ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
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**Alaska Department of Fish and Game**
**State Wildlife Grant**

**Grant Number:** **T-16** **Segment Number: 1**

**Project Number:** 1.0

**Project Title:** Songbird Migration Monitoring at Creamer's Field Migratory Waterfowl Refuge

**Project Duration**: July 1, 2010 – June 30, 2013

**Report Due Date to HQ:** December 31, 2012

**Principle Investigator:** Susan Guers

**Project Location:** Statewide: Creamer's Field Migratory Waterfowl Refuge (Creamer's Refuge) (64° 50°N, 147° 50°W), a 751 ha refuge located adjacent to the city of Fairbanks.

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## I. SUMMARY OF WORK COMPLETED ON JOBS *Briefly describe how Federal Aid funds were spent on each active job, listing the results achieved (1 paragraph each). If a job was not accomplished as planned, very briefly tell why.*

**Note: the last performance report was due September 1, 2012 and reported from July 1, 2011 – June 30, 2012. This performance report will summarize the entire duration of the project in addition to the period from June 30, 2012 through December 31, 2012.**

**Objectives:**

1. Continue operating the farthest north migration station in North America to continue monitoring effects of climate change on migration timing and relative abundance of songbirds migrating through Creamer's Refuge. *15 April – 30 September 2010-2013*.

ACCOMPLISHMENTS:

**The following summarizes the spring 2010 banding season (15 April—5 June 2010): note: this report was submitted to ADF&G mid-July of 2010 and was also posted on Alaska Bird Observatory's website.**

1. Beginning 19 April 2010, the CFMS manager and several ABO volunteers set up the banding station tent and net array in preparation for the spring migration season.
2. Twenty-six standard mist nets were operated for 6 hours, weather permitting, on alternate days from 26 to 30 April and daily from 1 May to 5 June 2010. Nets were operated for a total of 5,239 hours.
3. We netted 889 individuals of 24 species; of these 691 were new captures and 122 captures (representing 68 individuals) were birds that had been banded at CFMS in previous years. Recaptured birds (birds banded and recaptured this season) comprised the

remaining 260 captures (130 individual birds). The five most numerous species were Common Redpoll (403), Yellow-rumped Warbler (184), American Robin (94), Dark-eyed Junco (91), and Swainson's Thrush (58); these five species represent 77% of all captures. We captured 68 individuals (of 14 species) banded in previous years, approximately 7.0% (68/889) of the total number of captures. Noteworthy returns included those of two resident species – two Black-capped Chickadees first banded as hatching-year birds in 2006 and a Hairy Woodpecker banded as a second-year bird in 2008. Noteworthy migrant returns include an American Robin first banded as an adult in 2006 and a Northern Waterthrush banded as an adult in 2007.

4. Spring captures totaled 1,073 new and previously banded birds—a very productive banding session for CFMS. The average capture rate during the spring banding season at CFMS over its history is 721 birds. Capture rates (birds/1000 net hours) for Common Redpoll were one of the highest in CFMS history, continuing a trend of overall higher capture rates for this species in spring. Favorable weather conditions may be allowing them to stay in the Fairbanks area to nest during the entire spring/summer season. Lack of water in the seasonal wetland may have contributed to lower than normal capture rates for several water-loving species including: Northern Waterthrush, Wilson's Warbler and Rusty Blackbird. Hammond's Flycatcher numbers decreased over last spring, going back to average capture rates. No Alder Flycatchers were caught in our mist nets, but a few were heard around the netting area during the first week of June. Again, lack of water in the seasonal gully may have kept them out of the nets. Many of the warbler species (with the exception of Yellow-rumped Warbler) had capture rates similar to those in previous years. Most sparrow species (with the exception of the Fox Sparrow) saw an increase in capture rates this spring versus 2009.

5. Interesting captures include: Gray Jay, a Ruby-crowned Kinglet and three Rusty Blackbirds. These are species not very common at CFMS in spring. We did not catch any shorebirds or ducks as in years past since there was no water in the seasonal wetland this spring.

6. There was one bird mortality and no injuries at CFMS during spring 2010 banding. The injury/mortality rate at our site (0.09%, 1/1,073) is much lower than the accepted rate of 1-2% (Spotswood et al. 2011).

7. The spring 2010 CFMS staff consisted of three returning skilled passerine banders: Dayna Dominguez, Lila Tauzer and Sue Guers. In addition, two EPSCoR (Experimental Program to Stimulate Competitive Research) helped in the operation of the station.

8. Thirty volunteers contributed to the operation of CFMS by providing 700 hours of assistance.

9. ABO presented bird-banding demonstrations to 27 groups (641 participants). This program is conducted in cooperation with ADF&G's Creamer's Nature Program. More than 200 independent visitors came to the station during spring migration; most were presented with informal banding demonstrations and information about ABO and the spring migration project.

10. ABO continued it's collaboration with the Institute of Arctic Biology, University of Alaska, Fairbanks (UAF) through the Institutional Development Award program's Network of Biomedical Research Excellence collecting samples to test birds for avian influenza. In exchange for collecting fecal samples and cloacal swabs, UAF provided staff and resources to help operate CFMS. UAF staff and ABO biologists collected samples from banded birds this spring. This collaboration will continue through the fall of 2010.

11. Spring 2010 marked the beginning of a new collaboration with Drs. Ravinder Sehgal and Clarie Loiseau, professors at San Francisco State University who have a project studying the effects of global climate change on the northward spread of avian malaria. This spring, banders at CFMS collected 80 blood samples from 4 species of birds, including two resident species (Black-capped Chickadee and Common Redpoll) and two migratory species (Yellow-rumped Warbler and Swainson's Thrush). Blood samples will be collected in fall 2010 and will be analyzed during the winter. This collaboration will continue in 2011.

**The following summarizes the fall 2010 banding season (26 July- 30 September): note: this report was submitted to ADF&G in November of 2010 and was also posted on Alaska Bird Observatory's website.**

1. Prior to the fall banding season, a volunteer orientation session was held for new and returning CFMS volunteers. A brief summary of bird identification and CFMS protocols were discussed.
2. Thirty-six standard mist nets (2.6m high x 12m long, 30mm mesh) at 30 net locations were operated for 6 hours, weather permitting, daily from 26 July until 27 September 2010. The station was operated on alternate days (T, TH) during the week of 28 to 30 September. Nets were operated for a total of 11,425 hours.
3. We captured a total of 3,135 birds of 33 species. Of these, 2,605 birds were banded as first-time captures; the remaining birds were recaptures (456), returning birds from previous years (51) or birds that remained unbanded after capture (21). The most abundant species banded as first-time captures were: Yellow-rumped Warbler (940), Dark-eyed Junco (464), Lincoln's Sparrow (241), Orange-crowned Warbler (218), and Swainson's Thrush (121). Together, these five species comprised 63% (1,984/3,135) of all birds banded as first-time captures.
4. When comparing population indices of birds captured at CFMS from this season to years past, there seems to be no pattern, especially within bird families (Table 2). For example, within the Empidonax Flycatchers (of which CFMS typically captures two species), Alder Flycatchers still continue to show a decline. It is unclear if this species is declining or if the migration window is being missed—these birds may be leaving before daily fall mist-netting occurs. In contrast, Hammond's Flycatchers continue to show a higher-than-average index than the 19-year average. This species seems to be more prevalent around CFMS than in years20 past; habitat may be the answer. Black-capped Chickadee captures dipped slightly this year; a possible explanation is that more young did not survive the winter. We did not catch enough Boreal Chickadees this year to include them in the population indices analyses. Ruby-crowned Kinglets showed a decrease in capture rates

this fall versus previous years. Unlike fall 2009, captures of all thrush species (Gray-cheeked, Swainson's, Hermit and American Robin) show a decrease in their population indices. The same can be said for the warblers as a whole; this family exhibited decreased population indices this fall—Townsend's Warbler, an uncommon fall migrant at CFMS, went from having the highest captures last fall (n = 53) to having less than 10. Yellow-rumped Warbler, the species most-captured at CFMS, as well as Orange-crowned, Yellow, Blackpoll and Wilson's Warbler, all showed a decrease in capture rates from last year and have a population index that is lower than the 19-year average. Northern Waterthrush continued a decline for the second consecutive year. Many warbler species depend on riparian areas for nesting areas; I wonder if willow blight and lack of water in the gully may have attributed to these declines in capture rates. Many of the sparrow species, including American Tree Sparrow, Fox Sparrow and Dark-eyed Junco, experienced a decline in their population index. Again, it's hard to say if these species are experiencing a population decline or if localized weather conditions at Creamer's Field forced these birds to find alternate stopover sites. On a positive note, Lincoln's, Savannah and White-crowned Sparrow, all experienced an increase in population index over last fall. Large fallouts of Common Redpoll was not an issue this fall as they have been in years past; in fact, only six redpolls were captured the entire season.

5. Notable captures (because they are uncommon or not often caught in mist-nets) include: a male American Three-toed Woodpecker and a male Black-backed Woodpecker (3rd one in station history, with the last occurring in 2005), a juvenile Brown Creeper (4th one during station history with the last one occurring in 2008), an adult male Golden Crowned Kinglet (3rd one in station history with the last occurring in 1998!), a Western Wood-Pewee and two Golden-crowned Sparrows.
6. The injury and mortality rate at CFMS in fall 2010 was 0.54% (17/3135), which is below the accepted average of 1-2% (Spotswood et al. 2011). Much of the mortality can be attributed to predation by Sharp-shinned Hawk, in addition to fatal injuries sustained by the mist-netting process.
7. The fall 2010 CFMS staff consisted of six returning skilled passerine banders: Dayna Dominguez, Sue Guers, April Harding-Scurr, Lila Tauzer, Matt Timpf and Tim Walker. Three of these banders worked only during the month of August (April Harding-Scurr, Matt Timpf and Lila Tauzer), while three banders worked intermittently during the entire fall season (Dayna Dominguez, Sue Guers and Tim Walker). ABO staff operated a training program for two fall CFMS interns: Criag Feigenbaum and Cheyanna Swisher. The internship consisted of hands-on training in methods of mist netting and banding passerines.
8. A total of 40 volunteers contributed to the operation of CFMS by providing 876 hours of assistance.
9. ABO educators presented bird-banding demonstrations to 971 people (850 students and 121 adults) in 42 groups between 26 July and 30 September. The students observed bird-banding and learned about bird identification and research. At least 515 independent visitors to CFMS were greeted by staff, interns, and volunteers and presented with informal banding demonstrations.

10. This fall, ABO and the Institute of Arctic Biology, University of Alaska, Fairbanks (UAF) through the Institutional Development Award program's Network of Biomedical Research Excellence (INBRE), continued to collaborate in collecting samples to test birds for avian influenza (H5N1). In exchange for collecting fecal samples, UAF provided staff and resources to help operate CFMS. UAF staff collected 528 fecal samples from 24 songbird species during the 2010 banding seasons (spring and fall).
11. Spring 2010 marked the beginning of a new collaboration with Drs. Ravinder Sehgal and Clarie Loiseau, professors at San Francisco State University who are studying the effects of climate change on the northward spread of avian malaria. This spring and fall, banders at CFMS collected 179 blood samples from 4 species of birds, including two resident species (Black-capped Chickadee and Common Redpoll) and two migratory species (Yellow-rumped Warbler and Swainson's Thrush). Blood samples will be will be analyzed during the winter. This collaboration will continue in 2011.

**The following summarizes the spring 2011 banding season (25 April—3 June): note: this report was submitted to ADF&G in July of 2011 and was also posted on Alaska Bird Observatory's website.**

1. Beginning 18 April 2011, the CFMS manager and several ABO volunteers set up the banding station tent and net array in preparation for the spring migration season.
2. Twenty-six standard mist nets were operated for 6 hours, weather permitting, on alternate days from 25 to 29 April and daily from 2 May to 4 June 2010. Nets were operated for a total of 5,200 hours.
3. Spring captures totaled 768 new and previously banded birds of 28 species. The average spring season at CFMS over its 20-year history is 721 birds, so this spring appears to be a normal one. Of these 768 captures, 520 were new (previously unbanded) captures and 128 captures (representing 58 individuals) were birds that had been banded at CFMS in previous years. Recaptured birds (birds banded and recaptured this season) comprised the remaining 116 captures (63 individual birds); the remaining 4 captures were birds that remained unbanded. The five most numerous species were Yellow-rumped Warbler (164), Common Redpoll (115), Dark-eyed Junco (96), American Robin (67) and Northern Waterthrush (60); these five species represent 65% of all captures. One aspect of banding birds is using these data to calculate survival rates by recapturing the same bird year after year. At CFMS this spring, we captured 58 individuals (128 captures) of 14 species banded in previous years, approximately 16% (128/768) of the total number of captures. Noteworthy returns included those of two resident species –a Downy Woodpecker banded as a second-year bird in 2008 and a Black-capped Chickadee first banded as a juvenile in 2002—meaning this bird has survived 10 Fairbanks winters!!. Noteworthy migrant returns include a Swainson's Thrush first banded as an adult in 2007 and a Yellow-rumped (Myrtle) Warbler banded as a juvenile in 2007.
4. Late greenup and increased water levels in the seasonal gully may have contributed to an anomalous year timing of migration. The first migrant in our nets was an uncommon Golden-crowned Sparrow (this was the 6th capture of this species in spring) and not the usual early-arriving Yellow-rumped Warbler or Dark-eyed Junco. Capture rates

(birds/1000 net hours) for many of the thrushes and flycatchers remained stable. No Alder Flycatchers were caught in our mist nets, but a few were heard around the netting area during the first week of June. We may be stopping daily banding too early to be catching this late-arriving species. Many of the warbler species increased significantly over the past five years' rates. Capture rates for most sparrows seem to be stable. The one exception being Lincoln's Sparrow—with the increased water in the seasonal wetland, I fully expected our captures of this species to rebound this year. This did not happen. Productivity and/or overwintering survival rates might be the answer.

5. Interesting captures for spring 2011 included a Belted Kingfisher (the first one captured during the spring banding season at CFMS), a Golden-crowned Sparrow, a juvenile Gray Jay, and two Sharp-shinned Hawks, including a return from 2010. These are species not very common at CFMS in spring. Due to increased water levels in the seasonal wetlands this spring, capture rates of shorebirds increased dramatically this spring—we captured 12 Solitary Sandpipers and 1 Lesser Yellowlegs. Our captures of other water-loving species increased as well, especially for Northern Waterthrush and Rusty Blackbird.
6. There were four bird mortalities (due to predation by squirrels or raptors) and one injury at CFMS during spring 2011 banding. The injury/mortality rate at our site (0.65%, 5/768) is much lower than the accepted rate of 1-2% (Spotswood et al. 2011).
7. In spring 2011, the CFMS staff consisted of three skilled passerine banders: Dayna Dominguez, Sue Guers and Sarah Moore. In addition, an EPSCoR (Experimental Program to Stimulate Competitive Research) intern (Cheyanna Swisher) helped in the operation of the station.
8. During the spring banding season, 44 volunteers contributed to the operation of CFMS by providing 887 hours of assistance.
9. ABO staff educated almost 1,000 people at CFMS. Bird-banding demonstrations were presented to 31 groups (822 participants; 679 students and 143 adults). This program is conducted in cooperation with ADF&G's Creamer's Nature Program. Approximately 165 independent visitors came to the station during spring migration; most were presented with informal banding demonstrations and information about ABO and the spring migration project.
10. ABO continued its collaboration with the Institute of Arctic Biology, University of Alaska, Fairbanks (UAF) through the Institutional Development Award program's Network of Biomedical Research Excellence collecting samples to test birds for avian influenza. In exchange for collecting fecal samples and cloacal swabs, UAF provided staff and resources to help operate CFMS. UAF staff and ABO biologists collected samples from banded birds this spring. This collaboration will continue through the fall of 2011.
11. Spring 2011 marked the second year of collaboration with Drs. Ravinder Sehgal and Clarie Loiseau, professors at San Francisco State University who have a project studying the effects of global climate change on the northward spread of avian malaria. This spring, banders at CFMS collected 54 blood samples from 4 species of birds, including two resident species (Black-capped Chickadee and Common Redpoll) and two migratory species (Yellow-rumped Warbler and Swainson's Thrush). Blood samples will be

collected in fall 2011 (from adult birds only) and will be analyzed during the winter. This collaboration will continue in 2012.

**The following summarizes the fall 2011 banding season (18 July- 30 September). Note: this report was submitted to ADF&G in November of 2011.**

1. Prior to the fall banding season, a volunteer orientation session was held for new and returning CFMS volunteers. A brief summary of bird identification and CFMS protocols were discussed.
2. Thirty-six standard mist nets (2.6m high x 12m long, 30mm mesh) at 30 net locations were operated for 6 hours, weather permitting, daily from 18 July until 25 September 2011. The station was operated on alternate days (M, W, and F) during the week of 26 to 30 September 2011. Nets were operated for a total of 11,652 hours.
3. We captured a total of 3,276 birds of 42 species (we banded 39 species; species not banded included Mallard, Green-winged Teal and Ruffed Grouse). Of these, 2,622 birds were banded as first-time captures; the remaining birds were recaptures (567), returning birds from previous years (55) or birds that remained unbanded after capture (32). The most abundant species banded as first-time captures were: Common Redpoll (694), Lincoln's Sparrow (354), Dark-eyed Junco (332), American Tree Sparrow (204) and Swainson's Thrush (180). Together, these five species comprised 54% (1,764/3,276) of all birds banded as first-time captures.
4. When comparing population indices of birds captured at CFMS from this season to years past, there seems to be no pattern, especially within bird families. For example, within the *Empidonax* Flycatchers (of which CFMS typically captures two species), Alder Flycatchers showed an increase from last year's captures, but is still below the 20-year average. It is unclear if this species is declining or if the migration window is being missed or perhaps the habitat is changing at the banding station. In contrast, Hammond's Flycatchers, which were showing an upward trend over the past two years, showed a decline this year. Chickadees, both Black-capped Chickadee and Boreal captures both increased this year; in fact, this was a particularly good year for Black-capped Chickadees. Either they produced more young this summer, or flocks were moving around more so than usual in the latter part of the fall season looking for food. Ruby-crowned Kinglets showed a decrease in capture rates this fall versus previous years. Unlike fall 2010, captures of all thrush species (Gray-cheeked, Swainson's, Hermit and American Robin) this year show an increase in their population indices. This fall, we caught more Swainson's Thrushes than ever before in our 20-year history—almost twice the average rate. In contrast the warbler species—with the exception of Northern Waterthrush; this family exhibited decreased population indices this fall. Increased water levels in the seasonal gully most likely saw an increase in local waterthrush productivity. One of the most surprising finds this fall was significant decline of Yellow-rumped (Myrtle) Warbler captures. Until this fall, this species was always the most captured species at CFMS. In most years, we can capture 1,000 or more of this species. This fall, we captured 99 new Yellow-rumped Warblers—10% of our normal capture rate for this species. I can20t really say why the Yellow-rumps were so sparse this fall at CFMS, especially when local reports observed large flocks elsewhere. Indeed, migration

researchers from the central and eastern flyways are reporting larger-than-normal numbers of yellow-rumps this fall/winter. The sparrow family is also a mixed bag; some species experienced an increase in their population index while others showed a decrease from 2010. American Tree and Savannah Sparrows were up slightly from last fall, whereas the index for Lincoln's Sparrow almost doubled from last year; in fact, it's one of the highest indices in the CFMS 20-year history! On a more somber note, both White-crowned Sparrow and Dark-eyed Junco numbers were way down this fall. It's hard to say if these species are experiencing a population decline or if localized weather conditions at Creamer's Field forced these birds to find alternate stopover sites. Large fallouts of Common Redpoll occurred on several days during the fall banding season. In fact, 14 Pine Siskins (mostly juvenile birds) were captured within these flocks. Many folks had reported large flocks of siskins at their feeders during the latter winter months; it appears that this locally uncommon species did in fact breed in Fairbanks this year.

5. Notable captures (because they are uncommon or not often caught in mist-nets) include: a Yellow Warbler first captured as a Second-year bird in 2007—making this bird at least 5 years old; a Swainson's Thrush banded as an After-hatch year bird in 2008—making this bird at least 4 years old and a Black-capped Chickadee banded as a Hatch-year bird in 2002—making this bird 9 years old! That's a lot of winters of -40°F temperatures and less than 4 hours of daylight! Although our capture rates were somewhat lower than average, the species diversity was high this year and made for several exciting banding days. Some of the more unusual captures this year include: a Merlin, four American Three-toed Woodpeckers and four Black-backed Woodpeckers (all males), three juvenile Brown Creepers, an adult male Golden-crowned Kinglet, three Golden-crowned Sparrows and 14 White-winged Crossbills (all juvenile birds caught in the same net on 22 July).
6. The injury and mortality rate at CFMS in fall 2011 was 0.88% (29/3285), which is below the accepted average of 1-2% (Spotswood et al. 2011). This was an irruptive year for Common Redpolls at Creamer's Field this year. We had several 20fallout20 days for this species during the fall banding season—days with two or three hundred redpolls. Much of the injury and mortality can be attributed to large flocks of Common Redpolls hitting nets all at once—40 or 50 birds in one net causes a lot of stress to individual birds because of the weight of many birds in the net and also because it takes a lot of time to extract those birds.
7. This fall, the CFMS staff consisted of four returning skilled passerine banders: Dayna Dominguez, Sue Guers, Lila Tauzer, and Tim Walker and one new bander, Sarah Moore. One of these banders worked only during the month of July (Tim Walker), while two banders worked intermittently during the entire fall season (Sue Guers and Lila Tauzer). ABO staff operated a training program for two fall CFMS interns: Julie Polasik and Joshua See. The internship consisted of hands-on training in methods of mist netting and banding passerines. The interns were given daily practical experience that focused on the objectives, logistics and ethics associated with the operation of a netting program, species identification, age and sex determination, banding, handling, and measuring birds. While most days were spent out at the banding station, the banding staff of ABO offered a training regime consisting of species identification initially, then progressed to ageing and sexing of passerines using slide presentations and other training manuals. Both

interns received bird-banding training and contributed many hours to the operation our fall migration program at CFMS. All staff had daily experience that focused on the objectives, logistics and ethics associated with the operation of a netting program. In addition, species identification, age and sex determination, banding, handling, and measuring birds were part of the regime.

8. A total of 45 volunteers contributed to the operation of CFMS by providing 1,185 hours of assistance. Volunteers at the banding station received training in extracting birds from mist nets, net maintenance, bird identification, recording data, and handling birds for public demonstrations.
9. ABO educators presented bird-banding demonstrations to 1,260 people (1,071 students and 189 adults) in 55 groups between 18 July and 30 September 2011. The students observed bird banding and learned about bird identification and research. At least 500 independent visitors to CFMS were greeted by staff, interns, and volunteers and presented with informal banding demonstrations.
10. This fall, ABO and the Institute of Arctic Biology, University of Alaska, Fairbanks (UAF) through the Institutional Development Award program's Network of Biomedical Research Excellence (INBRE), continued to collaborate in collecting samples to test birds for avian influenza (H5N1). In exchange for collecting fecal samples, UAF provided staff and resources to help operate CFMS. The UAF and ABO staff collected 601 fecal samples from 26 species of birds. Three samples (all from Lincoln's Sparrows) initially tested positive, but were unable to grow the HN51 virus in the lab.
11. Fall 2011 marked the continuation of collaboration with Drs. Ravinder Sehgal and Clarie Loiseau, professors at San Francisco State University who are studying the effects of climate change on the northward spread of avian malaria. This fall, banders at CFMS collected 35 blood samples from 4 species of birds, including two resident species (Black-capped Chickadee and Common Redpoll) and two migratory species (Yellow-rumped Warbler and Swainson's Thrush). Blood samples will be will be analyzed during the winter. We hope that this collaboration will continue in 2012; dependent on funding for Drs. Sehgal and Loiseau.

**The following summarizes the spring 2012 banding season (23 April—4 June). Note: this report was submitted to ADF&G in July of 2012.**

1. Beginning 16 April 2012, the CFMS manager and several ABO volunteers set up the banding station tent and net array in preparation for the spring migration season.
2. Twenty-six standard mist nets were operated for 6 hours, weather permitting, on alternate days from 23 to 27 April and daily from 30 April to 4 June 2012. Nets were operated for a total of 4,945 net-hours over the course of 36 banding days.
3. Spring captures totaled 520 new and previously banded birds of 32 species. The average spring season at CFMS over its 21-year history is 713 birds, so this spring appears to be a bit below normal. Of these 520 captures, 365 were new (previously unbanded) captures and 69 captures were birds that had been banded at CFMS in previous years. Recaptured birds (birds banded and recaptured this season) comprised the remaining 80 captures (44 individual birds of 11 species); the remaining 6 captures were birds that remained

unbanded. The five most numerous species were Yellow-rumped Warbler (108), American Robin (71), Dark-eyed Junco (61), Swainson's Thrush (41) and Common Redpoll (40); these five species represent 63% of all captures (326/520). One aspect of banding birds is using these data to calculate survival rates by recapturing the same bird year after year. At CFMS this spring, we captured 37 individuals (69 captures) of 10 species banded in previous years, approximately 13% (69/520) of the total number of captures. Noteworthy returns included those of two resident species –a Downy Woodpecker banded as a second-year bird in 2010 by another researcher studying this species on the refuge and several Black-capped Chickadees first banded as juveniles in 2009. Noteworthy migrant returns include a Swainson's Thrush first banded as an adult in 2007 and a Yellow-rumped (Myrtle) Warbler banded as a juvenile in 2007.

4. Timing of this year's spring migration seemed on par with those of previous years, if not a bit early for a few species. Greenup occurred at CFMS on May 12th, a full week ahead of 2011. The first migrants in our nets were a few Dark-eyed Juncos. Dark-eyed Juncos and Yellow-rumped (Myrtle) Warblers, both short-distance migrants, are usually among the first migrant species to the Fairbanks area. I20m also happy to say that for the first time since 2003, we caught an Alder Flycatcher during spring banding! This species is the last migrant to arrive to CFMS (usually they arrive by 3 or 4 June). This year, the first Alder was caught on May 30th. It will be interesting to see if this earlier arrival trend for this long-distant migrant continues. Capture rates (birds/1000 net hours) for Hammond's Flycatchers decreased this year over last spring. Looking at their capture rates over the 21-year history, it appears that their populations fluctuate quite a bit. Capture rates of all of the thrushes increased this spring over last year; while those for warblers were on the decline (with the exception of Wilson's Warbler). Productivity and/or over wintering survival rates might be the answers for these fluctuations. Capture rates for sparrows seem stable over the past few years.
5. Interesting captures for spring 2012 included a female Boreal Owl (the first one captured during a spring banding season and the first one captured since 1996), a Gray Jay, two Ruby-crowned Kinglets (including a returning bird that was banded in 2011), a Golden-crowned Sparrow and two Varied Thrushes. These are species not very common at CFMS in spring. Due to increased water levels in the seasonal wetlands this spring, capture rates of shorebirds increased dramatically this spring—we captured 7 Solitary Sandpipers and 2 Wilson's Snipe. We also captured 3 Pectoral Sandpipers this spring, a species that hasn20t been captured since 2003. Our captures of other water-loving species increased as well, especially for Lincoln's Sparrow and Rusty Blackbird.
6. There were three bird mortalities (due to predation by squirrels or raptors) and one injury at CFMS during spring 2012 banding. The injury/mortality rate at our site (0.76%, 4/520) is much lower than the accepted rate of 1-2% (Fair et al. 2010, Spotswood et al. 2011).
7. In spring 2012, the CFMS staff consisted of two skilled passerine banders: Sue Guers and Toni Taylor-Salisbury. In addition, Robin Rauch started as a banding intern in May and will continue through the fall banding season.
8. During the spring banding season, 40 volunteers contributed to the operation of CFMS by providing 840 hours of assistance.

9. ABO staff educated over 1,000 people at CFMS. Bird-banding demonstrations were presented to 31 groups (763 participants; 633 students and 130 adults). This program is conducted in cooperation with ADF&G's Creamer's Nature Program. Approximately 285 independent visitors came to the station during spring migration; most were presented with informal banding demonstrations and information about ABO and the spring migration project.
10. Spring 2012 marked the third year of collaboration with Dr. Ravinder Sehgal, a professor at San Francisco State University studying the effects of global climate change on the northward spread of avian malaria. This spring, banders at CFMS collected 6 blood samples from 4 species of birds, including two resident species (Black-capped Chickadee and Common Redpoll) and two migratory species (Yellow-rumped Warbler and Swainson's Thrush).

**The following summarizes the fall 2012 banding season (18 July- 30 September). Note: this report was submitted to ADF&G in March of 2013.**

1. Prior to the fall banding season, a volunteer orientation session was held for new and returning CFMS volunteers. A brief summary of bird identification and CFMS protocols were discussed.
2. Thirty-six standard mist nets (2.6m high x 12m long, 30mm mesh) at 30 net locations were operated for 6 hours, weather permitting, daily from 25 July until 21 September 2011. The station was operated on alternate days (M, W, and F) during the week of 24 to 28 September 2012. Nets were operated for a total of 9,795 hours.
3. We captured a total of 2,995 birds of 34 species (we banded 33 species; species not banded included Green-winged Teal). Of these, 2,647 birds were banded as first-time captures; the remaining birds were recaptures (320), returning birds from previous years (18), and birds that remained unbanded after capture (10). The top 5 species captured this fall included: Dark-eyed Junco (779), Yellow-rumped Warbler (772), American Tree Sparrow (261), Orange-crowned Warbler (201) and Lincoln's Sparrow (197). These 5 species represent 74% (2,210/2,995) of all captures.
4. There seems a pattern in decreasing population indices for most the common species captured at CFMS (Table 2). However, within and among family groups, there is no consistent trend over CFMS history; variability in annual capture rates among species is common. Within the *Empidonax* Flycatchers (of which CFMS typically captures two species), both Alder and Hammond's Flycatcher both showed the lowest rates in 21 years. After exhibiting a spike in its population index in 2011, Black-capped Chickadee exhibited a decreasing trend over the past two years, whereas Boreal Chickadee continue to increase in captures at CFMS. Ruby-crowned Kinglet showed increased capture rates this fall for the first time in three seasons; however, the 2012 rate was still lower than the 21-year average. Unlike fall 2011, captures of most thrush species (Gray-cheeked, Swainson's, and American Robin) this year showed a decrease in their population indices. This fall, Hermit Thrush captures were on the increase. Most warbler species, with the exception of Northern Waterthrush, exhibited slight increases in their population indices this fall. Yellow-rumped (Myrtle) Warbler captures showed a significant increase versus that of fall 2011. Fall 2012 numbers reached average levels for this species. Similar to the warbler family, most species within the sparrow family experienced a

decrease in population indices this fall. However, in contrast to fall 2011, both White-crowned Sparrow and Dark-eyed Junco showed an increase in fall 2012, in fact, Dark-eyed Junco exhibited a population index almost twice that of the 21-year average. The finch species (Pine Siskin and Common Redpoll) were not captured in numbers sufficient for analyses.

5. In 2012 capture rates of HY birds were higher than AHY birds by almost 9:1. This ratio was true for all migrant species, whereas resident species had more adults captured (Downy Woodpecker, Bohemian Waxwing, Pine Siskin, Common Redpoll).
6. Although our capture rates were somewhat lower than average in fall 2012, the species diversity was higher than normal this year and made for several exciting banding days. Some of the more unusual captures this year includes: a Bohemian Waxwing, 6 Sharp-shinned Hawks, a juvenile Western Palm Warbler (the first since 2004) and a juvenile Chipping Sparrow (the first since 2007).
7. The injury and mortality rate at CFMS in fall 2012 was 0.40% (12/3028), which is below the accepted average of 1-2% for mist-netting (Spotswood et al. 2011). Sharp-shinned Hawks and Red Squirrels caused most of the mortality events this fall at CFMS.
8. This fall, the CFMS staff consisted of four skilled passerine banders: Sue Guers, Toni Taylor-Salisbury (returning from the spring 2012 season), Aaron Spidal, and Ben Zyla. ABO staff operated a training program for two fall CFMS interns, Cheryl Fisher and Robin Rauch (returning from the 2012 spring season). The internship consisted of hands-on training in methods of mist netting and banding passerines. The interns were given daily practical experience that focused on the objectives, logistics and ethics associated with the operation of a netting program, species identification, age and sex determination, banding, handling, and measuring birds. While most days were spent out at the banding station, the banding staff of ABO offered a training regime consisting of species identification initially, then progressed to ageing and sexing of passerines using slide presentations and other training manuals. Both interns received bird-banding training and contributed many hours to the operation our fall migration program at CFMS. All staff had daily experience that focused on the objectives, logistics and ethics associated with the operation of a netting program. In addition, species identification, age and sex determination, banding, handling, and measuring birds were part of the regime.
9. Between 25 July and 1 October 2012, a total of 40 volunteers contributed to the operation of CFMS by providing 900 hours of assistance. Volunteers at the banding station received training in extracting birds from mist nets, net maintenance, bird identification, recording data, and handling birds for public demonstrations. Several volunteers also donated time in helping take down the nets and banding station at the end of the banding season.
10. ABO worked cooperatively with the Alaska Department of Fish and Game to conduct environmental education programs for school, community, and tour groups. A curriculum designed by ABO was used to teach students about the importance of birds, their conservation and ABO research. ABO educators presented bird-banding demonstrations to 1,248 people (1,071 students and 177 adults) in 48 groups between 23 August and 28 September 2012. The students observed bird-banding and learned about bird

identification and research. At least 650 independent visitors to CFMS were greeted by staff, interns, and volunteers and presented with informal banding demonstrations.

11. Fall 2012 marked the continuation of collaboration with Drs. Ravinder Sehgal and Clarie Loiseau, professors at San Francisco State University who are studying the effects of climate change on the northward spread of avian malaria. Thus far, this collaboration has generated two published manuscripts from this work.

3. Using data from CFMS and two other banding stations in Alaska (Tok and Scottie Creek) as well as Breeding Bird Survey data, publish a manuscript that examines range expansion of Tennessee Warblers in Alaska *by 30 December*

ACCOMPLISHMENTS:

A paper entitled "Breeding range expansion of Tennessee Warbler in Central Alaska: A Spruce Budworm Connection?" was submitted to the Wilson Journal of Ornithology on 27 April, 2010. It was rejected due to lack of sample size. A paper on this topic was presented at the Alaska Bird Conference in November 2010. I've now expanded the data to include information gathered from Alaska biologists collecting point count data to gain more information on this species20 expansion within the state. I hope to submit this revised paper to Western Birds and will once issues with ABO data ownership are resolved.

3. Conduct a comprehensive analysis of 20 years of CFMS data to:

   a. Examine variation in the proportion of adults versus juveniles captured, by species, during fall migration at CFMS *by 30 June 2013*.
   b. Calculate mean spring and fall passage dates for all species with sufficient sample sizes; evaluate differences in autumn migration timing between adults and juveniles *by 30 June 2013.*
   c. Examine inter-annual and long-term trends in abundance and capture rates for species caught at Creamer's Field *by 30 June 2013*.
   d. Evaluate whether trends in spring arrival dates relate to changes in average temperature or other factors *by 30 June 2013*.
   e. Prepare manuscripts for publication and submit to journals as appropriate throughout duration of project.
   f. Present results at the Alaska Bird Conference, *2012.*
   g. Submit all required reports to ADF&G Partner Program.

ACCOMPLISHMENTS:

a. Examine variation in the proportion of adults versus juveniles captured, by species, during fall migration at CFMS *by 30 June 2013*.

Of the 83,451 birds of known age captured at ABO's Creamer's Field Migration Station (CFMS) during fall migration from 1992 to 2012, 89% (74,276) were juveniles or hatch-

year (HY) birds, and 11% (9,1750 were adults or after hatch-year (AHY) birds. The ratio of HY:AHY birds at CFMS is much higher than those documented by banding stations at lower latitudes, confirming that this station is very close to many species' breeding grounds and this station can provide indices of productivity for many songbird species. The proportion of adults versus juveniles captured during fall migration at CFMS was calculated for the 23 most commonly captured species (Table 1). Only new captures were included in these analyses and birds of unknown age were excluded.

Table 1. The total number captured and the proportion of adults and juveniles for 23 species captured during fall migration from 1992-2012 at ABO's Creamer's Field Migration Station, Fairbanks, AK. Scientific names for birds are given in Appendix 1.

| Species | # Adults (n) | Mean proportion of adults captured ± SD (1992-2012) | # Juveniles (n) | Mean proportion of juveniles captured ± SD (1992-2012) |
|---|---|---|---|---|
| Alder Flycatcher | 279 | 0.31 ± 0.11 | 641 | 0.69 ± 0.11 |
| Hammond's Flycatcher | 114 | 0.11 ± 0.06 | 1,022 | 0.89 ± 0.06 |
| Black-capped Chickadee | 304 | 0.20 ± 0.19 | 866 | 0.80 ± 0.19 |
| Boreal Chickadee | 20 | 0.13 ± 0.14 | 143 | 0.87 ± 0.14 |
| Ruby-crowned Kinglet | 196 | 0.10 ± 0.05 | 1,745 | 0.90 ± 0.05 |
| Gray-cheeked Thrush | 94 | 0.15 ± 0.09 | 478 | 0.85 ± 0.09 |
| Swainson's Thrush | 224 | 0.10 ± 0.04 | 2,144 | 0.90 ± 0.04 |
| Hermit Thrush | 13 | 0.03 ± 0.04 | 443 | 0.97 ± 0.04 |
| American Robin | 141 | 0.15 ± 0.13 | 628 | 0.85 ± 0.13 |
| Orange-crowned Warbler | 1,176 | 0.14 ± 0.07 | 7,565 | 0.86 ± 0.07 |
| Yellow-rumped Warbler | 1,125 | 0.07 ± 0.03 | 15,964 | 0.93 ± 0.03 |
| Yellow Warbler | 209 | 0.10 ± 0.08 | 1,909 | 0.90 ± 0.08 |
| Townsend's Warbler | 11 | 0.05 ± 0.13 | 166 | 0.95 ± 0.13 |
| Blackpoll Warbler | 64 | 0.07 ± 0.07 | 945 | 0.93 ± 0.07 |
| Northern Waterthrush | 73 | 0.07 ± 0.04 | 905 | 0.93 ± 0.04 |
| Wilson's Warbler | 166 | 0.09 ± 0.06 | 1,804 | 0.91 ± 0.06 |
| American Tree Sparrow | 1,109 | 0.15 ± 0.08 | 8,213 | 0.85 ± 0.08 |
| Savannah Sparrow | 95 | 0.06 ± 0.04 | 1,530 | 0.94 ± 0.04 |
| Fox Sparrow | 166 | 0.21 ± 0.08 | 566 | 0.79 ± 0.08 |
| Lincoln's Sparrow | 271 | 0.06 ± 0.03 | 4,296 | 0.94 ± 0.08 |
| Dark-eyed Junco | 866 | 0.09 ± 0.03 | 9,677 | 0.91 ± 0.03 |
| White-crowned Sparrow | 107 | 0.12 ± 0.09 | 945 | 0.88 ± 0.09 |
| Common Redpoll | 284 | 0.28 ± 0.28 | 1,679 | 0.72 ± 0.28 |
| **Total** | **7,107** | **0.10 ± 0.06** | **64,274** | **0.90 ± 0.06** |

For all 23 species, juvenile captures dominated those of adults during fall migration at CFMS by 9 to 1. Hermit Thrush had the least mean number of adults captured (3%) and the most juveniles captured (97%), while Alder Flycatcher had the most adults captured (31%) and the least number of juveniles captured (59%; Table 2).

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Table 2. Proportion of adults (AHY) and juveniles (HY) for 23 species captured during fall migration at CFMS from 1992-2012, Fairbanks AK.

| Species | Age | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALFL | AHY | 0.09 | 0.46 | 0.23 | 0.37 | 0.28 | 0.30 | 0.18 | 0.31 | 0.25 | 0.39 | 0.36 | 0.48 | 0.43 | 0.15 | 0.22 | 0.21 | 0.38 | 0.44 | 0.21 | 0.30 | 0.43 | 0.30 |
| | HY | 0.91 | 0.54 | 0.77 | 0.63 | 0.72 | 0.70 | 0.82 | 0.69 | 0.75 | 0.61 | 0.64 | 0.52 | 0.57 | 0.85 | 0.78 | 0.79 | 0.63 | 0.56 | 0.79 | 0.70 | 0.57 | 0.70 |
| HAFL | AHY | 0.11 | 0.15 | 0.24 | 0.04 | 0.11 | 0.09 | 0.00 | 0.17 | 0.08 | 0.13 | 0.05 | 0.23 | 0.18 | 0.09 | 0.07 | 0.12 | 0.03 | 0.08 | 0.15 | 0.08 | 0.11 | 0.10 |
| | HY | 0.89 | 0.85 | 0.76 | 0.96 | 0.89 | 0.91 | 1.00 | 0.83 | 0.92 | 0.87 | 0.95 | 0.77 | 0.82 | 0.91 | 0.93 | 0.88 | 0.97 | 0.92 | 0.85 | 0.92 | 0.89 | 0.90 |
| BCCH | AHY | 0.00 | 0.15 | 0.17 | 0.06 | 0.04 | 0.07 | 0.00 | 0.19 | 0.08 | 0.11 | 0.11 | 0.00 | 0.00 | 0.04 | 0.49 | 0.55 | 0.39 | 0.30 | 0.52 | 0.46 | 0.34 | 0.26 |
| | HY | 1.00 | 0.85 | 0.83 | 0.94 | 0.96 | 0.93 | 1.00 | 0.81 | 0.92 | 0.89 | 0.89 | 1.00 | 1.00 | 0.96 | 0.51 | 0.45 | 0.61 | 0.70 | 0.48 | 0.54 | 0.66 | 0.74 |
| BOCH | AHY | 0.00 | 0.10 | 0.00 | 0.17 | 0.00 | 0.17 | 0.07 | 0.00 | 0.14 | 0.17 | 0.00 | 0.22 | 0.00 | 0.08 | 0.00 | 0.00 | 0.15 | 0.20 | 0.40 | 0.00 | 0.09 | 0.12 |
| | HY | 1.00 | 0.90 | 1.00 | 0.83 | 1.00 | 0.83 | 0.93 | 0.00 | 0.86 | 0.83 | 1.00 | 0.78 | 0.00 | 0.92 | 1.00 | 1.00 | 0.85 | 0.80 | 0.60 | 1.00 | 0.91 | 0.88 |
| RCKI | AHY | 0.12 | 0.10 | 0.11 | 0.08 | 0.13 | 0.13 | 0.09 | 0.08 | 0.07 | 0.05 | 0.00 | 0.17 | 0.24 | 0.07 | 0.05 | 0.06 | 0.16 | 0.08 | 0.08 | 0.06 | 0.13 | 0.10 |
| | HY | 0.88 | 0.90 | 0.89 | 0.92 | 0.87 | 0.87 | 0.91 | 0.92 | 0.93 | 0.95 | 1.00 | 0.83 | 0.76 | 0.93 | 0.95 | 0.94 | 0.84 | 0.92 | 0.92 | 0.94 | 0.87 | 0.90 |
| GCTH | AHY | 0.08 | 0.38 | 0.11 | 0.00 | 0.16 | 0.24 | 0.25 | 0.20 | 0.13 | 0.25 | 0.10 | 0.10 | 0.12 | 0.15 | 0.08 | 0.24 | 0.05 | 0.19 | 0.12 | 0.10 | 0.20 | 0.16 |
| | HY | 0.92 | 0.62 | 0.89 | 1.00 | 0.84 | 0.76 | 0.75 | 0.80 | 0.88 | 0.75 | 0.90 | 0.90 | 0.88 | 0.85 | 0.92 | 0.76 | 0.95 | 0.81 | 0.88 | 0.90 | 0.80 | 0.84 |
| SWTH | AHY | 0.14 | 0.20 | 0.13 | 0.08 | 0.04 | 0.09 | 0.11 | 0.07 | 0.07 | 0.14 | 0.08 | 0.07 | 0.03 | 0.10 | 0.05 | 0.12 | 0.12 | 0.07 | 0.13 | 0.14 | 0.05 | 0.09 |
| | HY | 0.86 | 0.80 | 0.87 | 0.92 | 0.96 | 0.91 | 0.89 | 0.93 | 0.93 | 0.86 | 0.92 | 0.93 | 0.97 | 0.90 | 0.95 | 0.88 | 0.88 | 0.93 | 0.87 | 0.86 | 0.95 | 0.91 |
| HETH | AHY | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.05 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.05 | 0.05 | 0.00 | 0.10 | 0.03 | 0.03 |
| | HY | 0.83 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.92 | 0.95 | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 1.00 | 0.97 | 0.97 | 0.95 | 0.95 | 1.00 | 0.90 | 0.97 | 0.97 |
| AMRO | AHY | 0.44 | 0.53 | 0.11 | 0.21 | 0.14 | 0.14 | 0.14 | 0.12 | 0.08 | 0.16 | 0.07 | 0.20 | 0.22 | 0.15 | 0.00 | 0.11 | 0.07 | 0.00 | 0.06 | 0.11 | 0.16 | 0.18 |
| | HY | 0.56 | 0.47 | 0.89 | 0.79 | 0.86 | 0.86 | 0.86 | 0.88 | 0.92 | 0.84 | 0.93 | 0.80 | 0.78 | 0.85 | 1.00 | 0.89 | 0.93 | 1.00 | 0.94 | 0.89 | 0.84 | 0.82 |
| OCWA | AHY | 0.11 | 0.37 | 0.14 | 0.14 | 0.16 | 0.21 | 0.09 | 0.15 | 0.18 | 0.10 | 0.13 | 0.12 | 0.09 | 0.11 | 0.10 | 0.08 | 0.15 | 0.12 | 0.07 | 0.22 | 0.07 | 0.13 |
| | HY | 0.89 | 0.63 | 0.86 | 0.86 | 0.84 | 0.79 | 0.91 | 0.85 | 0.82 | 0.90 | 0.87 | 0.88 | 0.91 | 0.89 | 0.90 | 0.92 | 0.85 | 0.88 | 0.93 | 0.78 | 0.93 | 0.87 |
| MYWA | AHY | 0.05 | 0.16 | 0.06 | 0.08 | 0.05 | 0.06 | 0.07 | 0.10 | 0.07 | 0.07 | 0.07 | 0.06 | 0.04 | 0.05 | 0.06 | 0.06 | 0.08 | 0.09 | 0.04 | 0.14 | 0.07 | 0.07 |
| | HY | 0.95 | 0.84 | 0.94 | 0.92 | 0.95 | 0.94 | 0.93 | 0.90 | 0.93 | 0.93 | 0.93 | 0.94 | 0.96 | 0.95 | 0.94 | 0.94 | 0.92 | 0.91 | 0.96 | 0.86 | 0.93 | 0.93 |

Table 2 continued. Proportion of adults (AHY) and juveniles (HY) for 23 species captured during fall migration at CFMS from 1992-2012, Fairbanks AK.

| Species | Age | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YWAR | AHY | 0.08 | 0.39 | 0.12 | 0.16 | 0.06 | 0.06 | 0.10 | 0.10 | 0.08 | 0.09 | 0.18 | 0.08 | 0.08 | 0.17 | 0.06 | 0.07 | 0.09 | 0.05 | 0.04 | 0.07 | 0.03 | 0.10 |
| | HY | 0.92 | 0.61 | 0.88 | 0.84 | 0.94 | 0.94 | 0.90 | 0.90 | 0.92 | 0.91 | 0.82 | 0.92 | 0.92 | 0.83 | 0.94 | 0.93 | 0.91 | 0.95 | 0.96 | 0.93 | 0.97 | 0.90 |
| TOWA | AHY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.22 | 0.06 |
| | HY | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.60 | 1.00 | 1.00 | 0.57 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 0.00 | 0.78 | 0.94 |
| BLPW | AHY | 0.05 | 0.29 | 0.13 | 0.06 | 0.04 | 0.08 | 0.16 | 0.04 | 0.00 | 0.12 | 0.00 | 0.00 | 0.02 | 0.10 | 0.13 | 0.04 | 0.06 | 0.02 | 0.04 | 0.00 | 0.09 | 0.06 |
| | HY | 0.95 | 0.71 | 0.88 | 0.94 | 0.96 | 0.92 | 0.84 | 0.96 | 1.00 | 0.88 | 1.00 | 1.00 | 0.98 | 0.90 | 0.88 | 0.96 | 0.94 | 0.98 | 0.96 | 1.00 | 0.91 | 0.94 |
| NOWA | AHY | 0.02 | 0.10 | 0.06 | 0.04 | 0.03 | 0.08 | 0.03 | 0.12 | 0.10 | 0.10 | 0.05 | 0.05 | 0.13 | 0.11 | 0.04 | 0.08 | 0.13 | 0.17 | 0.03 | 0.04 | 0.04 | 0.07 |
| | HY | 0.98 | 0.90 | 0.94 | 0.96 | 0.97 | 0.92 | 0.98 | 0.88 | 0.90 | 0.90 | 0.95 | 0.95 | 0.87 | 0.89 | 0.96 | 0.92 | 0.87 | 0.83 | 0.97 | 0.96 | 0.96 | 0.93 |
| WIWA | AHY | 0.09 | 0.20 | 0.16 | 0.11 | 0.15 | 0.04 | 0.04 | 0.02 | 0.12 | 0.05 | 0.04 | 0.09 | 0.05 | 0.15 | 0.05 | 0.03 | 0.19 | 0.05 | 0.02 | 0.17 | 0.15 | 0.08 |
| | HY | 0.91 | 0.80 | 0.84 | 0.89 | 0.85 | 0.96 | 0.96 | 0.98 | 0.88 | 0.95 | 0.96 | 0.91 | 0.95 | 0.85 | 0.95 | 0.97 | 0.81 | 0.95 | 0.98 | 0.83 | 0.85 | 0.92 |
| ATSP | AHY | 0.31 | 0.28 | 0.13 | 0.18 | 0.16 | 0.09 | 0.07 | 0.13 | 0.04 | 0.09 | 0.06 | 0.17 | 0.30 | 0.11 | 0.07 | 0.12 | 0.24 | 0.09 | 0.11 | 0.18 | 0.28 | 0.12 |
| | HY | 0.69 | 0.72 | 0.87 | 0.82 | 0.84 | 0.91 | 0.93 | 0.87 | 0.96 | 0.91 | 0.94 | 0.83 | 0.70 | 0.89 | 0.93 | 0.88 | 0.76 | 0.91 | 0.89 | 0.82 | 0.72 | 0.88 |
| SAVS | AHY | 0.11 | 0.06 | 0.04 | 0.03 | 0.01 | 0.06 | 0.12 | 0.05 | 0.02 | 0.04 | 0.02 | 0.03 | 0.10 | 0.07 | 0.08 | 0.09 | 0.11 | 0.00 | 0.13 | 0.01 | 0.10 | 0.06 |
| | HY | 0.89 | 0.94 | 0.96 | 0.97 | 0.99 | 0.94 | 0.88 | 0.95 | 0.98 | 0.96 | 0.98 | 0.97 | 0.90 | 0.93 | 0.92 | 0.91 | 0.89 | 1.00 | 0.87 | 0.99 | 0.90 | 0.94 |
| FOSP | AHY | 0.21 | 0.23 | 0.20 | 0.19 | 0.16 | 0.32 | 0.17 | 0.30 | 0.20 | 0.26 | 0.14 | 0.13 | 0.17 | 0.22 | 0.11 | 0.20 | 0.23 | 0.25 | 0.08 | 0.45 | 0.26 | 0.23 |
| | HY | 0.79 | 0.77 | 0.80 | 0.81 | 0.84 | 0.68 | 0.83 | 0.70 | 0.80 | 0.74 | 0.86 | 0.87 | 0.83 | 0.78 | 0.89 | 0.80 | 0.77 | 0.75 | 0.92 | 0.55 | 0.74 | 0.77 |
| LISP | AHY | 0.07 | 0.12 | 0.05 | 0.05 | 0.03 | 0.06 | 0.05 | 0.08 | 0.03 | 0.04 | 0.02 | 0.06 | 0.07 | 0.05 | 0.06 | 0.12 | 0.10 | 0.09 | 0.06 | 0.02 | 0.05 | 0.06 |
| | HY | 0.93 | 0.88 | 0.95 | 0.95 | 0.97 | 0.94 | 0.95 | 0.92 | 0.97 | 0.96 | 0.98 | 0.94 | 0.93 | 0.95 | 0.94 | 0.88 | 0.90 | 0.91 | 0.94 | 0.98 | 0.95 | 0.94 |
| GWCS | AHY | 0.14 | 0.07 | 0.10 | 0.09 | 0.07 | 0.06 | 0.07 | 0.32 | 0.08 | 0.12 | 0.20 | 0.07 | 0.14 | 0.13 | 0.14 | 0.11 | 0.40 | 0.04 | 0.13 | 0.05 | 0.03 | 0.10 |
| | HY | 0.86 | 0.93 | 0.90 | 0.91 | 0.93 | 0.94 | 0.93 | 0.68 | 0.92 | 0.88 | 0.80 | 0.93 | 0.86 | 0.87 | 0.86 | 0.89 | 0.60 | 0.96 | 0.87 | 0.95 | 0.97 | 0.90 |
| CORE | AHY | 0.00 | 0.00 | 0.18 | 0.22 | 0.53 | 0.20 | 0.07 | 0.21 | 0.17 | 0.38 | 0.33 | 0.44 | 1.00 | 0.14 | 0.06 | 0.27 | 0.04 | 0.05 | 0.50 | 0.14 | 0.93 | 0.14 |
| | HY | 1.00 | 0.00 | 0.82 | 0.78 | 0.47 | 0.80 | 0.93 | 0.79 | 0.83 | 0.63 | 0.67 | 0.56 | 0.00 | 0.86 | 0.94 | 0.73 | 0.96 | 0.95 | 0.50 | 0.86 | 0.07 | 0.86 |

Note: Species are listed using the 4-letter code. ALFL= Alder Flycatcher; HAFL = Hammond's Flycatcher; BCCH = Black-capped Chickadee; BOCH = Boreal Chickadee; RCKI = Ruby-crowned Kinglet; GCTH = Gray-cheeked Thrush; SWTH = Swainson's Thrush; HETH = Hermit Thrush; AMRO = American Robin; OCWA = Orange-crowned Warbler; MYWA = Yellow-rumped Warbler; YWAR = Yellow Warbler; TOWA = Townsend's Warbler; BLPW = Blackpoll Warbler; NOWA = Northern Waterthrush; WIWA = Wilson's Warbler; ATSP = American Tree Sparrow; SAVS = Savannah Sparrow; FOSP = Fox Sparrow; LISP = Lincoln's Sparrow; GWCS = White-crowned Sparrow; CORE = Common Redpoll

I also tested to see if the proportion of adults to juveniles captured for each of the 23 species changed over the 21-year banding history. For most species, productivity indices remained constant over time. However, Black-capped and Boreal Chickadee, American Robin and Yellow Warbler, productivity indices did change significantly (Table 3). These four species are local breeders, so habitat change (including water levels in the seasonal wetlands that surrounds the net array) could provide explanations; a local demographic study is warranted to test this question.

Table 3. Regression analysis comparing mean productivity index for 23 species captured during fall migration from 1992-2012 at ABO's Creamer's Field Migration Station, Fairbanks, AK.

| **Species** | **F** | ***P*** |
|---|---|---|
| Alder Flycatcher | 0.683 | 0.419 |
| Hammond's Flycatcher | 0.446 | 0.512 |
| Black-capped Chickadee | 17.927 | <0.001** |
| Boreal Chickadee | 6.289 | 0.020* |
| Ruby-crowned Kinglet | 0.076 | 0.786 |
| Gray-cheeked Thrush | 0.450 | 0.511 |
| Swainson's Thrush | 1.175 | 0.292 |
| Hermit Thrush | 0.001 | 0.983 |
| American Robin | 10.392 | 0.004** |
| Orange-crowned Warbler | 3.552 | 0.075 |
| Yellow-rumped Warbler | 0.060 | 0.804 |
| Yellow Warbler | 5.591 | 0.029* |
| Townsend's Warbler | 0.622 | 0.440 |
| Blackpoll Warbler | 3.107 | 0.09 |
| Northern Waterthrush | 0.568 | 0.460 |
| Wilson's Warbler | 0.217 | 0.646 |
| American Tree Sparrow | 0.120 | 0.732 |
| Savannah Sparrow | 0.585 | 0.454 |
| Fox Sparrow | 0.259 | 0.617 |
| Lincoln's Sparrow | 0.029 | 0.867 |
| Dark-eyed Junco | 2.419 | 0.136 |
| White-crowned Sparrow | 0.047 | 0.831 |
| Common Redpoll | 0.456 | 0.508 |

**significance at the $P < 0.001$ level;
*significance at the $P = 0.05$ level

*b.* Calculate mean spring and fall passage dates for all species with sufficient sample sizes; evaluate differences in autumn migration timing between adults and juveniles *by 30 June 2013.*

Eighteen species captured during both spring and fall migration had sufficient sample size to calculate median Julian passage date (Figure 1). I calculated median rather than mean, as more papers use this measure (e.g. Benson and Winker 2001, Benson et al. 2012).

The median spring passage date analyses included birds that were newly captured and returning birds from previous years; recaptures of birds within the same season were not included. Further, to test for true migrants, birds exhibiting sexual characteristics (females with brood patches or males with cloacal protuberances) were excluded from the analyses.

The median fall passage date analyses included birds that were newly captured and returning birds from previous years; recaptures of birds within the same season were not included. Further, to test for true migrants, birds exhibiting sexual characteristics (females with brood patches or males with cloacal protuberances) and birds with juvenile plumage were excluded from the analyses. To further eliminate local breeders from the analyses, only birds captured after Julian date 213 (August 1) were included in the analyses. Only species with adult captures of ≥50 adults total were included; all years were pooled for sufficient sample sizes for adults. The statistical methods used were similar to those described in Benson et al. 2012 for migration timing.

At CFMS, we are lucky in having prior analyses of spring and fall migration dates (Benson and Winker 2001) of these 18 species. Compared to the 2001 analyses, even with a decade more worth of monitoring, spring migration passage dates have not significantly changed at CMFS. I would have guessed that most species would be arriving earlier, given results from other banding stations at lower latitudes. In fact, some species do arrive 1-3 days earlier, while others arrive 1-3 days later. The only significant change in spring arrival is for Alder Flycatcher, which is arriving 5 days earlier than the prior analyses. Changes in the spring banding protocol may have something to do with this result. The analyses from Benson and Winker (2001) are from the years 1992-1998. In 2000, the timing of spring banding was truncated by one week and this may have lessened captures of Alder Flycatchers and also their median capture dates—this species is the last to arrive in Fairbanks.

The passage of fall migration dates have been analyzed twice before for data collected at CFMS (Benson and Winker 2001; Benson et al. 2012). The current analyses show comparable median passage dates for the 18 species examined.

Figure 1. Timing of spring and fall migration and differences in passage dates between adults and juveniles during fall migration among 18 songbird species in Fairbanks, AK (1992-2012).

| | Spring migration | | | Fall migration | | | | | | Difference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Adults | | | Juveniles | | | |
| **Species** | ***n*** | **Range** | **Date[a]** | ***n*** | **Range** | **Date[a]** | ***n*** | **Range** | **Date[a]** | **Days** |
| Alder Flycatcher | 16 | 151-158 | 156 | 126 | 213-247 | 217 | 571 | 213-256 | 221 | 4* |
| Hammond's Flycatcher | 381 | 115-158 | 138 | 127 | 213-259 | 224 | 545 | 213-249 | 219 | 5* |
| Ruby-crowned Kinglet | 64 | 116-145 | 131 | 201 | 218-281 | 254 | 1,781 | 213-272 | 247 | 7* |
| Gray-cheeked Thrush | 202 | 135-158 | 145 | 134 | 225-272 | 245 | 680 | 216-271 | 243 | 2 |
| Swainson's Thrush | 789 | 132-159 | 145 | 309 | 213-281 | 238 | 2,551 | 213-272 | 231 | 7* |
| American Robin | 921 | 116-166 | 140 | 142 | 214-281 | 260 | 566 | 213-277 | 246 | 14* |
| Orange-crowned Warbler | 578 | 127-158 | 143 | 1,261 | 214-266 | 244 | 7,408 | 214-272 | 237 | 7* |
| Yellow-rumped Warbler | 1,896 | 115-166 | 137 | 1,188 | 213-277 | 245 | 15,216 | 213-277 | 234 | 11* |
| Yellow Warbler | 335 | 135-166 | 151 | 178 | 213-277 | 233 | 1,568 | 213-260 | 226 | 7* |
| Blackpoll Warbler | 164 | 135-155 | 143 | 64 | 215-271 | 235 | 958 | 213-262 | 231 | 4* |
| Northern Waterthrush | 613 | 131-166 | 142 | 83 | 214-258 | 227 | 949 | 213-259 | 227 | 0 |
| Wilson's Warbler | 336 | 129-158 | 146 | 179 | 216-281 | 243 | 1,848 | 213-272 | 229 | 14* |
| American Tree Sparrow | 159 | 113-153 | 131 | 1,165 | 219-277 | 258 | 8,874 | 214-275 | 257 | 1 |
| Savannah Sparrow | 405 | 125-158 | 142 | 109 | 213-268 | 231 | 1,473 | 213-270 | 231 | 0 |
| Fox Sparrow | 88 | 115-156 | 130 | 177 | 219-267 | 247 | 643 | 213-273 | 245 | 2 |
| Lincoln's Sparrow | 216 | 122-158 | 141 | 308 | 213-269 | 229 | 5,157 | 213-281 | 227 | 2 |
| White-crowned Sparrow | 263 | 123-156 | 138 | 109 | 213-266 | 238 | 902 | 213-272 | 229 | 9* |
| Dark-eyed Junco | 1,073 | 114-159 | 132 | 1,084 | 214-275 | 253 | 15,055 | 214-275 | 242 | 11* |

[a] Median Julian dates of passage; [b] Differences in median dates among age classes is considered significant (i.e., 95% CI does not contain zero)

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a. Examine inter-annual and long-term trends in abundance and capture rates for species caught at Creamer's Field *by 30 June 2013*.

Population indices for the 22 most abundant species (more than 10 individuals captured per fall season) were calculated using the geometric mean of daily fall banding data (birds/1,000 net hours, Table 4). A constant (one) was added to each daily capture rate to compensate for days with zero counts. Geometric mean (compared with arithmetic mean) is relatively insensitive to occasional unusually high counts while still reflecting small increases or decreases that are consistently present in daily counts across the entire migration season (Dunn and Hussell 1995). Individuals used in the analysis of abundance included: newly banded birds, returns of previously banded birds, and unbanded mortalities. Captures prior to 1 August were excluded, as they were likely to be breeding birds or local dispersing juveniles, rather than migrants.

Table 4. Population indices using geometric mean of daily fall migration counts (birds/1000 net hour) for 22 species (n >10 individuals each year) at CFMS from 1992-2012. Note * denotes < 10 captures of this species during this year.

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | **Average** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alder Flycatcher | 2.60 | 3.26 | 3.03 | 4.92 | 3.39 | 4.27 | 2.50 | 2.13 | 1.72 | 1.90 | 1.88 | 1.83 | 2.07 | 2.32 | 1.66 | 1.53 | 1.48 | 1.64 | 1.22 | 1.59 | * | **2.24** |
| Hammond's Flycatcher | 1.42 | 1.47 | 2.00 | 2.21 | 3.35 | 2.54 | 1.96 | 1.90 | 1.59 | 2.07 | 1.68 | 1.65 | 2.58 | 2.79 | 2.58 | 1.67 | 1.63 | 2.61 | 2.15 | 1.95 | 1.37 | **2.06** |
| Black-capped Chickadee | 2.18 | 1.58 | 1.53 | 3.39 | 1.79 | 1.84 | 8.21 | 2.37 | 2.86 | 2.81 | 2.29 | 2.10 | 1.71 | 2.52 | 1.80 | 2.86 | 7.13 | 3.70 | 2.33 | 4.74 | 2.51 | **2.96** |
| Boreal Chickadee | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2.03 | * | * | 1.31 | 1.36 | **0.22** |
| Ruby-crowned Kinglet | 3.10 | 3.61 | 5.46 | 4.62 | 6.42 | 5.53 | 5.74 | 2.47 | 4.18 | 2.64 | 1.86 | 2.18 | 3.15 | 5.27 | 6.14 | 3.08 | 2.95 | 4.85 | 1.94 | 1.64 | 3.22 | **3.81** |
| Gray-cheeked Thrush | 3.17 | 1.85 | 1.94 | 2.88 | 1.59 | 2.26 | 3.68 | 1.80 | 1.51 | 2.05 | 1.44 | 1.96 | 1.67 | 1.76 | * | 1.98 | 2.11 | 2.43 | 1.54 | 2.54 | 1.60 | **1.99** |
| Swainson's Thrush | 4.76 | 4.36 | 3.68 | 6.31 | 4.04 | 5.88 | 5.87 | 4.25 | 2.10 | 3.63 | 2.28 | 4.81 | 6.12 | 5.46 | 4.39 | 5.94 | 6.61 | 6.97 | 4.66 | 7.16 | 3.30 | **4.88** |
| Hermit Thrush | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2.14 | 2.26 | 2.15 | 3.12 | 1.43 | 1.93 | 2.33 | **0.73** |
| American Robin | 2.48 | 1.48 | 2.04 | 1.91 | 1.98 | 1.96 | 1.77 | 1.87 | 1.44 | 1.69 | 1.45 | 1.53 | 2.91 | 1.90 | 1.66 | 3.40 | 2.42 | 2.46 | 1.68 | 2.10 | 1.53 | **1.98** |
| Orange-crowned Warbler | 27.78 | 8.30 | 19.68 | 26.88 | 17.89 | 24.81 | 25.78 | 15.95 | 14.88 | 8.61 | 6.65 | 6.92 | 12.93 | 15.44 | 14.56 | 16.32 | 10.12 | 15.04 | 8.02 | 4.31 | 6.98 | **14.66** |
| Yellow Warbler | 7.12 | 3.34 | 3.39 | 7.42 | 3.89 | 5.69 | 3.02 | 5.68 | 3.53 | 2.29 | 2.10 | 2.19 | 3.06 | 2.80 | 2.89 | 2.58 | 2.08 | 3.72 | 1.89 | 1.48 | 2.20 | **3.45** |
| Yellow-rumped Warbler | 35.92 | 2.15 | 23.52 | 15.63 | 21.93 | 30.42 | 39.83 | 13.92 | 33.71 | 22.57 | 14.83 | 7.29 | 15.02 | 28.77 | 38.91 | 21.78 | 13.99 | 57.90 | 14.49 | 3.39 | 17.00 | **22.52** |
| Blackpoll Warbler | 4.02 | 1.69 | 2.50 | 3.01 | 2.69 | 3.18 | 2.76 | 3.44 | 1.80 | 1.71 | 1.45 | 1.58 | 2.16 | 2.25 | 1.98 | 2.60 | 1.57 | 2.56 | 1.95 | * | 2.15 | **2.24** |
| Northern Waterthrush | 5.15 | 2.53 | 1.66 | 2.37 | 2.10 | 2.83 | 2.25 | 2.70 | 2.16 | 2.21 | 2.20 | 3.18 | 2.44 | 1.84 | 2.60 | 3.10 | 4.44 | 2.38 | 1.96 | 3.04 | 2.17 | **2.63** |
| Wilson's Warbler | 6.61 | 4.07 | 4.38 | 7.22 | 3.53 | 3.89 | 4.73 | 3.08 | 3.14 | 3.07 | 2.04 | 3.19 | 5.52 | 3.89 | 2.95 | 3.38 | 2.79 | 4.39 | 2.45 | 1.84 | 2.16 | **3.73** |
| American Tree Sparrow | 6.34 | 13.38 | 11.64 | 28.78 | 12.44 | 24.66 | 14.68 | 10.19 | 6.70 | 5.10 | 7.81 | 6.95 | 2.65 | 6.37 | 11.61 | 6.80 | 4.75 | 9.04 | 2.62 | 5.72 | 4.64 | **9.66** |
| Savannah Sparrow | 3.19 | 3.41 | 1.73 | 6.48 | 3.20 | 3.70 | 5.22 | 5.80 | 2.91 | 2.25 | 2.15 | 3.87 | 2.38 | 5.57 | 3.10 | 4.57 | 2.18 | * | 2.54 | 3.37 | 1.91 | **3.31** |
| Fox Sparrow | 1.98 | 1.88 | 2.21 | 2.03 | 2.42 | 2.79 | 2.91 | 2.59 | 1.56 | 1.99 | 1.69 | 1.70 | 1.45 | 2.12 | 3.04 | 1.57 | 2.47 | 3.29 | 1.80 | 2.83 | 2.01 | **2.21** |
| Lincoln's Sparrow | 18.06 | 5.47 | 6.31 | 13.47 | 8.29 | 10.65 | 15.31 | 5.33 | 6.98 | 8.52 | 5.25 | 6.19 | 9.83 | 14.01 | 12.73 | 10.23 | 3.41 | 8.33 | 8.63 | 13.62 | 7.12 | **9.42** |
| White-crowned Sparrow | 3.37 | 2.24 | 3.29 | 2.38 | 3.91 | 2.40 | 5.02 | 2.00 | 3.29 | 2.11 | 2.42 | 1.68 | 2.32 | 3.95 | 2.48 | 2.65 | * | 1.86 | 2.50 | 1.65 | 2.26 | **2.61** |
| Dark-eyed Junco | 10.46 | 7.28 | 25.16 | 17.26 | 23.21 | 21.04 | 54.98 | 15.01 | 17.25 | 11.34 | 16.18 | 19.56 | 21.58 | 33.11 | 64.35 | 32.34 | 17.56 | 64.65 | 28.00 | 16.24 | 51.89 | **27.07** |
| Common Redpoll | * | * | * | * | * | * | * | * | * | * | * | 1.82 | * | * | 1.89 | 1.27 | 1.21 | 1.46 | * | 2.52 | * | **0.48** |

There seems a pattern in decreasing population indices for most the common species captured at CFMS (Table 4). However, within and among family groups, there is no consistent trend over CFMS history; variability in annual capture rates among species is common.

I tested inter-annual changes in relative abundance of the 23 most common species captured at CFMS during fall migration from 1992-2012. I used linear regression to test change in relative capture rate (population indice) over time (year). For 11 species, population indices changed significantly over the 21-year banding history (Table 5). Significant declines were noted for: Alder Flycatcher, Orange-crowned Warbler, Yellow Warbler, Blackpoll Warbler, Wilson's Warbler, American Tree Sparrow and White-crowned Sparrow. Significant increases were noted for: Boreal Chickadee, Hermit Thrush, Dark-eyed Junco and Common Redpoll.

It's important to note, that these analyses do not account for variability in weather, which is a known factor for affecting capture rates. The analyses in Benson et al. (2012) account for weather variables when estimating relative capture rates and the power to detect declines in population size.

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Table 5. Results of regression analyses testing population indices of 23 common species captured at CFMS during fall migration in Fairbanks, AK (1992-2012).

| Species | $R^2$ | F | *P* | slope |
|---|---|---|---|---|
| Alder Flycatcher | 0.619 | 30.88 | <0.001** | -0.137 |
| Hammond's Flycatcher | 0.00005 | 0.0009 | 0.993 | -0.002 |
| Black-capped Chickadee | 0.051 | 1.029 | 0.323 | +0.064 |
| Boreal Chickadee | 0.278 | 7.254 | 0.014* | +0.050 |
| Ruby-crowned Kinglet | 0.133 | 2.912 | 0.104 | -0.090 |
| Gray-cheeked Thrush | 0.098 | 2.083 | 0.165 | -0.037 |
| Swainson's Thrush | 0.072 | 1.474 | 0.240 | +1.167 |
| Hermit Thrush | 0.616 | 30.476 | <0.001** | +0.139 |
| American Robin | 0.022 | 0.426 | 0.522 | +0.012 |
| Orange-crowned Warbler | 0.399 | 12.634 | 0.002** | -0.729 |
| Yellow Warbler | 0.459 | 16.102 | <0.001** | -0.182 |
| Townsend’s Warbler | 0.092 | 1.918 | 0.182 | +0.022 |
| Yellow-rumped Warbler | 0.001 | 0.002 | 0.884 | -0.070 |
| Blackpoll Warbler | 0.296 | 8.003 | 0.011* | -0.074 |
| Northern Waterthrush | 0.005 | 0.009 | 0.770 | -0.010 |
| Wilson's Warbler | 0.375 | 11.392 | 0.003** | -0.138 |
| American Tree Sparrow | 0.315 | 8.727 | 0.008** | -0.600 |
| Savannah Sparrow | 0.106 | 2.243 | 0.151 | -0.081 |
| Fox Sparrow | 0.012 | 0.226 | 0.640 | +0.009 |
| Lincoln's Sparrow | 0.188 | 0.354 | 0.553 | -0.085 |
| White-crowned Sparrow | 0.186 | 4.342 | 0.051* | -0.071 |
| Dark-eyed Junco | 0.209 | 5.016 | 0.037* | +1.270 |
| Common Redpoll | 0.300 | 8.146 | 0.010* | +0.073 |

**significance at the $P < 0.001$ level; *significance at the $P = 0.05$ level

c. Evaluate whether trends in spring arrival dates relate to changes in average temperature or other factors *by 30 June 2013*.

In order to test if spring arrival dates are correlated to weather factors, I examined median arrival dates of 15 songbird species (dependent variable) versus year, mean May temperature and greenup date (independent variables). The mean May temperature data was obtained from the Alaska Climate Research Center (www.climate.gi.alaska.edu) and greenup data were obtained from the Bonanza Creek LTER (http://www.lter.uaf.edu/data_detail.cfm?datafile_pkey=300). Greenup is the rapid transformation of Interior Alaska from winter dormancy to spring green as the leaves of deciduous trees burst forth. Unlike mean May temperature, greenup date is a cumulative weather variable—its results are measured over the course of weeks, rather than as a continuous daily variable.

The median spring passage date analyses included birds that were newly captured and returning birds from previous years; recaptures of birds within the same season were not included. Further, to test for true migrants, birds exhibiting sexual characteristics (females with brood patches or males with cloacal protuberances) were excluded from the analyses. Species had to have >5 captures/year in order to be included. 15 species matched this criterion.

I used linear regression analyses to test for effects of year, mean May temperature and greenup date on the median spring arrivals of 15 species: Solitary Sandpiper, Hammond's Flycatcher, Gray-cheeked and Swainson's Thrush, American Robin, Orange-crowned, Yellow-rumped, Yellow, Blackpoll and Wilson's Warbler, Northern Waterthrush, American Tree, Savannah, and White-crowned Sparrow and Dark-eyed Junco. I found no relationship between year * spring arrival date, nor the combinations of greenup date * year and mean May temperature *year with spring arrival date. It should be mentioned, that I found no significant relationship between mean May temperature and year (although temperature is increasing +0.09/year; $F = 2.088$, $P = 0.170$, $R^2 = 0.0966$) nor greenup date and year (although it is occurring earlier +0.01/year; $F = 0.004$, $P = 0.951$, $R^2 = 0.0021$). I found this surprising, given all the literature about the boreal forest warming and repercussions from this process.

Multiple linear regression analyses showed that greenup date was a significant factor in predicting spring arrival dates for 4 out of the 15 species:

American Tree Sparrow: $F = 2.244$, $P < 0.001$, $R^2 = 0.117$, slope = +0.265

Hammond's Flycatcher: $F = 14.603$, $P < 0.001$, $R^2 = 0.435$, slope = +0.514

White-crowned Sparrow: $F = 8.634$, $P = 0.009$, $R^2 = 0.306$, slope = +0.40

Dark-eyed Junco: $F = 10.320$, $P = 0.005$, $R^2 = 0.352$, slope = +0.40

Migration strategy does not seem to influence spring arrival date. Neither short-or long-distance migrants are not significantly changing their arrival dates over the CFMS 21-year history. 21 years may be too short a time period to measure shifts in arrival and departure dates from CFMS.

e. Prepare manuscripts for publication and submit to journals as appropriate throughout duration of project.

See Section III below.

f. Present results at the Alaska Bird Conference, *2012.*

A paper entitled "Evaluation of autumn mist-netting data for monitoring passerine populations in interior Alaska" was given at the Alaska Bird Conference held in Anchorage, Alaska in October 2012.

g. Submit all required reports to ADF&G Partner Program.

Susan Guers of the Alaska Bird Observatory submitted all required reports to the ADFG.

## II. MANAGEMENT IMPLICATIONS *In 1–3 paragraphs, summarize management implications of your findings, or include a brief summary under each objective's findings above. Please provide suggestions for further work (i.e. what did this study show us, and where do we go from here)?*

Songbirds fill important ecological, economic, and aesthetic roles in our ecological and social environments. Unfortunately, populations of some once-common species have declined at alarming rates in recent decades. Population trend data are used by agencies to help identify species of conservation interest and thus for taking proactive action aimed at "keeping common species common." Recent analyses of CFMS banding data have shown several migrant songbird species can be monitored with power objectives proposed for federal agencies (Butcher et al. 1993, Bart et al. 2004). For 5 species, there was an 80% probability of detecting a 50% linear decline in relative capture rates over a 20-year period. These 5 species include: Ruby-crowned Kinglet, Swainson's Thrush, Orange-crowned Warbler, Yellow-rumped Warbler and Dark-eyed Junco. For Yellow Warbler and Wilson's Warbler, it could take 50 years to detect a 50% decline. Documenting population trend is only a retrospective tool and does not reveal the causes for an increase or decline. Combining information on population change with demographics (e.g., sex ratio, age distribution, nesting success, and survivorship) can provide valuable information on the factors or events limiting that population. Moreover, these population characteristics can provide early warning signals of problems before actual declines.

Unlike banding stations in the lower 48, juvenile birds dominate fall captures at CFMS. Benson et al. (2012) have shown that CFMS provide valuable data for monitoring more than 14 songbird species breeding in interior Alaska. These indices of productivity can be coupled with monitoring efforts that primarily sample the adult population during singing-bird surveys in June (i.e. Breeding Bird Survey and the Alaska Landbird Monitoring Survey). Thus, the monitoring objectives at CFMS could be more specifically defined as follows: 1) document multi-year changes in the timing of autumn migration for 14 passerine species; and 2) monitor trends in the index of productivity for 6 species with a >80% probability of detecting a 50% decline in relative capture rates. More work is needed to define the sampled population at CFMS.

Migration monitoring in Alaska provides a unique opportunity to study species-level responses to the extreme climatic pressures found at high latitudes. Climatic pressures, such as the very brief summer, are especially interesting in relation to climate change, occurring at high latitudes. For instance, future data collected at migration monitoring stations can be used to

examine how long-term climate changes affect fattening and molting strategies, juvenile dispersal, timing of migration (especially differences among the sexes), and survival of adults.

## III. PUBLICATIONS *Include posters, presentations and reports.*

1. Three manuscripts, using CFMS data, were published during this project's duration (2010-2012). The list includes:

   - Benson, A.M., W.N. Johnson, R.P. Berry and S.L. Guers. 2012. Evaluation of autumn mist-netting data for monitoring passerine populations in interior Alaska. Wildlife Society Bulletin 36: 328–335.
   - Loiseau C, R.J. Harrigan, A.J. Cornel, S.L. Guers, M. Dodge, et al. 2012. First evidence and predictions of Plasmodium transmission in Alaskan bird populations. PLoS ONE 7: e44729.
   - Spotswood, E., K. Roesch Goodman, J. Carlisle, R. Cormier, D. Humple, J. Rousseau, S. Guers and G. Barton. 2011. How safe is mist netting? Evaluating the risk of injury and mortality to birds. Methods in Ecology and Evolution 7:29-38.

   Another manuscript using CFMS data is in press at this time:

   - Dodge,M., S.L. Guers, C.H. Sekercioglu and R. N. M. Sehgal. 2012. North American transmission of Hemosporidian parasites in the Swainson's Thrush (*Catharus ustulatus*). Journal of Parasitology. *In-Press*.
2. A spring and fall technical report was submitted each year (2010-2012) to the Alaska Fish and Game.
3. A CFMS banding summary was written for the ABO summer and winter newsletters, which was mailed to ABO's 600+ members and was also published online via the ABO website.
4. A summary of all birds banded by ABO in 2012 was submitted to the Western Bird Banding Association to be included in their annual summary that's published in the *North American Bird Bander*.
5. ABO annually includes a summary of birds banded at CFMS for the Alaska Boreal Partners in Flight (BPIF) statewide banding summary.

6. Presentations describing CFMS were given to members of the Alaska Bird Observatory during annual meetings (2010-2012) and also to volunteers during volunteer orientation training (July 2010-2012). Due to the dissolution of ABO, these presentations are not in my possession at this writing.

## IV. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT

None.

## V. SIGNIFICANT DEVIATIONS:

The ABO Board of Directors dissolved the ABO as an organization on December 31, 2012; as a result, not all banding seasons were completed. There was to be one more season of spring banding, ending 7 June 2013, a few weeks before the contract end date of 30 June 2013.

**Prepared by:** Susan Guers

**Date:** 12 April 2013

Appendix 1. Avian species and their scientific names used within this report.

| Species | Scientific Name |
|---|---|
| Alder Flycatcher | *Empidonax alnorum* |
| Hammond's Flycatcher | *Empidonax hammondii* |
| Black-capped Chickadee | *Poecile atricapillus* |
| Boreal Chickadee | *Poecile hudsonica* |
| Ruby-crowned Kinglet | *Regulus calendula* |
| Gray-cheeked Thrush | *Catharus minimus* |
| Swainson's Thrush | *Catharus ustulatus* |
| Hermit Thrush | *Catharus guttatus* |
| American Robin | *Turdus migratorius* |
| Orange-crowned Warbler | *Vermivora celata* |
| Yellow Warbler | *Dendroica petechial* |
| Yellow-rumped Warbler | *Dendroica coronate* |
| Townsend's Warbler | *Dendroica townsendi* |
| Blackpoll Warbler | *Dendroica striata* |
| Northern Waterthrush | *Seirus noveboracensis* |
| Wilson's Warbler | *Wilsonia pusilla* |
| American Tree Sparrow | *Spizella arborea* |
| Savannah Sparrow | *Passerculus sandwichensis* |
| Fox Sparrow | *Passerella iliaca* |
| Lincoln's Sparrow | *Melospiza lincolnii* |
| White-crowned Sparrow | *Zonotrichia albicollis* |
| Dark-eyed Junco | *Junco hyemalis* |
| Common Redpoll | *Acanthis flammea* |