CARNIVORE SCENT STATION SURVEY SUMMARY, 2020

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INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for understanding 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 annually 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, Levi and Wilmers 2012).

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 46th year 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 tablet 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 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 or trails and are completed from September through October. Survey results are currently stratified based on 3 habitat zones within the state (forest (FO), transition (TR), and farmland (FA); Figure 1).

Track presence 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 182 routes and 1,664 stations were surveyed this year, the second fewest since the survey became fully operational in the early 1980's. Route density varied from 1 route per 855 km^2 in the Forest Zone to 1 route per 1,840 km^2 in the Farmland Zone (Figure 1). The recent decline in survey effort is likely a result of staffing shortages and competing workload demands.

Statewide, route visitation rates (% of routes with detection), in order of increasing magnitude, were opossums (5%), bobcats (13%), wolves (14%), domestic dogs (19%), domestic cats (26%), skunks (30%), coyotes (31%), red foxes (35%), and raccoons (36%). Regionally, species-specific route visitation rates were as follows: red fox – TR 27%, FA 27%, FO 42%; coyote – FO 21%, TR 35%, FA 51%; skunk – TR 23%, FO 24%, FA 57%; raccoon – FO 14%, TR 42%, FA 86%; domestic cat – FO 12%, TR 33%, FA 51%; domestic dog – FO 13%, TR 16%, FA 31%; opossum - FO 0%, TR 6%, FA 19%; wolf - FA 0%, TR 2%, FO 25%; and bobcat - FA 0%, TR 8%, FO 21%.

Figures 2-5 show station visitation indices (% of stations visited) from the survey's inception through the current year. Although the survey is intended to document long-term trends in populations, confidence intervals (CI) improve interpretation of the significance of any annual changes. However, I refrain from formal significance testing (e.g., determination of whether a CI on the difference between means overlaps 0) and instead use more informal methods (i.e., degree of CI overlap; Cumming and Finch 2005) to highlight changes from last year that likely represent significant differences. Using this approach, the only notable changes this year were an increase in domestic dog detections in both the Transition and Forest zones, and declines in bobcat and striped skunk indices in the Transition Zone (Figures 3 - 5).

In the Farmland Zone (Figure 2), red fox indices continue to remain well below their long-term average, as they have for nearly 20 years. Conversely, coyote and raccoon indices remain at or near record levels. Low red fox numbers are likely related, in part, to increased coyote abundance (Levi and Wilmers 2012). No consistent long-term trends are evident for other species in the Farmland Zone.

Similar to the Farmland, red fox and coyote indices have primarily exhibited inverse patterns in the Transition Zone, with red fox indices remaining low and coyote indices steadily increasing (Figure 3). Following a significant increase last year, there was a significant decrease this year in the striped skunk index in the Transition Zone, though long-term data do not show any consistent trend and current indices are just below their long-term average. Also following a significant increase last year, and in spite of large CIs, bobcat indices in the Transition Zone decreased significantly to 'typical' levels observed before last year's spike (Figure 5). Raccoon indices in the Transition zone have been comparatively stable and near their long-term averages over the past 2 decades. Wolves had exhibited a mild increase in the Transition Zone over time, but indices have been below the long-term average (and at or near 0) the past 3 years, with a moderate increase this year.

With the exception of increased domestic dog detections, no significant changes were noted in the Forest Zone (Figures 4 and 5). Unlike in the Farmland and Transition Zones, the Forest Zone coyote index has not increased over time and has been below average and stable for 2 decades, likely attributable to increased wolf abundance in the Forest Zone (Levi and Wilmers 2012). Red foxes, raccoons, and skunks have not exhibited consistent or notable trends over the past 20 years and all remain near or slightly below their long-term averages. Conversely, wolves and bobcats have exhibited increasing trends in the Forest Zone over the past 2 decades, though some shorter-term declines have occurred during this period.

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LITERATURE CITED

Conn, P. B., L. L. Bailey, and J. R. Sauer. 2004. Indexes as surrogates to abundance for low-abundance species. Pages 59-76 *in* W. L. Thompson, editor. Sampling rare or elusive species: Concepts, designs, and techniques for estimating population parameters. Island Press, Washington, D.C., USA.

Cumming, G., and S. Finch. 2005. Inference by eye: confidence intervals and how to read pictures of data. American Psychologist 60: 170-180.

Hochachka, W. M., K. Martin, F. Doyle, and C. J. Krebs. 2000. Monitoring vertebrate populations using observational data. Canadian Journal of Zoology 78:521-529.

Levi, T., and C. C. Wilmers. 2012. Wolves-coyotes-foxes: a cascade among carnivores. Ecology 93: 921-929.

Linhart, S. B., and F. F. Knowlton. 1975. Determining the relative abundance of coyotes by scent station lines. Wildlife Society Bulletin 3: 119-124.

Roughton, R. D., and M. D. Sweeny. 1982. Refinements in scent-station methodology for assessing trends in carnivore populations. Journal of Wildlife Management 46: 217-229.

Sargeant, G. A., D. H. Johnson, and W. E. Berg. 1998. Interpreting carnivore scent station surveys. Journal of Wildlife Management 62: 1235-1245.

Sargeant, G. A., D. H. Johnson, and W. E. Berg. 2003. Sampling designs for carnivore scent-station surveys. Journal of Wildlife Management 67: 289-298.

Thompson, W. L., G. C. White, and C. Gowan. 1998. Monitoring vertebrate populations. Academic Press, San Diego, California.

Wilson, G. J., and R. J. Delehay. 2001. A review of methods to estimate the abundance of terrestrial carnivores using field signs and observation. Wildlife Research 28:151-164.

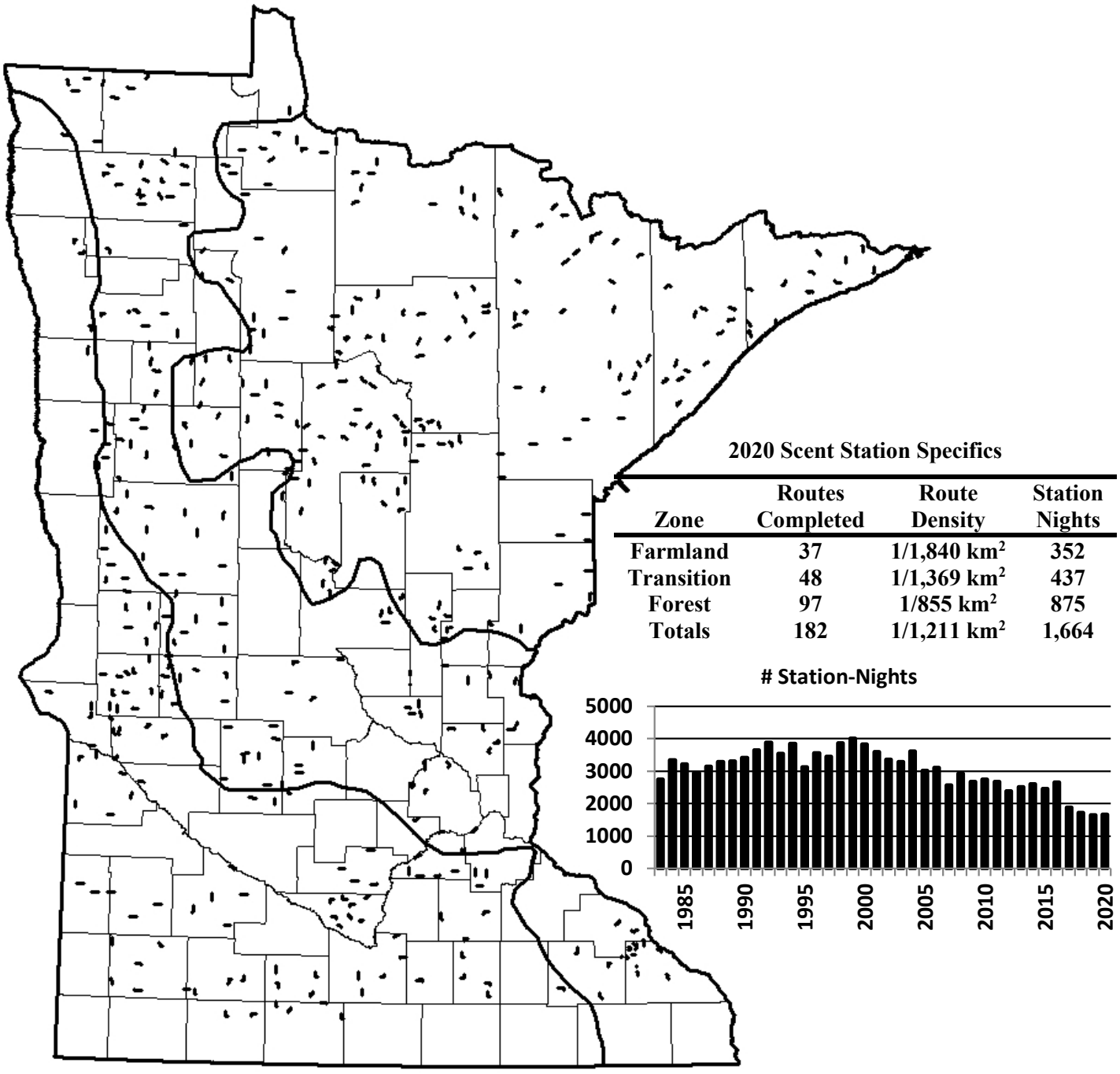

Figure 1. Locations of existing scent station routes (not all completed every year). Insets show 2020 route specifics and the number of station-nights per year since 1983.

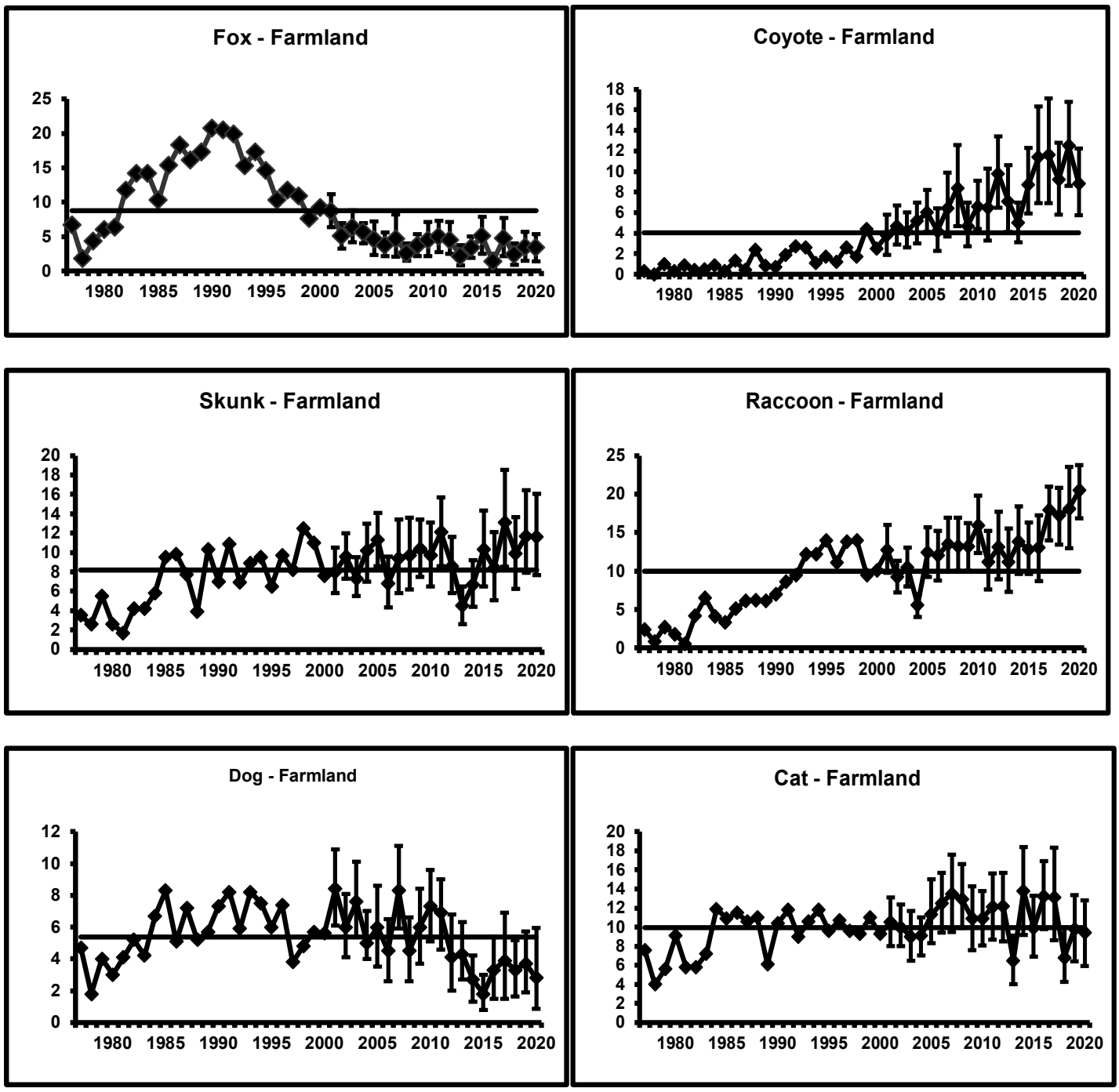

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2020. Horizontal line represents long-term mean.

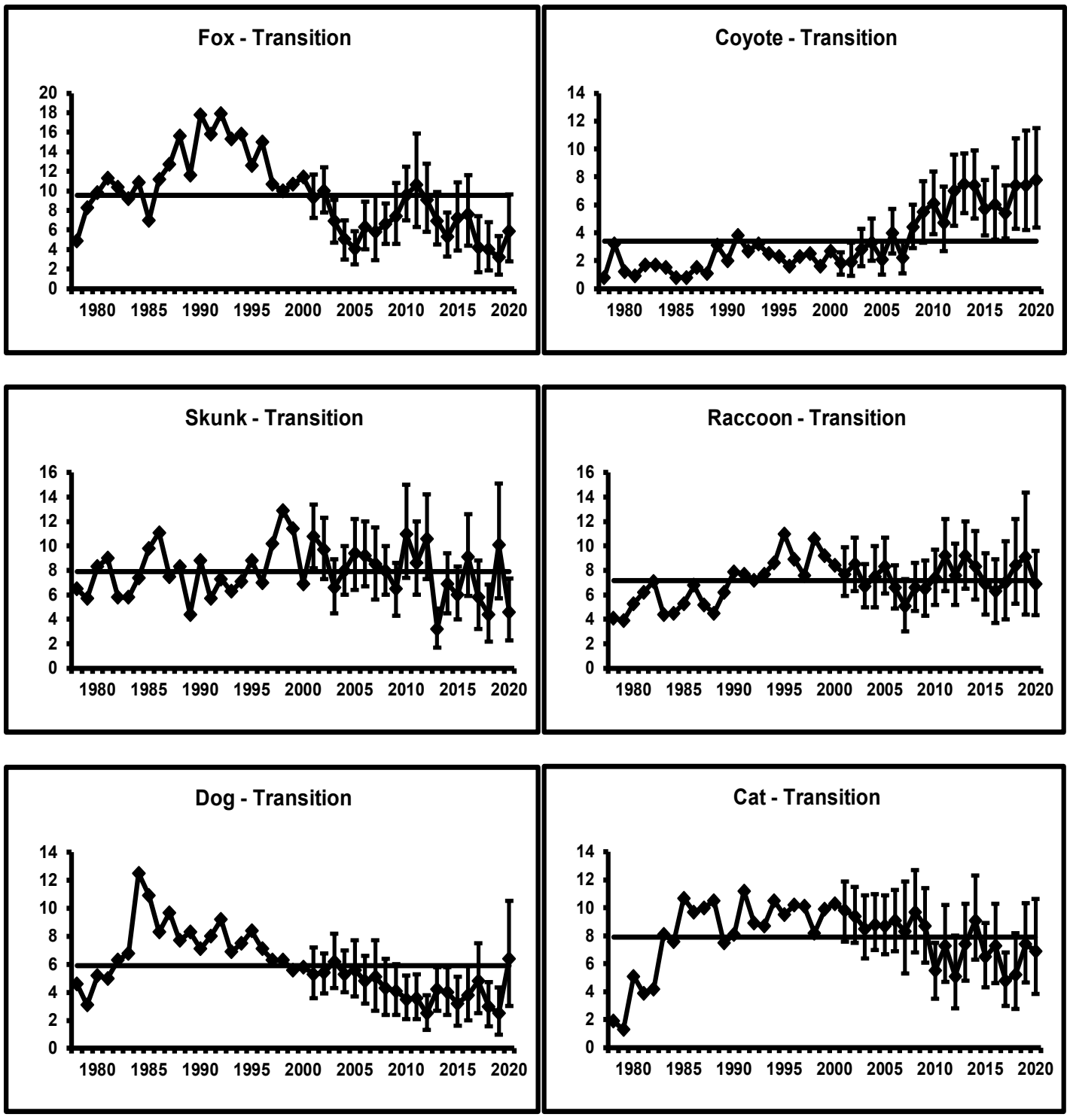

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2020. Horizontal line represents long-term mean.

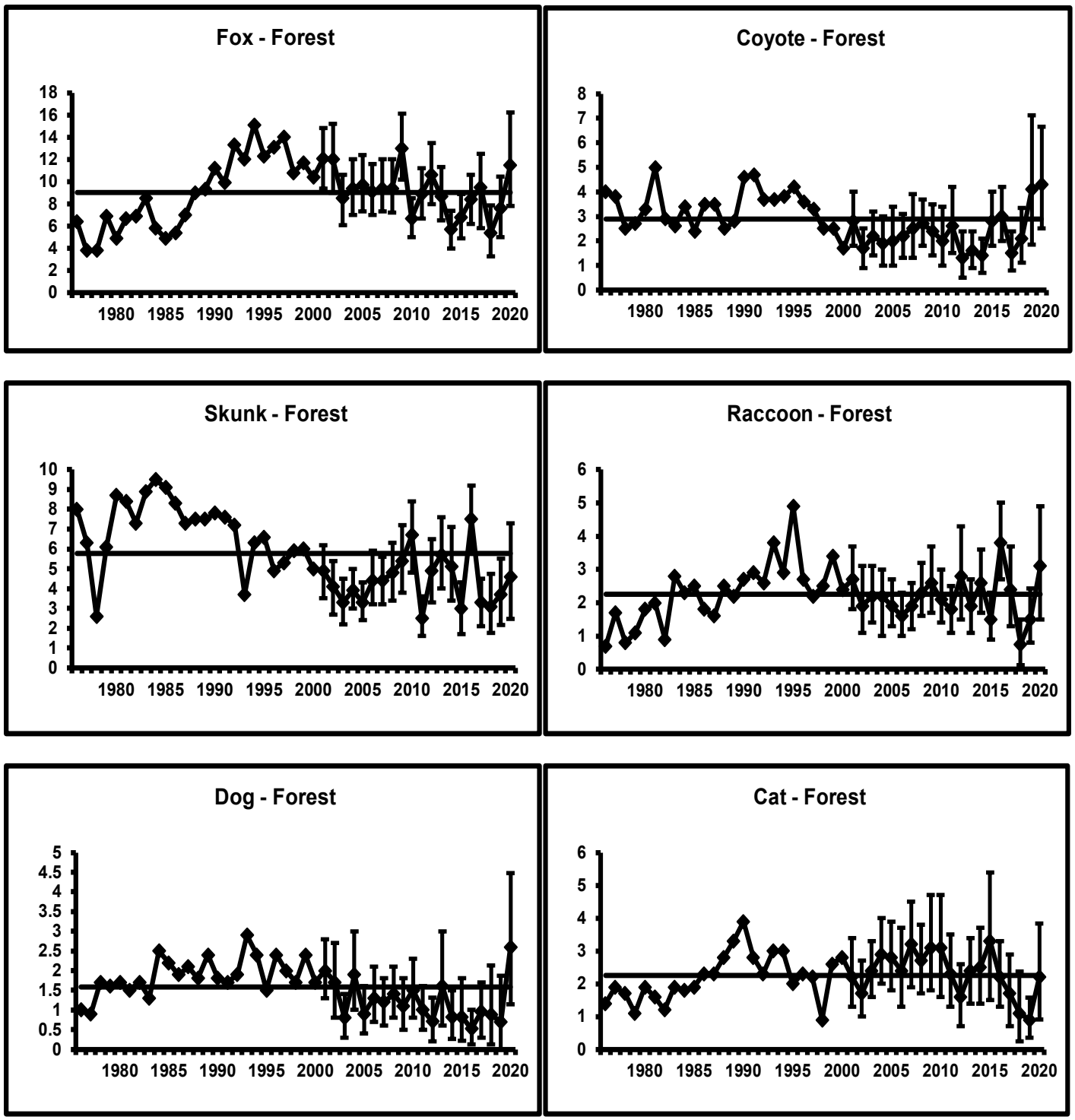

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2020. Horizontal line represents long-term mean.

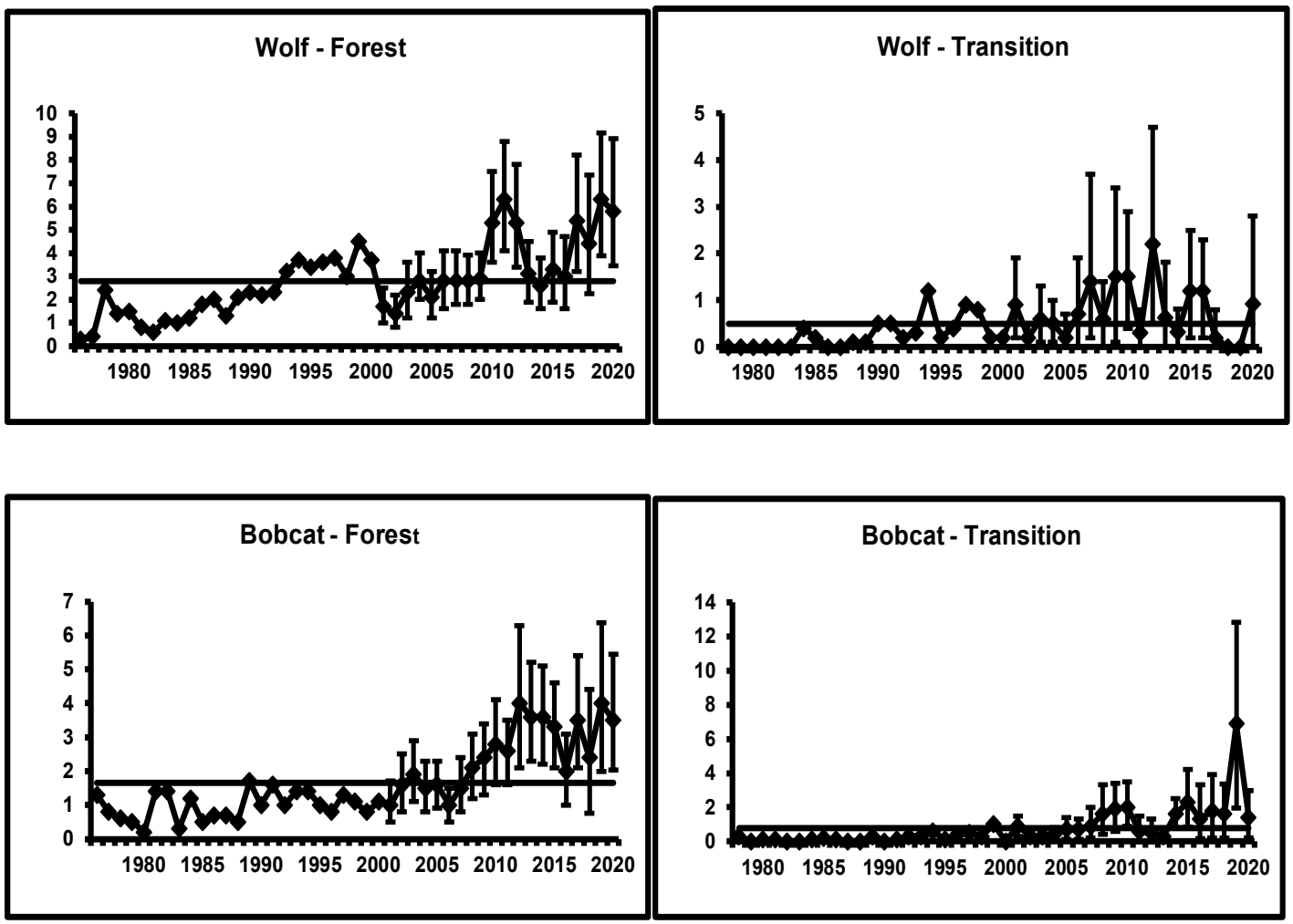

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2020. Horizontal lines represents long-term mean.