 'plot' size and habitat. Snowshoe hare (*Lepus americanus*) are recorded only as present or absent in the first 0.1 miles of each 0.5-mile segment. While most routes are surveyed 1 day after the conclusion of a snowfall (ending by 6:00 pm), thereby allowing 1 night for track 'registry', a few routes are usually completed 2 nights following snowfall. In such cases, track counts on those routes are divided by the number of days post-snowfall.

Currently, 3 summary statistics (2 graphs) are presented for each species. First, I compute the percentage of 0.5-mile segments with species presence after removing any duplicates (e.g., if the same fox clearly traverses 2 adjacent 0.5-mile segments along the road, and it was the only 'new' red fox (*Vulpes vulpes*) in the second segment, only 1 of the 2 segments is considered independently occupied). In addition to this metric, but on the same graph, the average number of tracks per 10-mile route is presented after removing any obvious duplicate tracks across segments. For wolves (*Canis lupus*) traveling through adjacent segments, the maximum number of pack members recorded in any 1 of those segments is used as the track total for that particular group, though this is likely an underestimate of true pack size. Because individuals from many of the species surveyed tend to be solitary, these 2 indices will often yield mathematically equivalent results (i.e., on average, one tends to differ from the other by a constant factor). In the case of wolf packs, and to a lesser extent red fox and coyotes (*Canis latrans*) which may start traveling as breeding pairs in winter, the approximate equivalence of these 2 indices will still be true if average (detected) group sizes are similar across years. However, the solitary tendencies in some species are not absolute, potential abundance (in relation to survey plot size) varies across species, and for wolves, pack size may vary annually. For these reasons, as well as to provide an intuitive count metric, both indices are currently presented. Because snowshoe hares are tallied only as present/absent, the 2 indices will by definition be equivalent. Hare survey data is also obtained via counts of animals observed on grouse drumming count surveys conducted in spring. Data for both the spring and winter indices are presented for comparison.

In the second graph for each species, I illustrate the percentage of routes where each species was detected (hereafter, the 'distribution index'). This measure is computed to help assess whether any notable changes in the above track indices are a result of larger-scale changes in distribution (more/less routes with presence) and/or finer-scale changes in density along routes.

Using bootstrap methods, I compute confidence intervals (90%) for the percent of segments with species presence and the percent of routes with species presence. For each of 1000 replicates, survey routes are randomly re-sampled according to the observed route sample size. Replicates are ranked according to the magnitude of the calculated index, and the 50^{th} and 950^{th} values constitute the lower and upper bounds of the confidence interval.

RESULTS

Forty-five of the 58 routes were completed this year (Figure 2). Survey routes took an average of 2.1 hours to complete. Total snow depths averaged 10" for completed routes, just slightly above the long-term average (Figure 3). Mean overnight low temperature the night preceding the surveys was -4°F, the second coldest since surveys began (Figure 3). Survey routes were completed between December 10^{th} and February 25^{th} this winter, with a mean survey date of January 7^{th} (Figure 3).

Though not a statistically significant change, fisher track indices (% of segments with detection) once again dropped to a new low (Figure 4). Fishers were detected on 5% of the route segments, and on 56% of the routes (Figure 4). Conversely, though still a non-significant change, marten track indices rebounded slightly. Their track index, however, remains well below the long-term average (Figure 4). Marten were detected on 5% of the route segments, and 40% of the survey routes.

Compared to last year, little change was observed in bobcat (*Lynx rufus*), wolf, red fox, and weasel (*Mustela* spp.) indices (Figure 4). Red fox and weasel remain below their long-term average, bobcats remain above their long-term average, with wolf indices near their long-term average. Wolves were detected on 71% of survey routes, while bobcats were detected on 41% of survey routes. The coyote index increased significantly this year, though only to a level approximating their long-term average. Both the spring and winter hare indices have remained stable in recent years, with no clear indication that the historic pattern of 10-year cycles is continuing in current times (Figure 4).

DISCUSSION

Reliable interpretation of changes in track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000) Because this remains an untested assumption, caution is warranted when interpreting changes, particularly annual changes of low to moderate magnitude, or short-term trends. Of particular note this year, the mean survey date was somewhat later than the long-term average, with average temperatures (on nights preceding each survey event) the second coldest since the survey began.

Based on confidence intervals, the only statistically significant change from last year was an increase in the coyote index, though only to a level approximating its long-term average. In addition, several multi-year patterns continue, with fisher, marten, fox, and weasel indices below their long-term average, and bobcat indices above their long-term average. Confidence interval data for previous years will continue to be incorporated over the next couple years.

I continue to review the adequacy of survey route sample size and distribution and hope that additional routes can be added in future years. We have also initiated fisher and marten research that, among other things, should provide some evaluation of track survey assumptions and possible approaches for estimating, and hence correcting for, any differences in the probability of detecting animals across years (e.g., MacKenzie et al. 2004). In particular, I hope to initiate repeat surveys on a subset of survey routes each winter, thereby allowing for estimation of year-specific detection rates.

ACKNOWLEDGEMENTS

I wish to thank all those who participated in this year's survey, including DNR field staff, USFS staff (Ely and Cook Districts), and staff from the Fond-du-Lac, Leech Lake, and Red Lake Bands, and the 1854 Treaty Authority.

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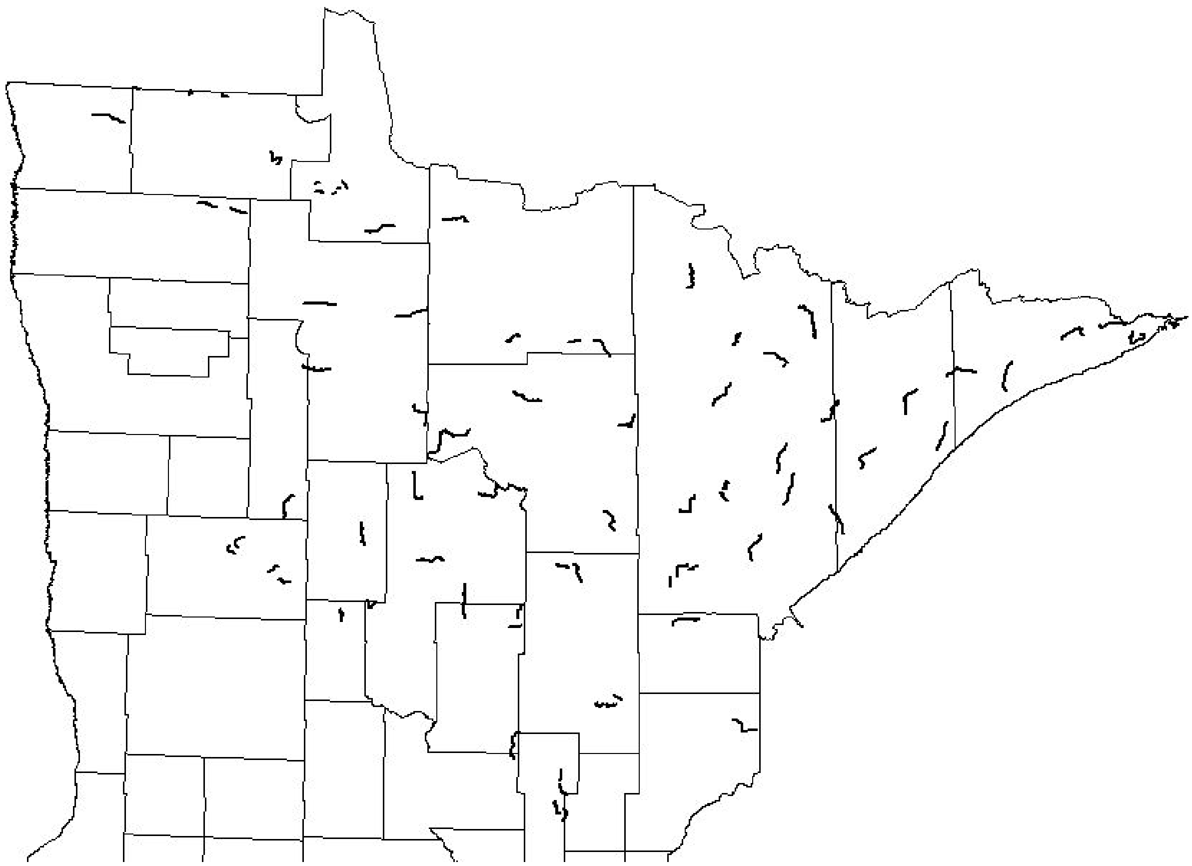

Figure 1. Locations of established furbearer winter track survey routes.

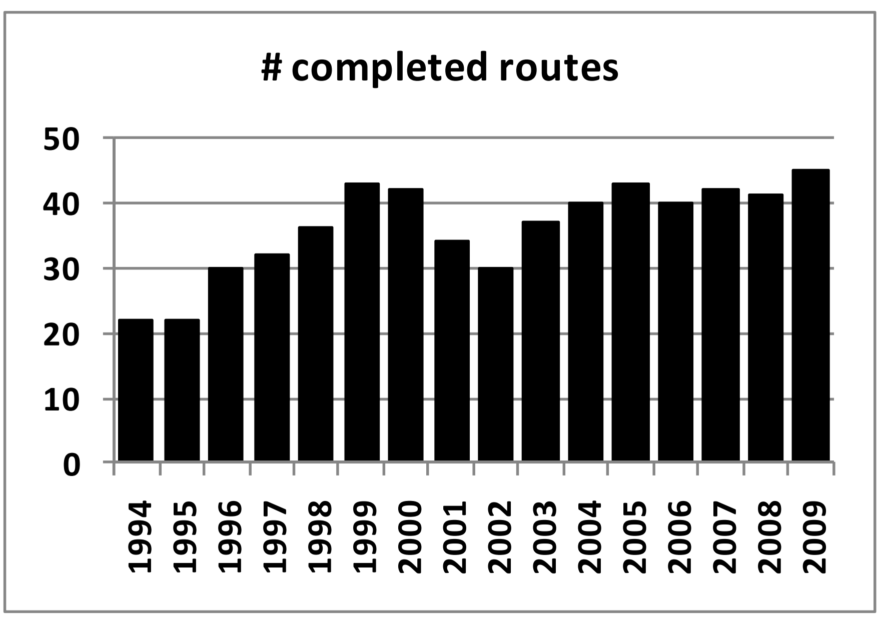

Figure 2. Number of winter track routes surveyed, 1994-2009.

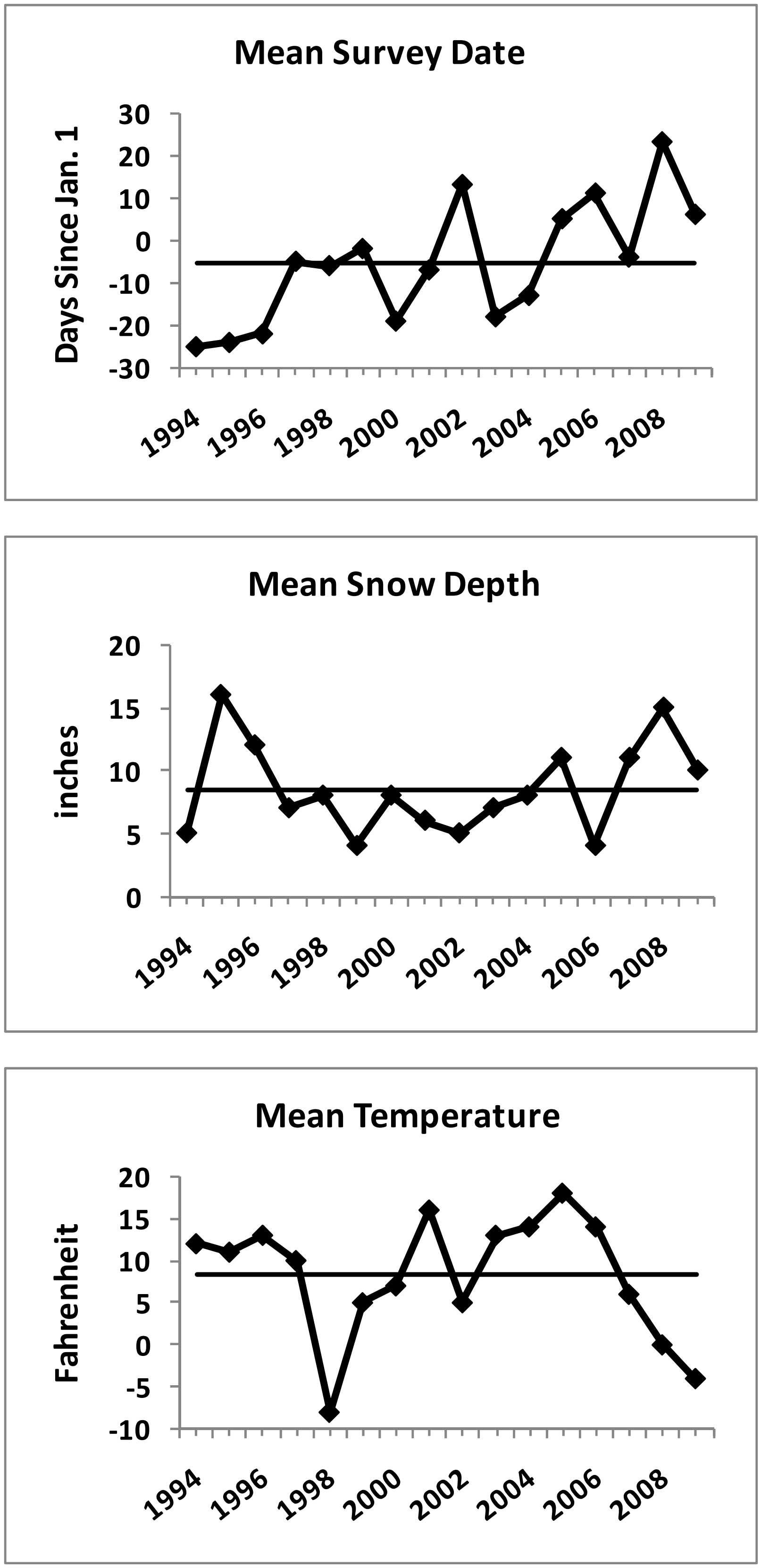

Figure 3. Average winter track survey date, snow depth, and temperature, 1994-2009. Horizontal line represents long-term mean.

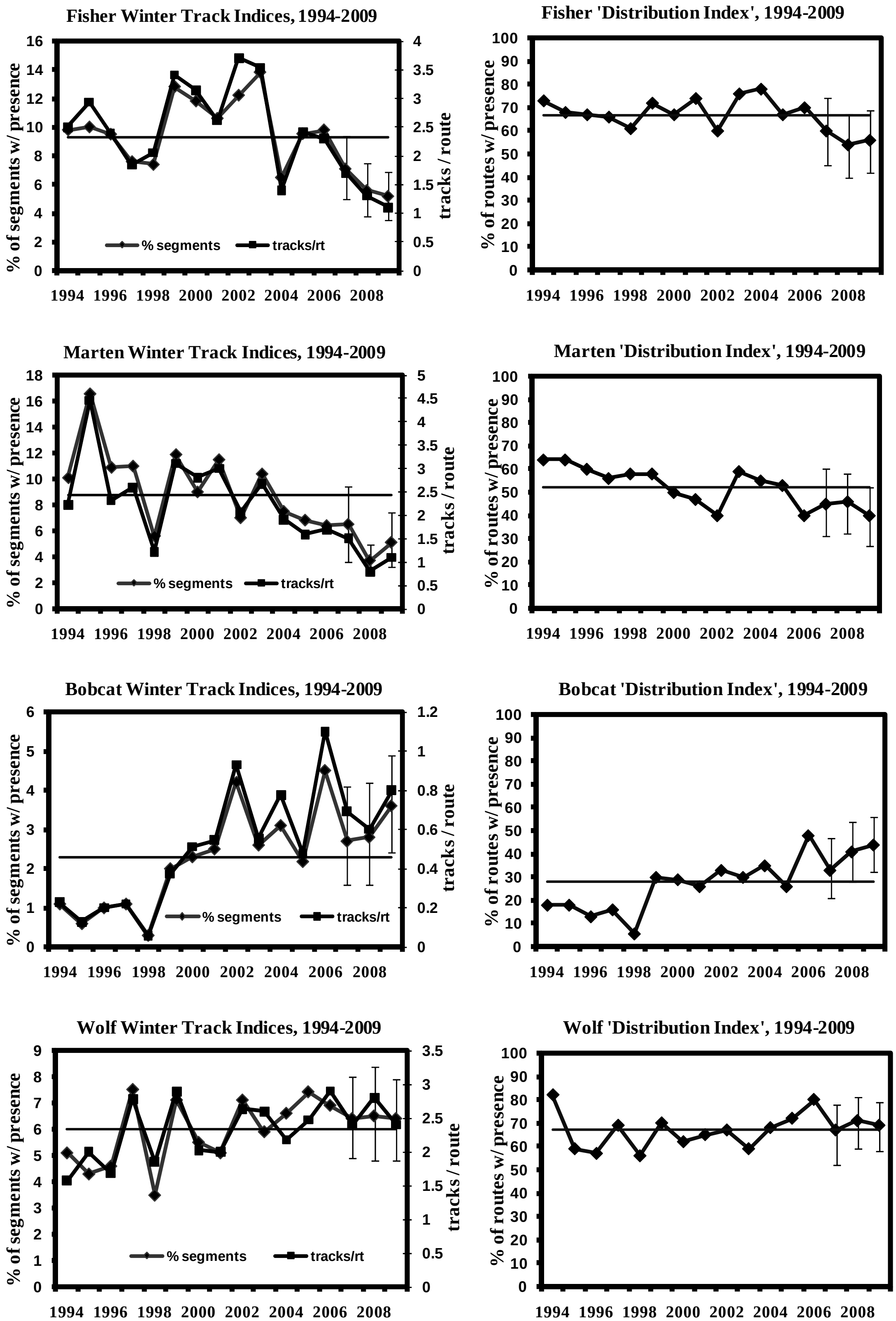

Figure 4. Winter track indices for selected species in Minnesota. Horizontal lines represent long-term average for percentage of segments and routes with presence.

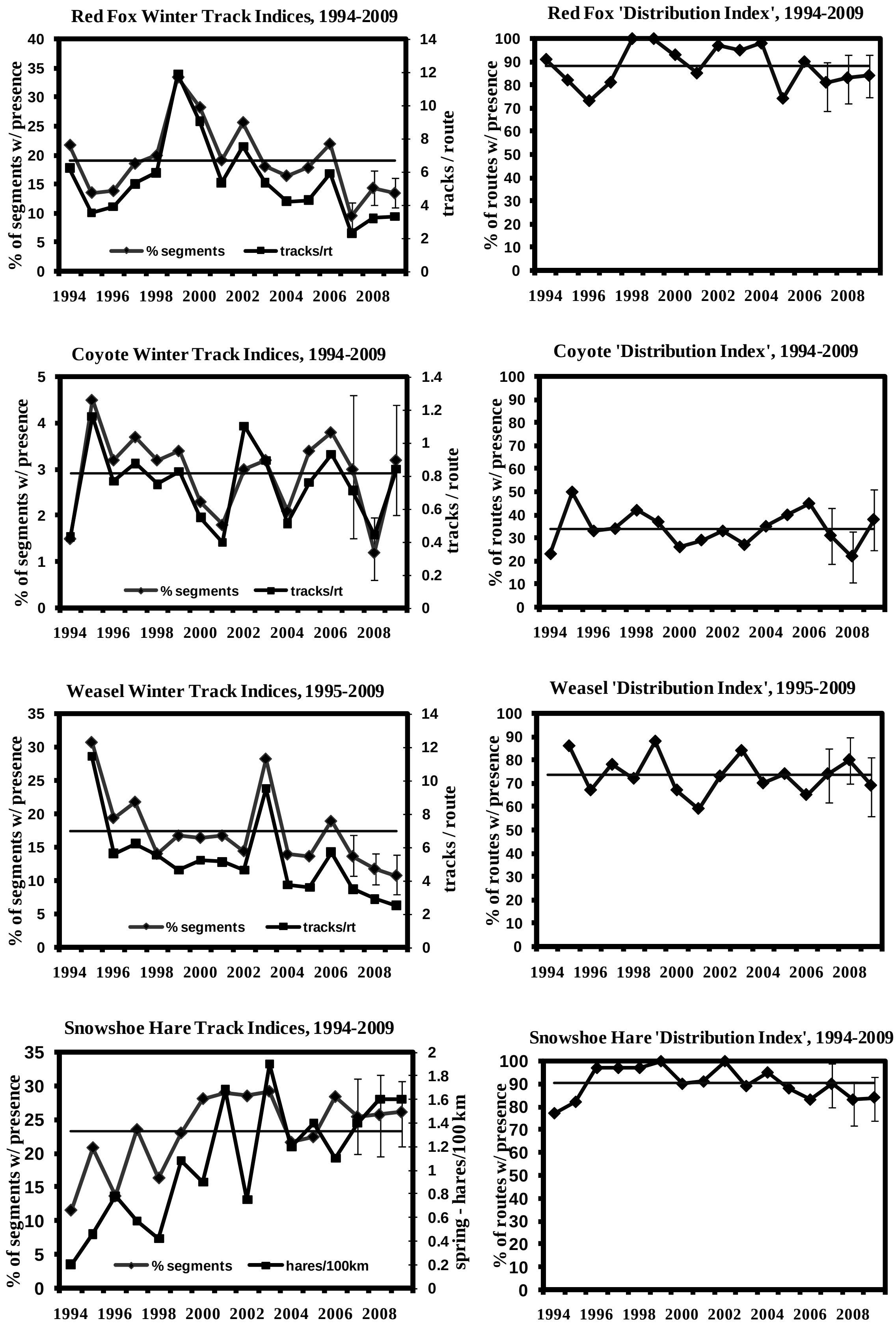

Figure 4 (continued). Winter track indices for selected species in Minnesota.