ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: **T-21** **Segment Number: 1**

Project Number: 2.0

Project Title: Assessing the status and ecology of the imperiled the Rusty Blackbird in Alaska

Project Duration: 16 April 2011 – 30 June 2014

Report Period: July 1, 2012 - June 30, 2013

Report Due Date: September 30, 2013

Principle Investigator: David Tessler

Project Location: Six study sites throughout Southcentral and Interior Alaska, including: Anchorage Coastal Refuge; Joint Base Elmendorf Richardson (JBER) in Anchorage; Copper River Delta near Cordova; the Tanana Flats in Fort Wainwright near Fairbanks; Yukon Flats National Wildlife Refuge; and Tetlin National Wildlife Refuge.

I. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY

Objective 1: *Determine Productivity (hatching and fledging success) and causes of loss and their variance between years and study sites;*

Job/Activity a. : *Complete intensive productivity studies began at the six Study Areas.*
Job/Activity b. : *Once productivity investigations are complete in all areas, analyze the data to determine overall productivity for the Alaskan sites, and how it varies between years and study areas.*

Accomplishments:

Objective 1:

Job/Activity a. :

Field crews were deployed to Tetlin National Wildlife Refuge and Anchorage (Joint Base Elmendorf-Ft. Richardson and the Anchorage Coastal Refuge) from May until early August 2012, and in Anchorage alone from May to June 30 2013. 2012 was the third and final year of productivity study at Tetlin, and 2013 was the sixth and final year in Anchorage. Crews monitored 44 nesting territories in Tetlin and 25 in Anchorage. Productivity investigations concluded the two years ago at study areas in the Copper River Delta near Cordova, Yukon Flats National Wildlife Refuge, and the Tanana Flats in Fort Wainwright near Fairbanks.

In each study area, researchers identified territorial Rusty Blackbirds, located nests, and identified the major factors contributing to reproductive failures. We exceeded our target

of 15-25 nests at each study site. After rapid surveys were completed, crews revisited survey units with Rusty Blackbirds for the remainder of the nesting period (26 May–15 July). Crews recorded evidence of mate pairing, identified territories using spot-mapping techniques, and mapped the locations of foraging adults and nests with a GPS. Nest monitoring protocols followed those of the University of Montana BBIRD program (Martin et al. 1997). Nests were revisited at 4-5 day intervals to determine nesting effort, the number and hatchability of eggs, length of the incubation and nestling periods, number of young fledged from successful nests, and the cause of each failed nesting attempt (i.e., predation, abandonment, etc.).

Job/Activity b. : Preliminary analyses of data from previous years were completed, and these preliminary analyses were presented at the Bird Conservation Conference in Plymouth, MA and at the Alaska Bird Conference – both in October 2012. 552 nests were monitored for productivity across all study sites through 2012. Clutch size did not vary significantly between study areas, and averages 5.14 ±0.31 eggs. Hatching success varies between years but is generally high averaging 78%±0.11 across study sites, but was significantly lower in Yukon Flats at 64%±0.15 than the other sites (P<.001). Nest success (proportion of active nests fledging at least one chick) also varied between years but not significantly and was relatively high across sites 64%±0.12, and also was significantly lower at Yukon Flat s(P<.001). Productivity (number of fledged young per breeding female) also varied widely between years, but was relatively high at 3.18±0.44. In general, productivity of the species appears relatively high in Alaska and along the higher end of the scale for passerines. Productivity in Alaska does not seem to be a major contributor to the decline of the species.

Final meta-analyses of productivity data from all sites is scheduled to take place winter 2013-2014. We expect this effort to lead to at least one peer reviewed publication in 2014.

Objective 2: *Determine demographic parameters that regulate population size (over winter survival, adult survival, natal philopatry, breeding site and mate fidelity).*

Job/Activity a. : *Employ a strategic banding program (to identify individual adults and chicks) and re-sighting ("recapture") efforts at all sites for a minimum of three years at each study area. Three years is the minimum required for survival estimates; four is better. We will continue to band and search for banded individuals in subsequent years using a robust mark-recapture statistical approach to determine whether apparent annual adult survival is aberrantly low for Rusty Blackbirds at any of the Alaska study sites. Banded individuals will also be used to estimate site and mate fidelity of adults, mating system, natal philopatry of chicks, and individual survival.*

Job/Activity b. : *Once demographic investigations are complete in all areas, analyze the data to determine demographic rates for all the Alaskan sites combined, how they varies between study areas, and determine if low adult survival or other demographic deficits represent a viability issue for blackbirds breeding in Alaska;*

Accomplishments:

Job/Activity a. :
At Tetlin, and in Anchorage, we continued to survey for birds marked in previous years. 2012 was the final year of the banding and demography study in Tetlin and Yukon Flats, and 2013 was the final year in Anchorage. Banding and demography efforts were concluded 2011 in the Copper River Delta and in the Tanana Flats.

Re-sighting efforts were divided into 3–4 sampling periods from 10 May to 10 June in order to estimate recapture probabilities. We plan to analyze resighting data using the robust design after Kendall et al. (1995) in order to estimate re-sighting probabilities, apparent adult survival, site and mate fidelity of adults, mating system, natal philopatry of chicks, recruitment and individual survival.

Job/Activity b. :
Preliminary analyses of data from previous years were initiated, and these preliminary analyses were presented at the Bird Conservation Conference in Plymouth, MA and at the Alaska Bird Conference in Anchorage, AK October 2012.

Only 9 of 371 chicks banded in the course of this work have ever been resighted, suggested very low natal philopatry, low first year survival, or both. Adults show greater breeding site fidelity than juveniles, but not as strong as many other passerines. 197 RUBL were banded as adults. Within year adult survival at all sites was 100%. Overall resighting rate (proportion of banded adults observed in at least one following year) varied between sites with 37.3% of in Anchorage, 33.3% in Copper River Delta, 17.1% in Tetlin NWR, and 24.5 in Yukon Flats NWR. In Anchorage where banding resighting efforts began in 2006 and we have the most complete record, there were no instances of marked adults being missed or not observed one year and showing up in subsequent years. Therefore, we assume our resighting rate is approximately one: meaning that if a marked bird is present, there is a 100% it will be observed. If that assumption is correct, then the annual resighting rate approximates annual adult survival, and ranges from 20.6% to 55.6% in Anchorage. Low juvenile survival or low survival of adults in Alaska could be impacting continental population levels, however the absence of data on the fate of individuals banded as chicks clouds the picture. More detailed population matrix analyses will help to identify which demographic segments are either most at risk, or require more effort to understand.

Final meta-analyses of demography data from all sites is scheduled to take place winter 2012-2013. We expect this effort to lead to at least one peer reviewed publication in 2013. Productivity and demography data may be analyzed jointly following a population matrix method to describe the overall longterm outlook for the the Alaska populations of this species.

Objective 3: *Determine methyl mercury (MeHG) concentration in the blood and other tissues of adults and chicks and its variance between years and study sites;*

Job/Activity a. : *Collect blood and feather samples from all adults and chicks captured at all study areas for analyses of methyl mercury – ideal is to capture some proportion of same individuals in subsequent years;*

Job/Activity b. : *Analyze biological samples for MeHG in laboratory.*
Job/Activity c. : *Analyze MeHG values to determine prevalence and degree of mercury body burdens in Alaska, how burdens vary within individuals from year to year, how prevalence and burden vary among and between study areas, and any correlations between productivity and MeHG.*
Job/Activity d. : *Collect potential invertebrate prey in foraging areas at all six study sites to determine MeHG burdens;*
Job/Activity d. : *Analyze prey specimens collected for MeHG;*

Accomplishments:

Objective 3:

Job/Activity - ALL

Methyl mercury field investigations were concluded in the 2009 and 2010 field seasons at all study sites. Preliminary results were presented in an invited talk at the American Ornithologists Union meeting in February 2010 (Mercury as a contributing factor in the population decline of the Rusty Blackbird), and were published in the Condor 2010 (Geographic and seasonal variation in mercury exposure of the declining Rusty Blackbird. The Condor 12(4):789-799.).

Final results were presented at the April 2011 meeting of the Alaska Chapter of The Wildlife Society in Juneau, AK, and were contained within the final Master's Thesis of Sam Edmonds, completed in May 2011, at Acadia University, Nova Scotia.

This study examined mercury levels in blood and feather samples collected from Rusty Blackbirds on breeding grounds from several sites in Alaska in the Northeast U.S. and Canadian Maritimes, and on wintering grounds in the Atlantic Coastal Plains, Ohio River Valley, and the Mississippi Alluvial Valley. Blood Hg concentrations in the Northeast/Maritimes were 3-26x those of the other regions, with an average of 1.06 ppm and a maximum of 3.42 ppm in a male breeding in Nova Scotia. While blood Hg levels in Alaska were lower than those in the Northeast/Maritimes, they were higher than all wintering regions, averaging 0.36 ppm, with a maximum of 1.11 ppm in a female breeding near Fairbanks. Feather total-Hg concentrations in the Northeast/Maritimes were approximately 5x those of the other regions: with an average 19.2 ppm and a maximum of 52 ppm in northeast Vermont and northern Nova Scotia. In Alaska, total-Hg in feathers was considerably lower, with an average of 1.27 ppm and a maximum of 5.27 ppm and was not statistically different than wintering areas. Approximately 30% of the Rusty Blackbirds sampled in the Northeast/Maritimes and 5% of those sampled in Alaska had blood Hg concentrations that exceeded the current estimated lowest observed adverse effects level (LOAEL) for mercury toxicity in songbirds (0.81 ppm), suggesting mercury may be a contributing stressor for this declining species, especially for birds in eastern North America. Wide variation in blood Hg within and between Alaskan study areas suggests that local as well as geographic factors are important in determining tissue Hg concentrations. The highest blood Hg levels found in Alaska were from birds in the Tanana Flats on Ft. Wainwright near Fairbanks, and at two sites near Anchorage: Eagle River Flats on JBER and Potter Marsh in the Anchorage Coastal Wildlife Refuge. While some Alaskan birds had relatively high levels of mercury, the majority did not. This

outcome suggests that if Hg is a contributor to the species decline, it may not be a factor influencing productivity or survival in Alaska.

Objective 4: *Determine where Rusty Blackbirds breeding in Alaska spend the non-breeding portion of their life cycles using a variety of techniques;*

Job/Activity a. : *Collect feather samples from all captured adults for analyses of stable isotopes of deuterium as an indication of likely wintering range;*

Job/Activity b. : *Collect claw samples from all adults captured for analyses of stable isotopes of deuterium to aid in development of deuterium isotope signatures for Alaska.*

Job/Activity c. : *Analyze isotopic signatures of feather and claw samples in the laboratory;*

Job/Activity d. : *Attach geolocators to some proportion of captured adults in one or more study areas in Alaska;*

Job/Activity e. : *Recapture geolocator carrying birds to download and analyze their movement data.*

Accomplishments:

Objective 4:

Job/Activity a, b, c:

Blood and feather samples were collected at all study areas during the 2009, 2010, and 2011 field seasons. Samples will be analyzed winter 2012-2013 by Keith Hobson, Environment Canada, Saskatchewan.

Job/Activity d, e:

In 2009 we deployed 19 geolocators on adult rusty blackbirds in the Anchorage vicinity. Three geolocator-tagged birds were recovered in 2010. Analyses on the movements of marked birds were conducted August –December 2011. Results were published in the Wilson Bulletin of Ornithology in December 2012, and were presented at the Bird Conservation Conference in Plymouth, MA and at the Alaska Bird Conference in Anchorage, AK October 2012.

The reasons for the poor rates of return of instrumented Rusty Blackbirds are being evaluated. The relatively large size of the device size and the method of attachment are suspected to have been largely responsible. New advances in geolocators and harnesses in the past year may lead to a reinvigoration of this geolocator movement study in 2013 and 2014.

Objective 5: *Assess breeding season diet, dietary differences between adults and chicks, differences between breeding areas, potential impacts of dietary differences on productivity and survival, and compare breeding season and wintering diet.*

Job/Activity a. : *Collect blood and feather samples from all captured adults and chicks for analyses of stable isotopes of carbon (C) and nitrogen (N) as an indication of trophic level of prey;*

Job/Activity b. : *Collect potential invertebrate prey in foraging areas at all six study sites;*

Job/Activity c. : *Analyze blood and feather samples for C and N stable isotopes in the lab;*
Job/Activity d. : *Analyze taxonomic type and diversity of potential invertebrate prey collected at all six study areas in the lab;*
Job/Activity e. : *Conduct analyses stable isotope values, compare adult and chick values, compare values between breeding areas and with productivity, compare with wintering isotopic signatures.*

Accomplishments:

Objective 5:

Job/Activity a, b, c, d, e:

All biological samples were collected in 2009-2011 field seasons. Analyses of diet and it's relation to productivity were underway from August 2011 through August 2012. Preliminary analyses were planned for presentation in poster format at the Bird Conservation Conference in Plymouth, MA October 2012 – however unforeseen circumstances delayed the finalization of these results. We expect that the final results of these analyses will be published in the Master's Thesis of David Loomis, Oregon State University in late 2013, and will be published as a peer reviewed journal article in 2013 or 2014.

Objective 6: *Investigate potential genetic differences between putative eastern and western breeding populations.*
Job/Activity a. : *Collect blood or other tissue samples from all adults and chicks captured at all study sites;*
Job/Activity b.: *Receive and curate blood and biological samples collected along East Coast of the U.S. and Canada;*
Job/Activity c. : *Extract DNA from all samples and analyze levels of population structuring;*

Accomplishments:

Objective 6:

Job/Activity a, & b:
All biological samples were collected in 2009-2011 field seasons. Biological samples are being stored at ADF&G in Anchorage. A subset of samples were shipped to the Smithsonian Institution July 2011.

Job/Activity d:
Samples from Tetlin, Yukon Flats, and Tanana Flats were extracted and analyzed at the Smithsonian Institution, Washington D.C. by R. Terry Chesser. Samples of mitochondrial DNA from the Alaska sites were compared to with samples from study sites in Vermont, the Canadian Maritime Provinces, and Massachusetts in May 2012. This was an initial analysis to determine if there was sufficient population structure between two putative populations to warrant further investigation. Final reporting of these genetic analyses is expected in late 2013.

The Smithsonian sequenced 46 Rusty Blackbirds, using 35 blood samples from the eastern part of the range and 11 samples from Alaska. The sampling encompassed the breeding range of both described subspecies. The first half of ND2 was sequenced and very little variability was found. A single haplotype was found in the majority of individuals (26/46), including a large percentage of individuals from both regions: 17/35 from the east and 9/11 from Alaska. Sequences of twenty individuals varied from this standard haplotype, but in all cases the difference was only a single base pair. Maximum sequence divergence between individuals was only 0.4%.

The lack of genetic variability and lack of phylogeographic structure seem consistent with a population that has undergone a recent population expansion, as might be expected for a boreal species. There was no support for the hypothesized eastern and western populations of the species.

Objective 7: *Examine Breeding season social structure and mating system.*

Job/Activity a. : *Conduct behavioral observation of banded adults breeding at all study sites to determine nature of apparent parental relationships (monogamous, polygamous, polygynous, etc…);*

Job/Activity b.: *Collect blood or other tissue samples from all adults and chicks captured at all study sites;*

Job/Activity c. : *Extract DNA from all samples and analyze for evidence of paternity and maternity among chicks in individual nests.*

Accomplishments:

Objective 7:

All behavioral observations and biological samples were collected in 2009-2011 field seasons. Analyses of behavioral data and genetic samples were conducted April 2011 through August 2012. Preliminary analyses were presented in poster format at the Bird Conservation Conference in Plymouth, MA and at the Alaska Bird Conference in Anchorage, AK October 2012. The final results of these analyses were published in the Master's Thesis of April Harding-Scurr, Humboldt State University in early 2013, and we expect these results will be published as a peer reviewed journal article in 2013 or 2014.

Multiple paternities found in 33% of nests. Social polygyny in 7% of nests. No polyandry found. No egg dumping found. Two nests from Yukon Flats NWR had ≥3 fathers contributing genetically. The number of males defending a nest or territory is not related to the number of males genetically contributing to that nest. Brood sex ration at the population level does not differ from 50:50, and did not vary between years. The flexible mating systems demonstrated in rusty blackbirds may allow individuals to maximize reproductive output under varying environmental conditions. The mating system and extra-pair paternity rates are similar to other blackbird species. While there is some degree of mate fidelity as measured by the proportion of paired adults that nest together in subsequent years, the plasticity of the actual mating system seems to undermine the hypothesis that the decline of the species is being hastened by the Allee effect (positive density dependence leading birds at lower population densities to decline more rapidly as a consequence of mate limitation or limitations in cooperative defense or feeding).

Objective 8: *Determine extent to which contaminants may play a role in limiting productivity.*

Job/Activity a. : *Collect all unhatched (addled) eggs in otherwise active nests (not abandoned);*

Job/Activity b.: *Analyze all addled eggs for a suite of contaminants;*

Accomplishments:

Objective 8:

Job/Activity a & b:

All biological samples were collected in 2009-2011 field seasons and were transferred to Angela Matz of the USFWS Environmental Contaminants Office in Fairbanks, AK. Analyses were conducted between December 2011 and late 2012. We are awaiting final paperwork on these analyses from USFWS.

Preliminary analyses indicate that are no contaminants in the eggs at levels of concern. Mercury, which we thought might have been an issue, is relatively low in egg samples. Low levels of mercury in the eggs combined with the low levels of mercury found in feathers suggests that mercury body burdens in Alaskan Rusty Blackbirds are low enough to allow any mercury accumulated in internal tissues to be redistributed to plumage and lost during molting. The low mercury levels found in eggs demonstrate that large amounts of Hg are not being excreted during egg formation.

Objective 9: *Incorporate ongoing findings into the development / revision of the Rusty Blackbird Conservation Strategy with the International Rusty Blackbird Working Group (IRBWG). Keep this project up to date and in sync with current research findings elsewhere and insure project continues to address the highest research and information priorities identified by the IRBWG.*

Job/Activity a. : *Continue to participate in emails, conference calls, and other electronic meetings with the IRBWG as a member of the Steering Committee.*

Job/Activity b. : *Continue to participate in the development of the revised Rusty Blackbird Conservation Strategy;*

Job/Activity c. : *Participate in person at annual meetings of the IRBWG;*

Accomplishments:

Objective 9:

Job/Activity a, b, c:

David Tessler continues to serve on the steering committee of the IRBWG, and is involved regularly with IRBWG business through conference calls and emails. Mr. Tessler served on the planning committee for the third workshop on rusty blackbird conservation sponsored by the IRBWG held in conjunction with the Bird Conservation Conference in Plymouth, MA in October 2012. This meeting was a forum to share recent developments in understanding the ecology of the rapidly declining rusty blackbird, and to coordinate research and conservation actions to stem the decline before a listing petition is filed for the species. The meeting was also a venue for collaborators to discuss

details of research project(s) and develop steps and roles for completing work and finalizing work products.

Objective 10: *Analyze all data make comparisons with other studies where appropriate, and develop final products (data bases, reports, and peer reviewed publication(s), and disseminate findings.*

Job/Activity a. : *Finalize analyses*
Job/Activity b. : *Develop final deliverables and submit (databases, reports , papers)*
Job/Activity c. : *Present interim and final results at various local, national, and international scientific conferences;*

Accomplishments:

Objective 10:

Job/Activity a, b, & c.

Analyses of various data sets were ongoing throughout the reporting period. Final analyses are expected in winter 2013-2014. Final data products are not complete.

Preliminary results of the HG study were reported in an oral presentation at the September 2011 meeting of The Wildlife Society in Juneau, Alaska. Final results of the geolocator migration study and preliminary results of the demography and productivity investigations were presented as oral papers at the Bird Conservation Conference in Plymouth, MA and at the Alaska Bird Conference in Anchorage, AK October 2012. Posters on the effects of breeding season diet on productivity and on the social structure of the species will be presented by associated graduate students at these same meetings.

II. PUBLICATIONS

Edmonds, S.T., D.C. Evers, , C. Mettke-Hofmann, L.L. Powell, D. Cristol, A.J. McGann, J.W. Armiger, O.P. Lane, D.F. Tessler, P. Newell, K.N. Heyden, and N. J. O'Driscoll. 2010. Geographic and seasonal variation in mercury exposure of the declining Rusty Blackbird. The Condor 12(4):789-799.

J.A. Johnson, J.A., S.M. Matsuoka, D.F. Tessler, and R. Greenberg. 2012. Identifying MigratoryPathways Used by Rusty Blackbirds Breeding in South-central Alaska. Wilson Journal of Ornithology, 124(4).

Presentations

Tessler, D.F., S.M. Matsuoka, D.L. Shaw, A.H. Scurr, D.Loomis, E.Cooper, and J.A. Johnson. Productivity and survival of the rusty blackbird in Alaska: towards a synthetic analysis of statewide demographic data. Oral paper presented at the Alaska Bird Conference, Anchorage, AK. October 2012.

Tessler, D.F., S.M. Matsuoka, D.L. Shaw, A.H. Scurr, D.Loomis, E.Cooper, and J.A. Johnson. Productivity and survival of the rusty blackbird in Alaska. Oral paper presented at the Bird Conservation Conference, Plymouth, MA. October 2012.

Johnson, J.A., S.M. Matsuoka, D.F. Tessler, and R. Greenberg. 2012. Seasonal migration routes of Rusty blackbirds breeding in Anchorage, Alaska: results from a pilot study using geolocators. Oral paper presented at the Bird Conservation Conference, Plymouth, MA. October 2012.

Scurr, A. H., T.L. George, S.M. Sharbaugh, S. L. Talbot, G.K. Sage, and D.F. Tessler. 2012. Saints or Swingers? The Mating System & Associated Behaviors of Rusty Blackbirds in Interior Alaska. Poster presented at the Bird Conservation Conference, Plymouth, MA. October 2012.

III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

IV. RECOMMENDATIONS FOR THIS PROJECT

As previously stated, the reasons for the poor rates of return of geolocator instrumented Rusty Blackbirds are being evaluated. We believe that new advances in geolocators and harnesses in the past year may lead to much better survival and return rates for this species. The information from such s study would be vital to understanding the migratory linkages for Alaska birds and for elucidating conservation challaenges and limitations during the non-breeding portion of their life-cycle. We recommend a renewed effort to study interseasonal using geolocators in 2014 and 2015.

Prepared by: David Tessler, ADF&G

Date: September 25, 2013