W 2800.7 F293
no. T-21-P-1 7/08-6/09 c.1

FINAL PERFORMANCE REPORT

FEDERAL AID GRANT NO. T-21-P-1

SWAINSON'S WARBLER STATUS ASSESSMENT IN OKLAHOMA

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

July 1, 2008 through June 30, 2009

FINAL PERFORMANCE REPORT

State: Oklahoma **Grant Number:** T-21-P-1

Grant Program: State Wildlife Grants Program

Grant Name: Swainson's Warbler Status Assessment in Oklahoma

Grant Period: July 1, 2004 – June 30, 2009

A. NEED

The Swainson's Warbler is one of many migratory bird species whose numbers have declined precipitously throughout North America (Brown and Dickson 1994). Once widespread in bottomland hardwood habitat, this species is now considered to be uncommon to rare across most of its range. Historically, Swainson's Warblers are believed to have been found in bottomland forests throughout eastern Oklahoma, but now they are found regularly only in the southeastern-most corner of the state. One reason for the decline of this species may be loss of breeding habitat due to large-scale inundation caused by reservoir construction and conversion of bottomland hardwood forest to croplands and other purposes. Swainson's Warblers nest in mature, damp, deciduous floodplain and swamp forests (Meanley 1971, Bushman and Therres 1988). Brown-headed Cowbird parasitism also contributes to reduced reproductive success in this species (M. Revels, unpublished data). Another potential threat to Swainson's Warblers is parasitism by *Protocalliphora*, a group of blowflies who lay their eggs in bird nests (Sabrosky *et al.* 1989, Revels in review). These eggs hatch into parasitic larvae that feed on the blood of the nestlings. *Protocalliphora* have been found in the nests of many warbler species and have been shown to cause a significant decrease in reproductive success (Revels 1997).

Swainson's Warblers are secretive birds whose habits are poorly known. They spend most of their time foraging on the ground in dark, densely vegetated woodlands, and are rarely seen except by the most persistent and skilled observers. They are most easily located by listening for the male's song, which has a loud, ringing quality. However, if the listener is unfamiliar with the song, it might be mistaken for that of a Louisiana Waterthrush or a Hooded Warbler. Because of these censusing difficulties, Swainson's Warblers may not always be detected during surveys. Intensive surveys in appropriate habitats by experienced observers are needed to clarify the range and distribution of this species in Oklahoma. Detected males, if banded, can provide information about survivorship, return rates, and territory fidelity.

The natural history of the Swainson's Warbler also needs further study. Their nests are difficult to locate and, as a result, there is very little information about their basic breeding biology (e.g. laying dates, incubation rates, feeding rates, etc). Nest searching, monitoring, and videotaping will contribute much needed basic information about the breeding biology of Swainson's

Warblers. Also, once the nesting attempt is completed, the nests can be collected and searched for *Protocalliphora* parasites.

As is the case with most Neotropical migrant songbirds, the winter distribution and migration patterns of Swainson's Warblers are poorly known. New techniques using stable isotopes in feathers can be used to determine wintering ground locations as well as movements between breeding populations (Rubenstein *et al.* 2002). This information can be used to identify the origin of previously unbanded males as well as determine an individual bird's wintering location. This information may in turn provide insights into the reasons for the decline of this species.

Determining the distribution and abundance of Swainson's Warblers in Oklahoma will allow conservation and government agencies to determine the status of the population. If populations are located inside of the boundaries of the Little River National Wildlife Refuge or on other federal or state conservation lands, steps can be taken to manage the habitats and these populations. By quantifying the habitat conditions within successful nesting territories, land managers will have a better understanding of the species' habitat needs when managing existing habitat or attempting to restore areas that have been converted to other land uses. Documenting reproductive success, cowbird parasitism rates, and *Protocalliphora* parasitism will help to determine the quality of Swainson's Warbler habitat in Oklahoma compared to that in other areas. Feather isotope analysis will provide an accurate measure of the location of wintering grounds and migratory movements of Oklahoma populations of Swainson's Warblers. Finally, videotape analysis will provide much needed information about the natural history of this poorly studied species.

B. OBJECTIVES

This study will be conducted to: (1) determine the current distribution and abundance of Swainson's Warblers in Oklahoma by censusing appropriate habitats throughout the state, (2) band individual birds to determine survival rates, return rates, and territory fidelity, (3) locate nests and determine their fates, (4) examine *Protocalliphora* parasitism rates and effects, (5) determine wintering sites and within breeding season movements using stable isotopes in feathers, and (6) quantify habitat variables of Swainson's Warbler nest sites and male territories.

C. RESULTS AND DISCUSSION

1. Determine the current distribution and abundance of Swainson's Warblers in Oklahoma by censusing appropriate habitats throughout the state.

Historically, Swainson's Warblers were found throughout the eastern half of Oklahoma in appropriate habitat. Records exist for the following 10 counties: Cherokee, Delaware, Johnston, Mayes, McCurtain, Payne, Pushmataha, Rogers, Tulsa, and Washington. For a complete history of Swainson's Warblers in Oklahoma prior to the initiation of this study, see Heck (2001).

Surveys were conducted systematically in appropriate habitats, primarily on publicly managed lands, in the eastern half of Oklahoma. Surveys were sometimes hampered by limited access, but when possible were conducted by driving, hiking, or biking, or by paddling rivers within the area. If Swainson's Warblers were detected, they were mist-netted and banded when possible, or their locations were documented when not. Within the 5 years encompassed by this project, I surveyed 27 Oklahoma Wildlife Management Areas and National Wildlife Refuges. Swainson's Warblers were detected on 11 of these in 8 counties. The other 16 either did not support suitable habitat types, or had problems that made their bottomland forest habitat unsuitable for Swainson's Warbler territories (primarily frequent flooding).

1. Large population: Little River NWR (several hundred)
2. Medium sized population: Wister WMA (n=24)
3. Small Populations/Few Individuals: Cherokee WMA/Camp Gruber (n=6), Deep Fork NWR (n=1), Hugo WMA (n=5), Okmulgee WMA (n=2), Pushmataha WMA (n=2, nearby), Spavinaw Hills WMA (n=1, nearby), Tishomingo NWR/Texoma WMA (n=2).
4. None detected: Cookson Hills WMA, Copan WMA, Deep Fork WMA, Eufala WMA, Fort Gibson WMA, Hulah WMA, Heyburn WMA, Kaw WMA, Keystone WMA, McGee Creek WMA, McClellen-Kerr WMA, Oolagah WMA, Pine Creek WMA, Sequoyah NWR, Skiatook WMA, and Stringtown WMA

Little River National Wildlife Refuge, McCurtain County, has the largest Swainson's Warbler population in Oklahoma. With 15,000 acres of bottomland hardwood forest, this is the state's largest area of this habitat type that is not subject to intensive or frequent spring flooding. Many patches of dense, early successional habitat are available for Swainson's Warbler territories and nest sites.

Wister Wildlife Management Area, LeFlore County, seems to have a fairly large population. Eighteen males were located along the Fourche Maline and Coal Creek in a relatively short searching period, and two active Swainson's Warbler nests were located. This habitat is fairly inaccessible and should be preserved. The closer you are to the lake, the less likely you are to find Swainson's Warblers and this again appears to be due to seasonal or periodic flooding. Swainson's Warblers had not been documented in LeFlore County prior to this study, which makes the discovery of what appears to be a fairly large breeding population on the Wister WMA that much more exciting. This WMA is fairly large and the area where Swainson's Warblers were located is relatively undisturbed. There is no cattle grazing, no logging, and it floods infrequently. A large number of males were located in a very brief time, and they were clustered in a small area that is representative of the rest of the WMA surround the Fourche Maline. This provides strong evidence that this is a successful breeding population that would respond well to continued habitat management.

Cherokee Wildlife Management Area, Cherokee County, and Camp Gruber, Muskogee County are comprised mostly of upland forested habitats, but the lower section of Greenleaf Creek contains more cane habitat than was found anywhere else in

northeastern Oklahoma during this study. Not only does this habitat contain Swainson's Warblers, but also Hooded Warblers and Wood Thrushes that are uncommon forest species that frequently co-occur in the same habitat with Swainson's Warblers in southeastern Oklahoma. This habitat should be preserved, but it also needs to be restored and expanded. From Mackey's Crossing to the border of the WMA shared with Camp Gruber, much of the riparian area along Greenleaf Creek has been converted to agricultural fields and pasture on the east side of the creek. If this riparian zone were allowed to regenerate into cane thickets much more of this unique habitat would be restored and would be available to expand the small Swainson's Warbler population.

Tishomingo National Wildlife Refuge and Texoma Wildlife Management Area (Johnston County) are similar in size to the LRNWR, but much of the habitat there is unsuitable for Swainson's Warblers because of conversion to agricultural crops and frequently, prolonged flooding. However, some Swainson's Warbler habitat exists along Pennington Creek where at least one territorial male and another adult of unknown sex were located during this study. Over the past ten years, Swainson's Warblers have been reported at Tishomingo NWR on several occasions and I suspect that a small population of these warblers currently exists there along the Washita River and its tributaries. Appropriate habitat could be increased by allowing areas adjacent to Pennington Creek that are currently utilized to grow crops to regenerate into early successional forest.

Hugo WMA (Pushmataha County) appears to experience flooding too frequently or of too great a magnitude to support a large Swainson's Warbler population. A few Swainson's Warblers were found on the area in the "high spots" along the banks of the Kiamichi River which are relatively resistant to spring flooding in most years.

Okmulgee WMA (Okmulgee County) was found to have Swainson's Warblers in the vicinity of the Tall Trees loop trail area along the Deep Fork River. Another male was located nearby on the adjacent Deep Fork National Wildlife Refuge. A very large section of the Deep Fork River is encompassed either by Wildlife Management Areas or National Wildlife Refuge for many miles, but it contains a limited acreage of appropriate Swainson's Warbler habitat because of springtime floods that appear to wash away the leaf litter that is necessary for foraging birds.

Spavinaw Hills WMA (Delaware County) potentially supports a small population of Swainson's Warblers based upon the discovery of a territorial male while conducting a survey of the forested bottomlands along Spavinaw Creek by canoe. This male was not located on the Wildlife Management Area, but in adjacent bottomland forest that is similar in structure to that found on the Spavinaw Hills area. These bottomland forests supported a diversity of forest birds and have conservation value to other species in addition to the Swainson's Warbler.

Pushmataha WMA (Pushmataha County) also has the potential to support a small population of Swainson's Warblers. A canoe survey was conducted along the Kiamichi River on and adjacent to Pushmataha WMA. During this survey, two singing males were

detected as well as other species, including the Hooded Warbler and Wood Thrush, which frequently co-occur in the same habitat as Swainson's Warblers.

Other Noteworthy Survey Locations where Swainson's Warblers were not Detected:

Copan WMA is a location of historical significance for Swainson's Warblers in Oklahoma. J.B. Kirn located male territories and active SWWA nests in the early 1900s along the Caney River in Washington County. The Copan WMA is very near to the area that Kirn studied, but most, if not all, of the habitat is currently unsuitable for Swainson's Warblers. There is very little riparian forest along the Little Caney River within the WMA. The remaining forest is exposed to cattle grazing and large numbers of flood events. Both the flooding and cattle disturb and/or remove the leaf litter ground cover that is necessary for Swainson's Warbler foraging. In addition, there are not many forested bottomland areas present along the length of the Caney River upstream or downstream from the WMA.

Oologah WMA was surveyed and most of the habitat was unsuitable because of flooding. Some habitat was located in the Overcup Bottoms area with large stands of cane, very dense understory and lots of leaf litter. However, no Swainson's Warblers were detected.

2. Band individual birds to determine survival rates, return rates, and territory fidelity

In 2005, 39 new males were banded, and 10 recaptured. In 2006, 43 new birds were banded, and 13 recaptured. In 2007, 12 new males were banded, one recaptured. In 2008 and 2009, 27 new males were banded, but there were no recaptures as most of the locations on the Refuge that were surveyed during those years were new and had not previously been surveyed.

Twenty-three male Swainson's Warblers were recaptured in at least one year following their initial banding year. Most of the males that were recaptured returned to the exact same territory where they were originally banded (n = 11) or shifted a relatively small distance (less than 0.6 miles) in the following years (n = 11). One male moved 1.7 miles, but in this case there were two males at the original banding site, which might indicate that he was a "floater" male that just happened to be captured at that location. Two males were located on the same territory for four sequential years, four for three sequential years, and 17 for two sequential years. This information demonstrates very strong site fidelity and indicates that Swainson's Warblers will continue to use the same areas for several years. However, Swainson's Warblers are not found in mature forest, and eventually a site that was suitable for them at one time will become completely unsuitable. A potential future study could examine how Swainson's Warbler territory sites change as the vegetation and habitat changes over time.

3. Locate nests and determine their fates

A total of nine active Swainson's Warbler nests were located and monitored. The average clutch size was 3 eggs (range 2-4 eggs). Nests were located by systematically searching Swainson's Warbler territories, and then monitored frequently from a distance to determine fate. Predation was indicated by the disappearance of eggs or nestlings before they were due to fledge. Fledging was determined by locating fledglings near the nests, or by observing the presence of a fecal sac on or below the nest at the appropriate time for fledging when fledglings were not located. Four out of nine active nests were depredated, two out of nine nests fledged young successfully, and the remaining three nests had unknown fates. This is a small sample size and it is difficult to make generalizations from these data. A larger number of nests were located on the Little River NWR during an earlier study that was funded by the Refuge. When the data for these nests (n=22) are combined with the data from the current study, the sample increases to 31 active nests: 6 were abandoned, 15 were depredated, and 10 successfully fledged young. The fates of the remaining 7 nests could not be determined.

4. Examine *Protocalliphora* parasitism rates and effects

Protocalliphora blow flies lay their eggs in bird's nests and the larvae parasitize the nestling birds. Many factors can affect the results of this parasitism, including the number of parasites, the number and condition of the nestlings, and other factors such as weather and food availability.

Nests were located following protocols outlined in Martin and Geupel (1993), monitored to determine their fate, and then collected. Only nests that had contained nestlings were collected. These nests were searched for *Protocalliphora* larvae, which were identified to species using the taxonomic key provided in Sabrosky *et al.* (1989). A bird nest was considered parasitized if it contained one or more *Protocalliphora* larvae. Pupae from a generalist parasitic fly species, *Protocalliphora deceptor*, were found in eight of twelve Swainson's Warbler nests that hatched chicks (some of these nests were collected during an earlier study funded by the USFWS Refuges Division and pooled with the data for the current study). Pupae numbers were variable in the parasitized nests and ranged from one to 38 per nest. There was no statistically significant trend between the number of pupae and the reproductive success in the parasitized nests, but the data suggest that unparasitzed nests are more likely to successfully fledge chicks than parasitized nests.

5. Determine wintering sites and within breeding season movements using stable isotopes in feathers.

As is the case with many migratory birds, Swainson's Warbler migration is difficult to study. Telemetry is both expensive and time consuming, and the birds that have been banded on their breeding grounds are infrequently recaptured on their wintering grounds. However, many migratory birds are exhibiting population declines and information about

the winter locations of Swainson's Warblers and other species is needed. One way to gain this information is by examining the feathers and determining the ratios of hydrogen isotopes deposited in those feathers. The location of feather production can then be determined by comparing these ratios to a map of known isotope concentrations for North America. To accomplish this, outer and central retrices (tail feathers), plus sample crown and breast feathers, were removed from adult nesting-season Swainson's Warblers that were netted during the summers of 2005 and 2006 in southeastern Oklahoma. A subsample of these feathers were analyzed to determine their hydrogen isotope ratios and to estimate their position on the published feather contour maps of isotope ratios across North America. The tips and bases of the rectrices were analyzed separately in the event that feathers were grown during migration (the feather tips grow before the bases). Single samples were processed for the crown and breast feathers.

Warblers, including the Swainson's Warbler, are thought to perform the prebasic (complete) molt on the nesting grounds prior to migration. Prior to this study, it was unclear whether the Swainson's Warbler had a prealternate molt during the winter or spring. In a preliminary study of ten warblers conducted by the Principle Investigator, the findings showed that only one bird grew its feathers in Oklahoma or the immediate vicinity, three birds started growing their rectrices in Oklahoma but finished well south of the border (off the feather map), and the remaining 6 grew all of their feathers far south of the border. For seventeen feather samples from which there were adequate data (potentially two retrices per bird), 12 showed different isotope signatures for the tip than the base. In each case, the tip was grown at least slightly further north than the base indicating some migratory movement during feather growth. There was no evidence for prealternate molt that may have taken place on the wintering grounds prior to the return migration to Oklahoma. As a control, feather samples taken from four different nestlings were identified as originating in southeastern Oklahoma.

Feather samples were collected from 112 Swainson's Warblers. These were mostly males, but include a few females and nestlings. These feather samples were processed at the University of Arkansas by Dr. Douglas James, and are available for future isotope analysis.

6. Quantify habitat variables of Swainson's Warbler nest sites and male territories.

In 2005, habitat analysis was conducted on 76 male banding sites and 18 nest locations. At the end of each breeding season, vegetation characteristics around each nest site and on each male territory were measured to determine the habitat requirements for Swainson's Warblers. For a detailed explanation of these measurements, see Martin and Geupel (1993). Briefly, vegetation measurements were taken surrounding single point. In the case of nest sites, the nest was that point. In the case of male territories, a point 50 meters from the banding lane in a random direction was used. Within a 5-meter radius circle surrounding that point, all plant species were identified, measured, and counted. Canopy cover was measured using a densiometer, canopy height was estimated using a clinometer and the dominant canopy species were identified. Ground cover

measurements were taken, including litter depth, litter type and the amount of ground cover. Within an 11.3 meter radius circle, all large (>8cm) trees were identified and classified by size.

Both territory sites and nest sites were located in areas with high canopy cover, a high stem count, and a ground cover predominated by leaf litter. Nest sites were in areas that were the darkest and densest "pockets" of the males' territories. Many times, nest sites were near roads and other edges (e.g. fields, sloughs, creeks). Territories and nests were often located in areas with cane, but sometimes were not. Swainson's Warblers are found in mid-successional habitats. Once a closed canopy is established, even a very low one, it may be appropriate for territories or nesting. This habitat will remain appropriate for some period of time until it matures to a degree where it becomes unacceptable because of shading that inhibits cane and understory shrub growth.

E. SIGNIFICANT DEVIATIONS: None

G. PREPARED BY: Mia Revels, Principle Investigator
Northeastern State University

H. DATE: 28 August 2009

I. APPROVED BY:

Wildlife Division Administration
Oklahoma Department of Wildlife Conservation

John D. Stafford
Federal Aid Coordinator
Oklahoma Department of Wildlife Conservation

J. LITERATURE CITED:

Brown, R.E., and J.G.Dickson. 1994. Swainson's Warbler (*Limnothlypis swainsonii*). In A.Poole and G.Gill, editors, The Birds of North America, No. 126. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union,Washington DC. 20 pp.

Bushman, E.S., and G.D. Therres. 1988. Habitat management guidelines for forest interior breeding birds on coastal Maryland. Maryland Department of Natural Resources, Wildlife Tech. Publ. 88-1. 50 pp.

Heck, B. 2001. History and Status of the Swainson's Warbler in Oklahoma. Bulletin Oklahoma Ornithological Society. Vol. 34, No. 2, pp. 5-11.

Meanley, B. 1966. Some observations on habitat of Swainson's Warbler. Living Bird 5:151-65.

Meanley, B. 1971. Natural history of the Swainson's Warbler. North American Fauna No. 69. U.S. Dept. Interior, Washington, D.C.

Revels, M.R. 1997. *Protocalliphora* (Diptera: Calliphoridae) parasitism of breeding birds in Arkansas: Ecological Relationships and effects on Hooded Warbler (*Wilsonia citrina*) breeding ecology. Ph.D. dissertation. University of Arkansas, Fayetteville, Arkansas.

Rubenstein, D.R., C.P. Chamberlain, R.T. Holmes, M.P. Ayres, J.R. Waldbauer, G.R. Graves, and N.C. Tuross. Linking breeding and wintering ranges of a migratory songbird using stable isotopes. Science Vol. 295:1062-1065.

Sabrosky, C.W., G.F. Bennett, and T.L. Whitworth. 1989. Bird Blow Flies (*Protocalliphora*) in North America (Diptera: Calliphoridae): with notes on the Palearctic species. Smithsonian Institution Press, Washington D.C.

RECEIVED
OCT 05 2009
OKLA. PUB. CLEARINGHOUSE