

Shared Birds and Migratory Connectivity – Western Tanager



**A cooperative research project between the Desert Southwest
Cooperative Ecosystem Studies Unit, Rocky Mountain National Park, and
Rocky Mountain Bird Observatory**

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ROCKY MOUNTAIN BIRD OBSERVATORY

Mission: *To conserve birds and their habitats*

Vision: *Native bird populations are sustained in healthy ecosystems*

Core Values: *(Our goals for achieving our mission)*

1. **Science** provides the foundation for effective bird conservation.
2. **Education** is critical to the success of bird conservation.
3. **Stewardship** of birds and their habitats is a shared responsibility.

RMBO accomplishes its mission by:

Partnering with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.

Studying bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.

Monitoring long-term trends in bird populations for our region.

Providing active, experiential, education programs that create an awareness and appreciation for birds.

Sharing the latest information in land management and bird conservation practices.

Developing voluntary, working partnerships with landowners to engage them in conservation.

Working across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.

Creating informed publics and building consensus for bird conservation needs.

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Cover photo: Western Tanager wearing light-level geolocator at Beaver Meadows in Rocky Mountain National Park by Greg Levandoski.

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Executive Summary

In 2012, the Desert Southwest Cooperative Ecosystem Studies Unit, Rocky Mountain Bird Observatory and the National Park Service initiated a project to investigate the migration patterns of Swainson's Thrush and Western Tanager at Rocky Mountain National Park. Funding for this project was received from the Desert Southwest Cooperative Ecosystem Studies Unit. The goal of the project was to deploy eight light-level geolocators on each species and recover as many as possible the following year to investigate migratory connectivity between Rocky Mountain National Park, Tumacácori National Historic Park, and tropical regions to the south. The first year of field work resulted in ten Western Tanagers being captured and outfitted with geolocators. In 2013, four tagged tanagers returned to territories occupied in 2012 of which two were recaptured. Data from recovered Geolocators produced maps showing migration routes, stop-over sites, and wintering areas for both tanagers. We identified southeast New Mexico and western Texas as stop-over locations and southern Mexico and portions of Guatemala as wintering areas. Instead of Tumacácori National Historic Park, it is evident that National Park Service units like Big Bend, Carlsbad Caverns, and Guadalupe National Parks, Fort Davis National Historic Site, and protected areas like Davis Mountains State Park, Lincoln National Forest may be used by Western Tanagers that breed in Rocky Mountain National Park during migration. This information represents the only thoroughly documented migration route for Western Tanagers throughout their range. Although the sample size is small, this information may be representative of the Western Tanager population occupying the southern Rocky Mountain region.

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Table of Contents

Executive Summary.....	3
Acknowledgements	3
Table of Contents.....	4
Introduction.....	5
Study Location and Field Methods.....	6
Analysis Methods.....	7
Results.....	7
Discussion.....	11
Literature Cited	12

Introduction

Landbirds are the most abundant and diverse group of birds in North America, with nearly 900 species distributed across every terrestrial habitat (Berlanga et al. 2010). Birds are indicators of environmental health as changes in their populations often indicate changes in habitat, water availability, avian disease, and climate. They are providers of critical ecosystem services, such as pest control, seed dispersal, and pollination and make a significant contribution to the economy. A recent report from the U.S. Fish and Wildlife Service showed that bird-watching injected \$107 billion dollars into the U.S. economy in 2011 (USFWS 2013).

Some of the last areas with intact functioning ecosystems in the United States are National Parks. Rocky Mountain National Park (Rocky Mountain NP) represents a protected island on the landscape that birds rely on for breeding habitat, migratory corridors, and winter habitat. Demonstrating connections between National Park Service (NPS) units, some which are designated Important Bird Areas (Rocky Mountain NP is a designated Globally Important Bird Area), and other domestic and international protected areas, can help focus education, research, monitoring, and collaborative conservation efforts. Despite decades of avian education and research the connection between protected areas is only recently getting much needed attention. The NPS can preserve and protect the lands they manage but has little influence on the lands between NPS units unless evidence exists showing the connection between these areas. The same applies for the connection between other protected areas such as designated Important Bird Areas. Shared birds equal shared responsibilities and educating people about this concept through research and education is a key step in the conservation of migratory species.

Many breeding, migrating, and wintering birds rely on habitats in Rocky Mountain NP and in other NPS units, such as Tumacácori National Historical Park, Fort Davis National Historic Site, Big Bend NP, Carlsbad Caverns NP, and Guadalupe Mountain NP. Migrating birds depend on intact habitats for safe travel and stop-over sites for refueling between breeding and wintering areas. A clear linkage between birds and habitats at other protected areas and National Park units and their wintering areas will help open doors for multi-national partnerships and to develop mechanisms for conserving both migrant and resident bird populations. Many of the bird species listed on NPSpecies lists and shown in the eBird occurrence database for the two park units are the same. Bird species that breed at Rocky Mountain NP migrate through southwestern national parks on their way to and from wintering grounds. At the moment, there is very limited information about migratory pathways for migratory bird species between specific locations.

Specific migratory pathways, stop-over sites, and wintering areas for most North American breeding species have not been documented simply because no available technology for tracking small birds existed until the development of geolocators. Until this technological breakthrough, ornithologists relied on infrequent recaptures of banded birds at the scattered banding stations to understand migratory routes. However, in 2009, a landmark study using geolocators documented migratory patterns, timing, and wintering areas for Purple Martins and Wood Thrushes breeding in Pennsylvania (Stutchbury et al. 2009). This research exposed the potential of this technology to ornithologists interested in tracking small birds.

Western Tanager (*Piranga ludoviciana*; hereafter WETA) is listed as a fairly common breeding species in Rocky Mountain NP occupying coniferous and aspen forests (Hudon 1999). WETA have a large distribution throughout western North America with the Southern Rocky Mountain region being the eastern edge of its range. WETA is considered a medium-distance complete migrant with no resident populations (Hudon 1999). It has been documented that some WETA migrate to the southwest U.S. and northwest Mexico where a complete prebasic molt occurs before continuing south to wintering area (Hudon 1999). Specific molt locations, or stop-over sites, for WETA breeding at Rocky Mountain NP have not been identified nor have migratory routes and wintering areas for WETA breeding in the southern Rocky Mountain Region.

The goal of this project was to document migratory connectivity for WETA that breed in Rocky Mountain NP and rely on southwestern national parks for migratory stop-over sites. The new knowledge of winter distribution for this species is important for targeting conservation efforts on wintering grounds.

Study Location and Field Methods

All field work was conducted at Rocky Mountain National Park for all three field seasons (2012-2014) of this project. We selected Bear Lake Road, Beaver Meadows, Hollowell Park, and Moraine Park as study locations because they were sites less visited by park visitors and occupied by WETA (Table 1). Habitats occupied by WETA at these study sites were aspen, mixed conifer, mixed-conifer/aspen, and ponderosa pine.

To capture WETA in 2012, an artificial decoy resembling a male WETA was placed near a mist-net and a recorded song of WETA was played to attract the tanagers. Effort was made by field staff to make certain both male and female WETA were present signifying that area was an occupied territory. This was important because targeting territorial birds, and not migrating or un-mated birds, increases the chances of re-trapping the same bird the following year. We found that male WETA defended territories readily and were easy to capture in 2012. When recapturing WETA in 2013, the same technique used in 2012 was repeated with mixed results. We were able to recapture two WETA, but the other two WETA that had returned to same territories occupied in 2012 could not be captured using the decoy/call playback technique. Several alternative techniques were attempted in 2013 such as placing decoys of predatory birds (Northern Pygmy-Owl and Steller's Jay were used during this study) near mist-nets in WETA territories while playing the call of the predatory species with the intention of eliciting aggressive behavior from tanagers. We also attempted placing a decoy painted like a female WETA positioned near mist net while playing a copulation solicitation call without success. In 2014, we again looked for returning WETA at all 2012 deployment sites. One male WETA wearing a band was seen at the Moraine Park site in 2014 and we assume it was the same bird that transported a geolocator 2012 to 2013 (please see site fidelity in Results section).

Analysis Methods

We analyzed the light data using the R-package GeoLight (Lisovski and Hahn 2012). The raw data was corrected for clock drift using the program Decompressor (British Antarctic Survey). The light threshold was set slightly above the baseline value which corresponds to slightly above complete darkness for the geolocator (Lisovski and Hahn 2012). Times of sunrise and sunset were used to calculate latitude and longitude. Latitude was calculated using length of day and night and longitude was calculated using time of local midday and midnight producing two location fixes per day. We visually inspected the light transitions and removed any false sunrises and sunsets possibly caused by shading. We also removed a period of 15 days prior to and after the autumnal and vernal equinox (autumnal: September 7 to October 7, vernal: March 5 to April 4). Geographic location error can result from variation in logger light sensitivity, behavior during sunrise and sunset, weather, cloud cover and topography (Lisovski et al. 2012, Fudickar et al., 2011). To visualize stopover areas and wintering areas, we created a convex polygon enclosing the location fixes for each period.

Results

Effort

We attached archival light-level geolocators (hereafter geolocators) to ten male WETA captured in 2012 at four locations at Rocky Mountain NP (Table 1) between 5 and 22 June, 2012.

Table 1. Dates and locations for ten geolocators deployed on WETA at Rocky Mountain NP in 2012.

Geolocator number	Deployment date	Recapture date	Zone*	Easting*	Northing*	General location
70	21-Jun-12	-	13	447584	4469429	Beaver Meadows
71	5-Jun-12	-	13	448263	4465950	Hollowell Park
72	8-Jun-12	-	13	448279	4465894	Hollowell Park
74	6-Jun-12	14-Jun-13	13	447713	4467783	Moraine Park
75	5-Jun-12	-	13	448422	4464089	Bear Lake Road
76	8-Jun-12	-	13	448279	4465894	Hollowell Park
78	21-Jun-12	12-Jun-13	13	448562	4469639	Beaver Meadows
81	7-Jun-12	-	13	448643	4466114	Hollowell Park
83	7-Jun-12	-	13	449368	4466521	Moraine Park
84	22-Jun-12	-	13	447063	4469624	Beaver Meadows

*location datum using NAD 83 format

Geolocator Recovery

Light-level geolocators were recovered from two WETA after a complete migration through fall and winter of 2012 and spring of 2013 representing a 20% (n=2/10) recovery rate for the project. Data

downloaded from geolocators were successfully interpreted to reveal migratory path, stop-over locations, and wintering locations for both tanagers (Figure 1). For the Moraine Park WETA, we identified southeast New Mexico and western Texas as the stop-over location and southern Mexico as the wintering area. For the Beaver Meadows WETA, west Texas was the stop-over location and Southern Mexico and Guatemala was the wintering area. Another two tagged WETA returned to 2012 breeding sites in 2013, however, we were unable to recapture these individuals in order to remove geolocators. Therefore in 2013, we observed a 40% ($n=4/10$) return rate of tagged birds, which is consistent with similar studies (Bridge et al. 2013).

Impacts on Health of Birds

Visual inspection of WETA that transported geolocators showed little wear on feathers or abrasions on skin when recaptured. Both recaptured male WETA appeared healthy and had returned to same territories occupied the previous year. Both were observed near female tanagers indicating they were potentially breeding in the same territories occupied the previous year.

Site Fidelity

The Beaver Meadows WETA (#78) was recaptured in 2013 approximately 50 meters from 2012 deployment location. We returned to this area in 2014 to search for the male WETA at the Beaver Meadows recapture site and did not locate the same male. Call playback was used at this territory in 2014 and an un-banded male WETA responded. We believe this indicates the territory was occupied by a different male WETA in 2014. The Moraine Park WETA (#74) had shifted its territory slightly in 2013; however, distance from 2012 deployment location to 2013 recapture location was not measured. The Moraine Park WETA was observed again in 2014 approximately 75 meters from 2012 capture location. This demonstrates three consecutive years of breeding site fidelity for the Moraine Park male WETA.

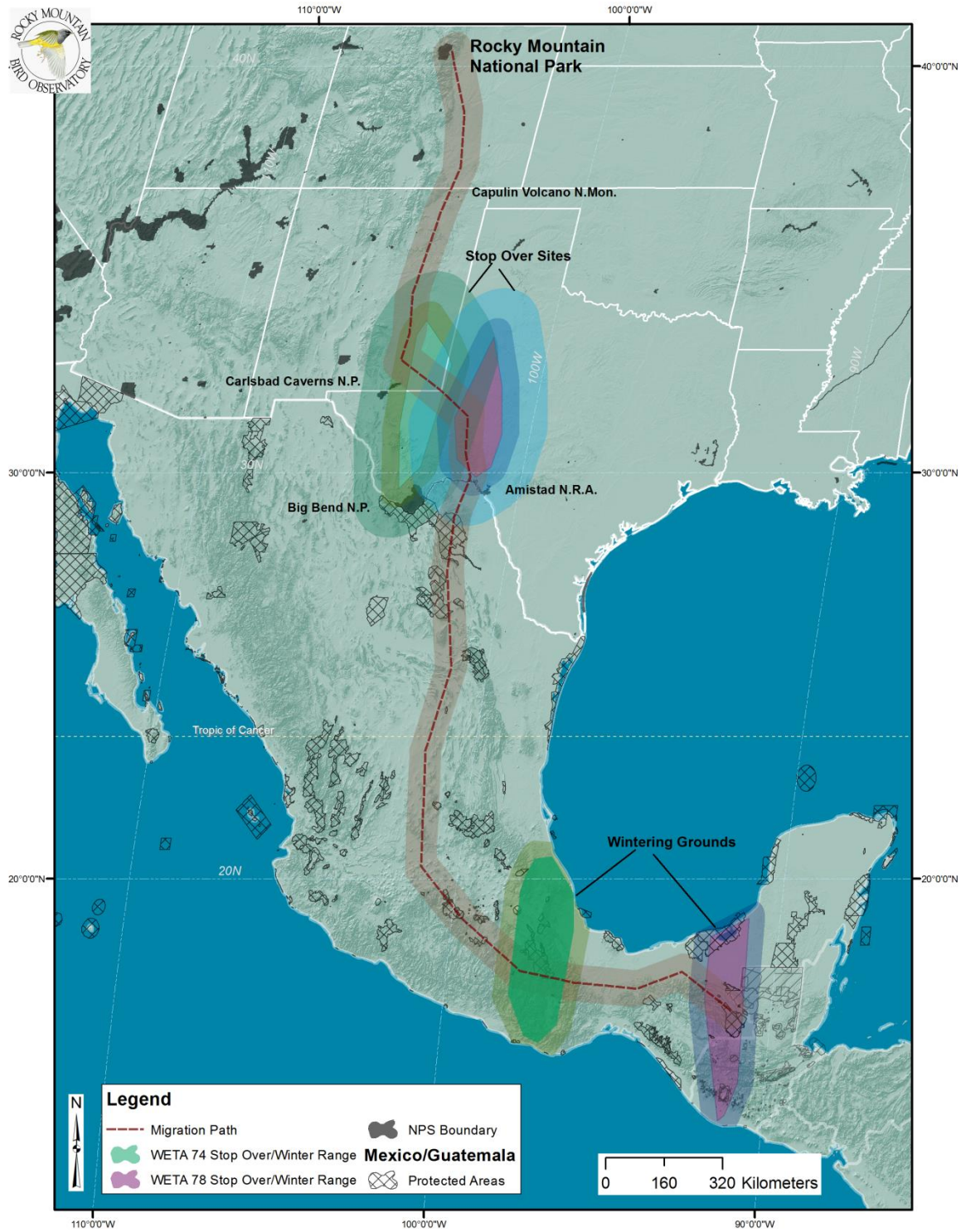


Figure 1. Map showing estimated migratory path from Colorado to late-summer/fall stop-over locations and wintering sites for two male WETA tracked from Rocky Mountain NP in Colorado using archival light-level geolocators.

Table 2. Dates of fall migration, fall stop-over, and spring migration for two WETA tracked from Rocky Mountain NP from 2012 to 2013.

Bird	Fall Migration	Molt stop-over	Spring Migration
Moraine Park (WETA 74)	5 July - 2 Dec	23 July - 12 Oct ¹	25 Apr - 3 June
Beaver Meadows (WETA 78)	27 July - 16 Nov	9 Aug - 6 Sept	1 May - 29 May

¹ We are unable to say for certain when WETA 74 left stop-over site because of inaccuracies of geolocators around fall equinox time period

Areas of Importance

Because of geolocators inaccuracies, we cannot say precisely where tanagers went after leaving Rocky Mountain NP. However, we can use the information to estimate where they spent time during the stopover period and at wintering areas.

The Moraine Park WETA (WETA 74) spent time in southeastern New Mexico, western Texas and possibly Mexico during the stopover period. There are several National Park Service units and other protected areas where this bird could have been in this area during stopover period that deserve mentioning: Big Bend NP, Big Bend Ranch State Park, Carlsbad Cavern NP, Guadalupe NP, Lincoln National Forests, Parque Nacional Canon de Santa Elena, Parque Nacional Maderas Del Carmen. Additionally, there are several protected areas (or Áreas Naturales Protegidas) in Mexico within the estimated wintering area: Arroyo Moreno, Cerro de las Culebras, Cerro La Galaxia, Cerro Macuiltepetl, Cerro Ta-Mee, Ciénega del Fuerte, El Tejar Garnica, Hierve El Agua, Isla de Amor, Jardín Botánico Francisco Javier Clavijero, La Martinica, Médano del Perro, Molino de San Roque, Pacho Nuevo, Pancho Poza, Predio Barragán, Rio Filobobos y su Entorno, San Juan del Monte, San Pedro en el Monte, and Valle de Cuicatlán.

The Beaver Meadows WETA (WETA 78) spent time in western Texas, and possibly eastern New Mexico and Mexico, during the stopover period. Protected areas where this bird could have been during stopover are Amistad National Recreation Area, Big Bend National Park, Parque Nacional Canon de Santa Elena, and Parque Nacional Maderas Del Carmen. Possible protected areas in estimated wintering area in Guatemala and Mexico were Area de Uso Multiple Cuenca de Lago Atitlán, Biotopo Monterrico-Hawaii, Biotopo Protegido Laguna del Tigre Río Escondido, Parque Nacional Laguna Del Tigre, Parque Natural Montes Azules, Parque Nacional Sierra Del Lacandón, Parque Natural De Laguna Lachua, Refugio de Vida Silvestre Petexbatún, Reserva de Biosfera Maya, Reserva de la Biosfera Pantanos de Centla, Reserve Biológica San Román, and R.F.Franja Transversal Del Norte.

Because of difficulty in locating accurate Geographical Information System data we are unable to produce maps showing protected area boundaries in Mexico and Guatemala in more detail. The migratory path shown in Figure 1 is estimated and should not be interpreted as the exact route taken by either WETA.

Discussion

This research provides novel information about the migration patterns of the WETA. All other bird tracking techniques available to investigate the distribution of WETA throughout the year provide incomplete information about the migration of this species. Even though the sample size for this project is small the information produced from this project may represent the late-summer/early-fall stop-over sites and winter distribution typical for WETA breeding in the southern Rocky Mountain Region.

Band recovery information from the Bird Banding Laboratory for WETA is sparse; however, there are two band recoveries that show large movements from the North American breeding range to wintering sites in tropical regions. One band recovery shows a WETA banded on 29 September, 1983 off the coast of California near San Francisco (possibly one of the Farallon Islands) being in the state of Sinaloa (at Mazatlán) along the coast of Mexico on 11 February, 1984. Another recovery shows a WETA banded near Bend, Oregon on 25 May, 1978 being near San Antonio Nejapa in the state of Chimaltenango, Guatemala on 11 November, 1978. Another band recovery shows a tanager banded at RMBO's Chico Basin banding station in southeast Colorado on 11 September, 2011 being recaptured in north-central Texas on 13 May, 2014. Even though this recapture does not show a complete migration it does reflect a similar migratory path demonstrated by tanagers tracked from Rocky Mountain NP during this project.

We queried the eBird database for detailed information about WETA distribution and noticed the area occupied during late-summer/early-fall stop-over may be east of what is expected for WETA. However, it should be noted that the amount of information in the eBird database for that area is low. According to the eBird database, portions of the wintering area shown in Figure 1 appear to be inhabited by WETA but there are also few data submitted for this area. The maps produced after analyzing geolocator data and made available in this report concur with accepted range maps such as those by NatureServe and other publications. It is also important to note that the official National Park Service bird checklist for Big Bend NP lists WETA as a fairly common migrant through that park further supporting the results of this research.

Recent advances in technology in the form of geolocators make this type of research possible. As additional advances in migration tracking technology occur it will be easier to track species and accuracy of new tracking devices of the size needed for these species has already improved greatly with the miniaturization of GPS technology. Migration research using tracking devices on small birds is in early stages of development and additional research on WETA migration at other locations in the range of the species should occur in the near future to verify and/or refine the findings of this study.

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