

2021 Ranger Creek MAPS Station Summary Report

1999-2021



Photos clockwise from top left (by Cyndi Smith):

*Cassin's Vireo (second year, unknown sex)
Olive-sided Flycatcher (after hatch year, unknown sex)
Western Tanager (second year female)*

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1.0 Background

The Monitoring Avian Productivity and Survivorship (MAPS) program was established in 1989 by The Institute for Bird Populations (IBP), Petaluma, California. Its goal is to provide long-term demographic data on landbirds as an aid in identifying the causal factors driving population trends documented by other avian monitoring programs such as the North American Breeding Bird Survey and Christmas Bird Counts (DeSante and Nott 2001). It is a cooperative effort among public agencies, private organizations, and individual bird banders in North America to operate a continent-wide network of constant-effort mist-netting stations during the breeding season.

1.1 Objectives

The objective of MAPS is to provide long-term population and demographic information on target passerine species at various spatial scales by providing:

- annual indices and longer-term trends in adult population size and post-fledging productivity from analyses of numbers and proportions of adult and young birds captured during the breeding season; and
- annual estimates and longer-term trends of adult survivorship, adult population size, and recruitment into the adult population from analyses of mark-recapture data on adult birds gathered at these same stations.

These indices and estimates can be used to aid in:

- identifying the proximate causes of population changes in the target species;
- identifying conservation and management actions to reverse the population trends of declining species; and
- evaluating the effectiveness of the conservation and management actions implemented.

MAPS data has contributed to publications on survival rate estimates (DeSante et al. 1995), proximate demographic causes of population change (DeSante and Nott 2001), and the influence of climate change on avian productivity in the Pacific Northwest (Nott et al. 2002). These publications, as well as many technical reports, can be found on the IBP's website <http://www.birdpop.org/pubmaps.htm>.

1.2 Target species

The MAPS program divides the continent into eight major regions based on biogeographical and meteorological considerations, and each region has target species identified within it. While IBP statisticians rarely analyse the data using these specific target species, it is still instructive to consider the original target list. Banff National Park falls into the Northwest Region, whose target species (scientific names can be found in Appendix A) are:

- Dusky Flycatcher
- Western Flycatcher complex
- Swainson's Thrush
- American Robin

- Warbling Vireo
- Orange-crowned Warbler
- Yellow Warbler
- MacGillivray’s Warbler
- Wilson’s Warbler
- Song Sparrow
- Lincoln’s Sparrow
- “Oregon” Dark-eyed Junco

2.0 Ranger Creek MAPS Station (RANG)

There are parameters for establishing a MAPS station. They should be sited in locations:

- that will allow for their operation indefinitely into the future, or at least for five to ten years;
- that will permit the capture of substantial numbers of many of the common species of passerines breeding in the area, including at least one of the target species for that region;
- where floating, transient and migrant birds do not tend to concentrate;
- that are upland woodland or forest habitats, lowland woodland or riparian habitats, or in scrub habitats;
- that are in relatively mature habitats or where the habitat is held in a lower successional stage by active management; and
- that are likely to remain free of major human-caused disturbance for the duration of the project.

The establishment of a MAPS station near Ranger Creek (RANG), in 1999, fulfilled these parameters. At the time of its establishment the only other MAPS station in the mountain national parks was in Mount Revelstoke National Park, which operated from 1993 until 2002. In 2002, a MAPS station was started in Waterton Lakes National Park, and in 2004, a MAPS station was initiated in Jasper National Park, and both are ongoing (Smith et al. 2008). Ranger Creek is the longest-running MAPS station in a national park in Canada, the 5th longest running station in Alberta, and the 7th longest running station in Canada.

The MAPS Program is a recommended survey in the Canadian Landbird Monitoring Strategy of the Canadian Wildlife Service (Anon. 1994). The *Special Resources of Banff National Park* (Achuff et al. 1986) recommended further study of “Bird Community 9” (montane shrub wetland, as classified by Holland et al. 1983), which is almost wholly confined to the Vermilion Lakes Ecoregion in the Montane ecoregion. While considerable study has been undertaken of the waterfowl species of this community, only recently have landbird surveys, such as point counts in the early 1990s (Mike McIvor, pers. comm.), been undertaken. Since 2007 autonomous recording units have been used to monitor landbirds at point count sites along permanent transects throughout the park (Whittington et al. 2019).

The Ranger Creek site was chosen as 1) being representative of the Ecoregion (wet shrub/spruce complex), 2) receiving little human traffic, and 3) having easy access. Monitoring of passerine use of the ecoregion will provide valuable baseline data to study the effects of vegetation changes and altered hydrological processes.

The station was established near where Ranger Creek joins the Bow River, approximately 17 km west of Banff on the Bow Valley Parkway (Fig. 1), also known as Highway 1A, at an elevation of approximately 1,380 m. The station area (approximately 100 m beyond each net) encloses about 11 ha of habitat.

2.1 Habitat description

The Ranger Creek station is situated in the Vermilion Lakes Ecosite 3 (VL3), which encompasses wet level floodplains dominated by forest and shrub vegetation (Holland et al. 1983). Vegetation patterns are complex (Figs. 2 and 3). A Rapid Habitat Structure Assessment (HSA) protocol (Nott 1999) was used in 1999 to determine spatial habitat patterns at the site, and re-assessed in 2004, 2011, 2016 and 2021 (Nott et al. 2003). Currently there are four primary habitat types: closed canopy forest of aspen with spruce and some pine, sedge meadow, closed canopy spruce/willow forest, and aspen shrubland with meadow (Fig. 3). Detailed habitat descriptions can be found in Smith (2001) and in the primary author's files. Since establishment of the station, beavers have left the site and the wetland is slowly drying out. A number of spruce trees on the edge of the pond blew down or died (Fig. 4). Also, with the reduction of elk in the area, the montane meadow has become predominantly an aspen shrubland.

3.0 Methods

3.1 Operation of station

The MAPS Program consists of standardized constant-effort mist-netting during the breeding season (DeSante et al. 2005, 2019). The breeding season is considered to extend from May 01 to August 28, depending on local latitude and altitude, and is divided into 10 ten-day periods. For Ranger Creek the MAPS season begins in period five (June 10 - June 19) and ends with period ten (July 30 - August 8). Mist-netting commences the first 10-day period during which the great majority of the breeding adults of the target species have established territories and migrant individuals of these species are no longer passing through the area. Ten mist nets were operated for six hours from sunrise on one day during each of the 10-day periods.

New mandatory access restrictions (closed from 8:00 p.m. until 8:00 a.m. between 1 May and 25 June) on the Bow Valley Parkway were implemented in 2014. This affects the first banding session in period five, but by setting and furling the nets the evening before, we are able to open the nets by 8:30 a.m., thus only losing 20 net hours.

The mist nets were placed where birds could be captured most efficiently, such as the brushy portions of wooded areas, forest breaks or edges, and the vicinity of water. Nets were removed from the site after the completion of each banding session, but poles and rebar pegs used to hold them in place, as well as banding table and chairs, were left until the end of the banding season.

The type and location of nets may be changed after the first year, but should be kept constant after that time. However, net 1 was discontinued after 2002 because of difficulty in accessing it across a small creek, and net 6 was discontinued after 2002 because rising waters from the wetland were flooding that lane; nets 11 and 12 were added in 2004 to keep the number of nets at 10. In 2001, the banding table was relocated from next to the grazing enclosure to near net 10, to

reduce trampling of vegetation adjacent to the enclosure, which is part of a long-term vegetation monitoring program of Parks Canada. Also in 2001, boardwalks were installed at nets 6-10 to reduce impact on the wetland vegetation. Some of these have been removed due to deterioration and to drying out of the wet area.

Ten mist nets (30-mm mesh; 2.6 m tall x 12 m long) were used to capture birds. A portable electronic scale (weighing to nearest 0.1 gram) was used to weigh birds.

3.2 Data collection

All birds captured were identified to species, age, and sex (Pyle 1997). Except for hummingbirds, all unbanded birds were banded with a uniquely-numbered internationally-recognized aluminum leg band. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines, using standardized codes and forms (DeSante et al. 2005, 2019):

- capture code (newly banded, recaptured, band changed, unbanded),
- band number,
- species,
- age (both calendar year and WRP coding) and how aged,
- sex (if possible) and how sexed (if applicable),
- extent of skull pneumaticization (if assessed),
- breeding condition of adults (i.e., extent of cloacal protuberance or brood patch),
- extent of juvenal plumage in young birds,
- extent of body and flight-feather moult,
- extent of primary-feather wear,
- presence of moult limits and plumage characteristics,
- wing chord,
- fat class and body mass,
- date and time of capture (net-run time),
- station and net site where captured, and
- any pertinent notes.

Since 2017 we have been cooperating with the Bird Genoscape Project (www.birdgenoscape.org) by collecting tail feathers (generally R1 and L6) from certain species for genetic analysis. The skin cells still attached to the shaft of the feather are a source of DNA that can be used to determine the breeding origin of an individual. The resulting population-specific range maps for these species can be used to explore various research questions (e.g., Bay et al. 2018, Ruegg et al. 2018). With reduced numbers of volunteers in 2020 and 2021 we did not collect feathers.

The times of opening and closing each net and beginning of each net run is recorded to the nearest 10 minutes each day (period) so that effort can be calculated to allow constant-effort comparisons of data. The breeding status (confirmed breeder, likely breeder, non-breeder) of each species seen, heard, or captured at the station on each day was recorded.

3.3 Data entry and verification

All banding data were entered into MAPSPROG ver. 5.0.00 (Froehlich et al. 2008) by the author. The critical data for each banding record (capture code, band number, species, age, sex, date, capture time and net number) were proofed by hand against the raw data and any computer-entry errors were corrected. All banding data were then run through a series of verification programs in MAPSPROG, as follows:

- clean-up programs to check the validity of all codes entered and the ranges of all numerical data,
- cross-check programs to compare state, date, and net fields from the banding data with those from the summary of mist netting effort data,
- cross-check programs to compare species, age, and sex determinations against degree of skull pneumaticization, breeding condition, and extent of body and flight-feather moult, primary-feather wear, and juvenal plumage,
- screening programs which allow identification of unusual or duplicate band numbers or unusual band sizes for each species, and
- verification programs to screen banding and recapture data from all years of operation for inconsistent species, age, or sex determinations for each band number.

Any discrepancies or suspicious data identified during these verification programs were examined manually and corrected if necessary.

3.4 Data analyses

All species encountered at the station were classified into six groups based upon their breeding or summer residency status. Each species was classified as one of the following:

- a regular breeder (B) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station during all years that the station was operated.
- a usual breeder (U) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station during more than half but not all of the years that the station was operated.
- an occasional breeder (O) if we had positive or probable evidence of breeding or summer residency within the boundaries of the MAPS station during half or fewer of the years that the station was operated.
- a transient (T) if the species was never a breeder or summer resident at the station, but the station was within the overall breeding range of the species.
- an altitudinal disperser (A) if the species breeds only at lower elevation than that of the station but disperses to higher elevations after breeding.
- a migrant (M) if the station was not located within the overall breeding range of the species. This category includes extralimital breeders, i.e., the species bred at the station but the station was outside the normal breeding range for the species.

The banding data from 1999 through 2021 were used to determine the:

- numbers of newly banded birds, recaptured birds (year-to-year, same year and same day), and birds released unbanded,
- the numbers and capture rates (per 100 net hours) of first captures (in a given year) of individual adults and young birds,
- an index of adult population size, and
- reproductive index.

The number of adult birds captured was used as an index of adult population size. The reproductive index (number of young divided by number of adults) reflects post-fledging productivity.

3.5 Population trend projections due to climate change

Bird communities are changing due to climate shifts, even within protected areas (Wu et al. 2018). To understand the projected trend in species composition, Parks Canada determined the climate suitability (based on range of temperature, precipitation and seasonal shifts) of 513 species in national parks across the country, then used climate models to determine future climate suitability (for the year 2050) for each species in each national park (Parker et al. 2019a). Two climate scenarios were modelled: a high-emissions pathway (RCP8.5) and a moderate-emissions pathway (RCP4.5) (Parker et al. 2019b). In Banff National Park, adequate data existed to model 145 of the 208 species currently found in the park in the summer (Parker et al. 2019b). Conditions for 73 species are projected to improve, 41 species are projected to remain stable, 19 are projected to worsen, and 12 may be locally extirpated.

To analyze climate change impacts we chose those species on the list for which we had data from at least half of the years of operation (minimum 12 years). We then used a 3-year moving average to smooth the annual variation in captures, which makes trends difficult to determine.

Populations of the following species are projected to decline:

- Ruby-crowned Kinglet
- Fox Sparrow
- Lincoln's Sparrow
- White-crowned Sparrow
- Orange-crowned Warbler
- Blackpoll Warbler
- Wilson's Warbler

Populations of the following species are projected to increase:

- Willow Flycatcher
- Least Flycatcher
- Warbling Vireo
- Golden-crowned Kinglet
- Swainson's Thrush
- American Robin
- Chipping Sparrow
- Brown-headed Cowbird
- MacGillivray's Warbler
- Common Yellowthroat
- American Redstart

Populations of the following species are projected to remain stable:

- Mountain Chickadee
- Clay-coloured Sparrow
- Northern Waterthrush
- Tennessee Warbler
- Yellow Warbler
- Yellow-rumped Warbler

4.0 Results and Discussion

At Ranger Creek MAPS station, in 2021:

- this was the 23rd year of operation of the station,
- 225 birds were captured (Table 1), which is on average ($n = 224$),
- 122 adults were banded, which is above average (average = 109, range 57-182), of 32 species (Table 2), and
- 36 juveniles of 16 species were banded (Table 3), which is below average (average = 40, range 7-115).

Between 1999 and 2021:

- 5,142 birds were captured,
- the busiest year was 2001, with 356 birds handled, but 2016 had the second highest number of captures, with 337 birds handled,
- of 3,433 known-age birds banded, 2,508 were adults (Table 2), of 71 species
- 928 juveniles, of 47 species, were banded (Table 3),
- 71 species (adults and juveniles) have been captured, with an average of 33 species per year,
- first capture rate of adults averaged 32.2 per 100 net hours (range 18.1-50.6),
- juvenile capture rate averaged 12.2 per 100 net hours (range 2.1-31.2), for first captures, and
- capture rates for all birds (newly banded adults and juveniles, recaptures and unbanded) peaked in 2016, but the long-term trend is steady ($r^2=0.0173$) since 1999 (Fig. 5).

The reproductive index (RI; number of young divided by number of adults) continues to fluctuate, with 2021 (0.34) being slightly below average (0.36; range 0.06-1.23), and only half of what it was in 2020 (0.68). These fluctuations (Fig. 6) are probably most influenced by early summer weather. The years 2002, 2007, 2012, 2013 and 2019 were very wet, with reduced numbers of young produced in all five years, possibly due to females having to leave the nest more frequently to feed in cold weather, harder to provision the nestlings, and/or direct hypothermia of nestling and fledglings. Compared to other low productivity years, in 2021 the weather was very hot and dry, which may reduce food resources, particularly insects, or have direct negative impacts on nestlings. It is possible that by scheduling period 10's date quite early in 2015 (July 26), due to the bander's scheduling conflict, rather than between July 30 and August 8, that some juveniles were not fledged yet. The RI in 2003 was very high (1.23), driven by the capture of 30 juvenile Yellow-rumped Warblers. The RI over the 22 years of operation is basically steady ($r^2=-0.0008$).

Many individuals are recaptured in the same year they were banded, but 229 individuals of 30 species or sub-species have been banded in one year and recaptured in a subsequent year at the site (Appendix B). Most recaptures occur in the first year following banding (Table 4), but many individuals have been recaptured in more than one year. In 2021, 14 individuals of seven species were recaptured from previous years.

The return rate of adults (recaptured at least once in a year subsequent to banding) for each species (Table 5) is a function of many factors, including: breeding site fidelity of that species (and sex), territorial fidelity, nest success in previous years, the probability of recapturing the bird if it is present, and the probability of it surviving the full year (or more) in between captures. The overall return rate for all species combined at Ranger Creek was 9%. It is interesting to compare the adult return rate to the reproductive index (RI) for a few species: the return rate of Northern Waterthrush was 28%, but the RI was only 0.12 (119 adults and 13 juveniles banded); the return rate of Golden-crowned Kinglet was zero but the RI was 6.91 (8 adults and 62 juveniles banded), and; the return rate of Ruby-crowned Kinglet was 3% but the RI was 0.52 (95 adults and 51 juveniles banded). Unsurprisingly, none of 168 Pine Siskins or 95 Cedar Waxwings banded have been recaptured, as these are irruptive species and only breed occasionally at the site.

There have been five significant recaptures over the years:

- an after-second-year (ASY) male Northern Waterthrush (#2321-20551) banded in 2012, was recaptured in 2013, but not recaptured again until 2020, making him at least 10 years old, which is a new longevity record for this species (BBL 2021),
- an ASY male Northern Waterthrush (#2321-20588), banded in 2015, was not recaptured again until 2018, then in 2019 and 2021, making him at least 9 years old, the second-oldest longevity record for this species (BBL 2021),
- an after-second-year (ASY) female Willow Flycatcher (#2440-33147) banded in 2009 was recaptured every year until 2018, making her at least 11 years and 2 months old, which is the longevity record for this species (BBL 2021), and
- in 2016 an after-second-year (ASY) male Pine Siskin (#2780-67607) was our first foreign recapture (not banded at Ranger Creek). It had been banded almost five months earlier at Long Point Bird Observatory in Ontario, approximately 2,850 kms in a straight line from our station (Appendix C).

In 2021 we had seven stressed birds and one mortality (Table 6). Three Rufous Hummingbirds, two Ruby-crowned Kinglets, a Wilson's Warbler, and a Swainson's Thrush appeared to be hypothermic and were held in the bird hospital for 5 to 25 minutes, then successfully released. A Ruby-crowned Kinglet died in the bag, but was not a difficult extraction and did not appear to be badly stressed. Since 1999 there have been 22 mortalities (0.43% of captures). This is higher than the average mortality (0.23% \pm 0.15) reported at 22 banding sites in North America (Spotswood et al. 2011), 0.34% in Jasper National Park (Wesbrook 2016) and 0.10% in Waterton Lakes National Park (Smith 2020). There have been 21 recorded injuries since 1999 (0.41% of captures), lower than 0.59% in Jasper National Park and higher than 0.16% in Waterton Lakes National Park. These included: bleeding in the mouth from being tongued, wing abrasion, wing strain, dislocated and broken legs, hypothermia and capture/handling stress (these latter two are difficult to separate). Since 1999, 16 birds have been considered stressed (no apparent injuries, hypothermic) and released (0.31% of captures).

The goal, of course, is to have no mortalities or injuries. A “hospital box” has been added to the banding station’s equipment, consisting of an insulated lunch box lined with soft material, with chemical hand warmers that can be wrapped in cloth and used as an external heat source. It is a quiet place for stressed birds to recover while being monitored. Volunteers are trained to use the “body grasp” technique (Ralph 2005) for removing birds from the net, which is faster and results in fewer leg and wing strains than the leg grip. An additional change that was implemented in 2017 was the use of coloured clothespins to designate high priority birds to be actioned first by the bander. These included birds that were a difficult extraction, hatch-year birds, and species considered sensitive (American Robin, kinglets, Fox and Lincoln’s sparrows, Swainson’s Thrush, and Wilson’s Warbler) (Wesbrook 2016; unpublished data this station). A detailed Bird Handling Protocol was developed and implemented in 2019 (Appendix D).

Some nets capture more birds than others due to their proximity to certain vegetation communities or water (Fig. 3). Habitat edges, where forest meets willow or grassy meadow, are the most productive. Net #2 was the most productive net, with 19% of new captures in 2021, followed closely by Net #5 (18% of new captures) (Table 7). It also has been the most productive net by far since 1999 (Table 8), capturing 22% of new captures, almost double the next busiest net (Net #5 with 13% of new captures).

Ten of the 12 target species (Section 1.2) have been captured, observed or heard at the site. The average number of individuals of these species captured per year is seven, ranging from 0-13 (Table 9). Swainson’s Thrushes have overtaken Wilson’s and Yellow warblers for highest average number of yearly captures, which reflects the increasing amount of aspen/mixed forest habitat. The two warblers primarily inhabit the willow shrubland with adjacent conifer forest.

Of the species predicted to show a declining trend by 2050 (Parker et al. 2019b) we had sufficient data on seven species for analysis. From 1999-2021, Fox Sparrow and Wilson’s Warbler showed a declining trend; Lincoln’s Sparrow, White-crowned Sparrow and Orange-crowned Warbler showed an increasing trend, and; Ruby-crowned Kinglet and Blackpoll Warbler were basically stable (Table 10, Fig. 7). Of the species predicted to show an increasing trend we had sufficient data on 12 species for analysis. Warbling Vireo, Swainson’s Thrush, American Robin, and American Redstart showed an increasing trend, while Willow and Least flycatchers, Chipping Sparrow and Common Yellowthroat showed a decreasing trend (Table 10, Fig. 8). Of the six species predicted to maintain a stable population Yellow Warbler is showing a decline, Mountain Chickadee, Clay-coloured Sparrow and Tennessee Warbler are showing increases, while Northern Waterthrush and Yellow-rumped Warbler are basically stable (Table 10, Fig. 9).

The Fox Sparrow and Common Yellowthroat decline may have been most influenced by a change in local habitat: beaver stopped being active at the site in 2004, and species such as these two, that may be more dependent on standing water, appear to have declined as the beaver pond has become a wet meadow. Concurrent with the decrease in standing water and grassland, is an increase in shrubland and early successional aspen stands. Species that prefer these habitats are generally showing increasing capture rates, such as Swainson’s Thrush and Orange-crowned Warbler.

Species richness (number of species captured per year, standardized to 340 net hours per year, which is the average) has been increasing since 1999 ($r^2=0.2252$) (Fig. 10). Seventy-one species, including recognizable subspecies, have been captured, with an average of 33 species per year. In terms of bird families that have been banded, warblers form the highest percentage, followed by sparrows, thrushes and flycatchers (Fig. 11). The site species list, including those that were captured, identified only by call, or were observed flying overhead, totals 113 species or subspecies, such as both Myrtle and Audubon warblers, as well as the collective Yellow-rumped Warblers. Forty-two of these species have been confirmed to be breeding in all (status = B) or over half (status = U) of the years (Table 10). An additional 28 species have bred at the site occasionally. A list of the common and scientific names of all species is in Appendix A (Pyle and DeSante 2020).

5.0 Volunteers

Over the reporting period volunteer participation has varied greatly from session to session and from season to season. There are typically five to seven volunteers each session, and volunteers currently contribute approximately 300 hours per year on the MAPS project. We were unable to accept as many volunteers in 2020 or 2021 due to Covid-19 restrictions placed on the project by Parks Canada. Still, volunteers contributed 178 hours of their time in 2021 on the MAPS project. This effort is provided not only on the banding days themselves, but also in planning, session coordination, site preparation, photography, data entry and report preparation. The contribution of all those who have volunteered valuable free time from their short mountain summers to keep this MAPS station operating is very much appreciated.

6.0 Authorities

The MAPS station is operated under research permit from Parks Canada (C98-15, BAN-2005-841, BAN-2013-13373, BAN-2016-21136, and BAN-2019-31257, consecutively). The Bander-in-Charge, Cyndi Smith, has a master banding permit (#10701) from Environment Canada. Assistant Bander, Ken Symington, has a sub-permit (#10701B) under Cyndi Smith. From 1999 through 2008, band management was under the permit of Grahame Booth (#10666). Since 2009 band management and station operation has been under the permit of Cyndi Smith.

7.0 Funding and Acknowledgements

Peter Duck of the Bow Valley Naturalists (BVN) manages the day-to-day coordination of the project. From 2000-2018 funds for this work were provided to BVN through a contract with Parks Canada which provided for reimbursement of costs upon submission of invoices. This contract provided funding for equipment and supplies, as well as per diems and/or expenses to ensure that a Bander-in-Charge is available for each session. The BVN website has a page on how the data is collected, links to reports, and a photo gallery of captured birds. Go to www.bowvalleynaturalists.org and choose the “Activities” menu button on the upper menu bar, then choose “Bird banding MAPS.”

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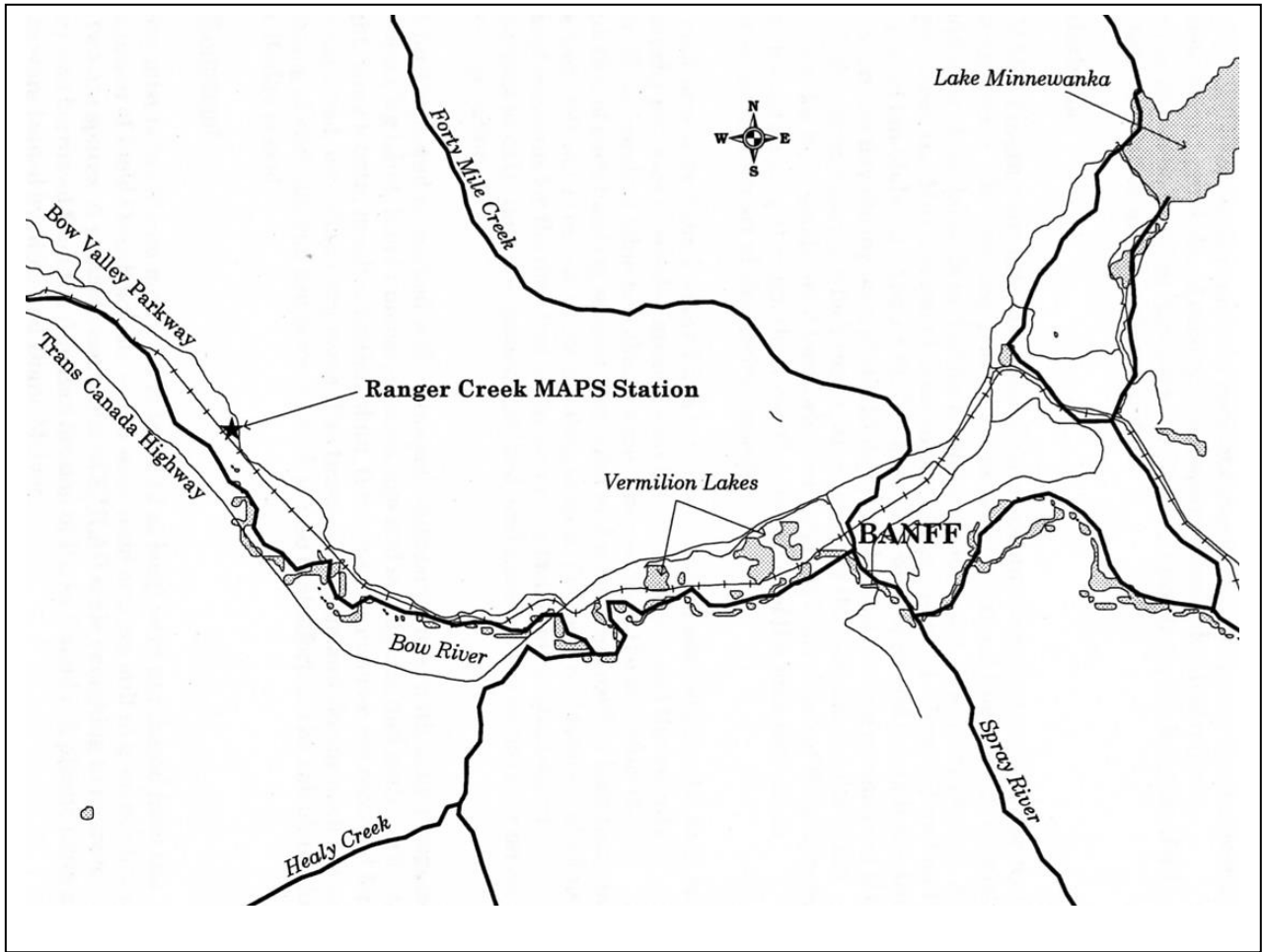


Figure 1. Location of Ranger Creek MAPS station in Banff National Park, Alberta.

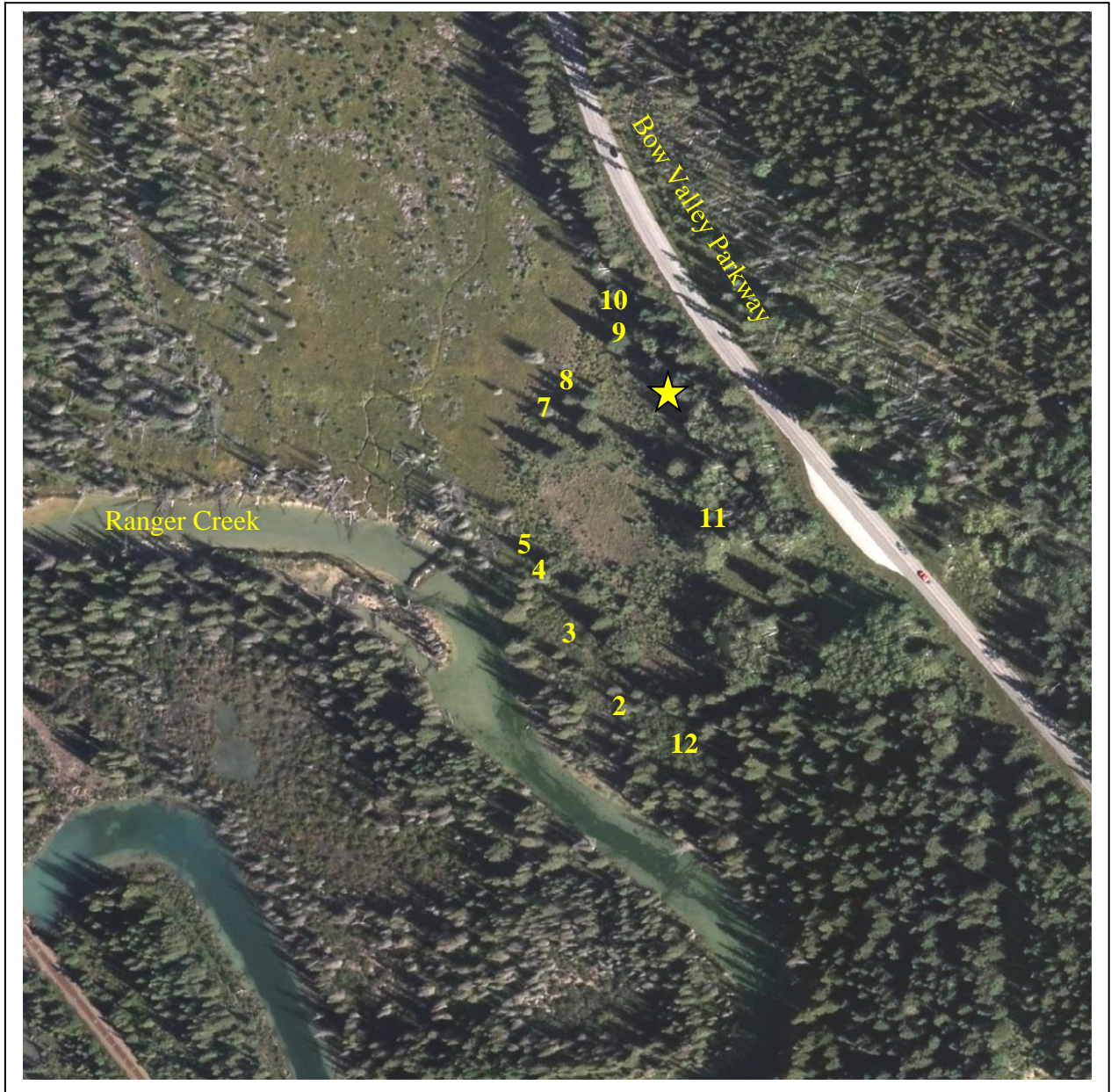


Figure 2. Aerial photograph (2014) of Ranger Creek MAPS station in Banff National Park, showing location of the banding table (star) and mist net lanes (shown by number).

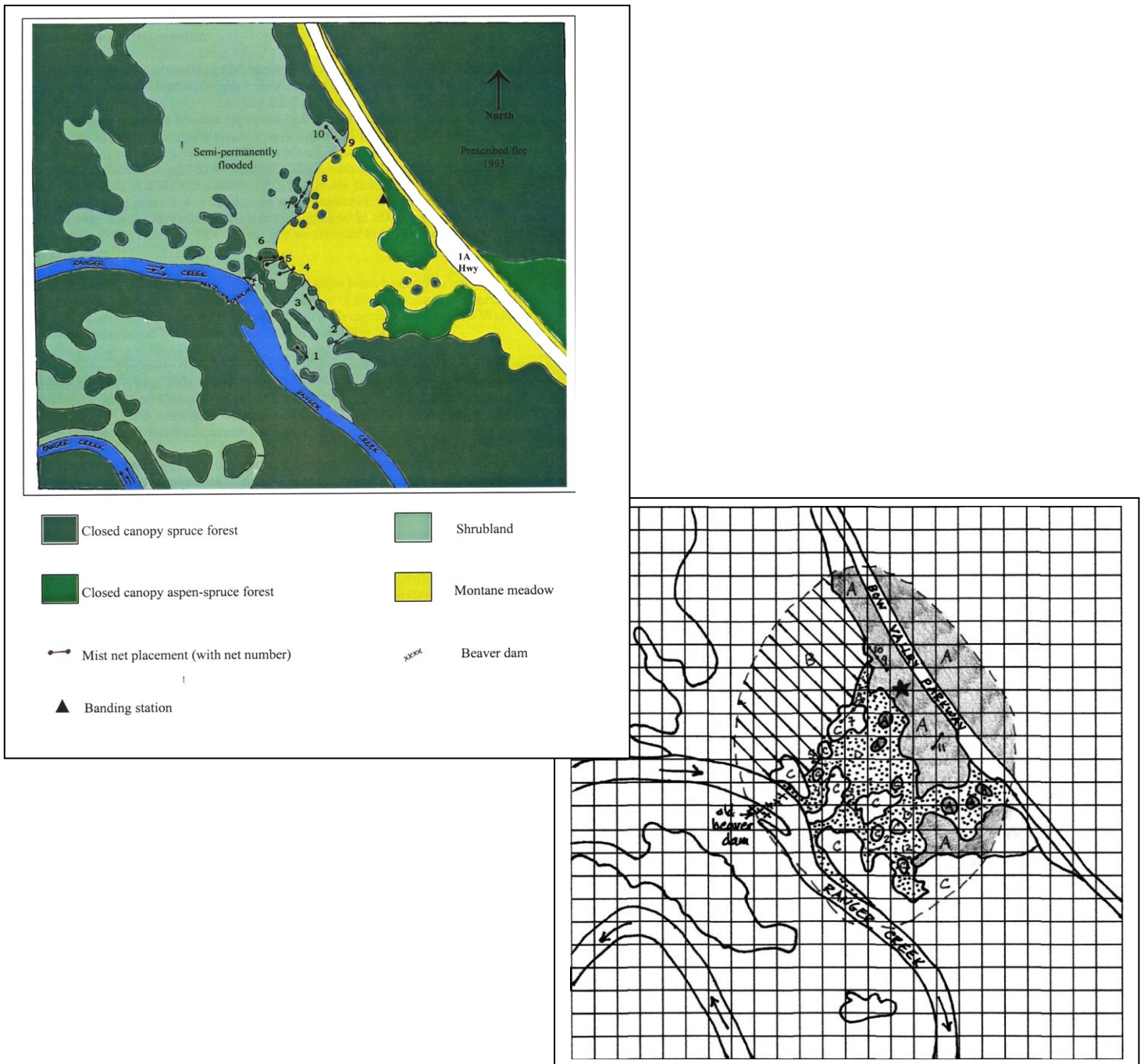


Figure 3. Colour (2004) and black-and-white (2016) maps of Ranger Creek MAPS station, showing habitat types and location of the banding table (triangle or star) and mist net lanes (shown by number). Each square is 30 m. The dotted line is the station “boundary” for purposes of recording birds seen and heard and station habitat types. Notice the changes in extent of habitat types, and conversion of meadow to shrubland. The habitat types are:
 A = Dominant habitat: closed forest aspen, mixed forest with spruce & some pine
 B = Sub-dominant habitat: sedge meadow C = Minor habitat 1: closed forest spruce and willow
 D = Minor habitat 2: aspen shrubland with meadow

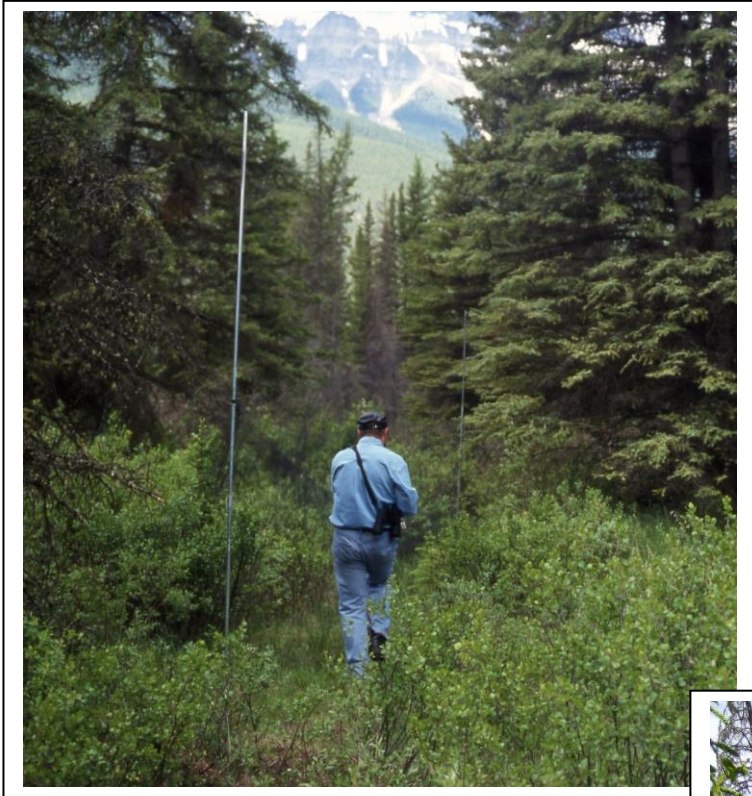


Figure 4. Net lane #5 in 2001 (upper left) was surrounded by fairly low willows and mature spruce trees. By 2016 (lower right) the spruce trees had died or been blown over and the willows have grown much taller.

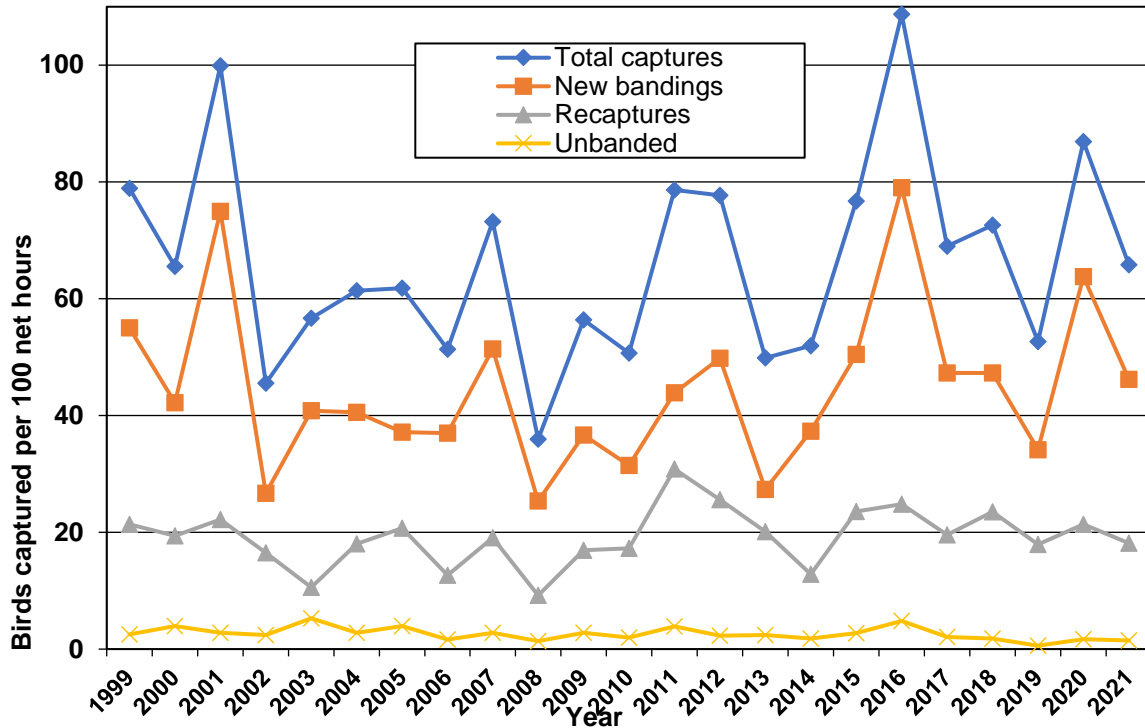


Figure 5. Total birds captured, new bandings, recaptures and birds released unbanded, per 100 net hours, at Ranger Creek (1999-2021).

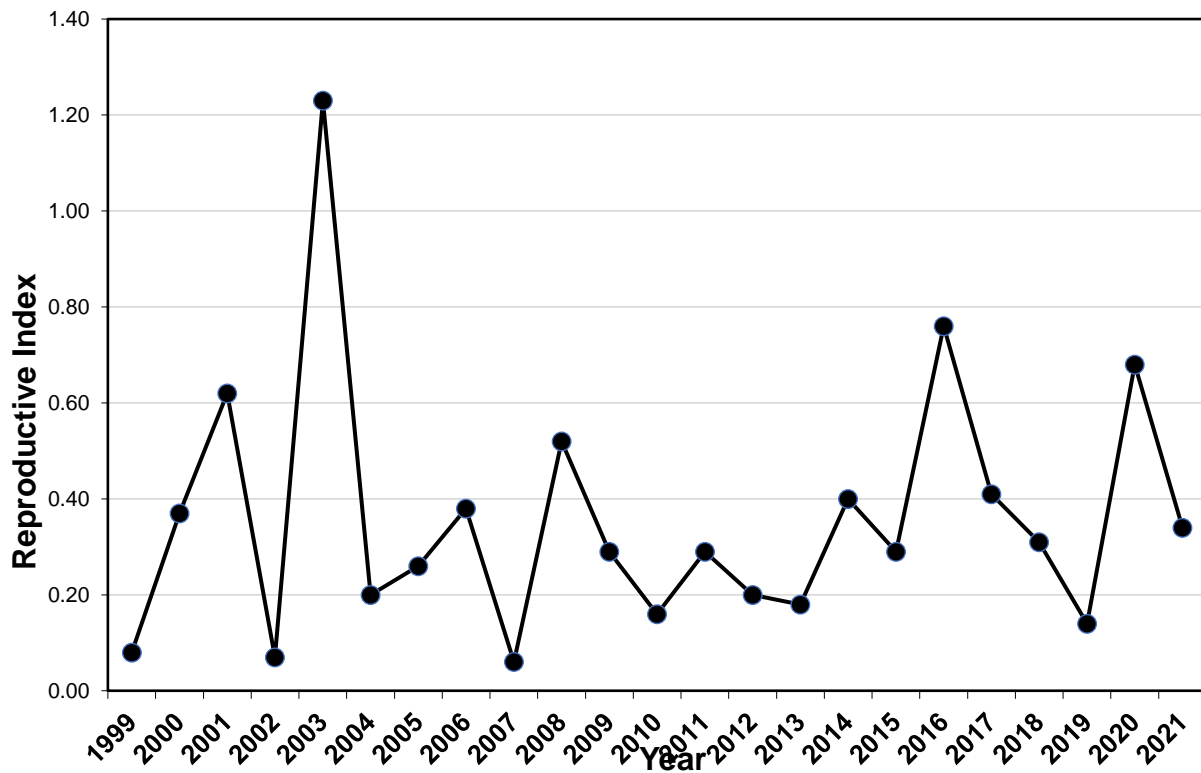


Figure 6. Reproductive index (number of young divided by number of adults) at Ranger Creek, 1999-2021. Number of adults in any given year includes newly banded adults from that year, as well as first recaptures of adults banded in previous years.

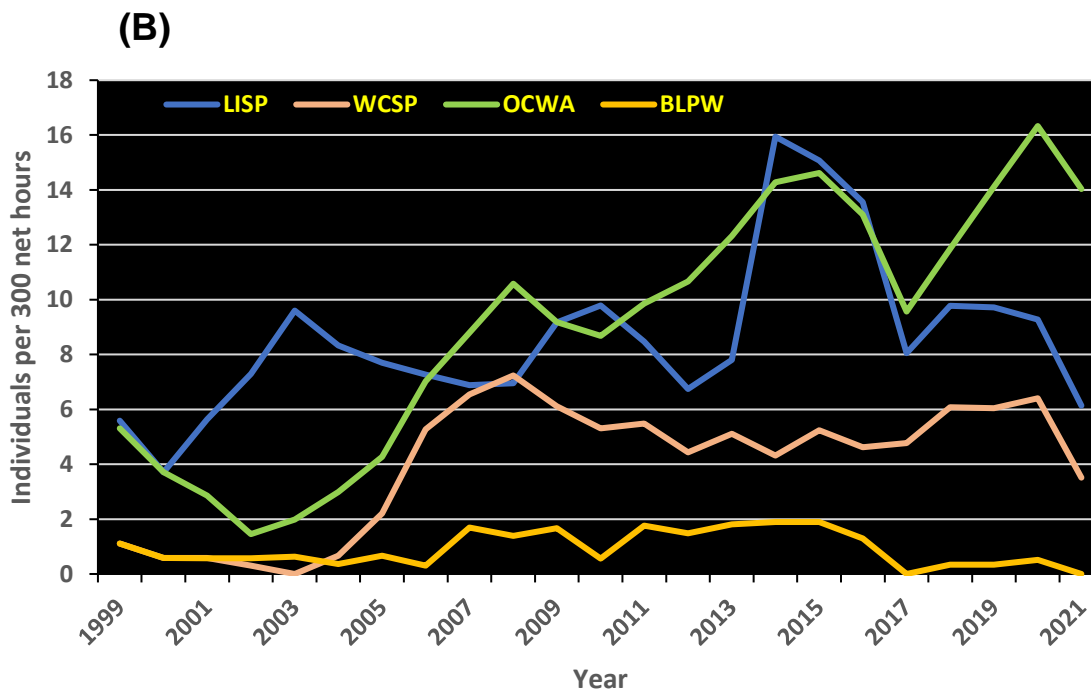
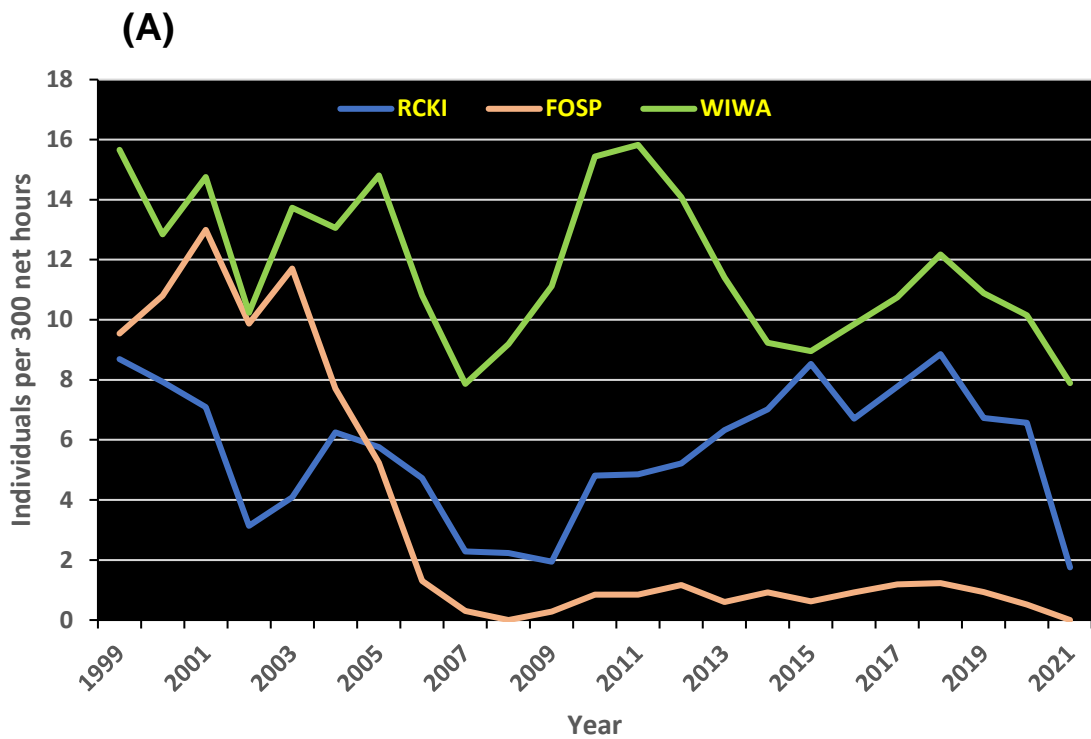


Figure 7. Population trend (1999-2021) of seven species whose numbers are predicted to decrease under climate change predictions, at Ranger Creek MAPS station in Banff National Park. (A) RCKI = Ruby-crowned Kinglet, FOSP = Fox Sparrow, WIWA = Wilson’s Warbler. (B) LISP = Lincoln’s Sparrow, WCSP = White-crowned Sparrow, OCWA = Orange-crowned Warbler, BLPW = Blackpoll Warbler.

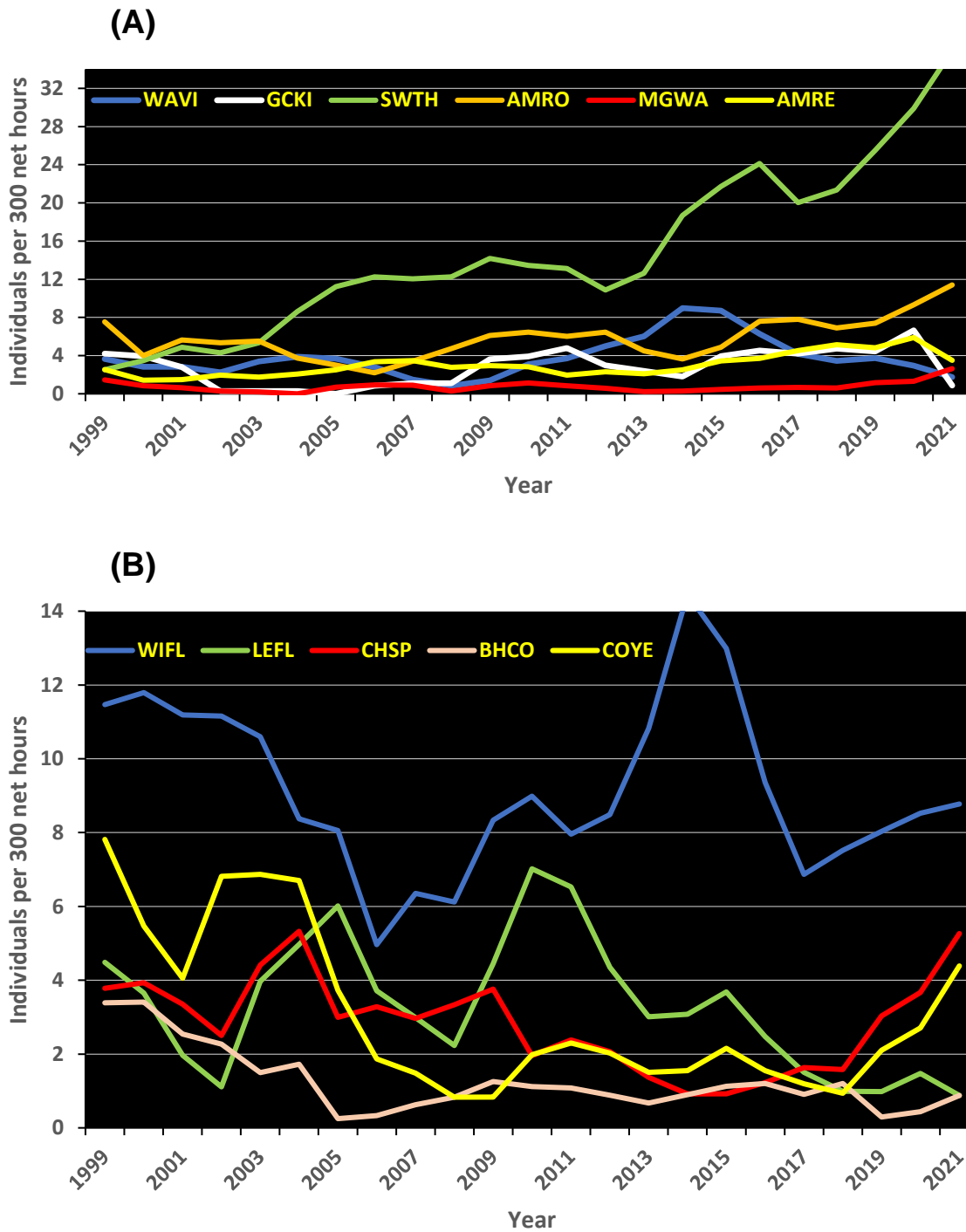


Figure 8. Population trend (1999-2021) of 11 species whose numbers are predicted to increase under climate change predictions, at Ranger Creek MAPS station in Banff National Park. (A) WAVI = Warbling Vireo, GCKI = Golden-crowned Kinglet, SWTH = Swainson’s Thrush. AMRO = American Robin, MGWA = MacGillivray’s Warbler, AMRE = American Redstart. (B) WIFL = Willow Flycatcher, LEFL = Least Flycatcher, CHSP = Chipping Sparrow, BHCO = Brown-headed Cowbird, COYE = Common Yellowthroat.

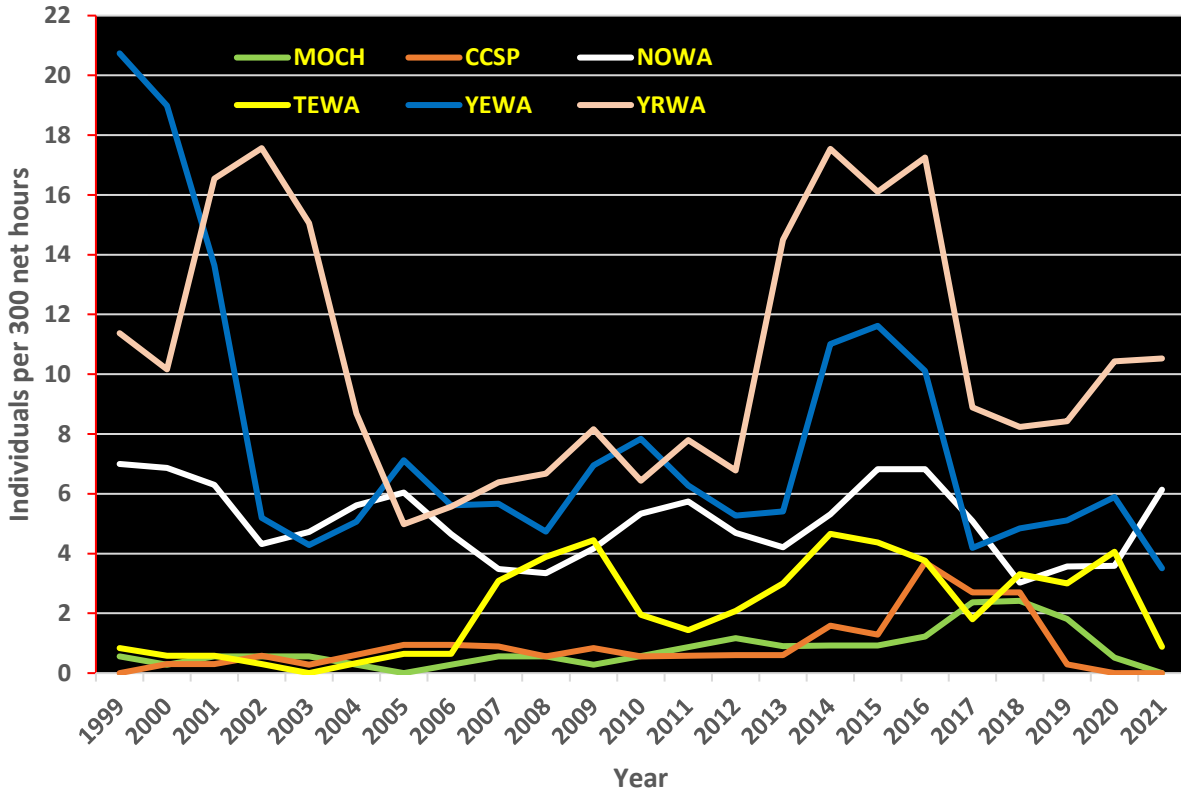


Figure 9. Population trend (1999-2021) of six species whose numbers are predicted to remain stable under climate change predictions, at Ranger Creek MAPS station in Banff National Park. MOCH = Mountain Chickadee, CCSP = Clay-colored Sparrow, NOWA = Northern Waterthrush, TEWA = Tennessee Warbler, YEWA = Yellow Warbler, YRWA = Yellow-rumped Warbler.

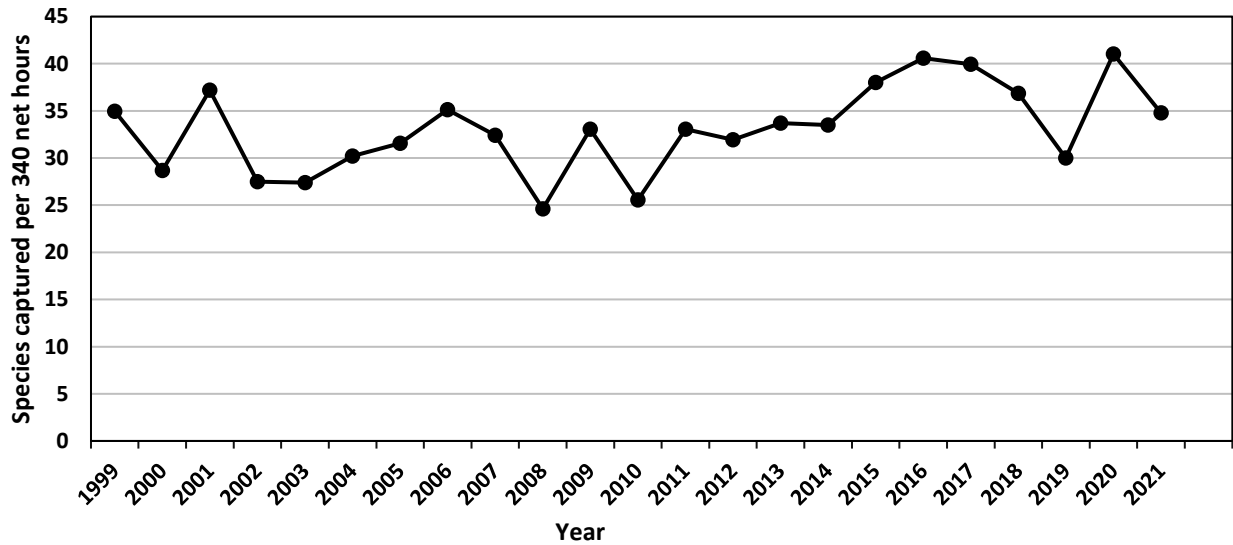


Figure 10. Species richness (number of species per 340 net hours) at Ranger Creek (1999-2021). Three hundred and forty is the average number of net hours per year at the site.

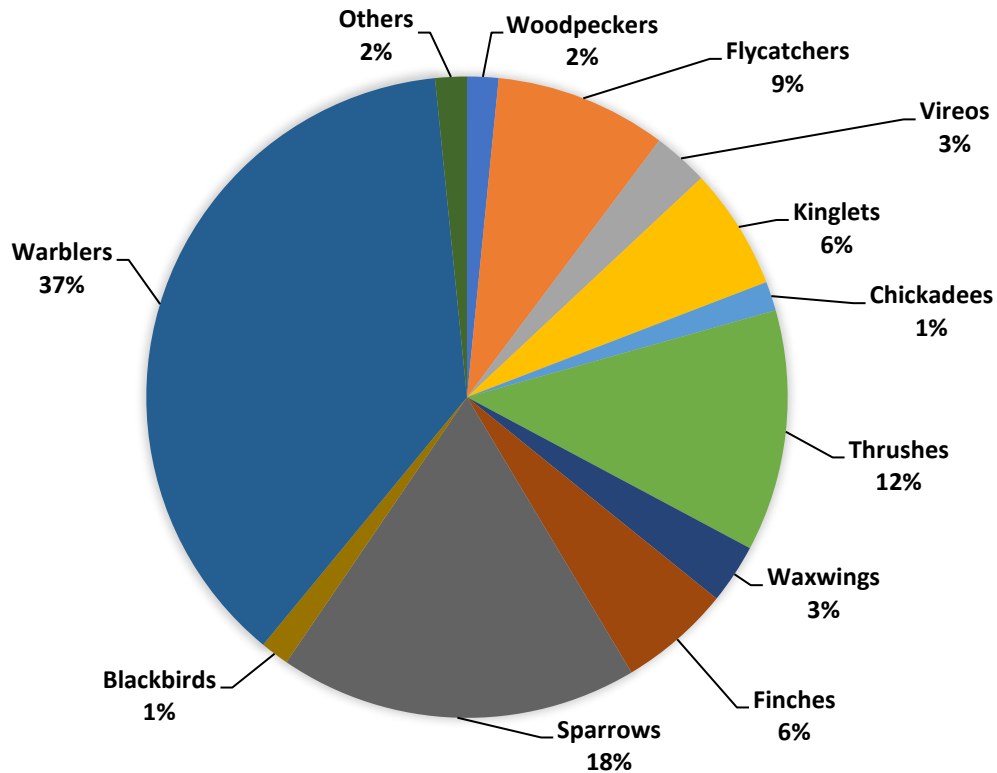


Figure 11. Bird families banded at Ranger Creek (1999-2021). Total number banded = 3,449.

Table 1. Captures at Ranger Creek (2021), by species, period and date.

CODE	COMMON NAME	16-Jun		28-Jun			07-Jul		15-Jul		24-Jul			05-Aug		TOT
		N	R	N	R	U	N	R	N	R	N	R	U	N	R	
RUHU	Rufous Hummingbird					1							3			4
RNSA	Red-naped Sapsucker	1		1							1					3
OSFL	Olive-sided Flycatcher	1														1
WIFL	Willow Flycatcher		2		1		1	2	4		1			1		12
LEFL	Least Flycatcher	1														1
CAVI	Cassin's Vireo			1												1
WAVI	Warbling Vireo						1		1							2
RBNU	Red-breasted Nuthatch													1		1
GCKI	Golden-crowned Kinglet										1					1
RCKI	Ruby-crowned Kinglet			1		1				1	1					4
SWTH	Swainson's Thrush	2	1	1			5	5	10	3	13	2		7		49
HETH	Hermit Thrush										1					1
AMRO	American Robin	1		3			3		4		2					13
CEDW	Cedar Waxwing						2									2
PISI	Pine Siskin			2			7		4							13
CHSP	Chipping Sparrow	2		1				1	3	2						9
DEJU	Dark-eyed Junco	1			1				1		1					4
SCJU	Slate-colored Junco													1		1
WCSP	White-crowned Sparrow								1					1		2
GWCS	Gambel's White-crowned Sp.			1	3			5	1							10
WTSP	White-throated Sparrow	1		1	1			1				1				5
LISP	Lincoln's Sparrow				4		1		2	2	1	1				11
BHCO	Brown-headed Cowbird	1														1
NOWA	Northern Waterthrush		2	2				2			2			1		9
TEWA	Tennessee Warbler						1									1
OCWA	Orange-crowned Warbler		2	3	2		1	1	4	1	2	1				17
MGWA	MacGillivray's Warbler													3	2	5
COYE	Common Yellowthroat			1			2		1		1					5
AMRE	American Redstart			1				2			1	1				5
YEWA	Yellow Warbler		1	2	1				1							5
YRWA	Yellow-rumped Warbler	2		2	1				2		3			1		11
MYWA	Myrtle Warbler			1				1								2
AUWA	Audubon's Warbler			1	2											3

N = new banding, *R* = recapture, *U* = unbanded.

Table 1, con't. Captures at Ranger Creek (2021), by species, period and date.

CODE	COMMON NAME	16-Jun		28-Jun			07-Jul		15-Jul		24-Jul			05-Aug		TOT
		N	R	N	R	U	N	R	N	R	N	R	U	N	R	
WIWA	Wilson's Warbler			3			1		3	1	1			1		10
WETA	Western Tanager								1							1
	<i># Birds/category</i>	13	8	28	16	2	25	20	43	10	32	6	3	17	2	225
	<i>Total no. birds/day</i>	21		46			45		53		41			19		225
	<i>Total no. species</i>	14		22			17		17		17			9		35
	<i>Net Hours</i>	39		58			63		60		61			61		342
	<i>Captures/100 net hours</i>	54		79			72		88		67			31		66

N = new banding, R = recapture, U = unbanded.

Table 2. Adults banded at Ranger Creek, 1999-2021, by species and year.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOT	
Wilson's Snipe	1		1															1	1					4	
Sharp-shinned Hawk			1	1										1											3
Red-naped Sapsucker					1		1										2			1	2		2		9
American Three-toed Woodpecker				1																					1
Downy Woodpecker																						1			1
Yellow-shafted Flicker																			1						1
Olive-sided Flycatcher								1	1														1		3
Western Wood-Pewee									2																2
Yellow-bellied Flycatcher										1	1		2												4
Alder Flycatcher																				2					2
Trail's Flycatcher	16		9						8											1					34
Willow Flycatcher		5		15	6	9	10	3		2	10	7	8	8	1	11	6	8	1	3	8	2	5		128
Least Flycatcher	3	3	4			4	3	2	7	2		5	9	9	1	2	3	2	3	1			1		64
Hammond's Flycatcher	1																								1
Cassin's Vireo																							1		1
Blue-headed Vireo							1	1			1	1													4
Warbling Vireo	4	3	5	1	3	4	3	1	3	2		1	3	4	2	5	7	7	6	1	6	4	2		77
Red-eyed Vireo											1														1
Canada Jay											1									2					3
Stellar's Jay																						1			1
Tree Swallow														1											1
Northern Rough-winged Swallow	2																								2
Black-capped Chickadee	1		1			2	1	1				2			1										9
Mountain Chickadee	1		1		1	1					1			1	1	1	1	1		1	2				13
Boreal Chickadee	1			6	3																				10
Red-breasted Nuthatch	1	1	3		2	1			1				3	1											13
Brown Creeper				1								2										2			5
Golden-crowned Kinglet	1	1	1							1								1		2			1		8
Ruby-crowned Kinglet	6	5	8	3	1	3	4	9	2		2	2	2	3	2	3	10	1	3	8	5	5	2		89
Townsend's Solitaire									1		1		1												3
Swainson's Thrush	3		1	6		3	5	7	9	9	10	8	12	4	5	3	13	6	17	9	10	13	27		180
Hermit Thrush																							1		1
American Robin	14	4	6	3	5	6	1	2	3	1	7	7	4	7	5	6	1	1	10	8	4	5	7		117
Varied Thrush	1													2								1			4
Cedar Waxwing		3	2	1	2	4	1	7	5	1	1	1	2	13	3	2	9	12	5	14	3	2	2		95
Evening Grosbeak																	3								3
Pine Grosbeak	1																								1

Table 2, con't. Adults banded at Ranger Creek, 1999-2021, by species and year.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOT	
Red Crossbill			4																					4	
White-winged Crossbill			6																						6
Pine Siskin	5	10	27		4	1	5		18		4	4	3	31	1	4	8	2	2	12		15	12	168	
Chipping Sparrow	4	6	5		1	6	2	4	2		9		2	2	2	2		1	1	1	2	2	2	56	
Clay-coloured Sparrow				1		1		1	2		1	1	1		1	1		4		5	1			20	
Fox Sparrow	3	7	6	3	5	7	5	2								1		1		1	2	1		44	
Dark-eyed Junco		4		2						2		1		1								2	2	14	
Slate-coloured Junco														1			1				1		1	4	
Oregon Junco	4		4		1	8	2	3	5	3	6	1		2	3	4	3	3	6	2	1			61	
White-crowned Sp.				1							3									1				5	
Mountain White-crowned Sp.								2		1	1		2	1	1		2		1	2	1			14	
Gambel's White-crowned Sp.	3								4	4	2	4	2	1	5	1	3		1		4	3	2	39	
White-throated Sp.				1													1	2	1	1	1	1	2	10	
Savannah Sparrow						1		1																2	
Song Sparrow									4	2								4		1			1	12	
Lincoln's Sparrow	7	2	4	3	3	4	5	6	7	4	4	3	7	4	2	4	6	8	5	3	10	11	2	114	
Red-winged Blackbird			2		4	4	2																	12	
Brown-headed Cowbird	2	3	2	2		4		1			2	1	2	1		1				4			1	26	
Northern Waterthrush	8	3	7	4	1	4	5	4	4	2	2	4	6	4	3	1	5	6	6	2	2	1	4	88	
Tennessee Warbler	2		1	1				1	1		8	4	2		2	4	4	7	3	1	1	5	1	48	
Orange-crowned Warbler	6	2	4	1		2	3	1		3	2	4	3	4	8	8	6	15	6	1	5	9	10	103	
Nashville Warbler	1																							1	
MacGillivray's Warbler	4	1	2		1				3			1	2	1					1	1	1		1	19	
Common Yellowthroat	16	6	4	6	3	13	4		3	1	1	1	1	5	2		3	2	2	1		1	5	80	
American Redstart	8	3		1		5		2	6	3	5	3	1	3	1	1	3	3	3	5	3	6	2	67	
Magnolia Warbler		2											2	1										5	
Yellow Warbler	14	15	13	6	1	6	5	4	9		3	11	6	4	2	4	5	9	6	3	4	4	3	137	
Blackpoll Warbler	3	1		1	1		1		1		5		1		3		2	1				1		21	
Yellow-rumped Warbler		2	3	1	6	2	1	1	3	2	2		1	2		1		1			1	2	9	40	
Myrtle Warbler	3	2	1			2					2	1	2	1	2	2	3	1	2	1			1	26	
Audubon's Warbler	11	8	3		5	7	1		3		11	2	9	2	3	5	8	5	6	6	2	4	1	102	
Townsend's Warbler	1	1	3	1		3		5		1			4		1	1	2	5		1		3		32	
Wilson's Warbler	22	8	19	9	6	6	12	7	12	10	2	14	14	16	11	6	4	9	7	10	13	7	8	232	
Western Tanager																	1							1	2
# of adults banded/yr	183	111	162	82	66	123	83	79	129	57	111	96	119	141	74	84	125	128	107	116	100	110	122	2508	
# of species/yr	36	25	33	25	23	29	24	26	28	21	31	27	31	32	27	26	29	30	27	34	30	25	32	71	

Table 3. Juveniles banded at Ranger Creek, 1999-2021, by species and year.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOT	
Red-naped Sapsucker					1													2		1			1	5	
Yellow-shafted Flicker				1																					1
Northern Flicker Intergrade																1									1
Yellow-bellied Flycatcher								1																	1
Trail's Flycatcher			1																						1
Willow Flycatcher		7			7								1	1			9	2	3	2			6	2	40
Least Flycatcher		1	2				3	1			1				1		1	1	1				2		14
Warbling Vireo								3						2		2	1	5							13
Canada Jay											1											1	1		3
Black-capped Chickadee		2			1												1								4
Mountain Chickadee										1									1	1	2	1			6
Boreal Chickadee			1													1	1	1	2				1		7
Red-breasted Nuthatch		1																	1					1	3
Brown Creeper			2		2			1												1		3	1		10
Golden-crowned Kinglet		2	9			1			1	2	1		12	2	3	5				12	1		12		63
Ruby-crowned Kinglet	1	1	8	1	2	1	1			4				6		1	5	1	6		3	6			47
Swainson's Thrush			5		4	1	3	6	9	3		3	6	6	4	5	4	20	5	12	2	10	11		119
Hermit Thrush							2																	1	3
American Robin	2		1		5		1		1		2	1	2	2				2	1	2		2	6		30
Cedar Waxwing												1	1					1		4					7
White-winged Crossbill			1																						1
Pine Siskin		1	15						1					1									1	1	20
Chipping Sparrow		1	2		1	1		2			2		1		1					1				3	15
Clay-colored Sparrow								1												3					4
Fox Sparrow		3	7	2	6	3	2						1	2		1				1					28
Dark-eyed Junco		2	1		3	3	1	2	5	8	4	4	2		1	2	2	6	2	2	1	3	1		55
Oregon Junco			10																	1					11
White-crowned Sp.			1							6	1	1						4	2	1		6	1		23
Gambel's White-crowned Sp.									1						1										2
White-throated Sp.																	2	2				1		1	6
Song Sparrow									4		1		1					2				1			9
Lincoln's Sparrow	2	1			6	3	3	1	3	5	1	5	6	2		4	4	18	2	3	1	1	2		73
Brown-headed Cowbird	2	3	2		1	1										1	1								11
Northern Waterthrush		1	2		1		1	1	2	1	1			2						1				1	14
Tennessee Warbler											2			1						1			2		6
Orange-crowned Warbler													2		1	7	2	7	1	2		2			24

Table 3, con't. Juveniles banded at Ranger Creek, 1999-2021, by species and year.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOT
Nashville Warbler		1																						1
MacGillivray's Warbler																1							2	3
Common Yellowthroat		1		1		1	1	1													1			6
American Redstart		1												1				1					2	5
Yellow Warbler	2	1	18	1		1			7	1	2		3	3	1	1	2	10				4		57
Blackpoll Warbler																		2						2
Yellow-rumped Warbler		4	7	1	27	7		5	4	2	1			1	1		3	25	4	4		4	1	101
Myrtle Warbler	1	1								1														3
Audubon's Warbler	3		1		3			1								2		1						11
Townsend's Warbler		2	1					2					0			4		2				3		14
Wilson's Warbler		2	1		10		3	4			1	2	1	2	3	3	4		2	1		5	1	45
# of young banded/yr	13	39	98	7	80	23	21	32	38	34	21	17	39	34	17	41	42	115	49	41	16	75	36	928
# of species/yr	7	21	22	6	16	11	11	15	11	11	14	7	14	15	10	16	15	21	19	16	10	21	16	47

Table 4. Number of individuals banded in a previous year and recaptured (number of species in parentheses) at Ranger Creek, 1999-2021.

Year of recapture	Year Banded																			No./yr				
	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002		2001	2000	1999	
2000																							11 (9)	11
2001																						13 (9)	7 (5)	20
2002																				7 (5)	6 (6)	4 (2)	17	
2003																			2 (2)	3 (3)	1 (1)	1 (1)	7	
2004																		6 (5)	-	1 (1)	1 (1)	-	8	
2005																	13 (11)	1 (1)	-	2 (2)	-	-	16	
2006																3 (2)	7 (7)	1 (1)	-	-	-	-	11	
2007															3 (1)	2 (2)	-	-	-	-	-	-	5	
2008														5 (5)	1 (1)	-	-	-	-	-	-	-	6	
2009													6 (4)	3 (3)	-	-	1 (1)	-	-	-	-	-	10	
2010												6 (5)	6 (5)	1 (1)	-	-	-	-	-	-	-	-	13	
2011											13 (8)	3 (3)	2 (2)	-	-	-	-	-	-	-	-	-	18	
2012										12 (9)	3 (2)	3 (3)	-	-	-	-	-	-	-	-	-	-	18	
2013									5 (8)	6 (6)	5 (4)	2 (2)	1 (1)	-	-	-	-	-	-	-	-	-	19	
2014								8 (6)	5 (3)	5 (3)	-	1 (1)	-	-	-	-	-	-	-	-	-	-	19	
2015							4 (4)	5 (5)	1 (1)	3 (2)	3 (1)	1 (1)	-	-	-	-	-	-	-	-	-	-	17	

Table 4, con't. Number of individuals banded in a previous year and recaptured (number of species in parentheses) at Ranger Creek, 1999-2021.

Year of recapture	Year Banded																				No./yr		
	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001		2000	1999
2016						17 (11)	1 (1)	2 (2)	-	1 (1)	-	1 (1)	-	-	-	-	-	-	-	-	-	-	22
2017					4 (4)	2 (3)	-	1 (1)	2 (2)	-	-	1 (1)	-	-	-	-	-	-	-	-	-	-	10
2018				12 (4)	1 (1)	2 (2)	-	-	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-	-	16
2019			8 (4)	6 (4)	1 (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
2020		8 (6)	1 (1)	1 (1)	-	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	11
2021	10 (6)	2 (2)	1 (1)	-	1 (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14

Table 5. Return rate of banded adults that have been recaptured at least once in subsequent years at Ranger Creek, 1999-2021.

CODE	Common Name	Adult new	Recaptures	% recaptured	Adult males	Recaptures	% recaptured
SSHA	Sharp-shinned Hawk	3	1	33			
RNSA	Red-naped Sapsucker	9	2	22			
NOWA	Northern Waterthrush	88	25	28	37	15	41
WCSP	White-crowned Sparrow ^a	58	13	22	32	9	28
BCCH	Black-capped Chickadee	9	2	22			
SWTH	Swainson's Thrush	180	35	19	77	21	27
FOSP	Fox Sparrow	44	7	16	23	4	17
MOCH	Mountain Chickadee	13	2	15			
LISP	Lincoln's Sparrow	114	19	17	60	16	27
OCWA	Orange-crowned Warbler	103	14	14	50	10	20
WTSP	White-throated Sparrow	10	1	10			
DEJU	Dark-eyed Junco ^b	79	8	10	44	6	14
YEWA	Yellow Warbler	137	14	10	72	11	15
BLPW	Blackpoll Warbler	21	2	10	10	2	20
LEFL	Least Flycatcher	64	6	9	16	0	0
SOSP	Song Sparrow	12	1	8			
WIWA	Wilson's Warbler	232	18	8	135	15	11
WAVI	Warbling Vireo	77	5	6	6	1	17
TRFL	Traill's Flycatcher ^c	164	11	7	48	0	0
CHSP	Chipping Sparrow	56	3	5	23	0	0
AMRO	American Robin	117	6	5	58	0	0
COYE	Common Yellowthroat	80	3	4	54	0	0
RCKI	Ruby-crowned Kinglet	89	3	3	51	0	0
AMRE	American Redstart	67	4	6	39	1	3
BHCO	Brown-headed Cowbird	26	0	0			
BOCH	Boreal Chickadee	10	0	0			
CCSP	Clay-coloured Sparrow	20	0	0			
CEDW	Cedar Waxwing	95	0	0			

^a includes Gambel's and Mountain white-crowned sparrows ^b includes Oregon and Slate-coloured juncos

^c includes Alder and Willow flycatchers

Table 5, con't. Return rate of banded adults that have been recaptured at least once in subsequent years at Ranger Creek, 1999-2021.

CODE	Common Name	Adult new	Recaptures	% recaptured	Adult males	Recaptures	% recaptured
GCKI	Golden-crowned Kinglet	8	0	0			
MGWA	MacGillivray's Warbler	19	0	0			
PISI	Pine Siskin	168	0	0			
RBNU	Red-breasted Nuthatch	13	0	0			
RWBL	Red-winged Blackbird	12	0	0			
TEWA	Tennessee Warbler	48	0	0			
TOWA	Townsend's Warbler	32	0	0			
YRWA	Yellow-rumped Warbler ^d	168	10	6			
	<i>Totals</i>	<i>2445</i>	<i>215</i>	<i>9</i>	<i>835</i>	<i>111</i>	<i>13</i>

^d includes Audubon's and Myrtle's warblers

Table 6. Mortalities and injuries at Ranger Creek, 1999-2021.

Year	# stressed recovered	# injured released	# mortalities	Total #	# captured	% released	% mortalities	Total %
1999	0	0	2	2	284	0.00	0.70	0.70
2000	0	1	0	1	233	0.43	0.00	0.43
2001	0	0	0	0	356	0.00	0.00	0.00
2002	0	1	1	2	152	0.66	0.66	1.32
2003	1	2	1	4	204	1.47	0.49	1.96
2004	0	2	0	2	221	0.90	0.00	0.90
2005	0	2	0	2	173	1.16	0.00	1.16
2006	0	0	0	0	154	0.00	0.00	0.00
2007	0	2	2	4	238	0.84	0.84	1.68
2008	0	3	0	3	129	2.33	0.00	2.33
2009	0	1	1	2	203	0.49	0.49	0.99
2010	0	2	1	3	182	1.10	0.55	1.65
2011	0	0	2	2	283	0.00	0.71	0.71
2012	0	1	1	2	273	0.37	0.37	0.73
2013	0	0	0	0	166	0.00	0.00	0.00
2014	1	0	0	1	174	0.57	0.00	0.57
2015	2	0	1	3	254	0.79	0.39	1.18
2016	1	0	5	6	337	0.30	1.48	1.78
2017	1	3	2	6	229	1.75	0.87	2.62
2018	0	1	0	1	241	0.41	0.00	0.41
2019	1	0	1	2	179	0.56	0.56	1.12
2020	2	0	1	3	252	0.79	0.40	1.19
2021	7	0	1	8	225	3.11	0.44	3.56
<i>sums</i>	<i>16</i>	<i>21</i>	<i>22</i>	<i>59</i>	<i>5142</i>	<i>0.72</i>	<i>0.43</i>	<i>1.15</i>
<i>averages</i>	<i>0.70</i>	<i>0.91</i>	<i>0.96</i>	<i>2.30</i>	<i>224</i>			

Table 7. New bandings of adults and juveniles at Ranger Creek by net and species, 2021. Nets 1 and 6 were last used in 2002; nets 11 and 12 were opened in 2004.

CODE	SPECIES	2	3	4	5	7	8	9	10	11	12	Totals
RNSA	Red-naped Sapsucker	1	1				1					3
OSFL	Olive-sided Flycatcher	1										1
WIFL	Willow Flycatcher	1			4	2						7
LEFL	Least Flycatcher					1						1
CAVI	Cassin's Vireo				1							1
WAVI	Warbling Vireo								2			2
RBNU	Red-breasted Nuthatch									1		1
GCKI	Golden-crowned Kinglet	1										1
RCKI	Ruby-crowned Kinglet	1	1									2
SWTH	Swainson's Thrush	4	2	3	4	2	3	6	7	1	6	38
HETH	Hermit Thrush			1								1
AMRO	American Robin		4		1		2	3		1	2	13
CEDW	Cedar Waxwing				2							2
PISI	Pine Siskin	4	4		3			1	1			13
CHSP	Chipping Sparrow	1					5					6
DEJU	Dark-eyed Junco		1	1			1					3
SCJU	Slate-colored Junco		1									1
WCSP	White-crowned Sparrow							1				1
GWCS	Gambel's White-crowned Sparrow		1				1					2
WTSP	White-throated Sparrow	1	1					1				3
LISP	Lincoln's Sparrow				1	2		1				4
BHCO	Brown-headed Cowbird			1								1
NOWA	Northern Waterthrush	3		1							1	5
TEWA	Tennessee Warbler			1								1
OCWA	Orange-crowned Warbler	3		1	3	2				1		10
MGWA	MacGillivray's Warbler	1						1		1		3
COYE	Common Yellowthroat			2	3							5
AMRE	American Redstart	2										2
YEWA	Yellow Warbler			1	1	1						3
YRWA	Yellow-rumped Warbler	2	2		3	1				2		10
MYWA	Myrtle Warbler		1									1
AUWA	Audubon's Warbler					1						1
WIWA	Wilson's Warbler	3	1	1	2	1		1				9
WETA	Western Tanager	1										1
	<i>All species pooled</i>	30	20	13	28	13	13	15	10	7	9	158
	<i>Ranking</i>	1	3	5	2	5	5	4	6	8	7	.

Table 8. New bandings of adults and juveniles at Ranger Creek by net, 1999-2021. Nets 1 and 6 were last used in 2002; nets 11 and 12 were opened in 2004.

Year / Net no.	2*	3	4	5**	7	8	9	10	11	12	Totals
1999	36	11	25	42	23	19	20	20			196
2000	37	5	10	19	23	13	18	25			150
2001	69	20	17	44	27	25	28	37			267
2002	29	4	12	13	3	4	11	12			88
2003	20	4	24	51	10	8	15	15			147
2004	25	14	22	12	13	10	22	14	10	4	146
2005	24	12	11	4	8	5	13	14	9	4	104
2006	19	15	20	5	8	7	11	10	4	12	111
2007	28	14	16	9	13	9	20	24	17	17	167
2008	26	6	13	4	7	4	10	6	2	13	91
2009	23	14	9	10	6	6	19	13	15	15	130
2010	21	16	17	4	8	2	7	15	7	15	112
2011	42	19	26	8	5	6	12	19	6	16	159
2012	45	12	18	17	19	8	16	18	10	12	175
2013	28	6	8	9	7	3	11	4	4	11	91
2014	34	5	19	13	8	4	9	15	4	13	124
2015	36	26	18	18	13	6	18	10	4	18	167
2016	53	22	17	44	13	21	21	29	6	19	245
2017	47	29	26	28	24	13	16	11	13	21	228
2018	27	16	23	20	13	8	16	20	2	12	157
2019	21	13	23	18	1	9	13	10	3	5	116
2020	45	13	19	38	11	13	14	18	7	7	185
2021	30	20	13	28	13	13	15	10	7	9	158
<i>All years pooled</i>	<i>765</i>	<i>316</i>	<i>406</i>	<i>458</i>	<i>276</i>	<i>216</i>	<i>355</i>	<i>369</i>	<i>130</i>	<i>223</i>	<i>3514</i>
<i>Ranking</i>	<i>1</i>	<i>6</i>	<i>3</i>	<i>2</i>	<i>7</i>	<i>9</i>	<i>5</i>	<i>4</i>	<i>10</i>	<i>8</i>	

* For the years 1999-2002, net #1 is included with net #2. It was then replaced by net #11 in 2004.

** For the years 1999-2002, net #6 is included with net #5. It was then replaced by net #12 in 2004.

Table 9. Number of individuals (adult and juvenile) of MAPS target species captured at Ranger Creek, by year and mean, 1999-2021.

SPECIES	Dusky Flycatcher	Pacific-slope Flycatcher	Warbling Vireo	Swainson's Thrush	American Robin	Oregon Junco	Song Sparrow	Lincoln's Sparrow	Orange-crowned Warbler	Yellow Warbler	MacGillivray's Warbler	Wilson's Warbler	TOTAL
1999			4	3	16	4	0	10	6	16	4	22	85
2000			3	0	4	6	0	5	2	17	1	10	48
2001			5	6	7	17	0	4	4	32	2	23	100
2002			1	6	3	2	0	3	1	7	0	9	32
2003			3	5	10	4	0	13	0	1	1	16	53
2004			4	4	6	11	0	9	2	7	0	6	49
2005			3	8	2	3	0	9	3	5	0	17	50
2006			7	13	2	5	0	7	1	4	0	12	51
2007			3	18	4	10	7	10	0	16	3	12	83
2008			2	12	1	13	2	9	3	1	0	10	53
2009			0	10	8	10	1	5	2	5	0	3	44
2010			1	12	8	6	0	8	4	11	1	17	68
2011			3	18	6	0	2	8	5	9	2	15	68
2012			6	10	9	2	0	6	4	4	1	17	59
2013			2	9	5	4	0	2	9	3	0	14	48
2014			7	8	6	6	0	8	15	5	1	9	65
2015			8	17	1	6	0	10	8	7	0	0	57
2016			12	26	3	9	6	26	22	19	0	9	132
2017			6	22	11	9	0	7	7	6	1	9	78
2018			1	21	9	4	1	6	3	3	1	11	60
2019			6	19	4	3	1	12	5	4	1	14	69
2020			4	23	7	5	1	12	11	8	0	12	83
2021			2	38	13	4	0	4	10	3	3	9	86
<i>Total</i>	0	0	93	308	145	143	21	193	127	193	22	276	1521
<i>Average</i>	0	0	4	13	6	6	1	8	6	8	1	12	7
		<i>rank</i>	7	1	4	5	9	3	6	3	8	2	
		<i>max</i>	12	38	16	17	7	26	22	32	4	23	

Table 10. Population trend (1999-2021) of species whose numbers are predicted to change or remain stable due to climate change, at Ranger Creek MAPS station in Banff National Park. Significant increase or decrease in r^2 value shown in bold type.

Species predicted to decrease																								
SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	r^2
Ruby-crowned Kinglet	8.7	7.9	7.1	3.1	4.1	6.3	5.8	4.7	2.3	2.2	1.9	4.8	4.9	5.2	6.3	7.0	8.5	6.7	7.8	8.9	6.7	6.6	1.8	0.006
Fox Sparrow	9.5	10.8	13.0	9.9	11.7	7.7	5.2	1.3	0.3	0.0	0.3	0.8	0.8	1.2	0.6	0.9	0.6	0.9	1.2	1.2	0.9	0.5	0.0	-0.617
Wilson's Warbler	15.7	12.8	14.8	10.2	13.7	13.1	14.8	10.8	7.9	9.2	11.1	15.4	15.8	14.1	11.4	9.2	9.0	9.9	10.7	12.2	10.9	10.2	7.9	-0.237
Lincoln's Sparrow	5.6	3.7	5.6	7.3	9.6	8.3	7.7	7.3	6.9	7.0	9.2	9.8	8.5	6.7	7.8	15.9	15.1	13.6	8.0	9.8	9.7	9.3	6.1	0.236
White-crowned Sp.	1.1	0.6	0.6	0.3	0.0	0.7	2.2	5.3	6.5	7.2	6.1	5.3	5.5	4.4	5.1	4.3	5.2	4.6	4.8	6.1	6.0	6.4	3.5	0.462
Orange-crowned War.	5.3	3.7	2.9	1.5	2.0	3.0	4.3	7.0	8.8	10.6	9.2	8.7	9.9	10.7	12.3	14.3	14.6	13.1	9.6	11.9	14.1	16.3	14.0	0.815
Blackpoll Warbler	1.1	0.6	0.6	0.6	0.6	0.4	0.7	0.3	1.7	1.4	1.7	0.6	1.8	1.5	1.8	1.9	1.9	1.3	0.0	0.3	0.3	0.5	0.0	0.001
Species predicted to increase																								
Willow Flycatcher	11.5	11.8	11.2	11.2	10.6	8.4	8.1	5.0	6.4	6.1	8.3	9.0	8.0	8.5	10.8	14.5	13.0	9.4	6.9	7.5	8.0	8.5	8.8	-0.030
Least Flycatcher	4.5	3.7	2.0	1.1	4.0	5.0	6.0	3.7	3.0	2.2	4.4	7.0	6.5	4.3	3.0	3.1	3.7	2.5	1.5	1.0	1.0	1.5	0.9	-0.173
Chipping Sparrow	3.8	3.9	3.3	2.5	4.4	5.3	3.0	3.3	3.0	3.3	3.8	2.0	2.4	2.1	1.4	0.9	0.9	1.2	1.6	1.6	3.0	3.7	5.3	-0.132
Brown-headed Cowbird	3.4	3.4	2.5	2.3	1.5	1.7	0.3	0.3	0.6	0.8	1.3	1.1	1.1	0.9	0.7	0.9	1.1	1.2	0.9	1.2	0.3	0.4	0.9	-0.433
Common Yellowthroat	7.8	5.5	4.1	6.8	6.9	6.7	3.7	1.9	1.5	0.8	0.8	2.0	2.3	2.0	1.5	1.6	2.2	1.5	1.2	0.9	2.1	2.7	4.4	-0.391
Warbling Vireo	3.6	2.8	2.8	2.2	3.4	3.9	3.7	2.8	1.5	0.8	1.4	3.1	3.7	5.0	6.0	9.0	8.7	6.3	4.2	3.4	3.7	2.9	1.8	0.089
Golden-crowned Kinglet	4.2	3.9	2.8	0.3	0.3	0.3	0.0	0.8	1.1	1.1	3.6	3.9	4.8	3.0	2.4	1.8	3.9	4.5	4.2	4.7	4.4	6.6	0.9	0.202
Swainson's Thrush	2.5	3.5	4.9	4.3	5.4	8.6	11.2	12.3	12.0	12.2	14.2	13.4	13.1	10.9	12.6	18.7	21.7	24.1	20.0	21.4	25.5	29.9	36.0	0.882
American Robin	7.5	4.0	5.6	5.3	5.5	3.7	3.0	2.2	3.4	4.7	6.1	6.5	6.0	6.5	4.5	3.7	4.9	7.6	7.8	6.9	7.4	9.3	11.4	0.334
MacGillivray's Warbler	1.5	0.8	0.6	0.3	0.2	0.0	0.7	0.9	0.9	0.3	0.8	1.1	0.9	0.6	0.2	0.3	0.5	0.6	0.7	0.6	1.2	1.3	2.6	0.105
American Redstart	2.5	1.4	1.5	2.0	1.8	2.1	2.5	3.3	3.5	2.8	3.0	2.8	1.9	2.3	2.1	2.5	3.5	3.7	4.5	5.1	4.8	5.9	3.5	0.577
Species predicted to remain stable																								
Mountain Chickadee	0.6	0.3	0.6	0.6	0.6	0.3	0.0	0.3	0.6	0.6	0.3	0.6	0.9	1.2	0.9	0.9	0.9	1.2	2.4	2.4	1.8	0.5	0.0	0.2741
Clay-coloured Sp.	0.0	0.3	0.3	0.6	0.3	0.6	0.9	0.9	0.9	0.6	0.8	0.6	0.6	0.6	0.6	1.6	1.3	3.7	2.7	2.7	0.3	0.0	0.0	0.1400
Northern Waterthrush	7.0	6.9	6.3	4.3	4.7	5.6	6.0	4.7	3.5	3.3	4.2	5.3	5.7	4.7	4.2	5.3	6.8	6.8	5.1	3.0	3.6	3.6	6.1	-0.0852
Tennessee Warbler	0.8	0.6	0.6	0.3	0.0	0.3	0.6	0.6	3.1	3.9	4.4	2.0	1.4	2.1	3.0	4.7	4.4	3.8	1.8	3.3	3.0	4.1	0.9	0.3676
Yellow Warbler	20.7	19.0	13.6	5.2	4.3	5.1	7.1	5.6	5.7	4.7	7.0	7.8	6.3	5.3	5.4	11.0	11.6	10.1	4.2	4.8	5.1	5.9	3.5	-0.2251
Yellow-rumped War.	11.4	10.2	16.5	17.6	15.1	8.7	5.0	5.6	6.4	6.7	8.2	6.4	7.8	6.8	14.5	17.5	16.1	17.3	8.9	8.2	8.4	10.4	10.5	-0.0009

Table 11. Yearly and cumulative breeding status of species detected at Ranger Creek, 1999-2021.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Status*
Canada Goose	T	T	T	T	T	T	-	T	-	-	T	T	-	-	-	-	-	-	-	-	-	-	-	T
Blue-winged Teal	B	-	-	-	B	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O
Mallard	T	T	L	L	B	B	B	L	L	B	B	L	T	L	T	T	T	L	L	T	B	-	L	U
Common Goldeneye	T	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B	T	O
Common Merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	T	-	-	-	-	-	-	-	T
Ruffed Grouse	T	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Dusky Grouse	-	T	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Mourning Dove	-	-	-	T	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	T
Black Swift	-	-	T	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Calliope Hummingbird	-	B	L	T	B	T	T	-	-	-	T	L	L	T	-	-	T	-	T	T	-	-	-	O
Rufous Hummingbird	T	B	B	T	T	T	-	L	L	-	B	-	L	B	B	L	T	L	-	T	B	B	B	U
Virginia Rail	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Sora	B	B	-	B	B	B	B	-	-	-	-	-	L	B	-	B	B	B	L	-	-	-	B	U
Wilson's Snipe	B	B	B	B	B	B	B	T	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Spotted Sandpiper	-	-	T	-	-	-	-	T	T	B	B	B	B	-	T	B	-	L	L	T	-	-	T	O
Lesser Yellowlegs	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M
Common Loon	T	-	-	-	T	-	T	-	-	T	-	T	T	T	T	T	-	T	T	-	-	-	T	T
Great Blue Heron	T	B	L	T	L	L	L	-	T	-	-	T	-	T	-	-	-	-	-	-	-	-	-	T
Osprey	T	T	-	T	T	T	-	T	T	T	T	T	T	T	T	-	T	T	-	-	-	-	L	T
Golden Eagle	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Sharp-shinned Hawk	T	T	T	T	-	-	T	T	-	T	-	-	-	T	T	-	-	T	-	-	-	-	-	T
Cooper's Hawk	-	T	-	T	-	T	-	-	-	-	-	T	T	-	-	-	-	-	-	-	-	-	-	T
Bald Eagle	T	T	-	T	T	-	-	T	-	-	T	-	-	T	-	-	T	-	-	-	-	-	T	T
Red-tailed Hawk	-	T	-	T	-	T	T	T	T	T	T	T	T	T	-	-	T	T	T	T	T	T	-	T
Belted Kingfisher	T	T	T	L	T	T	T	L	T	T	T	T	-	T	L	-	T	B	T	-	T	L	L	O
Red-naped Sapsucker	-	-	-	-	T	-	T	-	-	-	-	-	-	L	-	-	B	B	-	B	B	-	B	O
American 3-toed Woodp.	-	-	-	T	T	T	-	-	-	-	T	L	T	-	B	-	-	-	-	-	-	-	-	O
Downy Woodpecker	-	-	-	-	-	-	-	B	T	-	-	-	-	-	-	-	-	-	-	-	L	-	-	O
Hairy woodpecker	-	-	T	-	-	-	-	-	-	-	-	T	-	-	T	-	-	-	T	-	-	-	-	T
Northern Flicker*	-	-	-	-	-	-	-	-	L	-	-	L	B	T	B	L	T	L	L	B	L	B	B	O
Yellow-shafted Flicker	T	-	T	-	-	-	-	-	-	L	-	-	-	-	-	-	-	-	L	-	-	-	-	O
Northern Flicker Intergrade	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	-	-	-	-	-	T
Red-shafted Flicker	-	-	-	T	B	T	T	L	T	-	T	-	-	-	-	-	-	-	-	-	-	-	-	O
Pileated Woodpecker	T	-	T	T	T	-	-	-	-	-	T	-	-	-	-	-	-	T	L	L	T	-	L	O
American Kestrel	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	T	T
Merlin	-	-	-	-	-	-	-	-	-	T	T	-	-	-	-	-	-	-	-	-	T	-	T	T

* These species only counted when neither of separate species or subspecies were differentiated.

** A=altitudinal disperser, B=breeders, L=likely breeders, T=transients, M=migrants, U=usual breeder (> 1/2 of yrs), O=occasional breeder (≤ 1/2 of yrs)

Table 11, con't. Yearly and cumulative breeding status of species detected at Ranger Creek, 1999-2021.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Status*	
Eastern Kingbird	T	-	-	T	T	T	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	T	
Olive-sided Flycatcher	-	-	-	-	T	-	-	T	T	-	-	T	-	T	T	T	-	T	-	-	-	T	B	T	
Western Wood-Pewee	T	-	T	T	T	T	T	T	L	L	L	T	-	L	-	-	-	-	L	-	T	-	-	O	
Yellow-bellied Flycatcher	-	-	-	-	-	-	-	M	-	M	M	-	M	-	-	-	-	-	-	-	-	-	-	M	
Alder Flycatcher	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	-	-	B	B	B	B	B	B	B	B
Traill's Flycatcher*	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	-	-	B	B	B	B	B	B	B	B
Willow Flycatcher	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Least Flycatcher	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	L	B	B	B
Hammond's Flycatcher	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Pacific-slope Flycatcher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	T
Cassin's Vireo	B	-	L	-	-	-	-	L	L	-	-	-	-	B	-	-	-	-	-	-	-	-	-	L	O
Blue-headed Vireo	-	M	-	-	M	M	M	M	M	M	M	M	M	-	B	B	-	-	-	-	-	-	-	-	O
Warbling Vireo	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	L	B	B	B	B	B
Red-eyed Vireo	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	B	-	-	-	-	O
Canada Jay	-	T	T	T	L	T	T	-	T	T	L	L	L	T	-	T	T	T	B	B	B	-	B	O	
Steller's Jay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	T
Clark's Nutcracker	-	-	-	-	T	-	-	T	-	T	-	T	-	-	-	-	T	T	-	-	T	T	T	T	T
Black-billed Magpie	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	T
American Crow	T	T	T	-	-	T	-	T	T	T	-	T	-	T	-	-	T	-	T	-	-	-	-	L	T
Common Raven	T	T	T	B	L	T	T	L	T	T	T	L	T	T	L	T	T	-	T	B	T	B	T	O	
Tree Swallow	-	-	-	-	L	T	T	L	L	-	T	T	-	L	T	-	T	T	-	-	-	-	-	-	O
Northern Rough-winged Sw.	T	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Barn Swallow	T	T	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	T
Cliff Swallow	-	T	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T
Black-capped Chickadee	B	B	B	B	B	B	B	B	B	L	B	L	L	L	T	-	T	B	B	B	-	-	-	L	U
Mountain Chickadee	T	T	B	-	L	L	L	L	-	L	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Boreal Chickadee	T	-	T	B	B	T	T	L	L	B	B	-	L	-	B	L	L	B	B	-	-	B	-	U	
Red-breasted Nuthatch	L	B	B	B	B	B	L	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
White-breasted Nuthatch	-	-	T	-	-	-	-	-	-	-	-	-	L	L	-	-	-	-	-	-	-	-	-	-	O
Brown Creeper	T	-	L	T	T	T	-	L	-	-	-	T	-	-	-	-	-	-	L	-	B	B	-	O	
Golden-crowned Kinglet	T	B	B	-	-	B	-	-	-	B	L	-	L	L	L	L	-	B	B	B	B	B	B	U	
Ruby-crowned Kinglet	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Townsend's Solitaire	-	-	-	-	-	-	T	-	-	T	T	T	T	-	T	-	-	-	-	-	-	-	-	-	T
Swainson's Thrush	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Hermit Thrush	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	L	T
American Robin	B	B	B	B	B	B	B	B	-	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

* These species only counted when neither of separate species or subspecies were differentiated.

** A=altitudinal disperser, B=breeders, L=likely breeders, T=transients, M=migrants, U=usual breeder (> 1/2 of yrs), O=occasional breeder (≤ 1/2 of yrs)

Table 11, con't. Yearly and cumulative breeding status of species detected at Ranger Creek, 1999-2021.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Status*	
Varied Thrush	T	-	-	-	T	T	T	T	B	-	T	B	B	B	L	B	-	L	B	B	L	-	B	O	
Gray Catbird	-	-	-	-	T	-	-	T	-	-	-	-	-	-	-	T	-	-	T	-	-	-	-	T	
Cedar Waxwing	T	B	L	B	B	B	B	L	B	B	L	B	B	B	B	B	B	B	B	B	B	L	B	B	
Evening Grosbeak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	T	
Pine Grosbeak	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	
Red Crossbill	-	-	T	-	-	-	-	-	T	-	-	-	-	-	-	-	L	-	T	-	-	-	-	T	
White-winged Crossbill	-	-	T	T	-	T	-	-	T	T	-	L	T	T	L	-	T	-	T	B	-	-	-	O	
Pine Siskin	B	B	B	T	B	B	B	L	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
American Goldfinch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	L	-	-	-	T	
Chipping Sparrow	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	T	L	B	B	B	B	B	B	B	
Clay-coloured Sparrow	-	-	-	T	-	T	-	T	-	-	T	B	T	-	B	L	-	B	-	B	B	-	-	O	
Fox Sparrow	B	B	B	B	B	B	B	B	B	B	-	-	B	B	B	T	B	L	B	B	L	-	-	U	
Dark-eyed Junco	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Slate-coloured Junco															L	-	M	-	M	-	L	-	M	M	
Oregon Junco*	B	-	B	-	T	B	B	L	B	B	B	-	-	B	B	B	B	B	B	B	B	B	-	-	U
White-crowned Sparrow*	B	-	B	T	-	-	-	L	B	L	-	B	B	B	B	B	B	B	B	B	B	B	B	B	U
Mountain White-crowned Sp.	-	-	-	-	-	-	-	T	-	L	-	-	T	B	L	-	L	-	B	B	B	B	-	O	
Gambel's White-crowned Sp.	B	-	-	-	-	-	-	-	B	B	B	L	B	B	B	B	B	B	B	-	B	B	B	U	
White-throated Sparrow	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-	-	B	B	B	B	B	B	B	O	
Savannah Sparrow	T	-	-	-	-	T	-	T	-	-	-	L	-	-	-	-	-	-	L	-	-	-	-	O	
Song Sparrow	B	B	-	L	B	-	-	-	B	B	B	-	B	B	B	B	L	B	B	B	B	B	B	U	
Lincoln's Sparrow	B	B	B	T	B	B	B	L	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Yellow-headed Blackbird	-	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	
Red-winged Blackbird	B	B	B	B	B	B	B	L	B	L	-	-	-	B	T	B	B	-	-	-	-	-	B	U	
Brown-headed Cowbird	B	B	B	B	B	B	L	L	B	L	B	L	B	B	B	B	B	-	L	B	-	-	L	U	
Brewer's Blackbird	T	-	-	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	
Northern Waterthrush	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Tennessee Warbler	T	-	L	T	-	-	-	T	L	B	B	B	B	B	B	B	B	B	B	B	B	B	B	U	
Orange-crowned Warbler	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Nashville Warbler	M	M	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	M	
MacGillivray's Warbler	T	T	L	-	T	-	-	-	B	L	-	B	L	B	B	B	B	-	L	L	L	-	L	U	
Common Yellowthroat	B	B	B	B	B	B	B	B	B	B	L	L	B	B	B	B	B	B	B	B	B	L	B	B	
American Redstart	T	T	-	B	B	B	-	L	B	B	B	B	L	B	L	B	T	B	B	B	B	B	B	U	
Magnolia Warbler	-	T	-	-	-	-	-	-	-	-	-	-	L	B	-	-	-	-	-	-	-	-	-	O	
Yellow Warbler	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Blackpoll Warbler	B	B	B	B	B	L	T	-	B	-	B	B	B	B	B	B	T	B	B	L	B	L	-	U	

* These species only counted when neither of separate species or subspecies were differentiated.

** A=altitudinal disperser, B=breeders, L=likely breeders, T=transients, M=migrants, U=usual breeder (> ½ of yrs), O=occasional breeder (≤ ½ of yrs)

Table 11, con't. Yearly and cumulative breeding status of species detected at Ranger Creek, 1999-2021.

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Status*	
Yellow-rumped Warbler*	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Myrtle's Warbler	B	B	L	-	B	B	-	-	-	L	B	L	B	B	B	L	L	T	B	L	-	-	B	U	
Audubon's Warbler	B	B	B	B	B	B	B	L	B	-	B	B	B	B	B	B	L	B	B	B	L	B	B	U	
Townsend's Warbler	T	B	B	B	L	L	-	B	L	B	L	L	B	L	B	L	L	B	B	B	B	B	B	B	B
Wilson's Warbler	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Western Tanager	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	L	T	
<i>Total species</i>	70	55	58	59	65	59	48	59	58	56	58	63	59	65	60	49	61	55	60	54	55	45	60	114	
<i>Total species breeding</i>	33	35	32	30	36	33	27	21	33	31	34	30	35	40	38	36	31	39	39	43	39	36	40	23	

* These species only counted when neither of separate species or subspecies were differentiated.

** A=altitudinal disperser, B=breeders, L=likely breeders, T=transients, M=migrants, U=usual breeder (> ½ of yrs), O=occasional breeder (≤ ½ of yrs)

Appendix A. Common name, American Ornithological Union (AOU) code and scientific name of all species detected at Ranger Creek MAPS station (1999-2020), arranged alphabetically (Pyle and DeSante 2020).

COMMON NAME	CODE	SCIENTIFIC NAME
Alder Flycatcher	ALFL	<i>Empidonax alnorum</i>
American Crow	AMCR	<i>Corvus brachyrhynchos</i>
American Goldfinch	AMGO	<i>Spinus tristis</i>
American Kestrel	AMKE	<i>Falco sparverius</i>
American Redstart	AMRE	<i>Setophaga ruticilla</i>
American Robin	AMRO	<i>Turdus migratorius</i>
American Three-toed Woodpecker	ATTW	<i>Picoides dorsalis</i>
Audubon's Warbler	AUWA	<i>Setophaga coronata auduboni</i>
Bald Eagle	BAEA	<i>Haliaeetus leucocephalus</i>
Barn Swallow	BARS	<i>Hirundo rustica</i>
Belted Kingfisher	BEKI	<i>Megaceryle alcyon</i>
Black Swift	BLSW	<i>Cypseloides niger</i>
Black-billed Magpie	BBMA	<i>Pica hudsonia</i>
Black-capped Chickadee	BCCH	<i>Poecile atricapilla</i>
Blackpoll Warbler	BLPW	<i>Setophaga striatus</i>
Blue-headed Vireo	BHVI	<i>Vireo solitarius</i>
Blue-winged Teal	BWTE	<i>Spatula discors</i>
Boreal Chickadee	BOCH	<i>Poecile hudsonicus</i>
Brewer's Blackbird	BRBL	<i>Euphagus cyanocephalus</i>
Brown Creeper	BRCR	<i>Certhia americana</i>
Brown-headed Cowbird	BHCO	<i>Molothrus ater</i>
Calliope Hummingbird	CAHU	<i>Selasphorus calliope</i>
Canada Goose	CANG	<i>Branta canadensis</i>
Canada Jay	CAJA	<i>Perisoreus canadensis</i>
Cassin's Vireo	CAVI	<i>Vireo cassinii</i>
Cedar Waxwing	CEDW	<i>Bombycilla cedrorum</i>
Chipping Sparrow	CHSP	<i>Spizella passerina</i>
Clark's Nutcracker	CLNU	<i>Nucifraga columbiana</i>
Clay-coloured Sparrow	CCSP	<i>Spizella pallida</i>
Cliff Swallow	CLSW	<i>Petrochelidon pyrrhonota</i>
Common Goldeneye	COGO	<i>Bucephala clangula</i>

Appendix A, con't. Common name, American Ornithological Union (AOU) code and scientific name of all species detected at Ranger Creek MAPS station (1999-2020), arranged alphabetically (Pyle and DeSante 2020).

COMMON NAME	CODE	SCIENTIFIC NAME
Common Loon	COLO	<i>Gavia immer</i>
Common Merganser	COME	<i>Mergus merganser</i>
Common Raven	CORA	<i>Corvus corax</i>
Common Yellowthroat	COYE	<i>Geothlypis trichas</i>
Cooper's Hawk	COHA	<i>Accipiter cooperii</i>
Dark-eyed Junco	DEJU	<i>Junco hyemalis</i>
Downy Woodpecker	DOWO	<i>Dryobates pubescens</i>
Dusky Grouse	DUGR	<i>Dendragapus obscurus</i>
Eastern Kingbird	EAKI	<i>Tyrannus tyrannus</i>
Evening Grosbeak	EVGR	<i>Coccothraustes vespertinus</i>
Fox Sparrow	FOSP	<i>Passerella iliaca</i>
Gambel's White-crowned Sparrow	GWCS	<i>Zonotrichia leucophrys gambelii</i>
Golden Eagle	GOEA	<i>Aquila chrysaetos</i>
Golden-crowned Kinglet	GCKI	<i>Regulus satrapa</i>
Gray Catbird	GRCA	<i>Dumetella carolinensis</i>
Great Blue Heron	GBHE	<i>Ardea herodias</i>
Hairy woodpecker	HAWO	<i>Dryobates villosus</i>
Hammond's Flycatcher	HAFL	<i>Empidonax hammondii</i>
Hermit Thrush	HETH	<i>Catharus guttatus</i>
Least Flycatcher	LEFL	<i>Empidonax minimus</i>
Lesser Yellowlegs	LEYE	<i>Tringa flavipes</i>
Lincoln's Sparrow	LISP	<i>Melospiza lincolnii</i>
MacGillivray's Warbler	MGWA	<i>Geothlypis tolmiei</i>
Magnolia Warbler	MAWA	<i>Setophaga magnolia</i>
Mallard	MALL	<i>Anas platyrhynchos</i>
Merlin	MERL	<i>Falco columbarius</i>
Mountain Chickadee	MOCH	<i>Poecile gambeli</i>
Mountain White-crowned Sparrow	MWCS	<i>Zonotrichia leucophrys oriantha</i>
Mourning Dove	MODO	<i>Zenaida macroura</i>
Myrtle's Warbler	MYWA	<i>Setophaga coronata coronata</i>
Nashville Warbler	NAWA	<i>Leiothlypis ruficapilla</i>

Appendix A, con't. Common name, American Ornithological Union (AOU) code and scientific name of all species detected at Ranger Creek MAPS station (1999-2020), arranged alphabetically (Pyle and DeSante 2020).

COMMON NAME	CODE	SCIENTIFIC NAME
Northern Flicker	NOFL	<i>Colaptes auratus</i>
Northern Rough-winged Swallow	NRWS	<i>Stelgidopteryx serripennis</i>
Northern Waterthrush	NOWA	<i>Parkesia noveboracensis</i>
Olive-sided Flycatcher	OSFL	<i>Contopus cooperi</i>
Orange-crowned Warbler	OCWA	<i>Leiothlypis celata</i>
Oregon Junco	ORJU	<i>Junco hyemalis oregonus</i>
Osprey	OSPR	<i>Pandion haliaetus</i>
Pacific-slope Flycatcher	PSFL	<i>Empidonax difficilis</i>
Pileated Woodpecker	PIWO	<i>Dryocopus pileatus</i>
Pine Grosbeak	PIGR	<i>Pinicola enucleator</i>
Pine Siskin	PISI	<i>Spinus pinus</i>
Red Crossbill	RECR	<i>Loxia curvirostra</i>
Red-breasted Nuthatch	RBNU	<i>Sitta canadensis</i>
Red-eyed Vireo	REVI	<i>Vireo olivaceus</i>
Red-naped Sapsucker	RNSA	<i>Sphyrapicus nuchalis</i>
Red-shafted Flicker	RSFL	<i>Colaptes auratus cafer</i>
Red-tailed Hawk	RTHA	<i>Buteo jamaicensis</i>
Red-winged Blackbird	RWBL	<i>Agelaius phoeniceus</i>
Ruby-crowned Kinglet	RCKI	<i>Regulus calendula</i>
Ruffed Grouse	RUGR	<i>Bonasa umbellus</i>
Rufous Hummingbird	RUHU	<i>Selasphorus rufus</i>
Savannah Sparrow	SAVS	<i>Passerculus sandwichensis</i>
Sharp-shinned Hawk	SSHA	<i>Accipiter striatus</i>
Slate-colored Junco	SCJU	<i>Junco hyemalis hyemalis</i>
Song Sparrow	SOSP	<i>Melospiza melodia</i>
Sora	SORA	<i>Porzana carolina</i>
Spotted Sandpiper	SPSA	<i>Actitis macularius</i>
Steller's Jay	STJA	<i>Cyanocitta stelleri</i>
Swainson's Thrush	SWTH	<i>Catharus ustulatus</i>
Tennessee Warbler	TEWA	<i>Leiothlypis peregrina</i>
Townsend's Solitaire	TOSO	<i>Myadestes townsendi</i>

Appendix A, con't. Common name, American Ornithological Union (AOU) code and scientific name of all species detected at Ranger Creek MAPS station (1999-2020), arranged alphabetically (Pyle and DeSante 2020).

COMMON NAME	CODE	SCIENTIFIC NAME
Townsend's Warbler	TOWA	<i>Setophaga townsendi</i>
Traill's Flycatcher	TRFL	<i>Empidonax alnorum/trailii</i>
Tree Swallow	TRES	<i>Tachycineta bicolor</i>
Varied Thrush	VATH	<i>Ixoreus naevius</i>
Virginia Rail	VIRA	<i>Rallus limicola</i>
Warbling Vireo	WAVI	<i>Vireo gilvus</i>
Western Tanager	WETA	<i>Piranga ludoviciana</i>
Western Wood-Pewee	WEWP	<i>Contopus sordidulus</i>
White-breasted Nuthatch	WBNU	<i>Sitta carolinensis</i>
White-crowned Sparrow	WCSP	<i>Zonotrichia leucophrys</i>
White-throated Sparrow	WTSP	<i>Zonotrichia albicollis</i>
White-winged Crossbill	WWCR	<i>Loxia leucoptera</i>
Willow Flycatcher	WIFL	<i>Empidonax traillii</i>
Wilson's Snipe	WISN	<i>Gallinago delicata</i>
Wilson's Warbler	WIWA	<i>Cardellina pusilla</i>
Yellow Warbler	YEWA	<i>Setophaga petechia</i>
Yellow-bellied Flycatcher	YBFL	<i>Empidonax flaviventris</i>
Yellow-headed Blackbird	YHBL	<i>Xanthocephalus xanthocephalus</i>
Yellow-rumped Warbler	YRWA	<i>Setophaga coronata</i>
Yellow-shafted Flicker	YSFL	<i>Colaptes auratus auratus</i>

Appendix B. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
American Redstart	226086611				B	r																		
American Redstart	241018916																				B	x	r	r
American Redstart	241018986																						B	r
American Robin	087219819					B	r																	
American Robin	087219825						B	r	r															
American Robin	087219869														B	x	r							
American Robin	087219870														B	r	r							
American Robin	087219888																B	r						
American Robin	092289924																			B	r			
Audubon's Warbler	212013310		B	x	r																			
Audubon's Warbler	212013320		B	r																				
Audubon's Warbler	228078578					B	r	r																
Audubon's Warbler	228078602					B	r																	
Audubon's Warbler	244033151											B	x	x	x	r								
Audubon's Warbler	256029012												B	r										
Audubon's Warbler	256029051													B	r									
Audubon's Warbler	272013041																				B	r		
Audubon's Warbler	272013043																				B	r		
Black-capped Chickadee	212013165	B	x	r																				
Black-capped Chickadee	228078650						B	r	r															
Blackpoll Warbler	256029062													B	r	r								
Blackpoll Warbler	269054846																	B	r					
Chipping Sparrow	212013316		B	r																				
Chipping Sparrow	244033148																							
Chipping Sparrow	272013090												B	r	r							B	r	
Common Yellowthroat	212013169	B	r																					
Common Yellowthroat	228078660						B	r																
Common Yellowthroat	228078661						B	x	r															
Dark-eyed Junco	212013380		B	x	r																			
Fox Sparrow	146114935						B	r																
Fox Sparrow	146114936						B	r	r	r														
Fox Sparrow	168165311			B	r																			
Fox Sparrow	805165215				B	r																		
Fox Sparrow	805165235						B	r																
Fox Sparrow	805189015		B	r	r																			
Fox Sparrow	805189016		B	r																				

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Appendix B, con't. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Gambel's Wh-crowned Sp	139186707													B	r									
Gambel's Wh-crowned Sp	139186759															B	r							
Gambel's Wh-crowned Sp	139186795																	B	r	r				
Gambel's Wh-crowned Sp	224125559											B	x	r										
Gambel's Wh-crowned Sp	224125577												B	r										
Gambel's Wh-crowned Sp	224125578												B	r										
Gambel's Wh-crowned Sp	247153212																						B	r
Gambel's Wh-crowned Sp	258168578															B	r	r	x	r				
Least Flycatcher	212013194	B	r																					
Least Flycatcher	212013393		B	r																				
Least Flycatcher	228078628						B	r																
Least Flycatcher	233015551												B	r										
Least Flycatcher	264034152														B	r								
Least Flycatcher	267065202																B	r						
Lincoln's Sparrow	167157511					B	r																	
Lincoln's Sparrow	167157580									B	r	r	x	r										
Lincoln's Sparrow	167157592										B	r												
Lincoln's Sparrow	167185836			B	x	x	x	r																
Lincoln's Sparrow	222121417																					B	r	r
Lincoln's Sparrow	222121440																						B	r
Lincoln's Sparrow	222121444																						B	r
Lincoln's Sparrow	232120510												B	r										
Lincoln's Sparrow	232120512												B	r										
Lincoln's Sparrow	232120513												B	r										
Lincoln's Sparrow	232120524													B	r	r	r							
Lincoln's Sparrow	232120525													B	r	x	r	r						
Lincoln's Sparrow	232120529													B	r	x	r	r						
Lincoln's Sparrow	232120559														B	x	x	r						
Lincoln's Sparrow	232120595																	B	r					
Lincoln's Sparrow	252189723																		B	r				
Lincoln's Sparrow	252189770	B	r																	B	r	r		
Lincoln's Sparrow	311156703	B	r																					
Mountain Chickadee	244033149											B	x	x	r									
Mountain Chickadee	272013051											B	x	x	r						B	r		
Mountain Wh-crowned Sp	139186715													B	r	r								
Mountain Wh-crowned Sp	277174607													B	r	r					B	r		

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Appendix B, con't. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Mountain Wh-crowned Sp	277174654																					B	r	
Myrtle's Warbler	212013162	B	r																					
Northern Waterthrush	167157518					B	x	x	x	r														
Northern Waterthrush	167157524						B	r																
Northern Waterthrush	167157536							B	x	x	r													
Northern Waterthrush	167157546							B	r	r														
Northern Waterthrush	167157588										B	x	r											
Northern Waterthrush	167157592										B	r												
Northern Waterthrush	167185809			B	x	r																		
Northern Waterthrush	167185810			B	r																			
Northern Waterthrush	167185813			B	r																			
Northern Waterthrush	232120508												B	r										
Northern Waterthrush	232120521													B	r	r	r							
Northern Waterthrush	232120549													B	x	x	x	x	r					
Northern Waterthrush	232120550													B	r									
Northern Waterthrush	232120551													B	r	x	x	x	x	x	x	r		
Northern Waterthrush	232120567														B	r								
Northern Waterthrush	232120569														B	x	r							
Northern Waterthrush	232120588																B	x	x	r	r	x	r	
Northern Waterthrush	232120589																B	r						
Northern Waterthrush	252189703																	B	r					
Northern Waterthrush	252189722		B	r	r													B	x	r				
Northern Waterthrush	252189734																	B	r	x	x	x	r	
Northern Waterthrush	252189772																		B	x	r			
Northern Waterthrush	311156714	B	r	r	x	r																		
Northern Waterthrush	311156728		B	r	r																			
Orange-crowned Warbler	212013179	B	r	r	r																			
Orange-crowned Warbler	212013308		B	r																				
Orange-crowned Warbler	228078653						B	r	x	r	r	r												
Orange-crowned Warbler	241018937																					B	r	
Orange-crowned Warbler	241018949																					B	r	r
Orange-crowned Warbler	244033119										B	x	r											
Orange-crowned Warbler	264034185														B	r	r							
Orange-crowned Warbler	269054881																B	r						
Orange-crowned Warbler	272013005																		B	r	x	r		
Orange-crowned Warbler	272013015																		B	r				

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Appendix B, con't. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Orange-crowned Warbler	272013024																			B	r			
Orange-crowned Warbler	272013111																						B	r
Orange-crowned Warbler	278081631																		B	r				
Oregon Junco	228078635						B	r	r															
Oregon Junco	244033083									B	r													
Oregon Junco	244033133											B	r											
Oregon Junco	252189705																	B	r					
Oregon Junco	264034171															B	r							
Oregon Junco	264034172														B	x	r							
Red-naped Sapsucker	805165255																	B	r					
Red-naped Sapsucker	805165256																	B	r					
Ruby-crowned Kinglet	206029444		B	r																				
Ruby-crowned Kinglet	228078630						B	r																
Ruby-crowned Kinglet	257020105													B	r									
Sharp-shinned Hawk	087219880														B	r								
Slate-coloured Junco	256029092														B	r	r							
Song Sparrow	224125513									B	r	r												
Swainson's Thrush	139186732														B	x	r							
Swainson's Thrush	139186745														B	x	r							
Swainson's Thrush	139186749														B	r								
Swainson's Thrush	139186760														B	r								
Swainson's Thrush	139186787																	B	r					
Swainson's Thrush	139186796																	B	r					
Swainson's Thrush	143155304			B	r																			
Swainson's Thrush	146114940						B	x	r															
Swainson's Thrush	146114970								B	r	r													
Swainson's Thrush	146114986								B	r	x	r												
Swainson's Thrush	146114988								B	r														
Swainson's Thrush	224125503									B	r	r	r											
Swainson's Thrush	224125510									B	x	r												
Swainson's Thrush	224125540										B	r												
Swainson's Thrush	224125543										B	x	r											
Swainson's Thrush	224125544										B	r	x	r	x	r								
Swainson's Thrush	224125557											B	r											
Swainson's Thrush	224125558											B	x	x	r									
Swainson's Thrush	224125579												B	r	x	r								

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Appendix B, con't. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Swainson's Thrush	224125584												B	r										
Swainson's Thrush	224125585												B	x	r									
Swainson's Thrush	224125596													B	r	r	x	r	r					
Swainson's Thrush	258168507																	B	r					
Swainson's Thrush	258168572																			B	r	r		
Swainson's Thrush	258168581																			B	r			
Swainson's Thrush	258168583																			B		r		
Swainson's Thrush	258168584																			B		r		
Swainson's Thrush	258168586																			B	r			
Swainson's Thrush	258168589																			B	r			
Swainson's Thrush	258168596																			B	r			
Swainson's Thrush	277174604																				B	r		
Swainson's Thrush	277174618																				B	r		
Swainson's Thrush	277174623																				B	r		
Swainson's Thrush	277174637																				B	r		
Swainson's Thrush	277174655																						B	r
Swainson's Thrush	277174686																						B	r
Swainson's Thrush	277174689																						B	r
Traill's Flycatcher	212013143	B	x	r	x	r																		
Traill's Flycatcher	212013148	B	x	r	r																			
Traill's Flycatcher	212013168	B	x	r	r																			
Traill's Flycatcher	212013185	B	r	x	r																			
Traill's Flycatcher	222019212			B	x	r																		
Traill's Flycatcher	233015401							B	r															
Traill's Flycatcher	233015474									B	r													
Traill's Flycatcher	233015474									B	r													
Warbling Vireo	212013334		B	r																				
Warbling Vireo	228078684						B	r																
Warbling Vireo	232120537													B	x	x	r							
Warbling Vireo	232120553														B	x	x	x	x	r				
Warbling Vireo	232120579																B	r						
Warbling Vireo	256029034												B	r	x	r								
White-crowned Sparrow	139186707													B	r									
White-crowned Sparrow	224125549										B	x	r											
White-crowned Sparrow	224125563											B	r											
White-crowned Sparrow	224125564											B	r											

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Appendix B, con't. History of individual birds that were banded in one year and recaptured in a subsequent year at Ranger Creek, 1999-2021.

Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
White-crowned Sparrow	224125577												B	r										
White-crowned Sparrow	224125578												B	r										
White-throated Sparrow	139186784																	B	r					
Willow Flycatcher	228078553					B	r																	
Willow Flycatcher	233015509										B	r												
Willow Flycatcher	233015552												B	r	r	r	x	r						
Willow Flycatcher	233015570												B	x	x	r	x	r						
Willow Flycatcher	244033147											B	r	r	r	r	r	r	r	r	r			
Willow Flycatcher	256029039												B	x	r	x	x	r						
Willow Flycatcher	256029053													B	r									
Willow Flycatcher	267065217																B	r	r					
Willow Flycatcher	269054845																	B	r					
Willow Flycatcher	269054852																	B	r	r				
Willow Flycatcher	269054868																	B	r	r	r			
Willow Flycatcher	272013091																					B	r	r
Willow Flycatcher	272013106																						B	r
Willow Flycatcher	272013134																						B	r
Wilson's Warbler	206029426	B	r																					
Wilson's Warbler	206029441		B	x	r	x	x	r																
Wilson's Warbler	226086601					B	r	x	r															
Wilson's Warbler	233015504										B	r	r											
Wilson's Warbler	233015507										B	r	r	r										
Wilson's Warbler	233015550												B	r										
Wilson's Warbler	233015581													B	r	r								
Wilson's Warbler	241018948																					B	r	
Wilson's Warbler	241018963																					B	r	
Wilson's Warbler	257020126														B	r	x	r						
Wilson's Warbler	257020138														B	r								
Wilson's Warbler	257020141														B	r								
Wilson's Warbler	257020173															B	x	r	r					
Wilson's Warbler	257020181															B	r							
Wilson's Warbler	272013009			B	r																B	r		
Wilson's Warbler	272013021			B	r																B	r	r	
Wilson's Warbler	350089807			B	r																			
Wilson's Warbler	350089813			B	x	r																		
Wilson's Warbler	350089850			B	x	x	r	r																

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Species	Band No.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Yellow Warbler	212013110	B	r	r																				
Yellow Warbler	212013155	B	r																					
Yellow Warbler	212013307		B	r	r																			
Yellow Warbler	212013329		B	r																				
Yellow Warbler	212013347		B	r																				
Yellow Warbler	212013351		B	r	x	r																		
Yellow Warbler	222019411			B	r																			
Yellow Warbler	222019422			B	r																			
Yellow Warbler	244033021							B	x	r														
Yellow Warbler	256029023												B	x	x	r								
Yellow Warbler	264034190															B	x	r	r					
Yellow Warbler	269054859																	B	r					
Yellow Warbler	278081630																		B	r				

B = banded in that year, r = recaptured in that year, x = not detected but survival deduced from re-encounter in subsequent year.

Appendix C. Story of Pine Siskin banded in Ontario and recaptured at Ranger Creek in 2016. Excerpted from the Fall 2018 Newsletter of the Bow Valley Naturalists, with permission.

THE AMAZING SISKIN

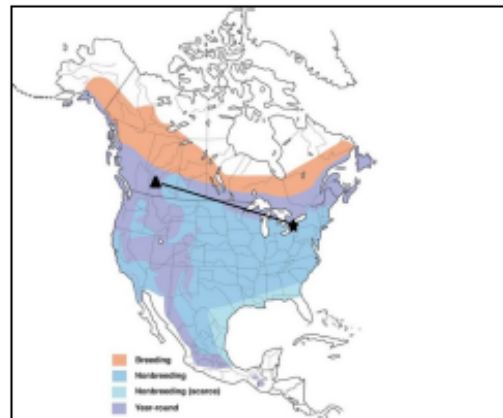
Foreign Recapture of Pine Siskin (*Spinus pinus*) at Ranger Creek MAPS Station. *Cyndi Smith*

The Monitoring Avian Productivity and Survivorship (MAPS) station at Ranger Creek has been operated by BVN since 1999. In that time we have captured 4,491 birds, of which 1,308 have been recaptures of birds banded at the site in previous years or earlier in the same year (or day). However, on 26 June 2016 we finally had a "foreign recapture" ... a bird banded elsewhere! On that day, bander-in-charge Ken Symington captured a male Pine Siskin (#2780-67607) that had been banded on 19 February 2016 at Long Point Bird Observatory in southern Ontario. The straight line distance between the two locations is approximately 2,850 kilometres in a northwesterly direction as indicated by the black line on the adjacent map. Of course, this would not likely represent the true path of movement, so the distance this bird travelled is likely much greater. He has not been recaptured since.



Pine Siskin (*Spinus pinus*). *Cyndi Smith Photo.*

As their name suggests, Pine Siskins feed predominantly on conifer seeds, but also eat seeds of deciduous trees, shrubs, grasses and forbs, and insects. They are also frequent visitors to bird feeders. Pine Siskins are known as "irruptive winter finches" because of their erratic, continental scale movements, following the conifer seed crops year to year. As seed crops fail in their normal winter range, Pine Siskins may be found as far south as Florida and Mexico. From continental banding records it appears that birds encountered in south central and southeastern states came from, and returned to, the north-central portion of the continent, while birds encountered in the northeastern US and southeastern Canada came from, and returned to, western provinces and states (Cornell Lab of Ornithology 2018, Yunick 1997).



Pine Siskin Range Map. Source: Cornell Lab of Ornithology. 2017

References:

- Cornell Lab of Ornithology. 2017. [All about birds: Pine Siskin.](#)
- Cornell Lab of Ornithology. 2018. Project Feederwatch: [Tracking Pine Siskin movements.](#)
- Yunick, R. P. 1997. Geographical distribution of re-encountered Pine Siskins captured in upstate, eastern New York during the 1989-1990 irruption. *North American Bird Bander* 22(1):10-15.

APPENDIX D. Bird handling protocol (adopted 2019)

Since the establishment of this MAPS station in 1999 we have handled 4,489 birds, an average of 225 birds annually, with a high count of 356 in one year. In order to minimize mortality and injury rates, we have established protocols that have been informed by the following publications and discussions with fellow banders:

1. DeSante, D.F., K.M. Burton, P. Velez, D. Froehlich, D. Kaschube, and S. Albert. 2018. MAPS manual 2018 protocol: instructions for the establishment and operation of constant-effort bird-banding stations as part of the Monitoring Avian Productivity and Survivorship (MAPS) program. Institute for Bird Populations, Point Reyes Station, CA. [Available from: <http://www.birdpop.org/docs/misc/MAPSManual18.pdf>]
2. Mackenzie, S.A. and M.A. Gahbauer. 2014. Guidelines for prioritizing bird safety during high capture events. *North American Bird Bander* 39:61-65. [Available from: <http://www.nabanding.net/wp-content/uploads/2012/04/Mackenzie-and-Gahbauer.-Guidelines-for-prioritizing-bird-safety.pdf>]
3. Ralph, C.J. 2005. Body grasp technique: a rapid method of removing birds from mist nets. *North America Bird Bander* 30(2):65-70. [Available from: https://okologia.files.wordpress.com/2010/11/ralph_removing_birds_mist_net_05.pdf]
4. Smith, H., J. McCracken, D. Shepherd, and P. Velez. 1997. The mist netter's bird safety handbook: a bird bander's guide to safe and ethical mist netting and banding procedures. Institute for Bird Populations, Point Reyes Station, CA. [Available from: https://www.birdpop.org/docs/pubs/Smith_et_al_1997_Mist_Netters_Bird_Safety_Handbook.pdf]
5. Spotswood, E.N., K.R. Goodman, J. Carlisle, R.L. Cormier, D.L. Humple, J. Rousseau, S.L. Guers and G.G. Barton. 2011. How safe is mistnetting? evaluating the risk of injury and mortality to birds. *Methods in Ecology and Evolution*. doi: 10.1111/j.2041-210x.2011.00123.x.

“Red flag” or “sensitive” species, are those that warrant closer monitoring (more prone to hypoglycemia, stress, hypothermia, net entanglement, tonguing), and they include:

- American Robin
- Fox Sparrow
- Lincoln's Sparrow
- Swainson's Thrush
- Tennessee Warbler
- White-throated Sparrow
- Wilson's Warbler
- hummingbirds (always released at net unless showing signs of stress)
- kinglets, especially juveniles
- hatch-year birds, especially if in heavy body moult
- any bird that was badly tangled or shows signs of stress
- legally listed Species at Risk

Specifically, we apply the following methods:

1. Nets are checked a minimum of every 30 minutes, or every 15-20 minutes during periods of colder or hotter temperatures or during light mist, and left alone between visits. This minimizes injury rates, while maximizing capture rates.
2. Birds are placed in separate bags and kept near the bander. This may be in the shade if it is hot, or sometimes in weak sunlight during cooler temperatures. Birds that are extremely active in the bag, jumping and struggling constantly, will be elevated in priority.
3. When sustained winds or frequent strong wind gusts push out the net panels in consistent “half-moon” arcs, the net is closed.
4. The nets are closed if mist or rain is heavy enough so that water droplets collect on the mesh of the net, or if feathers stick to the fingers during extraction.

5. If a predator is noticed in the vicinity of a net, there are a number of options to be taken depending on whether it is a bird or mammal: 1) check the net more frequently to deter predation, 2) raise the bottom panel so that captured birds are not accessible, or 3) close the net.
6. Ambient air temperature will be at least +4 C for the nets to be opened (this may require nets to be closed after they have been opened, as the temperature often dips just after sun rise). As the temperature may vary across the site depending on tree cover, it is the bander's discretion to only open some nets.
7. Birds will not be kept in holding bags for more than one net run or 30 minutes prior to 07:30 and two net runs or one hour for the remainder of the banding period. When approaching this limit, a second bander will be used and/or nets will be closed.
8. If the capture rate has the potential of exceeding the above, the bander will minimize the amount of data that is collected, focusing on just the basics of species, age and sex, in order to process birds more quickly.
9. All "red flag" species (see list above) are identified with a coloured peg attached to their bags so they are processed first from that net run (implemented in 2017).
10. Birds that have been tangled badly and appear to be stressed may be released at the net and not banded. As much information as possible from this individual is recorded on the unbanded datasheet.
11. Immediately after banding, hatch year birds are returned to the vicinity of the net where they were captured, to enable the parents to find them.
12. If a bird is tangled badly and is stressed the net may be cut in order to quickly release the bird.
13. All hummingbirds are released immediately at the net. As much information as possible is recorded on the unbanded datasheet.
14. Extractors are taught the "body grasp" technique for removing birds from the net. This is a faster technique than the earlier leg-hold technique and results in far fewer leg and wing strains.
15. People extracting birds are mentored by senior extractors, prior to them extracting birds without oversight, until at least two senior extractors are satisfied with their skill level.
16. All net teams carry a radio so that a senior extractor or bander can be called to deal with difficult removals.
17. In response to changes in humidity, nets are constantly adjusted to maintain proper tension, which reduces potential for injury.
18. Holes and tears in nets are repaired the same day they are discovered, and if they are too large to do on-site then the net is replaced.
19. Net storage bags are numbered with their net lane, and all bags are accounted for at the end of each banding day.
20. A recovery box (a padded lunch box), with the option of heat pack and sugar water are available for birds that appear stressed (shivering, lethargic, cold, wet) or who don't fly immediately upon release (sometimes evidence of wing strain). When a heat pack is used it is wrapped in a small piece of fleece so that it does not directly contact the bird.
21. The use of the recovery box is recorded with links to the individual bird, total time in captivity and ambient air temperature (to be implemented in 2019).
22. A bird first aid kit is kept in the banding box, including heat packs, sugar water, veterinarian blood stopper gel, and splinting material (tape, vet wrap, toothpicks). Blood stopper gel is applied to wounds that are bleeding. Broken legs are splinted in a flexed position (similar to a perching bird). Dislocated legs that have been reduced may also be splinted.
23. Injured or ill birds that are not immediately considered terminal but that cannot be released will be taken to the Alberta Institute for Wildlife Conservation (AIWC) (ph: 403-946-2361).
24. If a bird has to be euthanised the only acceptable means is by cervical dislocation. Injuries that would likely require euthanasia include broken wing and severe wounds that do not stop bleeding.
25. When a bird dies the following data will be collected: species, age, sex, time, ambient air temperature, total captivity time, injuries, body condition, mass, and any contributing factors (will implement all categories in 2019).
26. In the event of a mortality or injury necessitating euthanasia, the body will be submitted to the Canadian Wildlife Health Centre (CWHC) node at the University of Calgary, Faculty of Veterinary Medicine for necropsy.