

TEXAS ORNITHOLOGICAL SOCIETY

STATUS AND DISTRIBUTION OF WEST TEXAS HUMMINGBIRDS, BASED ON BANDING AND OBSERVATIONAL DATA FROM 2007 TO 2019

KELLY B. BRYAN, MARYANN EASTMAN, MARC EASTMAN,
CHARLES O. FLOYD AND NANCY FLOYD



Occasional Publication No. 8
Published by
Texas Ornithological Society
2021

Occasional Publication No. 8
Jack Clinton Eitnien, Series Editor
Copyright@2021 Texas Ornithological Society

TEXAS ORNITHOLOGICAL SOCIETY

**STATUS AND DISTRIBUTION OF WEST TEXAS
HUMMINGBIRDS, BASED ON BANDING
AND OBSERVATIONAL DATA FROM 2007 TO 2019**

KELLY B. BRYAN, MARYANN EASTMAN, MARC EASTMAN,
CHARLES O. FLOYD AND NANCY FLOYD

Occasional Publication No. 8
Published by
Texas Ornithological Society
2021



Lucifer Hummingbird juvenile female (Maryann Eastman)

STATUS AND DISTRIBUTION OF WEST TEXAS HUMMINGBIRDS, BASED ON BANDING AND OBSERVATIONAL DATA FROM 2007 TO 2019

KELLY B. BRYAN¹, MARYANN EASTMAN², MARC EASTMAN²,
CHARLES O. FLOYD³ AND NANCY FLOYD³

¹649 Wedgewood Dr., China Spring, Texas 76633

²101 Deer Run, Fort Davis, Texas 79734

³P.O. Box 375, Christoval, Texas 76935

Abstract.—From 2007 through 2019 a concerted effort was made to determine the exact seasonal status of hummingbirds in central portions of the Trans-Pecos Region of west Texas. Primary study sites were established at several locations in Jeff Davis and Brewster counties. Study sites in the central Jeff Davis County area represented the higher elevation habitats of the region situated in and around the Davis Mountains near Fort Davis. Study sites in southern Brewster County represented the lower elevation desert habitats situated in and around the Christmas Mountains of Terlingua Ranch, and at times, at Lajitas on the Rio Grande. On occasion, locations were sampled in other portions of the region when opportunities presented themselves to add information on the status of less common species. Our primary research efforts resulted in the capture and banding of 21,525 birds of 15 different species. Herein we characterize the overall results by presenting the banding data for each species. These data provide new insight into the exact seasonal status of the 15 species encountered. Observational data enhanced banding data and seasonal information, adding 3 additional species, for a total of 18 out of the 19 species on the official Texas list. First documented Texas breeding records were established for two species and two species were added as first documented records to the regional list. One of the latter species, the Amethyst-throated Mountain-gem, provided a first record for Texas and the United States.

INTRODUCTION AND A BRIEF HISTORY

The Trans-Pecos Region of west Texas hosts the greatest diversity of hummingbirds in Texas, considerably higher than any other region of the state (Bryan 2004). In fact, diversity in west Texas rivals that of southwestern New Mexico and southeastern Arizona. Situated in the north-central portion of the vast Chihuahuan Desert ecoregion, elevations range from near 1,000 ft. along the Rio Grande in Val Verde County to above 8,700 ft. in the Guadalupe Mountains of Guadalupe Mountains National Park in Culbertson County. Located in the eastern foothills of the Davis Mountains, the most expansive mountain range in the region and Texas, Fort Davis is the highest elevation city in the state at just under 5,100 ft. The summit of the range, Mount Livermore, is just under 8,400 ft. At the western tip of the state, El Paso averages 3,700 ft. in elevation while the Franklin Mountains tower above at just under 7,200 ft. In Big Bend National Park, the Chisos Mountains rise above 7,000 ft. looking down on the Rio Grande to the west, south and east. One hundred and six peaks in west Texas are over 7,000 ft.

Created by drastic changes in elevation, the landscape and topography of the region contain a vast diversity of habitats types primarily due to varying weather patterns and annual/seasonal rainfall totals. Habitats commonly occupied by hummingbirds include, but are not limited to, desert scrub, arid canyons, oak-juniper woodlands, lush riparian cottonwood-willow woodlands, pine-oak woodlands, and montane evergreen forests. The lower desert areas contain the hottest and driest habitats in the region and state, and these areas are normally the least diverse. The region as a whole is often characterized as a land of mountain islands and desert seas; it is in the montane islands where the highest diversity can be found.

Our interest in the hummingbirds of the region started in the late 1970s and continued through the 1980s in the Black Gap and Big Bend areas and ultimately in the Davis Mountains. One event that piqued that interest occurred in the summer of 1993 in upper Limpia Canyon, in the heart of the Davis Mountains. On 20 June, the late Pansy Espy of Fort Davis took Bryan to two private residences where he was able to photograph three different White-eared Hummingbirds. This provided only the fourth documented occurrence of the species

in Texas, but more importantly, the first report of multiple birds (Lasley and Sexton 1993, Bryan and Karges 2001). Thanks to the generosity of the landowners there, the door opened for limited access to the immediate area.

Nearby in Cochise Canyon (a part of Limpia Canyon), the Eastmans had established a residence and hummingbird feeding station, gaining additional knowledge and experience with the hummingbirds in that portion of the mountains. They had acquired property there in the 1992 and used it part time for the first five years. They then made their escape from the big city to move up to the mountains full time in 1997 which proved to be a timely decision. In August of 1997, they hosted the state's first documented record of a Berylline Hummingbird (Lasley et al. 1998, Lockwood and Freeman 2014). Subsequently, they hosted the state's second and third documented records for the species in 1999 and 2000. Through their diligence and keen observations, they found yet more special birds, including more White-eared Hummingbirds and the region's first Mexican Violetear.

As the region's hummingbird notoriety became better known, more opportunities for novices, birders and researchers opened up. Initially sponsored by the Fort Davis Chamber of Commerce, a hummingbird "round-up" (festival) was first offered in August of 1997. It has been held, in some form, almost every year since. Another important event occurred that same year. The Nature Conservancy acquired a significant portion of the McIvor Ranch, including upper Madera Canyon and the summit of the range, Mount Livermore. This important acquisition in the central portion of the mountains, would eventually lead to additional investigations of the range's unique avifauna. Then, in August of 1999, Prude Ranch hosted an unofficial organization called the "Hummingbird Research Group". This gathering (more like a scientific conference) was a consortium of hummingbird banders from all over the United States and Canada. The event provided one of the first opportunities for limited hummingbird banding to be conducted in the Fort Davis area and it was during this time that we had our first opportunity to get to know Bob and Martha Sargent from Alabama. From the first day we met him, Bob preached the importance of the region to hummingbird diversity in the state and the US. He was sure that a comprehensive banding study on hummingbirds of the area would produce volumes of data and perhaps, some very surprising results. Mr. Rubythroat, as Bob was known, was seldom wrong. Bob and Martha came back many times in subsequent years with their network of banders, and the "Hummingbird Research Group" met again in Fort Davis in August of 2015.



Figure 1. The Christmas Mountains Oasis

Down in southern Brewster County in 1980, Carolyn Ohl had just finished the initial development of a large tract of property adjacent to Terlingua Ranch that would later be known as the “Christmas Mountains Oasis”. Eventually, she committed to a full-time effort to develop a bird sanctuary on her property near her residence as part of her master plan. Although her concept was almost always a “project in progress”, little did she realize the importance it would play to the implementation and completion of this monumental study. Not only did Carolyn help organize banding sites in the Terlingua Ranch area, but she volunteered to assist with the banding operation as an integral part of the banding team when she could, in both the Terlingua area of southern Brewster County and at several of the Jeff Davis County banding sites. Her contributions cannot be understated.

The pressure from Bob Sargent to start a banding study was growing throughout the early 2000s. However, nothing could be initiated or even attempted until special training was completed and authorization finalized. Licensed bird banders simply cannot switch to banding hummingbirds from banding passerine and non-passerine birds without prior training and approval. That initial training took two years and was conducted in 2005 and 2006. During 2007, the first year of data collection, only a couple of sites were utilized in the Fort Davis area, including a 30-acre property acquired by the primary author only a quarter mile from the site of the June 1993 White-eared Hummingbird record noted above. This site served as our primary study site in the Davis Mountains study area and produced the largest and most diverse banding totals. By 2008 more study sites were added and in August our first banding sessions were attempted at Christmas Mountains Oasis, thus starting our efforts in the Terlingua area. At one point during the study, banding was being conducted six mornings a week. The Eastmans joined the research team in 2010 and the Floyds, after making numerous trips to the Davis Mountains to assist, made plans to move to the mountains in 2014 becoming an integral part of the team. Through the combined effort of all involved, our data collection grew into a significant achievement, the results of which are reported herein.



Figure 2. Upper Limpia Canyon

Study Sites

All banding data are tied to specific study sites in the region. Most of the locations listed within the primary study areas were utilized on a rotational basis as described in the banding protocols; however, not all of the sites listed below were utilized for the entire study. For instance, none of the South Brewster County (SBC) sites were utilized in 2017, 2018 or 2019. Also in the Jeff Davis County study area, two study sites (FD and CD) were not sampled after 2015. Public locations or areas with limited public access are listed by name; private locations are listed generically. Figures 3 and 4 show the approximate locations of the Jeff Davis County and South Brewster County study sites respectively.

Jeff Davis County primary study area (**JDC**):

1. (MC) A private residence in upper Limpia Canyon of the Davis Mountains Resort subdivision located west of Fort Davis (Habitat—Pine-oak woodlands; elevation 6,300 ft.)
2. (EA) A second private residence in upper Limpia Canyon (Habitat—Pinyon-juniper-oak woodlands; elevation 5,800 ft.)
3. (CF) A third private residence in upper Limpia Canyon (Habitat—Pinyon-juniper-oak woodlands; elevation 5,700 ft.)
4. (FD) A private residence in Fort Davis (Habitat—Urban/residential; elevation 4,910 ft.)
5. (CD) The Chihuahuan Desert Nature Center located four miles south of Fort Davis (Habitat—Plateau grasslands; elevation 5,050 ft.)
6. (MO) The McDonald Observatory (Habitat—Pinyon-juniper-oak woodlands; elevation 6,290 ft. in the residential area)
7. (DM) The McIvor Education Center on the Davis Mountains Preserve (Habitat—Pine-oak woodlands; elevation 5,900 ft.)

South Brewster County primary study area (**SBC**):

1. (CM) The Christmas Mountains Oasis (Habitat—Desert scrub; elevation 3,960 ft., CMO in the text)
2. (TS) A private residence in the western rim of the Christmas Mountains of Terlingua Ranch (Habitat—Desert scrub; elevation 3,630 ft.)
3. (TW) A second private residence in the southeastern rim of the Christmas Mountains (Habitat—Desert scrub; elevation 2,950 ft.)
4. (FF) Far Flung casitas in Study Butte (Habitat—Urban/commercial in a desert setting; elevation 2,550 ft.)
5. (LJ) The Thirsty Goat Restaurant at the Lajitas Resort on the Rio Grande (Habitat—Rio Grande riparian; elevation 2,340 ft.)
6. (SB) Two other private locations in the Study Butte area (Habitat—Desert scrub; elevation 2,900 ft. and 2,500 ft.)

Other areas sampled on occasion (**OAS**):

1. Three private residences in the Limpia Crossing subdivision between Fort Davis and the McDonald Observatory (Habitat—Pinyon-juniper-oak grasslands; average elevation 5,200 ft.)
2. Three private residences in Alpine (Habitat—Urban/residential; elevation 4,500 ft., 4,500 ft. and 4,470 ft.)
3. One private residence in Marathon (Habitat—Urban/residential; elevation 4,110 ft.)
4. The Miller Ranch near Valentine (Habitat—Desert scrub/grasslands; elevation 4,400 ft.)
5. One private residence in Fort Stockton (Habitat—Urban/residential; elevation 2,995 ft.)
6. Three private residences in El Paso (Habitat—Urban/residential; elevation 3,760 ft., 3,935 ft. and 4,140 ft.)

Observational records from various locations in the region were included primarily when they added important seasonal information to the species accounts or additional species to the list. These records included species or individuals that were observed and/or documented by photographs out-of-season or during a time frame in which no birds of that species were banded. Observational data added three additional species to the database, including the Mexican Violetear, Amethyst-throated Mountain-gem, and Berylline Hummingbird. Details are provided in the species account sections for each of the above species. After the species accounts, you will also find details on some of the hybrid hummingbirds encountered during the study. Most of these were caught and banded, but a few were observed and photographed. Listed are forty-three hybrid birds of fourteen different probable parental combinations.

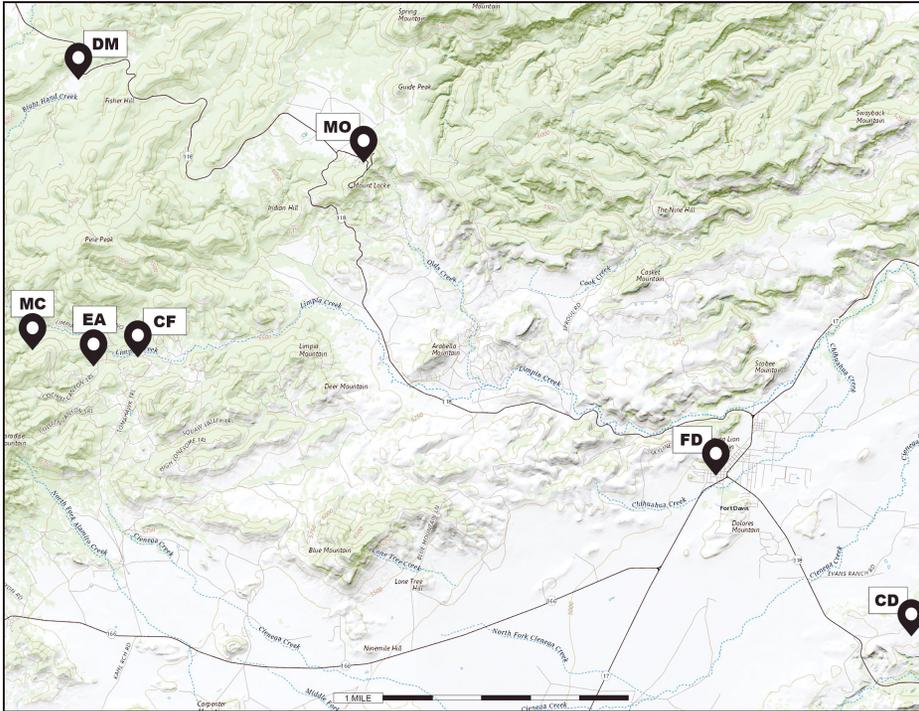


Figure 3. Map of the primary study sites in the JDC study area.

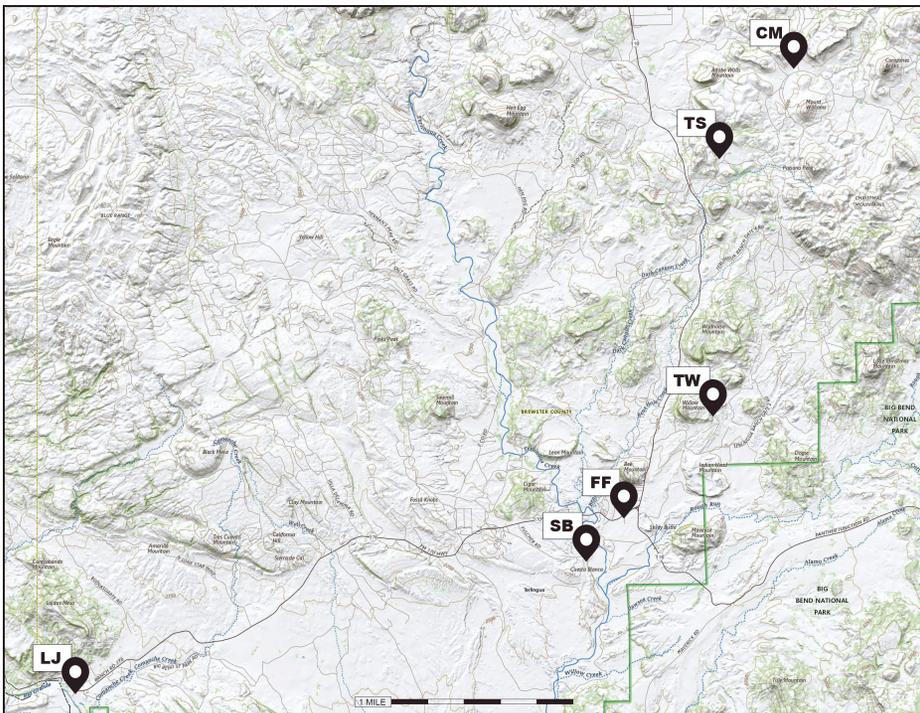


Figure 4. Map of the primary study sites in the SBC study area.

Banding Protocols and Data Collection

In this publication, we make no attempt to quantify any of our data. We report only our raw numbers for each species caught and banded at each of our study sites; however, so that the reader will appreciate the effort involved to collect these data, we provide a list of the number of banding sessions conducted at each of our sampling locations (Table 1). Additionally, our field data sheets included important time parameters (not included herein) for each banding session such as the time the first bird was caught and the time the last bird was caught. Each banding session was implemented in basically the same manner. Almost all banding sessions were conducted during the morning hours, normally concluding before noon. On some sampling days, we banded at up to three different locations in sequence in a single morning. This strategy was used primarily on our trips down south to our SBC study sites but occasionally at some of our JDC sites as well. Trapping operations were concluded when 1) no new unbanded birds were being caught and/or 2) when a majority of the late session captures were already banded, having been banded earlier in the session. Most banding sessions were at least two hours in length; rarely did we commit 4-5 hours to banding and recording data at a single location. Study sites were sampled on a rotational basis, normally the same day of the week each week for each of our primary sites. As an example of a standard sampling week during the much of the project the following locations were visited; Monday—LJ, FF and TW, Tuesday—TS and CM, Wednesday—DM, Thursday—EA and Friday—MC. When needed, Saturdays were utilized to visit and sample other listed sites.

The tables below present the number of sampling sessions held per year at each of our major study sites in the JDC and SBC study areas, by year (Table 1) and month (Table 2). At study sites “MC” and “CF” from 2016-2018, banding activities included a combination of trapping sessions and incidental catches of hummingbirds during songbird banding operations. OAS sites are presented together and labeled as such.

Table 1. Sampling sessions by study site and year.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC SITES														
1 - MC	3	7	28	22	19	25	22	17	24	25	34	33		259
2 - EA			1	15	18	12	11	16	13	6	6	4	6	108
3 - CF										13	10	14	1	38
4 - FD	5	6	21	13	11	6	7	5	6					80
5 - CD			4	5	7	2	1	1	1					21
6 - MO										2	2	3	3	10
7 - DM				10	12	10	11	12	18	4	2	2	2	83
SBC SITES														
1 - CM		8	19	18	15	24	24	19	22	7				156
2 - TS			13	15	10	15	18	17	17	3				108
3 - TW			3	15	12	15	20	16	17	1				99
4 - FF						8	17	8	2	1				36
5 - LJ						7	19	16	18	5				65
6 - SB				8										8
OAS		1	8	17	12	12	4		5					59
Totals	8	22	97	138	116	136	154	127	143	67	54	56	12	1130

Table 2. Sampling sessions by study site and month.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
JDC SITES													
1 - MC		1	5	11	32	16	41	52	44	41	14	2	259
2 - EA				2	7	10	33	26	20	8	2		108
3 - CF				3	6		4	6	11	4	4		38
4 - FD	1	2	5	7	9	2	6	14	15	12	5	2	80
5 - CD					2	2	2	7	4	2	1	1	21
6 - MO								8	2				10
7 - DM				2	3	3	17	36	15	6	1		83
SBC SITES													
1 - CM	5	1	6	2	11	12	21	27	25	20	18	8	156
2 - TS	5		3		7	10	13	23	18	11	11	7	108
3 - TW	5	2	5		9	10	11	16	14	7	10	10	99
4 - FF	7	2	1			1	3	1	8	4	3	6	36
5 - LJ	12	6	2		1	1	3	6	8	5	10	11	65
6 - SB										3	2	3	8
OAS	2		1				5	7	13	11	10	10	59
Totals	37	14	28	27	87	67	159	229	197	134	91	60	1130

To start each banding session, a hummingbird trap was placed in position where a feeder was previously hanging and the feeder was then hung within the trap. Normally, only one or two traps were utilized during each sampling effort. A banding table was set up in a shaded location nearby to facilitate the processing of each bird that was captured. Almost all sessions involved more than one person; normally three persons, including a trapper (someone to retrieve each bird from the trap), a recorder (someone to record the data on the field data sheets), and a bander (including only the authors of this paper—all licensed hummingbird banders) or a visiting licensed bander from Texas or out-of-state. All study sites were sampled no more than once a week unless, 1) we were holding a Hummingbird Study Group conference, 2) we were conducting training sessions, 3) we were conducting public banding demonstrations at our festival, or 4) an unusual circumstance such as a schedule conflict dictated that we sample twice within a week.

Data collection was the most important aspect of each sampling session. For each bird caught, the handling and processing protocol was exactly the same, assuring maximum safety for each bird being handled. Once each bird was retrieved from a trap, it was gently and carefully placed in a soft holding bag, delivered to the banding table and hung (the bag) on a revolving wheel with twelve hooks. Birds in their holding bags were placed on the wheel in the order in which they were trapped then removed and processed in a likewise manner. Once the wheel became full, then trapping was placed on hold until the wheel had a “vacancy”. At times, more than one licensed bander would operate at the banding table, decreasing the holding time for each bird and increasing production. It was the goal of each bander to process his/her bird in less than two minutes. This time parameter allowed us to maintain accuracy as to each species caught, and to properly record the age and sex of each bird as well as all additional information recorded on the field data sheet (such as morphological measurements, weight and molt).

The handling procedure was essentially the same for each bird waiting to be banded and processed. The bird was removed from its holding bag and then placed in a stocking toe to facilitate the banding and examination process. The stocking toe was used to maintain safe control over the bird as it was banded, examined, and measured. This device was instrumental in keeping each bird from flapping its wings uncontrollably. First, the bird was identified as to species, age and sex; then a proper sized band was placed on the bird’s right leg

utilizing a custom-made set of banding pliers matched to each different size band. We used five different size bands during this study ranging from a 5.4mm band for Calliope Hummingbirds and male Ruby-throated Hummingbirds, up to a 7.6mm band for Rivoli's Hummingbird and Blue-throated Mountain-gem. Other band sizes utilized were 5.6mm, 5.8mm and 6.0mm. If additional parameters were needed to fully determine age and sex, those required data were recorded once the confirming characters were noted. Basic measurements (in millimeters) that were taken included the length of the wing (wing chord), tail length (from the rump to the tip of the longest tail feather), and bill length (culmen). All measurements and other data were taken following the guidelines found in *The North American Banders' Manual for Hummingbirds* (Russell et al. 2018).

In each species account, we have summarized morphometric data, including mean and range for each measurement taken. For most of the species banded, these are the largest samples of morphometric data ever taken in Texas. In this specific order, the wing chord was measured first followed by the tail length and then the culmen. If the bird was suspected to be a juvenile, the upper mandible of the bird's bill was examined under hand-held magnification for grooving (corrugations), a confirmation of that age. Grooving was recorded as percent of the upper mandible containing this juvenile characteristic. Next, the number of iridescent gorget feathers was noted, if any, on the field data sheet. Finally, with the stocking toe still around the bird, it was placed on a scale and weighed (in grams, after taring the scale to the weight of the stocking). Any additional information pertinent to the record was placed in the "notes" column on the field data sheet. These data might include molt limits, unusual molt patterns, noticeable injuries (especially to the bill), fat deposits, and any other abnormalities. In summary, that was the process for data gathering. On occasion, a few birds were found to be uncooperative with the process. Those birds were banded, identified as to species, aged, sexed and then released. For several species, only a portion of the birds we banded were included in the morphometric data tables.

Once the above process was completed, each bird was released immediately. Any bird showing any sign of stress from the process and birds noted to be underweight were hand fed from a feeder located on the banding table. Almost always, those birds did not hesitate to drink sugar water solution from the table feeder. Another aspect of the capture process was properly recording previously banded birds. Ninety-nine percent of the time previously banded birds were our own birds from a prior banding session (these are known as returns). However, we were successful in capturing a few birds that were not banded by our team (these are known as foreign recaptures). We were also fortunate to have some of our banded birds encountered elsewhere, mostly out of the west Texas region. Data reflecting the return of previously banded birds to our own banding sites are reported herein for select species only; however, we do list (after the species accounts) all of the foreign recaptures we encountered as well as those encountered by others. During the twelve-year study period, we were fortunate to capture and band fifteen species of hummingbirds and 21,525 individual birds. Totals for each of the fifteen species are as follows:

- ⇒ Rivoli's Hummingbird (RIHU)—251
- ⇒ Blue-throated Mountain-gem (BTMO)—5
- ⇒ Lucifer Hummingbird (LUHU)—882
- ⇒ Ruby-throated Hummingbird (RTHU)—660
- ⇒ Black-chinned Hummingbird (BCHU)—8,717
- ⇒ Anna's Hummingbird (ANHU)—551
- ⇒ Costa's Hummingbird (COHU)—5
- ⇒ Calliope Hummingbird (CAHU)—611
- ⇒ Rufous Hummingbird (RUHU)—5,149
- ⇒ Allen's Hummingbird (ALHU)—151
- ⇒ Broad-tailed Hummingbird (BTLH)—4,506
- ⇒ Broad-billed Hummingbird (BBLH)—14
- ⇒ White-eared Hummingbird (WEHU)—21
- ⇒ Violet-crowned Hummingbird (VCHU)—1
- ⇒ Buff-bellied Hummingbird (BUFH)—1

In the species accounts that follow, we present the exact seasonal occurrence of each of the eighteen species we encountered based on banding and observational data. Each account opens with the regional status stated for each species, followed by detailed occurrence information for five distinct seasons defined as follows:

Winter (December through February), Spring (March through May), Summer (June and July), early Fall (August and September) and late Fall (October and November). Three tables add important information to the species accounts including: 1) banding totals by year and study area, 2) seasonal banding totals and observations by month, age, and sex, and 3) morphometric information (for most of the banded species). For the purposes of this paper, the age units included in the second table are, AHY (after hatch-year birds and after second-year birds in some species—all adult birds), HY (hatch-year birds—juveniles), and U (birds of unknown age). Known SY (second-year) birds are listed as AHY for the purposes of data presentation in this paper in most species. The sex of each bird is listed as M (male) and F (female). In the third table, measurements are in millimeters and weights are in grams.

SPECIES ACCOUNTS

Mexican Violetear (*Colibri thalassinus*)

Regional status: Mexican Violetear is a very rare post breeding vagrant from tropical areas of Mexico. Only four records of this species exist for the Trans-Pecos Region. All of the well documented occurrences were recorded at two of our primary study sites in upper Limpia Canyon area of the Davis Mountains. The first record for this species in the region was an immature bird observed 1-8 July 2003 (Lockwood 2004); subsequently, a second immature bird was observed at the same location periodically from 16 May through 3 July 2006 (Lockwood et al. 2007). Both of these records occurred just prior to the initiation of the banding study. The third and fourth documented records were obtained nearby, approximately two miles west of the above location. What stands as the third record for the region, was an immature bird observed 4-19 September 2015 (Lockwood and Carpenter 2017); and the fourth record, likely the same individual returning as an adult to the same location, from 24 July through 31 August 2016 (Carpenter 2019).

MEVI seasonal observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Totals							obs	obs	obs				2 obs



Figure 5. Mexican Violetear adult male (Michael Gray)

Rivoli's Hummingbird (*Eugenes fulgens*)

Regional status: Rivoli's Hummingbird is considered a rare to uncommon summer resident in the three major mountain ranges of the central Trans-Pecos. The species' exact status prior to our study was not fully understood. Where was it most abundant and exactly where did it breed? Therefore, we were very encouraged in the first few years of the study by the abundance of RIHUs in the central Davis Mountains. In the El Paso, at the western edge of the region, less than ten records exist. In the Chisos Mountains of Big Bend National Park, it is considered a rare but regular visitor during spring and fall migration but is not known to breed there. Blue-throated Mountain-gem is the common large hummingbird in the Chisos, especially during the summer months. In the Guadalupe Mountains on the New Mexico border, its status is described as very uncommon to rare and possibly breeds, although documentation of breeding is lacking from that range as well. In the central portions of the Davis Mountains, the presence of adult birds during the breeding season along with numerous juvenile birds by late June provide evidence of annual breeding in the upper elevation habitat of the range; however, only one nest has been documented in the range and for Texas (Lockwood et al. 2009).



Figure 6. Rivoli's Hummingbird female on nest in the Davis Mountains (Mark Lockwood)

Winter (December through February)—0: The first winter record for Texas was a male of this species present in upper Limpia Canyon in the JDC study area on 10 December 2009. The individual survived an eight-inch snow event the week before it was last observed. [There is also at least one winter record for El Paso, 13-14 December 2009].

Spring (March through May)—33: The first birds can arrive as early as the first week of March; however, the bulk of the spring migrants occurred from late March through mid-April. We found this species to be common only at the highest elevation locations in the JDC study area; normally absent from lower elevation JDC study sites and totally absent from SBC study sites. The only exception to the latter situation occurred in 2011 and into early 2012, during the exceptional drought period we experienced. A few RIHUs wandered out of the highest elevations and were observed at feeders in the foothills of the Davis Mountains (primarily in the Limpia Crossing area) but not in Fort Davis proper. Not recorded in the SBC study area during the drought years or for the entire study.

Summer (June and July)—67: June and July activity at the upper elevation JDC study sites was very strong prior to the drought of 2011. After that, birds were seen consistently but not in the large numbers previous observed. Also, breeding activity was very strong prior to the drought and continued with smaller numbers post-drought. This was evidenced by the number of female birds collecting nesting cotton to use in nest construction. In 2009, at our highest elevation JDC study site, at least six different adult females were observed collecting cotton from those panels. Additional evidence of breeding was the number of juvenile birds caught and banded during the period, a number that doubled by August as migrants began to enter the mix.

Early Fall (August and September)—124: Early fall produced a blend of local breeding birds and juvenile birds, as well as a few possible early migrants from locations to the north of the Davis Mountains. This was the peak month for the species based on banding data, numbers increased in August primarily due to juvenile birds present at each study site. However, for those birds caught and banded, it was impossible to discern lingering local breeders and local juvenile birds from migrants. The data show a consistent presence of birds by late September, represented by the presence of mostly juvenile birds. One very interesting encounter of one of our banded male birds occurred on 4 September 2010, recaptured by a banding team in the Chiricahua Mountains of southeastern Arizona. This individual was banded by us in upper Limpia Canyon as a juvenile male on 6 October 2009. It was previously thought that birds from the population in the eastern sierras (the Sierra Madre Oriental) did not mix with birds in the western sierras (the Sierra Madre Occidental). This likely represents the first occurrence of that nature.

Late Fall (October and November)—26: October included a fair mix of adult birds and juveniles but by November most individuals had moved out, migrating south into Mexico. Almost every year, a bird or two lingered through late November. We can provide two prime examples of banded birds that likely stayed from spring, through summer and into late fall based on banding data. The first was an adult female that was originally banded on 29 May 2009 and subsequently caught again on 12 October 2011. This bird was at least three years old when recaptured. Another three-year-old bird, also an adult female when originally banded on 1 June 2010, was caught again on 10 October 2012.

RIHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	14	24	68	48	23	12	5	8	7	6	23	13	0	251
SBC														0
OAS														0
Totals	14	24	68	48	23	12	5	8	7	6	23	13	0	251

RIHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M			obs	3	17	6	15	20	2	4	1	obs	68
HY M					1	4	11	29	20	8	1		74
AHY F			2	3	8	12	15	17	5	3	obs		65
HY F							4	13	18	8	1		44
Totals			2	6	25	22	45	79	45	23	3	obs	251

RIHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	65	71.1 (62.5-75.1)	43.6 (38.0-48.0)	26.1 (22.8-30.6)	7.8 (6.3-9.6)
HY M	63	71.4 (67.7-75.1)	43.5 (40.0-46.5)	26.3 (23.2-30.2)	7.9 (6.8-9.2)
AHY F	58	66.9 (63.4-70.0)	40.7 (37.5-46.5)	28.4 (25.5-31.4)	7.2 (6.2-9.0)
HY F	43	67.4 (62.1-70.1)	41.3 (38.0-44.5)	28.3 (22.8-30.9)	6.9 (6.5-7.7)



Figure 7. Rivoli's Hummingbird juvenile female (Kelly Bryan)



Figure 8. Rivoli's Hummingbird juvenile male (Kelly Bryan)



Figure 9. Rivoli's Hummingbird adult male (Michael Gray)

Amethyst-throated Mountain-gem (*Lampornis amethystinus*)

Regional status: No records. This species is normally endemic to the mountains of Mexico and Central America (AOU 1998). It was considered a sedentary (non-migratory) species showing only short-range seasonal movements in response to food resource acquisition. On the afternoon of 14 October 2016 an unusual-looking large hummingbird was spotted attempting to utilize a feeder at one of our primary study sites in upper Limpia Canyon of the Davis Mountains. Once definitive looks were obtained, the bird was identified as an Amethyst-throated Mountain-gem (formerly the Amethyst-throated Hummingbird but changed by the American Ornithologist Union with the 58th supplement of the AOU Checklist in 2017). Both Bryan and Floyd were present for the bird's occurrence that afternoon. In a remarkable circumstance, initial documentation was obtained on a live hummingbird cam operating at the location through the Bird Cams Lab at Cornell University. Bryan immediately notified the director of the lab that the bird was utilizing a feeding port on the cam feeder (one of a dozen feeders still hanging at that time). Two documentary videos were obtained that afternoon (see Youtube videos at: <https://www.youtube.com/watch?v=Y74qxherLh4> and <https://www.youtube.com/watch?v=JAAXKSsKKPk>). Shortly after the first video clip was obtained, documentary photographs were taken by Bryan with a digital camera and telephoto lens. The bird was present until sunset that day and appeared again the next morning just after sunrise, but disappeared soon after and was not seen again. This well documented record constituted not only a first record for the region and the State, but a first record for the United States (see Bryan and Floyd, 2017 for additional details and photographs).

ATMO seasonal observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Totals										obs			1



Figure 10. Amethyst-throated Mountain-gem on feeder with cam (Kelly Bryan)



Figure 11. Amethyst-throated Mountain-gem closeup (Kelly Bryan)

Blue-throated Mountain-gem (*Lampornis clemenciae*)

Regional status: The Blue-throated Mountain-gem is the common spring, summer and fall large hummingbird species in the Chisos Mountains of Big Bend National Park. It is a fairly common breeding species in the highest elevations of the mountain range, the only location in Texas with such a status. It is a rare but regular species in the Davis Mountains; however, there are no documented breeding records there. There are also no documented breeding records from the Guadalupe Mountains National Park north along the border with New Mexico. The species has been reported there, but it is the Rivoli's Hummingbird that is the expected large hummingbird in that range.

Winter (December through February)—2: The first winter record for the region and the third for Texas was a male bird found and photographed at Lajitas on 17 December 2013. He was captured and banded on 8 January 2014 and was last observed a week later on 14 January. The winter of 2013/14 was an exceptional period for winter hummingbird diversity and abundance with eight species and over 60 individuals present at that location overlooking the Rio Grande, and at Study Butte. Three old winter records from El Paso were relegated to hypothetical status due to lack of documentation; however, on 29 October 2014 an adult female was photographed in the upper valley of El Paso County and was captured, banded and examined on 16 January 2015. This occurrence provided the first documented record for the County. She was last observed in early April but returned to the same location the next two years staying through the winter months.

Spring (March through May)—1: In the Davis Mountains, a female banded on 11 May 2011 was still present in August. Otherwise, the spring occurrence of BTMO at our JDC study sites was normally considered rare with the exception of the drought year (2011). Several individuals were noted in the Davis Mountains that year, likely refugees from the Chisos Mountains to the south looking for adequate food resources. The two drought-year records from the SBC study sites involved adult males; the first was a one-day wonder photographed at CMO on 8 May. 2017 and 2018 brought several new records, some facilitated by the Cornell University live cam. A female was noted and documented with screen shots from 4-9 May 2017.

Summer (June and July)—1: The second drought-displaced bird found in the lower desert during 2011 was a male first observed on 8 July in the southern foothills of the Christmas Mountains, captured and banded on 10 July and last observed a week later. At the JDC study sites in the upper elevations, BTMOs usually became more frequent in occurrence during the summer season. An adult male was found and photographed on 3 July 2010, during the passage of the remnants of Hurricane Alex that brought rains to the region from interior Mexico. At the same location, a female was documented by the live cam on 12 July 2017.

Early Fall (August and September)—1: Two immature birds were documented from our study sites in early fall. The first was a juvenile bird photographed on 4 September 2009, a bird that had the plumage of a recently fledged individual; the second was a juvenile female caught and banded on 17 September 2010. The first BTMO documented by the live cam was an adult female on 14 September 2015. In 2018, a male showed up at our highest elevation study site in upper Limpia Canyon on 4 August, stayed a day then moved about two miles away to the east to another one of our study sites. He eventually came back to the first location and was photographed again on 13 August. He finally departed a week later. Although it was not banded, we compared photographs and could tell the bird was the same individual due to distinctive damage to the bird's tail.

Late Fall (October and November)—Providing a second confirmed record for the El Paso area, a juvenile male was observed and well-photographed in the upper valley 20-27 October 2015. Also, documented by the live cam, a male was captured by screen shot on 16 October 2015. At least one bird was observed lingering in the Davis Mountains in mid-November prior to initiation of the current study.

BTMO banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals
JDC			obs	1	1				obs	obs	obs	obs	2
SBC					1		obs	1					2
OAS		obs						obs	1				1
Total	0	obs	0	1	2	0	obs	1	1	obs	obs	obs	5

BTMO seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M	1			obs	obs	obs	1	obs				obs	2
HY M							obs	obs		obs			obs
AHY F	1	obs	obs	obs	1	obs	obs	obs	obs	obs	obs	obs	2
HY F									1				1
Totals	2	obs	obs	obs	1	obs	1	obs	1	obs	obs	obs	5

BTMO morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	2	74.2 (74.1-74.2)	45.5 (45.0-46.0)	22.2	8.6
AHY F	2	67.4 (66.3-68.5)	44.0 (43.0-45.0)	24.6 (24.4-24.8)	6.6 (6.5-6.6)
HY F	1	70	44	26.1	6.8



Figure 12. Blue-throated Mountain-gem adult male (Kelly Bryan)



Figure 13. Blue-throated Mountain-gem juvenile male (Kelly Bryan)

Lucifer Hummingbird (*Calothorax lucifer*)

Regional status: The Lucifer Hummingbird is considered a locally common breeding species in the canyons and foothills of the Chisos Mountains of Big Bend National Park, and in adjacent suitable desert habitat, especially in the Christmas Mountains area of Terlingua Ranch. There are also possible isolated breeding populations in the Glass Mountains, Chinati Mountains, Sierra Vieja, southern Presidio County (Big Bend Ranch State Park?), and the Davis Mountains. More recently, spring and summer records have been obtained from the lower canyons of the Rio Grande and along the Pecos River just south of Sheffield, Pecos County, Texas. Only three records exist from El Paso, two from July and one from October of 2011 (during the drought).

The Lucifer Hummingbird is a complex species most closely aligned with three other tropical hummingbirds known as “sheartails”. It is a desert adapted species with a primary range from the northern Chihuahuan Desert and southern Sonoran Desert ecoregions of the southwestern US and northern Mexico, south into south-central Mexico. The *C. lucifer* species complex includes two distinct populations; a resident population in south-central Mexico (primarily in Nayarit and Jalisco) and a migratory population (the one that winters in south-central Mexico and breeds in central and northern Mexico, and the southwestern US). Recent DNA studies have shown that these two populations are genetically divergent from each other to a degree that they are similarly divergent from a very closely related species the Beautiful Hummingbird (*Calothorax pulcher*). The Beautiful Hummingbird is also resident in south-central Mexico. The data analysis and conclusions suggest that the two-species complex is actually three species (Yuyini et. al. 2018).

In consideration of this study back in the early 2000s, a significant unknown factor was going to be any attempt to determine the exact status of the LUHU. No one had attempted to conduct a long-term study on the species in the west Texas region. One of the potential obstacles was the fact that the bulk of the breeding population in Texas was assumed to occur only within Big Bend National Park. It would have taken a serious effort and commitment to obtain the permits necessary to conduct a banding operation in the national park. In addition to the fact that the only feeders located on the park were at a handful of private residences in restricted areas. Accessing areas of natural habitat would have been unproductive and impractical due to the fact that most were far removed from access roads. In 2008, an opportunity opened up to conduct a banding session at a site within the northern rim of the Christmas Mountains adjacent to Terlingua Ranch (at the Christmas Mountains Oasis). The center of the Christmas Mountains range is located approximately 18 miles northwest of Panther Junction, the National Park headquarters and visitor’s center. That first effort in August, resulted in the capture and banding of 5 individuals (2 adult males and 3 adult females). We were thrilled that a sample of 5 birds could be realized that day in the Christmas Mountains. We could not have predicted that by the end of the study we would achieve a sample size of almost 900 birds providing invaluable data on the species. The seasonal occurrence of LUHU in west Texas based on our overall banding and observation data is as follows.

Winter (December through February)—1: The first winter record for the region, Texas and the US was an adult male that was captured, banded and photographed at the Far Flung casitas in Study Butte (SBC) on 9 December 2013. The second winter occurrence involved the return of a previously banded adult male at a private location along the southeastern rim of the Christmas Mountains on 2 December 2015, and last observed on 12 December. This bird was known to have lingered from fall into early winter because of the band it was wearing. It fact, it was originally banded 25 May 2015. [The above records represented the only winter occurrences of the species in the US until a female was photographed in New Iberia, Louisiana in a snow/ice storm on 9 December 2017.] Birds returning in spring can arrive the last week of February. Records of observations at CMO reveal that February arrivals are not uncommon. On 26 February 2013, we were fortunate to recapture a five-year old adult male that was previously banded on 16 August 2009 (as an adult). That bird was first observed on 23 February.

Spring (March through May)—116: The spring status of breeding LUHUs in SBC presented us with more questions than answers. During the study, only 7 new birds were banded in the months of March and April, the prime arrival time for the species. That represented a mere 0.8% of the LUHU database of banded birds. Although a few of our previously banded individuals were normally included in the mix of early breeding birds, the early spring population as a whole was not large based on banding and recapture numbers. Albeit, breeding behavior by the few individuals that were present in early spring appeared normal. Courtship displays by male to female birds were observed as early as the first week of March, but by April the species was normally totally absent from feeders and not found in surrounding natural habitat. This change in status at the

feeders just happened to coincide with the blooming of ocotillo; however, LUHUs were almost never observed feeding on ocotillo blooms and apparently, do not depend on their flowers as a primary nectar source (Scott 1994). Penstemon and acanthus appear to be the most important early spring nectar sources for the species based on studies in Panther Canyon at Big Bend National Park (Scott 1994), and the population there in early spring is normally substantial. Astonishingly, by May the SBC population normally increased 10-fold at our study sites. Depending on the year, this occurred in early May, mid-May, late May, or even as late as early June as was the case in 2010. One could postulate that these spring population fluctuations were tied to weather patterns and food resources. However, we have speculated that perhaps the bulk of the SBC spring population stopped initially in Mexico and attempted to breed before the lower elevation breeding habitat found there got too hot, then headed farther north into SBC to higher elevation locations in May. It may also be possible that the spring population simply utilized natural nectar resources in April and then by May became more feeder dependent, congregating at locations like CMO. The data show that the first juvenile birds captured and banded occurred the last week of May. Therefore, early spring breeding activities were successful to some degree where-ever the birds were located. To what degree we cannot be totally certain. May definitely marked the time frame that breeding activity in LUHUs kicked into high gear in the SBC study area in anticipation of the onset of monsoon rains in July.

In the JDC study area, LUHUs normally did not appear until late April or May. Despite the number observed and/or banded, there were no documented breeding records for the JDC area, even into and through summer. We suggest that the number of adults and juveniles present (in summer) support the fact that breeding likely occurred in select localized areas of the JDC study area. It is just a matter of time before an active nest is discovered and that status is documented. [In 2020, the first March and early April records were documented at more than one location in the central Davis Mountains.]

Summer (June and July)—340: June activity in the SBC study area was similar to that of late May with adult birds and a few juvenile birds present at the study sites. June was typically hot and dry with no expectations of monsoon rains until July. Breeding activities continued in earnest in anticipation of the onset of monsoon rains. By July, the overall population increased again as more juvenile birds joined the mix. The only exception to that occurred during the drought year of 2011. Reproductive success was less than 6% that year, an amazing statistic for this desert adapted species, in addition to the fact that birds became very feeder dependent during that time frame in which natural food resources such as nectar and insects were scarce or even nonexistent. This is reflected in the number of birds captured and banded during the drought. In the JDC study area, an unprecedented invasion of the Davis Mountains occurred during the drought year of 2011. This unusual movement likely represented birds moving into the mountains looking for cooler temperatures and new food resources. An amazing 67 birds were captured and banded that year at the JDC study sites, that is thirty-nine percent of all LUHUs banded at JDC study sites for the extent of the thirteen-year project. Add in the 42 birds from the 2015 incursion and that adds up to sixty-three percent of all LUHUs banded at the JDC study sites. Some adult LUHUs began their annual flight feather molt in mid-July while others waited until August or September to start.

Early Fall (August and September)—393: In the SBC area, adult birds continued breeding activities through August and into early September. By the end of August, a good portion of the population began to move out, most likely migrating south into Mexico. Most of the adult males tended to move out by early September, leaving females and juveniles birds behind. In fact, a good number of female LUHUs were still tending nests in mid-September, evidenced by the number of juvenile birds (many just fledged) caught from late September through October. In the JDC study areas, LUHUs lingered in the mountains well into September, some staying into October.

Late Fall (October and November)—32: Breeding continued into early October at the SBC study sites as evidenced by the number of just-fledged individuals caught through late October. A good example of the latter was a female fledgling caught and banded on 19 October 2008 at CMO with an undeveloped culmen measurement of 17.4 mm. That same bird was recaptured (returned) as an adult on 4 September 2009, bearing a fully developed culmen with a measurement of 20.6 mm. In November, only a few remaining juvenile birds were found at the SBC study sites with the exception of the known banded adult male that lingered into December. The late date recorded for one of the juvenile birds was 9 November. At the JDC study sites a bird banded on 25 October 2017 was still present on 6 November.

LUHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	0	0	7	7	68	4	6	6	42	14	7	6	6	173
SBC	0	14	65	93	124	28	66	87	177	52	0	0	0	706
OAS	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Totals	0	14	75	100	192	32	72	93	219	66	7	6	6	882

LUHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M		obs	4	1	63	35	91	54	9	1		1	259
HY M					2	12	78	92	65	17	3		269
AHY F		obs	2		42	36	49	53	23	3			208
HY F					2	7	32	49	48	7	1		146
Totals	0	obs	6	1	109	90	250	248	145	28	4	1	882

LUHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	229	37.5 (35.2-40.2)	31.2 (29.0-34.0)	21.1 (17.6-23.0)	3.4 (2.9-4.3)
HY M	254	39.3 (36.3-41.6)	25.1 (23.5-26.5)	21.1 (19.4-23.2)	3.4 (2.9-5.0)
AHY F	195	41.3 (39.1-43.9)	25.6 (23.0-28.5)	22.2 (19.6-24.4)	3.5 (2.5-4.6)
HY F	135	41.8 (39.2-44.2)	25.4 (24.0-27.0)	22.1 (20.3-24.2)	3.4 (2.9-4.1)



Figure 14. Lucifer Hummingbird adult male (Kelly Bryan)



Figure 15. Lucifer Hummingbird adult female (Kelly Bryan)



Figure 16. Lucifer Hummingbird juvenile female (Maryann Eastman)

Ruby-throated Hummingbird (*Archilochus colubris*)

Regional status: Prior to the early 1990s, there were very few records for this species in the Trans-Pecos region. In fact, the species was considered extremely rare in occurrence, except in the area of Del Rio in Val Verde County (Oberholser 1974). The establishment of a bird banding operation at Davis Mountains State Park in 1992 by the primary author produced data revealing a possible change in status for the Ruby-throated Hummingbird (RTHU) in central portions of the region, primarily in the fall. That operation ran until the spring of 2002. Although hummingbirds were not being banded during that timeframe as a part of that operation, a number of RTHUs were incidental captures in the songbird nets in August, September, and October. Those that were caught were released immediately; however, the exact number of birds released was not recorded, just the date birds were caught. Once the current study was initiated, all individuals that were captured were banded, processed and released per the banding protocols. The data produced for this predominately eastern species were quite dramatic and surprising for the west Texas region. The seasonal occurrence of RTHU based on observations and banding data is as follows.

Winter (December through February)—1: The first winter record for the region was a female that appeared at a Fort Davis feeder on 8 December 2002. The bird was last seen on 17 December but not before being well documented with photographs. Another female bird was found at the same location on 3 January 2007, was eventually captured and banded on 27 February and last observed one week later in early March. Finally, a juvenile male was present at CMO on 7 December 2012. [There are two additional documented winter records for the region, one from Presidio County (an adult male photographed 12 December 2009 at the Cibolo Ranch) and one from El Paso County (a juvenile male in December 2017).]

Spring (March through May)—6: Based on observations and banding totals from the primary study sites and other locations, birds were recorded occasionally throughout central portions of the region. Records range from 17 March to 20 May. In the spring of 2009 no fewer than eight birds were noted at various locations in the Fort Davis area. Six birds were banded for the period, including one juvenile plumaged (second-year) male on 30 March 2012 and an adult female on 12 May 2011, both from SBC study sites, and four adult males all from JDC locations (6 May 2009, 6 May 2011, 20 April 2014, and 16 April 2015). Observational records, all of adult males, add another 22 records for the period from CMO, Alpine, and Fort Davis. Not yet recorded west of the Davis Mountains during this season.

Summer (June and July)—2: No records for June. Only two records for July, a juvenile male captured and banded on 31 July 2014, and an early migrant adult male observed and photographed on 25 July 2018, then captured and banded on 26 July and last observed on 30 July, both birds found in upper Limpia Canyon of the Davis Mountains.

Early Fall (August and September)—596: Adult males usually arrive first in August followed by adult females and a few juvenile birds. August records are normally more frequent at JDC locations, but, by September, SBC locations are dominated by RTHUs as both LUHUs and BCHUs numbers decline as they begin to migrate out. Adult females and juveniles are usually the only birds found by late September. This study revealed a remarkable movement of this eastern species through the lower desert habitats of SBC in September. Top single day captures included 31 birds on 4 September 2009, 37 birds on 9 September 2014 and 29 birds on 14 September 2015. Data collected in September suggest that RTHUs are far more abundant than BCHUs at SBC locations during this portion of fall migration.

Late Fall (October and November)—55: Only one record of an adult male in late fall; a bird captured and banded on 7 October 2017 at one of the JDC study sites. Likewise, only a single record of an adult female in October, one captured and banded on 18 October 2012 in Alpine. Otherwise, only juvenile males and females represent the species during late fall migration in October. Only three records for November, a juvenile male captured and banded at Lajitas on 13 November 2012, and juvenile males observed at CMO 16-23 November 2012 and 8 November 2018.

RTHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	2	0	45	38	67	20	21	34	30	3	16	28	6	310
SBC	0	22	57	26	10	36	55	52	59	1	0	0	0	318
OAS	0	0	1	19	3	6	1	0	2	0	0	0	0	32
Totals	2	22	103	83	80	62	77	86	91	4	16	28	6	660

RTHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M			1	2	2		1	52	44	1			103
HY M							1	28	218	37	1		285
AHY F	obs	1			1			15	90	1		obs	108
HY F								28	121	15			164
Totals	obs	1	1	2	3	0	2	123	473	54	1	obs	660

RTHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	89	38.2 (36.1-42.1)	28.8 (26.5-31.5)	15.9 (13.5-17.6)	3.2 (2.6-4.3)
HY M	233	40.9 (36.9-44.6)	26.2 (24.5-28.5)	16.1 (13.5-17.8)	3.0 (2.5-4.2)
AHY F	95	43.2 (40.8-45.6)	26.7 (24.5-28.5)	17.7 (15.2-19.9)	3.5 (2.9-4.4)
HY F	149	44.0 (41.2-46.5)	26.8 (25.0-29.0)	17.7 (14.5-19.8)	3.3 (2.4-4.7)



Figure 17. Ruby-throated Hummingbird adult male at CMO (Kelly Bryan)



Figure 18. Ruby-throated Hummingbird adult male in the Davis Mountains (Maryann Eastman)

Black-chinned Hummingbird (*Archilochus alexandri*)

Regional status: The Black-chinned Hummingbird is the most common hummingbird species in the region. It is an abundant summer resident throughout the region in most all habitats and at most all elevations from March through September; during wetter years, it is usually less abundant than Broad-tailed Hummingbird at the highest elevations of the major mountains; during drier years, it becomes more abundant at the higher elevations as birds move up from the lower desert to seek new food resources.

Winter (December through February)—4: The first documented winter records were obtained in 2010 with adult females in Marathon (a bird originally banded on 10 November) and the Davis Mountains in mid-December. Three additional documented records, two from the winter of 2012-13 with single birds in Terlingua Ranch on 17 January and the Davis Mountains on 3 February, and an adult male captured and banded at Study Butte on 10 January 2014. Finally, an adult female was banded at Lajitas during the winter of 2014-15 (banded 8 December 2014) and recaptured at that same location on 7 January 2016.

Spring (March through May)—930: The first arriving birds (normally adult males) appear the first week of March followed by females soon after, but birds are never very common until April. Breeding activities commence by early April. The first juvenile birds can be found by late May.

Summer (June and July)—3357: The summer season provided a good mix of adult birds and juveniles at all study sites. As migration begins in July, local birds are joined by birds (both adults and juveniles) moving around in search of adequate food resources as the monsoon rains begin. During July, adults slightly outnumber juveniles.

Early Fall (August and September)—4354: August brings more migrants into the mix of birds at all of our study sites. Very soon, juvenile birds vastly outnumber adult birds, but by September a large portion of the population has moved out of the region and migrated south into Mexico.

Late Fall (October and November)—72: We found no adult males in late fall. The season is dominated by a few lingering juvenile birds with only two adult females caught and banded. By mid-October, almost all remaining individuals of the species have migrated south. We only caught and banded one juvenile female during the month of November.

BCHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	18	56	648	803	1057	652	445	807	1014	319	370	563	101	6853
SBC		47	187	177	255	134	218	186	229	108	0	v0	0	1541
OAS		62	55	76	47	17	0	0	66	0	0	0	0	323
Total	18	165	890	1056	1359	803	663	993	1309	427	370	563	101	8717

BCHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M	2		22	115	329	302	910	429	117				2226
HY M					2	73	700	1298	601	44			2718
AHY F	obs	1	22	131	308	296	753	727	193	2	obs	1	2434
HY F					1	23	300	699	290	25	1	obs	1339
Totals	2	1	44	246	640	694	2663	3153	1201	71	1	1	8717

BCHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	1377	41.0 (37.8-45.5)	25.4 (23.0-28.5)	18.2 (15.0-20.5)	3.2 (2.5-5.0)
HY M	2013	42.8 (38.7-45.9)	25.4 (23.0-28.0)	18.2 (15.6-21.1)	3.2 (2.5-4.8)
AHY F	1782	45.3 (42.5-49.1)	26.7 (24.0-30.0)	19.9 (15.7-23.2)	3.6 (2.7-5.6)
HY F	1052	45.6 (43.0-50.3)	27.0 (25.0-30.0)	19.8 (16.2-22.9)	3.5 (2.6-5.7)



Figure 19. Black-chinned Hummingbird adult male (Maryann Eastman)



Figure 20. Black-chinned Hummingbird juvenile female (Maryann Eastman)

Anna's Hummingbird (*Calypte anna*)

Regional status: The Anna's Hummingbird is a fairly common late fall migrant throughout the region and a locally common winter resident in selected areas. Most birds are gone by early February. Therefore, spring records are very rare. Likewise, summer records are equally rare. The four nesting records for Texas, all from this region, are detailed in the Discussion and Summary section to follow.

Despite our best efforts, we still do not know exactly where the birds that overwinter in and migrate through portions of Texas originate from. Since the bulk of the ANHU population in the western US is non-migratory, it should be certain that our birds do not come from any of those sedentary populations, ones that initiate nesting activities in December and are usually done with the nesting cycle by March. In recent years, the species has been expanding its range to the north, even as far north as western Canada and southern Alaska, perhaps extending the nesting timeframe for the species into April and May in these populations. It is also certain that most of these extended populations withdraw in fall from much of that area. For an ANHU to migrate from any portion of the species' population north of California, it would have to migrate southeast (not south) to reach any portion of Texas. We only needed one foreign encounter or one foreign recapture to provide a clue to solve this mystery. Unfortunately, we've got neither.

Winter (December through February)—200: Uncommon to abundant from December through mid-January at both our SBC and JDC study areas depending on year and environmental conditions. We were astonished by the 50+ ANHUs that overwintered in the Lajitas area during the winter of 2013/14. A similar invasion occurred at our upper elevation JDC study sites during the winter of 2016/17, but ended by early January. Those birds that intend to migrate usually begin moving in mid-January and are gone by mid-February. For any birds lingering into late winter, breeding activities should be noted and followed up on.

Spring (March through May)—1: Any birds lingering into early spring should be checked for breeding activities. Otherwise, ANHUs are primarily absent during this season. One mid-April documented record in upper Limpia Canyon, a juvenile male photographed on 17 April 2018, one that lingered through summer. Also, one documented late spring record at CMO; an adult female was photographed there on 24 May 2011.

Summer (June and July)—5: Summer season status was very similar to that of spring. ANHUs were normally rare to absent during the time that our other species are at the peak of their breeding activities. Isolated records, all from our JDC study area, included an adult female lingering in upper Limpia Canyon, June to August 2007; one to two birds were at the same location in July of 2008; an adult female was at another location nearby from 12 July to 28 August 2013; and sub-adult males were also noted in upper Limpia Canyon in August of 2013 and July of 2014 (the latter three birds were all captured and banded). In 2016, an adult female that was captured and banded on 26 July, lingered into November, and a banded adult male was documented with a screen shot on the West Texas hummingbird cam on 18 July 2016. Summer birds were recorded in 2017 and 2018; in the latter, the just-fledged juvenile male first observed in mid-April and banded mid-May, remained at that same location through July.

Early Fall (August and September)—41: The first fall migrant birds were normally not encountered until mid-September; however, during the years immediately following the drought of 2011, they were not noted until October. During those same years, early migrants were very uncommon in the JDC area, but totally absent in 2014.

Late Fall (October and November)—304: By late fall, numbers continued to increase at most of our sampling sites in both the JDC and the SBC study areas. The data show that more birds were banded during the month of November than during any other month.

ANHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	1	16	22	60	20	8	13	7	4	53	8	4	0	216
SBC		42	22	16	24	37	64	68	29	16	0	0	0	318
OAS			5	5	3	1	2	0	1	0	0	0	0	17
Totals	1	58	49	81	47	46	79	75	34	69	8	4	0	551

ANHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M	32	3					obs		7	27	27	17	113
HY M				obs	1	obs	obs	2	6	23	56	14	102
AHY F	79	7	obs		obs		3	2	15	57	33	4	200
HY F									5	11	24	11	51
U F						1	1		4	8	38	33	85
Totals	111	10	obs	obs	1	1	4	4	37	126	178	79	551

ANHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	86	48.1 (44.3-50.2)	32.2 (30.0-34.0)	17.5 (15.0-20.2)	4.6 (3.9-6.1)
HY M	84	48.8 (44.2-51.6)	27.9 (25.0-30.0)	17.9 (14.5-20.3)	4.4 (3.6-5.5)
AHY F	159	48.8 (44.6-52.2)	27.8 (26.0-30.0)	18.2 (15.9-21.0)	4.1 (3.5-5.5)
HY F	27	48.3 (45.2-50.6)	27.5 (26.0-29.5)	18.1 (16.7-19.6)	4.0 (2.9-4.9)
U F	67	48.8 (44.6-51.0)	27.7 (26.0-29.0)	18.2 (16.3-21.0)	4.2 (3.5-5.6)



Figure 21. Anna's Hummingbird adult male (Kelly Bryan)



Figure 22. Anna's Hummingbird adult female (Kelly Bryan)

Costa's Hummingbird (*Calypte costae*)

Regional status: This Sonoran Desert cousin of the Anna's Hummingbird, the COHU is a sporadic but fairly regular fall and winter visitor to the west Texas region, especially to the El Paso area. Almost half of the records come from El Paso; about 80% of the accepted Texas records are from this region. Most of the records are from late fall and extending through the winter months; there is one record from March. In the winter of 1994/95, up to seven different birds were present in and around El Paso, representing the largest number of individuals recorded from any season. There is only one summer record for Texas, an adult male was observed and photographed in the Limpia Crossing subdivision northwest of Fort Davis, Jeff Davis County, from 10 June through 1 September 2001.

Winter (December through February)—2: Refer to the late fall season below for details on an adult female that overwintered two years in a row in the winters of 2009/10 and 2010/11. Our second winter record was established when an adult female was unexpectedly caught on the morning of 14 January 2013 at the Far Flung casitas in Study Butte. We were there that day to follow up on several ANHUs that were wintering at that location. She was last observed on 19 January.

Spring (March through May)—0: No records were obtained during the study for the months of April and May. The lone March record was an adult female that wintered at one of our SBC study sites and was last observed in 2010 the first week of March (details presented in the late fall section below).

Summer (June and July)—0: No records were obtained during the study for this time frame.

Early Fall (August and September)—0: The first early fall record was a male that was found and photographed in Alpine on 20 August 2007 and observed through 4 October. The second early fall record for this species was an adult male that showed up in Alpine on 26 August 2018, the day that the 2018 edition of the Davis Mountains Hummingbird Celebration ended. Several participants were lucky enough to see this bird, one that was well documented with photographs. It was last observed on 31 August.

Late Fall (October and November)—3: Our first record of this species was an apparent adult male (with complete fresh adult plumage but still molting in gorget and crown) that was captured and banded on 19 October 2008 at CMO. The second record obtained was an adult female caught and banded on 29 October 2009 at our study site in the southern portion of the Christmas Mountains. This bird overwintered at that location and its band number verified when it was recaptured on 26 January, but stayed put for another six weeks finally leaving the first week of March. The same individual returned the following winter when it was recaptured on 17 October 2010 and last observed on 15 February 2011. In Alpine in northern Brewster County, a male COHU returned for three consecutive years to the same feeders starting in the fall of 2007 (see above), then in 2008 (16 September through 25 January 2009) and 2009 (3 September through 19 October), and was well documented with photographs. The latest fall record during our study was a male bird first observed on 22 November 2013 at the same location that hosted an adult female during the winters of 2009/10 and 2010/11. It was captured and banded on 3 December and last observed the following day.

COHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals
JDC													0
SBC		1	1	obs	obs	1	2						5
OAS		obs	obs	obs								obs	0
Totals	0	1	1	obs	obs	1	2	0	0	0	0	obs	5

COHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M								obs	obs	1			1
HY M											1	1	2
AHY F	1	obs	obs							1	obs	obs	2
HY F													0
Totals	1	obs	obs	0	0	0	0	obs	obs	2	1	1	5

COHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	1	39.7	23.5	16.2	3.6
HY M	2	44.6 (44.3-45.0)	24.5 (24.0-25.0)	17.6 (17.1-18.0)	3.4 (3.3-3.6)
AHY F	2	44.1 (43.9-44.4)	24.3 (23.5-25.0)	16.6 (16.4-16.6)	3.0 (2.9-3.0)



Figure 23. Costa's Hummingbird adult male in Alpine (Mark Lockwood)



Figure 24. Costa's Hummingbird adult female in the Christmas Mountains (Carolyn Ohl)

Calliope Hummingbird (*Selaphorus calliope*)

Regional status: The Calliope Hummingbird is the smallest bird in the US, but more notoriously, it is the smallest long-distance migratory bird in the world. The CAHU is an uncommon to, at times, a common fall migrant. In west Texas, we enjoy their presence with the onset of fall migration each year in July. They occasionally wander east to central and coastal parts of the state and some birds are known to return to the same location several years in a row, especially birds that choose to winter at a given location. Foreign recaptures and returns of this species are notoriously low in number. Only one CAHU we banded was encountered elsewhere. We were notified that a male CAHU we banded the previous year on 23 August 2009, was recaptured by hummingbird banders in Estes Park, Colorado on 20 July 2010. The only bird we intercepted returning back through upper Limpia Canyon of the Davis Mountains was a juvenile male originally banded on 9 September 2011, then recaptured at the same location as an adult male on 17 August 2012.

Winter (December through February)—0: We encountered no CAHUs during the winter season for the entire study. [There are at least four winter records for the region, all from El Paso, 22 December 1995, the winter of 2000-01, the winter of 2001-02 and the winter of 2012-13].

Spring (March through May)—0: The CAHU is considered very rare in the spring in west Texas. The only spring record we noted during this study was a male photographed in upper Limpia Canyon on 8 May 2012.

Summer (June and July)—68: Adult males usually made their appearance in the second week of July, and dominated the numbers for the month (89% based on the banding data). Only one juvenile was caught and banded in the month of July, on 26 July 2016 at one of our JDC study sites in upper Limpia Canyon.

Early Fall (August and September)—539: By August, there were normally good numbers of CAHUs at the JDC study sites, including all age/sex classes. At the SBC study sites, a few CAHUs were captured and banded mixed in with the other species. The data show that almost all of the adult males have moved on into Mexico by the end of August leaving only the other age/sex classes present. In 2009, we encountered good numbers of CAHUs in an urban area of El Paso while conducting our limited banding sessions at that location.

Late Fall (October and November)—3: A few juvenile birds lingered into early October. The latest record for the study was a juvenile male in Alpine on 27 October 2011.

CAHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC		2	85	40	159	47	55	15	68	26	9	26	21	553
SBC			3	3	9	6	4		4	6				35
OAS			16	5	1									22
Totals	0	2	104	48	169	53	59	15	72	32	9	26	21	610

CAHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M					obs		60	72	6				138
HY M							1	147	138	2			288
AHY F							7	67	7				81
HY F								51	51	1			103
Totals	0	0	0	0	obs	0	68	337	202	3	0	0	610

CAHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	114	38.0 (35.7-41.5)	21.1 (19.5-23.0)	14.1 (11.7-16.7)	2.9 (2.3-3.8)
HY M	234	40.7 (36.9-43.3)	21.9 (20.0-24.5)	14.1 (11.9-16.7)	2.8 (2.1-4.3)
AHY F	63	41.3 (38.1-44.4)	21.8 (18.0-24.0)	15.5 (13.3-17.9)	2.9 (2.4-3.9)
HY F	87	42.7 (39.9-45.5)	23.6 (21.0-26.5)	15.2 (13.3-16.7)	2.9 (2.2-3.9)



Figure 25. Calliope Hummingbird adult male (Maryann Eastman)



Figure 26. Calliope Hummingbird adult female (Kelly Bryan)

Rufous Hummingbird (*Selaphorus rufus*)

Regional status: The Rufous Hummingbird is listed as a common to abundant early fall migrant with adult male birds usually arriving and passing through the region by the first week of July. As females and juvenile birds join in mix of migrant birds, RUHUs can be one of the most common species at selected locations by early August, especially in the mountains. Every year, migrants linger well into late fall. Those that are still present by early December normally chose to overwinter; however, they are usually gone by the end of February. Early spring records are not uncommon, but normally from mid-April through late June the species is absent from the region.

We were fortunate to have some interesting foreign encounters (recaptures) of our banded birds (see Table 3). At the top of that list would be an adult female RUHU that we banded on 27 August, 2012 in upper Limpia Canyon of the Davis Mountains wearing band number P05173. She was recaptured by our northern most hummingbird bander in the US (Kate McLaughlin) on 4 July 2013, not in the continental US, but in Chenega Bay, Alaska. Turns out she caught that same bird once again the next year on 24 June 2014. The distance between the Davis Mountains of Texas and Chenega Bay, Alaska is approximately 2,870 miles. This represents only the second RUHU to be banded in the lower 48 and recaptured in Alaska. Both were recaptured by Kate.

Winter (December through February)—61: The RUHU is an uncommon winter resident in the region. Most of the birds overwintering at our study sites were females; however, a few juvenile male birds that were banded in the fall stayed through January and February. The distribution of wintering birds between the JDC study sites and the SBC study sites was normally about equal, with the exception of the winter 2013/14 population at Lajitas. Among the 50+ ANHUs and four other species present that winter, there were at least 14 different RUHUs. That proved to be a remarkable winter season for hummingbird abundance and diversity in west Texas, greater than any other wintering location in the entire State.

Spring (March through May)—3: A few overwintering birds (both males and females) remained into early March, along with consistent reports of migrants passing through in March and early April. Undoubtedly, these were birds that wintered at locations east of the region in the Gulf Coast portion of the US and were returning to their breeding ranges in western North America. We obtained two documented records for April and May in upper Limpia Canyon at one of our JDC study sites. An adult female was photographed there on 7 April 2018 and an adult male even later in the season on 9 May 2018.

Summer (June and July)—532: Each year the first fall migrants normally occur the last week of June; however, these birds do not linger long at feeders. Sometimes they feed for less than an hour and move on. The early arrival date for a fall migrant was 24 June. By early July, several adult males were noted at our study sites in the Davis Mountains along with the first passing adult females. Only late in the month did juvenile male and female birds begin to appear.

Early Fall (August and September)—4327: RUHU numbers explode in the region in the month of August. At times, RUHU numbers were greater than those of the BTLHs and BCHUs. Based on the banding data, juvenile birds outnumbered adult birds by just about 2:1. By September, adult and juvenile numbers declined by two-thirds; however, juvenile birds outnumbered adults by a larger margin (8:1). Migrant birds were by far more abundant at the JDC study sites as compared to the SBC study sites during this time frame.

Late Fall (October and November)—226: By late fall, numbers continued to decline. The majority were juvenile birds but a few adult birds that could be considered “late migrants” were still passing through. Normally, those birds that stayed through late November would be the same birds that stayed into the winter months.

RUHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	35	93	352	674	946	645	624	331	397	232	243	248	46	4866
SBC		3	23	7	32	36	38	21	28	8				196
OAS		1	24	21	19	11	2		9					87
Totals	35	97	399	702	997	692	664	352	434	240	243	248	46	5149

RUHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M	2	obs			obs	obs	205	428	53	11	4	6	709
HY M							41	997	649	106	16	20	1809
AHY F	17	4	3	obs			205	878	156	30	9	2	1304
HY F							81	850	336	37	13	10	1327
Totals	19	4	3	obs	obs	obs	532	3133	1194	184	42	38	5149

RUHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	526	40.0 (37.5-42.5)	28.9 (26.0-32.0)	16.4 (13.7-18.7)	3.6 (2.6-5.4)
HY M	1541	42.1 (38.6-45.5)	26.9 (24.0-29.5)	16.5 (14.1-18.9)	3.4 (2.4-5.6)
AHY F	1011	43.8 (40.9-46.6)	27.5 (25.0-29.5)	17.8 (15.4-20.2)	3.7 (2.9-5.4)
HY F	1148	44.6 (41.1-47.6)	27.1 (25.0-29.0)	17.7 (15.8-20.7)	3.5 (2.7-5.3)



Figure 27. Rufous Hummingbird adult male (Maryann Eastman)



Figure 28. Rufous Hummingbird adult female (Kelly Bryan)

Allen's Hummingbird (*Selaphorus sasin*)

Regional status: The Allen's Hummingbird is considered a rare fall migrant in the region from mid-July through September. Late fall records for the species are few and winter records for the region did not exist prior to our study. ALHU is absent from spring through June.

The ALHU is another example of a species that, quite frankly, going into this project we had very little information available to predict the bird's exact status here. Primarily due to work conducted by various dedicated banders along coastal regions of the state, the species' status in Texas was upgraded from very rare to occurring annually by the 1990s. In fact, it was removed from the Texas Review List in 2004. However, it was still considered accidental in west Texas in the late 1990s due to lack of documented records. Once the project got started, it was evident that it also occurred in the region on an annual basis based on the banding data. We found it fairly easy to identify adult males and juvenile males due to their unique in-hand features that separated them from Rufous Hummingbirds, but the learning curve for picking out females among the hordes of Rufous Hummingbirds was, at times, challenging. Plumage features and measurement differences for separating females ALHUs from female RUHUs required fine scrutiny. Despite our best efforts, we never had a foreign encounter of one of our banded ALHUs, nor did we capture a banded bird from elsewhere in the US. We simply do not know where the birds that migrate through and over-winter in Texas come from. Somewhere along the west coast of the US to be sure, but the exact regional area is still unknown.

Winter (December through February)—14: Based on data collected during this study, ALHU is now considered a rare but regular winter visitor in central portions of the region. The first documented winter record for the region was a juvenile male that was banded at CMO on 5 November 2010, then photographed by Carolyn Ohl there on 10 January 2011. Then the following December, two juvenile males were captured and banded on the same day, 7 December 2011, one in Alpine and one in Marathon. Ten of fifteen winter records were from the SBC study sites, two were from the JDC sites and the remaining three from other locations. Thirteen of those records were verified by capture and banding—the other two by photography. A bird that overwintered in Fort Davis was finally caught and the species identity confirmed on 7 March 2015.

Spring (March through May)—1: Other than the above March record confirmed by capture and banding, there were no spring records noted for this species.

Summer (June and July)—7: No records were noted for the month of June. The first migrants for this species were noted in the Davis Mountains in mid-July. The early date for the JDC study sites was 16 July. There were no July records for any of the SBC study sites or any other area sampled.

Early Fall (August and September)—104: August was the peak month for the ALHU at our study sites, with 38% of the total birds captured and banded during the month. The early arrival date for Alpine was 29 August, and for the SBC study sites, 20 August. For the period, 68% of our entire database for this species occurred in early fall. A vast majority of the individuals passing through in early fall were noted from the JDC study sites as compared to the SBC study sites, especially from those higher elevation sites in the Davis Mountains. The top single day record for the species was six caught and banded on 5 August 2011 in upper Limpia Canyon.

Late Fall (October and November)—24: The numbers decreased significantly by October based on the data. However, there were still birds passing through at both the JDC and SBC study areas.

ALHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	1	4	10	17	29	9	10	4	10	1	2	6	1	104
SBC		5	1	2	2	3	6	3	5	3				30
OAS			1	8	4	1	2	0	0	0				16
Totals	1	9	12	27	35	13	18	7	15	4	2	6	1	150

ALHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M	2	2						1	6	1	1		13
HY M							4	49	31	10	7	5	106
AHY F	2	1	1				3	4	7	3	2	1	25
HY F								5	1				6
Totals	4	4	1	0	0	0	7	59	45	14	10	6	150

ALHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	13	38.1 (36.1-39.8)	25.5 (24.0-27.5)	16.5 (15.4-17.8)	3.4 (3.0-3.7)
HY M	95	39.8 (37.7-42.3)	24.6 (22.0-26.5)	16.5 (14.4-18.6)	3.4 (2.9-4.3)
AHY F	22	41.7 (39.5-43.5)	25.2 (23.5-26.5)	17.8 (15.6-19.8)	3.6 (3.1-4.1)
HY F	6	41.5 (39.7-42.7)	25.1 (24.5-26.0)	17.6 (16.8-18.2)	3.4 (3.0-4.0)



Figure 29. Juvenile male Allen's Hummingbird in flight (Kelly Bryan)



Figure 30. Allen's Hummingbird adult male (Maryann Eastman)

Broad-tailed Hummingbird (*Selaphorus platycercus*)

Regional status: The Broad-tailed Hummingbird is a montane breeding species in the west Texas region. It is normally common to abundant in the proper habitat (in pinyon-juniper and mature pine-oak woodlands) at elevations above 5,500 ft. This choice of breeding habitat confines the BTLH to the three major mountain ranges in the region; the Guadalupe Mountains, the Davis Mountains and the Chisos Mountains. Due to lack of proper habitat, there are no breeding BTLHs in the Franklin Mountains near El Paso; however, there are a few winter records for the El Paso area. The BTLH is also a common to abundant migrant through the region, yet, it is very uncommon at lower elevations. Winter records are primarily confined to the higher elevations of the Davis Mountains.

Winter (December through February)—0: We did not band any BTLHs during the winter season at any of our study sites; however, we did observe birds at our upper Limpia Canyon study sites in the JDC area prior to the drought of 2011. This species was recorded almost annually on the Christmas Bird Count starting in the early 2000s through 2010. It has been very rare in early winter since then. The first migrant male BTLHs can often be seen the last week of February, but it is our experience that these birds simply pass through and do not linger long at feeders.

Spring (March through May)—274: In the mountains, the BTLH is normally more common than the BCHU in March. By April their numbers usually remain very steady but the banding data show definite increases in May. During the drier years, BTLH numbers normally increase but are usually outnumbered by BCHUs that have moved up in elevation from the lower desert; during wetter years, their numbers can vary but are usually equal to or greater than BCHU numbers. The first juvenile birds were caught and banded the last week of May.

Summer (June and July)—1192: BTLH numbers remained steady through early June. By July, their numbers increase substantially as juvenile birds join in the mix, along with the BCHUs that do the same and the arrival of RUHUs and CAHUs that have started their fall migration out of the Rocky Mountains.

Early Fall (August and September)—2491: Adult birds remained common at our upper Limpia Canyon JDC study sites in August, but by September juvenile birds dominated. Fall migrant BTLHs were found in much lower numbers in the foothills of the Davis Mountains and at all of our SBC study sites.

Late Fall (October and November)—549: Late fall was dominated by juvenile males at our higher elevation JDC study sites. In fact, based on the banding data 75% of the birds present were juvenile males.

BTLH banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	30	146	458	640	509	517	423	392	399	154	289	495	40	4492
SBC		1	2	1	2	1	1	1	4					13
OAS			1											1
Totals	30	147	461	641	511	518	424	393	403	154	289	495	40	4506

BTLH seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M		obs	5	8	130	76	228	300	122	29	1	obs	899
HY M					2	35	345	504	569	365	36	obs	1856
AHY F			9	10	108	117	282	297	112	11	3		950
HY F					1	16	71	294	223	81	5		691
HY U					1	1	21	32	38	16	1		110
Totals	0	obs	14	18	242	245	947	1427	1064	503	46	obs	4506

BTLH morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	660	48.5 (45.4-52.1)	32.9 (29.5-36.5)	17.6 (14.8-20.8)	3.6 (2.8-5.2)
HY M	1528	48.4 (45.6-52.3)	32.0 (29.0-35.0)	17.5 (14.6-19.9)	3.4 (2.6-5.1)
AHY F	711	49.1 (46.2-52.4)	31.7 (29.0-35.5)	18.8 (15.9-21.6)	3.6 (2.8-5.2)
HY F	598	48.5 (46.0-51.7)	31.7 (29.0-35.0)	18.4 (15.9-21.4)	3.4 (2.8-5.4)
HY U	100	48.2 (46.2-50.3)	31.5 (29.0-35.0)	18.1 (15.7-20.4)	3.4 (2.7-4.3)



Figure 31. Broad-tailed Hummingbird adult male (Maryann Eastman)



Figure 32. Broad-tailed Hummingbird juvenile male stretching (Kelly Bryan)

Broad-billed Hummingbird (*Cynanthus latirostris*)

Regional status: The exact status of the BBLH in west Texas, including the species' known breeding status, has been previously published (Bryan et al. 2014). The historical record for the species is fairly extensive within the region and in 2003 the Texas Bird Records Committee removed BBLH from its review list. There were reports of the species breeding in the 1930s and 40s along the Rio Grande near Castolon in southern Brewster County, north to Alpine (see Oberholser 1974). However, none of the reported nesting records in those early years were documented in any way. At least one report was published, with creditable descriptions of the nest and birds (Quillen 1935). There were about a dozen observations of this species in the Big Bend area from the 1960s to the 1990s (Wauer 1996). Our experience with the species in the Davis Mountains area started in the 1990s. Observations of BBLHs occurred almost every year in the spring, summer and fall through the 2000s. One notable male first observed in Fort Davis in April 1998, returned to the same feeder for four out of the following five years in spring, each time staying into early summer. Through 2012, the El Paso area had recorded eighteen records for the BBLH, including four winter records (in 1992, 1999, 2001 and 2010).

Winter (December through February)—2: The first winter record for the Big Bend area was an adult female found at Lajitas on 1 January 2014, captured and banded on 8 January and last observed on 18 January. This record occurred during the winter that unprecedented numbers of winter hummingbirds occurred at Lajitas that included six species and up to sixty individuals at times. The first winter record for the Davis Mountains area was an adult male first noted in the Limpia Crossing subdivision northwest of Fort Davis in November 2015, was captured and banded on 4 December and last observed in early January 2016. The following year a female wintered in upper Limpia Canyon at one of our study sites.

Spring (March through May)—7: Most of our banding records for the BBLH occurred during the spring season and all seven birds that were banded were from our JDC study sites. Adult males were banded in upper Limpia Canyon on 8 May 2009 and then on 28 May 2010. At that same location, an adult female was photographed collecting nesting material in April 2010 and then was captured and banded on 6 May. We would learn in early June the outcome of that nesting attempt. In Fort Davis, an adult female was banded on 28 May 2009. More recently, in 2018, a female BBLH was present at one of our study sites in upper Limpia Canyon. That bird was banded on 27 April and then was photographed gathering nesting material on 5 May. Even though she was observed periodically through June, there was no evidence that a successful nesting attempt had occurred. Even though we did not catch and band any birds elsewhere away from the Davis Mountains, there were documented records for the following; an adult female in Alpine on 29 March 2015, another adult female this time at CMO on 22 May 2017, and an adult male at CMO 24-25 May 2017.

Summer (June and July)—5: The 2010 nesting attempt was successful and both of the fledglings were caught and banded on the same day, on 10 June. Both birds were present at the feeders through the rest of June and into early July, and the juvenile male was recaptured on 8 July. An additional adult female was banded at that same location on 15 July, and the following year, on 25 June 2011, an adult female was banded at our study site in Fort Davis.

Early Fall (August and September)—0: A juvenile male thought to be the product of a local nest in 2008 when multiple adults were present, was photographed at one of our upper Limpia Canyon study sites on 20 August. An adult male was found and photographed at Davis Mountains State Park in 2017 during the Davis Mountains Hummingbird Celebration, returning the following year to the same location. Also in 2017, an adult male was discovered and photographed in Alpine 27-30 September.

Late Fall (October and November)—0: We produced no banding records for BBLH in late fall. Observation records pertained to one individual that lingered into the first week of October, and an adult male that was first observed in late November of 2015 and then stayed into January of 2016.

BBLH banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	obs	obs	2	5	3	obs	obs		1		obs	2		13
SBC								1	obs		obs			1
OAS							obs				obs			0
Totals	obs	obs	2	5	3	obs	obs	1	1	obs	obs	2	0	14

BBLH seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY M			obs	obs	4	obs	obs	obs	obs	obs	obs	1	5
HY M						1							1
AHY F	1		obs	1	2	1	2	obs				obs	5
HY F						1							1
Totals	1	0	obs	1	6	3	2	obs	obs	obs	obs	1	14

BBLH morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
AHY M	5	50.3 (48.6-52.7)	31.3 (30.0-33.0)	20.2 (18.8-20.9)	3.3 (3.0-3.5)
HY M	1	50.3	32.0	20.7	3.5
AHY F	7	49.8 (49.0-51.1)	30.8 (28.0-36.0)	21.6 (19.7-22.8)	3.4 (3.2-3.7)
HY F	1	50.9	31.0	21.4	2.9



Figure 33. Adult female Broad-billed Hummingbird collecting nesting material (Kelly Bryan)



Figure 34. Broad-billed Hummingbird adult female (Maryann Eastman)



Figure 35. Broad-billed Hummingbird adult male (Maryann Eastman)

White-eared Hummingbird (*Basilinna leucotis*)

Regional status: The exact status of the WEHU in west Texas, including its recently discovered breeding status, has been previously published (Bryan et al. 2014). The species is considered a rare summer resident in the Davis Mountains from late April through September, with scattered records elsewhere. For the region, there are only two records from the El Paso area including a bird that was present 12-20 October 1994, and a bird found in the Franklin Mountains on 30 June 2002. The one record from the Guadalupe Mountains was a bird found along a mountain trail on 31 May 1996. The multiple records from the Big Bend area, including the Chisos Mountains, have occurred from late April through September (Wauer 1996). That fateful day in June of 1993 that took Bryan into upper Limpia Canyon to find three WEHUs, started a long journey that has brought us to this point. The WEHU is surely one of our most special west Texas hummingbird species.

Winter (December through February)—0: There are no records for this season in Texas, and we did not encounter any during our study.

Spring (March through May)—1: All encounters during this study were from our upper elevation study sites in the JDC study area. The first arriving WEHUs in spring were observed in late April. Both male and female birds were present in May and the one banding record for the month was the female caught and banded on 29 May 2009. Upon close examination, that bird was found to be gravid (carrying an egg in her ovary) providing the first evidence of nesting in the Davis Mountains.

Summer (June and July)—8: Eight birds were captured and banded during the summer season. In June, we recorded the following: an ASY male on 9 June 2009, another ASY male on 26 June 2009, an ASY male and a female on 28 June 2010, and a HY (hatch-year) male on 30 June 2015. In July, these birds were recorded; an ASY male and a female on 16 July 2010, and a SY male on 27 July 2010. An ASY male was extensively photographed on 18 June 2015. Almost all of the above birds were present at the feeders for multiple days/months in the years in which they were banded and/or photographed.

Early Fall (August and September)—12: Of the six birds banded on 13 August 2007, three were SY males and three were females. Providing additional evidence for nesting success in 2009 (in addition to the gravid female banded in May) was a HY male captured and banded on 9 August, and an additional HY male was banded on 8 September 2009. Other early fall birds that were banded included a female on 28 August 2019 and a SY male on 7 August 2019. In 2015, a female was documented on the hummingbird cam on 4 September, and the lingering juvenile male banded back in summer was photographed on 24 September.

Late Fall (October and November)—0: No records were obtained during this study for the late fall season.

WEHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Totals
JDC	6	obs	5	5	obs		obs	1	1	obs		1	2	21
SBC														0
OAS														0
Totals	6	obs	5	5	obs	0	obs	1	1	obs	0	1	2	21

WEHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
SY/ASY M				obs	obs	3	1	5					9
HY M						1	1	1	1				4
SY/ASY F					1	1	1	5	obs				8
Totals	0	0	0	obs	1	5	3	11	1	0	0	0	21

WEHU morphometric data:

	N	Wing Chord	Tail Length	Culmen	Weight
SY/ASY M	10	55.5 (53.0-57.4)	34.5 (32.2-36.0)	17.9 (16.5-18.5)	4.0 (3.8-4.3)
HY M	3	56.3 (55.9-56.9)	35.2 (35.0-35.5)	18.5 (17.4-19.1)	3.9 (3.8-4.0)
SY/ASY F	7	51.2 (50.2-52.0)	31.9 (30.1-33.0)	18.2 (16.9-20.9)	3.6 (3.3-3.9)



Figure 36. White-eared Hummingbird adult male (Kelly Bryan)



Figure 37. White-eared Hummingbird adult female (Kelly Bryan)

Violet-crowned Hummingbird (*Leucolia violiceps*)

Regional status: Just over 80% of the twenty-two records for this tropical hummingbird in Texas have occurred in the west Texas region with fifteen of those having occurred since 2007. Past documented records for various locations in this region include; 1-12 December 1987 from the west side of El Paso, 31 October 1996 at Lake Amistad, 30-31 March 1996 along the Rio Grande near Boquillas Canyon in Big Bend National Park, a single individual wintered in northeast El Paso from 6 November 2001 through 16 February 2002, a single bird was observed and photographed at the Clay Miller Ranch west of Valentine in the Sierra Vieja range 24 May through 6 June 2002, and a bird found in northeast El Paso on 30 October 2010 and staying until late February 2011.

Just before we initiated this banding project and extending into the early years of our efforts, we noticed a change in the occurrence pattern of VCHUs. Several birds were showing up in the winter, a pattern also noted in southeastern Arizona during the same time frame. Of the eleven records from 2007 through 2011, all in the Fort Davis, Alpine and Fort Stockton areas, five occurred during the winter months. Attempts to capture and band the Fort Stockton and one of the Fort Davis birds were unsuccessful. Note that there are no records from 2012 through 2016. Details of the winter records mentioned above are found in the seasonal section below along with other records noted at various locations during our study.

Winter (December through February)—0: The following winter season records were noted during the study. First, was a bird that was first noted in Fort Davis, Jeff Davis County on 24 December 2007, but succumbed to a harsh freezing weather event on 2 January 2008. A bird wintered in Fort Stockton, Pecos County from 1 November 2008 through 8 January 2009. A bird that was photographed in Fort Davis stayed from 13 January through 13 February 2009. A juvenile bird that was captured and banded in the Davis Mountains on 11 November 2010, was present from 8 November through 21 December, 2010. A probable juvenile bird was photographed at the Christmas Mountains Oasis from 30 November to 6 December, 2011. Additional birds have been observed since 2016 including a bird photographed in Limpia Crossing subdivision northwest of Fort Davis on 22 December 2007. Finally, a bird first noted in Sanderson, Terrell County, on 13 December 2017 was found dead in the yard on 1 January 2018 after a harsh winter weather event.

Spring (March through May)—0: An adult bird photographed in upper Limpia Canyon on 23 April 2007 stands as our only spring record during the study.

Summer (June and July)—0: In 2019, two birds were found in late July providing the first summer records for the region and Texas. The first was a bird first noted on 8 July along Limpia Creek in the Davis Mountains Resort subdivision then not observed for five days, but likely returned on 15 July and stayed until 29 July. What was possibly that same individual made a one-day appearance and was photographed about two miles up canyon in upper Limpia Canyon at one of our previous study sites. What had to be a second individual was a bird found in the Limpia Crossing subdivision on 25 July and observed periodically through 17 September. Both of the above birds were well documented with photographs at all three locations.

Early Fall (August and September)—0: Fall records include a bird photographed in Alpine and present from 15 to 22 September 2007, one in upper Limpia Canyon in the Davis Mountains from 31 August through 10 October 2007 (photographed), and a bird found in Fort Davis and observed 18 August through 30 October 2008 (also photographed).

Late Fall (October and November)—1: Several birds that lingered into late fall or were first observed in late fall and lingered into winter are imbedded in the seasonal accounts above. The 2010 bird in upper Limpia Canyon was captured and banded on 11 November. The bill characteristics of that individual indicated that it was a juvenile bird.

VCHU banding totals by year and study area:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals
JDC	obs	obs	obs	1								obs	1
SBC					obs								obs
OAS	obs	obs									obs		obs
Total	obs	obs	obs	1	obs	0	0	0	0	0	obs	obs	1

VCHU seasonal banding totals and observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
AHY U	obs	obs		obs			obs	obs	obs	obs	obs	obs	obs
HY M											1	obs	1
Totals	obs	obs	0	obs	0	0	obs	obs	obs	obs	1	obs	1



Figure 38. Violet-crowned Hummingbird at CMO (Carolyn Ohl)



Figure 39. Violet-crowned Hummingbird at Fort Stockton (Kelly Bryan)

Berylline Hummingbird (*Saucerottia beryllina*)

Regional status: There are five accepted records of this tropical species for Texas. All are from the Trans-Pecos Region, including one accepted sight record from the Chisos Mountains in Big Bend National Park (18 August 1991) and four documented records from the Davis Mountains (Lockwood and Freeman 2014). All of the Davis Mountains records were recorded at our JDC study sites, three prior to the banding study being initiated and reported on herein. The first fully documented record was an immature bird present 17 August through 4 September 1997 in upper Limpia Canyon, then appearing again at the same location in 1999 (3 and 8 August) and 2000 (25 May, 4 June and 12 July). The last accepted Texas record was an immature bird in upper Limpia Canyon approximately two miles west of the above location from 25 to 28 August 2007. On the morning of 29 August, an attempt was made to capture and band that bird to confirm age and obtain morphological data but the bird was not present that morning and was not observed again.

BEHU seasonal observations:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Totals	0	0	0	0	0	0	0	obs	0	0	0	0	obs



Figure 40. Juvenile Berylline Hummingbird in the Davis Mountains in 2007 (Mark Lockwood)

Buff-bellied Hummingbird (*Amazilla yucatanensis*)

Regional status: The circumstances surrounding the unexpected occurrence of this tropical and Rio Grande Valley species in the region are as follows. On 19 October 2012 at CMO, a regularly scheduled banding session had been completed that morning. Shortly after packing up the banding gear and returning to Fort Davis, Carolyn Ohl spotted a large hummingbird that was not present during the morning banding session. Knowing that it was definitely something different, she managed to get a couple of documentary photographs of the bird as it fed on acanthus flowers. She was sure it was an *Amazilla* of some kind but was hesitant to say it was a BUFH since she was also considering Berylline Hummingbird (in the genus *Amazilla* at the time). Once the photos were downloaded and sent for examination, it was certain that she had found the first record of BUFH for the region. The next morning, on 20 October, a trap was set up on the feeder identified by Ohl as the one preferred by the bird. Usually, BUFHs tend to be trap shy based on previous experience with the species within its normal range. Within about ten minutes the bird came in and approached the feeder in the trap and was captured, despite the fact that none of the other feeders were taken down or covered. Examination of the

bird's plumage and characteristics (especially corrugations in the upper mandible of the bird's bill) revealed that it was a juvenile female, one that was likely less than a month out of the nest that produced it. Not only does the record represent a first for the region, but it represents the westernmost record of the species in the US.

BUFH seasonal observations and banding totals:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Totals										1			1



Figure 41. Buff-bellied Hummingbird feeding on acanthus at CMO (Carolyn Ohl)



Figure 42. Buff-bellied Hummingbird juvenile female in hand after banding (Kelly Bryan)

Foreign Recaptures and Encounters

Here we detail the list of previously banded individuals that were caught or found during the course of our study. Included here are birds that were encountered by others at various locations as noted below or caught by us at our study sites. We were fortunate to experience a good number of records during the course of our sampling efforts.

Foreign recaptures of birds not originally banded in west Texas:

Table 3. Foreign recaptures

Species	Date	Recapture Location	Orig. Band Date	Original Band Location
Rufous	19 Aug 2009	Fort Davis	16 May 2009	Dunster, B.C.
Rufous	27 Jul 2010	Upper Limpia Canyon	9 May 2009	Dunster, B. C.
Rufous	6 Aug 2010	Davis Mts. Preserve	21 Jul 2007	Snoqualmie Pass, Wash.
Rufous	8 Aug 2010	Upper Limpia Canyon	21 May 2010	Bitterroot Val., Montana
Broad-tailed	10 Sep 2010	Upper Limpia Canyon	26 May 2010	Estes Park, Colorado
Rufous	27 Jul 2011	Upper Limpia Canyon	2 Jul 2008	Vernon, B. C.
Black-chinned	23 Sep 2011	Christmas Mts. Oasis	17 Aug 2011	Los Alamos, New Mexico
Rufous	8 Aug 2012	Davis Mts. Preserve	17 May 2008	Spokane, Washington
Black-chinned	9 Jul 2013	Upper Limpia Canyon	8 May 2012	Christoval, Texas
BCHU X RTHU	25 Aug 2014	Lajitas	31 Aug 2012	Christoval, Texas
Rufous	25 Aug 2017	Davis Mts. Preserve	29 Jul 2017	Grand Lake, Colorado
Rufous	23 Jul 2018	Upper Limpia Canyon	23 Jan 2018	Gulf Breeze, Florida

Foreign encounters of birds originally banded in west Texas (*found dead):

Table 4. Foreign encounters

Species	Encounter Date	Encounter Location	Orig. Band Date	Original Band Location
Calliope	20 Jul 2010	Estes Park, Colorado	23 Aug 2009	Fort Davis
Broad-tailed*	14 Jun 2010	Westcliffe, Colorado	3 Sep 2009	Upper Limpia Canyon
Rivoli's	4 Sep 2010	Chiricahua Mts., Arizona	6 Oct 2009	Upper Limpia Canyon
Rufous	13 Apr 2012	Northridge, California	31 Aug 2011	Upper Limpia Canyon
Black-chinned*	7 Apr 2012	Mason, Texas	18 Aug 2008	Upper Limpia Canyon
Broad-tailed	15 May 2013	Rocky Mts. Bird Obs., Col.	8 Oct 2010	Upper Limpia Canyon
Black-chinned*	22 May 2013	Arabela, New Mexico	1 Sep 2011	Upper Limpia Canyon
Rufous	4 Jul 2013	Chenega Bay, Alaska	27 Aug 2012	Upper Limpia Canyon
Rufous	28 Dec 2013	Covington, Louisiana	24 Sep 2013	Christmas Mts. Oasis
BCHU X RTHU*	15 Apr 2014	Beaver, Oklahoma	27 Aug 2012	Christmas Mts. Oasis
Rufous**	24 Jun 2014	Chenega Bay, Alaska	27 Aug 2012	Upper Limpia Canyon
Rufous	25 Jul 2014	Shelly, Idaho	28 Jul 2011	Upper Limpia Canyon
Rufous	16 Jan 2015	Lake Jackson, Texas	20 Aug 2014	Upper Limpia Canyon
Rufous	23 Jan 2015	Lake Jackson, Texas	24 Aug 2014	Upper Limpia Canyon

**Same individual as the 4 July 2013 encounter at the same location.

Hybrid Hummingbirds

Hybrid Hummingbirds—The breeding strategy of male hummingbirds is responsible for a significant production of hybrid individuals within the family. Since there is no pair bonding in hummingbirds, male birds aggressively pursue multiple females during the breeding season. In areas and/or regions where two or more species overlap, hybridization is not uncommon. In fact, it is just as common within species of the same genera (intraspecific hybridization) as it is between species of two different genera (interspecific hybridization). The most “famous” hybrid we encountered during the study was an adult male Black-chinned X Broad-tailed hybrid in upper Limpia Canyon. That bird was originally banded in August of 2006 by Bob Sargent as a hatch-year Broad-tailed Hummingbird because it showed the basic characteristics of a juvenile male. When it was recaptured in 2008 as an adult, it was clear that the bird was a hybrid individual. This same bird returned for the next six years to the same location and occupied a breeding territory. It was observed displaying to females of both species of its parental parentage, and in 2012 was the subject of a comparative study of his display patterns compared to pure BTLH and BCHU males (Clark et al. 2012). His age at last observation in 2014 (8 years) should stand as the longest known living hybrid hummingbird.

Many of the hybrid individuals we encountered were adult male birds. Obviously, it is much easier to discern hybrid characteristics in adult male birds than in juvenile or adult female birds. One success story in identifying a hybrid individual in juvenile plumage occurred on 24 July 2011 at CMO. Notes added to a juvenile bird’s data that day, banded as a hatch-year male Black-chinned Hummingbird, included “possible hybrid, bill slightly de-curved, light cinnamon wash on the flanks”. When recaptured as an adult on 26 Jun 2013 it was obvious that the individual was indeed a hybrid bird, a Black-chinned X Lucifer hybrid.

We also had two interesting encounters with banded male Black-chinned X Ruby-throated hybrids. We caught and banded an adult male hybrid of this combination at CMO on 27 August 2012. Two years later we were notified that the bird had succumbed to a spring winter weather event on 15 April 2014 in Beaver, Oklahoma. The central Oklahoma location where the bird was found was squarely in the known hybrid zone for the two species. In a similar circumstance, we caught an adult male hybrid of this combination while banding at Lajitas on 25 August 2014. That bird was originally banded as a juvenile bird (identified as a BCHU due to lack of any colored gorget feathers) on 31 August 2012 at Hummer House in Christoval, Texas. There was no way to know whether the bird was reared locally or was a migrant from points north of the Concho Valley.

Without a doubt, the most interesting and intriguing hybrid hummingbird noted during the study was a bird first observed on 29 April 2009 during the third year of our study. A medium large male hummingbird was found that day by the Eastmans at their residence in Cochise Canyon (a part of upper Limpia Canyon). As with any hybrid bird, especially one not examined in hand, we must postulate the parental combination based solely on plumage characteristics. In this case, the combination of a distinct, but not bold, ear stripe, an iridescent green gorget, and intermediate size between the suspected parental species, led to the suggestion that it was a Rivoli’s X White-eared hybrid. A photograph of this strange looking bird was previously published (Lockwood et al. 2009). An attempt to capture the bird and examine it in hand was not successful.

Below we present the purported hybrid hummingbirds we encountered during this study. Since no DNA samples were taken from any of these birds, the hybrid combinations we list are based on our experience and best opinion. All but two of the forty-two birds presented in Table 4 were banded. Each of these birds was carefully examined and the parental species were suggested based on weighing multiple factors such as plumage characteristics, measurement data if banded, color (especially gorget color), feather shape (especially the tail feathers), and overall size. If you examine the data below, you will find that the most common hybrid combination we encountered was that between a Black-chinned Hummingbird and a Broad-tailed Hummingbird. We banded thirteen individuals, all but one at our study sites in the upper Limpia Canyon area of the Davis Mountains. Most, if not all of these birds were thought to be summer-resident birds in the habitat found there. The second most common hybrid combination was between Black-chinned Hummingbird and Ruby-throated Hummingbird. All of these birds were migrants.

Table 5. Hybrid Hummingbird observations and banded birds

Date	Hybrid combination	Age	Sex	Location	How	Notes/ID factors
20 Aug 2006	BCHU X BTLH	HY	M	ULC	B	Ph; Last observed in 2014
Spring 2009	RIHU X WEHU	AHY	M	ULC	O	Ph; 29 Apr to 11 May
25 Jul 2009	BCHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
29 Sep 2009	ANHU X ALHU	AHY	M	Fort Davis	B	Plumage/tail feather shape
20 Aug 2010	CAHU X RUHU	AHY	F	ULC	B	Plumage/measurements
26 Aug 2010	BCHU X BTLH	AHY	M	Fort Davis	B	Plumage/gorget color
15 Sep 2010	RTHU X BCHU	HY	M	CMO	B	Gorget feather color
1 Oct 2010	CAHU X BTLH	HY	F	ULC	B	Plumage/measurements
11 May 2011	BCHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
5 Aug 2011	BCHU X BTLH	AHY	F	ULC	B	Plumage/measurements
8 Jul 2012	BCHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
27 Aug 2012	RTHU X BCHU	AHY	M	CMO	B	Ph.; plumage/gorget color
31 Aug 2012	BCHU X LUHU	HY	M	CMO	B	Plumage/measurements
18 Sep 2012	CAHU X RUHU	HY	M	ULC	B	Plumage/gorget color
2 Aug 2013	BCHU X BTLH	HY	M	ULC	B	Plumage/gorget color
8 Aug 2013	ANHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
26 Aug 2013	BCHU X BTLH	HY	U	ULC	B	Plumage/measurements
27 Aug 2013	RTHU X BCHU	AHY	M	CMO	B	Plumage/gorget color
15 Jul 2014	BCHU X LUHU	AHY	M	ULC	B	Plumage/gorget color
25 Jul 2014	CAHU X RUHU	AHY	M	ULC	B	Plumage/gorget color
8 Aug 2014	ANHU X RUHU	AHY	M	ULC	B	Plumage/gorget color
22 Aug 2014	RUHU X BTLH	HY	M	DMP	B	Plumage/gorget color
25 Aug 2014	RTHU X BCHU	AHY	M	Lajitas	R	Plumage/gorget color
9 Sep 2014	RTHU X BCHU	HY	M	CMO	B	Gorget feather color
9 Sep 2014	RTHU X BCHU	HY	M	TS	B	Gorget feather color
10 Sep 2014	RTHU X BCHU	HY	M	DMP	B	Gorget feather color
25 Sep 2014	RTHU X BCHU	HY	M	CMO	B	Gorget feather color
26 Jan 2015	ANHU X RUHU	AHY	F	Lajitas	B	Plumage/measurements
3 May 2015	BCHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
17 Jul 2015	BCHU X BTLH	AHY	M	ULC	B	Plumage/gorget color
17 Jul 2015	BCHU X BTLH	HY	M	ULC	B	Plumage/measurements
8 Aug 2015	ANHU X ALHU	AHY	M	ULC	B	Plumage/gorget&crn color
24 Aug 2015	BCHU X ANHU	AHY	F	ULC	B	Gorget pattern/plumage
1 Sep 2015	BTLH X RUHU	HY	M	CMO	B	Plumage/measurements
22 Sep 2015	RTHU X BCHU	HY	M	Lajitas	B	Gorget feather color
21 Dec 2015	CAHU X ANHU	HY	M	Lajitas	B	Gorget feather color
28 Jun 2016	COHU X BCHU	AHY	M	ULC	B	Plumage/gorget&crn color
22 May 2018	BCHU X BTLH	AHY	F	ULC	B	Plumage/measurements
Sum. 2018	BTLH X LUHU	AHY	M	ULC	O	Ph., plumage/gorget color
26 Jul 2018	BCHU X LUHU	AHY	M	ULC	B	Plumage/gorget color
4 Aug 2018	CAHU X RUHU	AHY	M	ULC	O	Ph., Plumage/gorget color
12 Aug 2018	BCHU X BTLH	HY	M	ULC	B	Gorget feather color
24 Aug 2018	RTHU X BCHU	HY	M	ULC	B	Gorget feather color

ULC = upper Limpia Canyon; B = banded by us; O = observed; R = recaptured by us



Figure 43. Hybrid Allen's X Anna's Hummingbird adult male in Fort Davis (Kelly Bryan)



Figure 44. Hybrid Rufous X Anna's Hummingbird adult male in the Davis Mountains (Maryann Eastman)



Figure 45. Hybrid Rufous X Calliope Hummingbird adult male (Kelly Bryan)



Figure 46. Hybrid Lucifer X Broad-tailed Hummingbird adult male (Kelly Bryan)



Figure 47. Hybrid Lucifer X Black-chinned Hummingbird adult male (Maryann Eastman)



Figure 48. Hybrid Costa's X Black-chinned Hummingbird adult male (Maryann Eastman)



Figure 49. Hybrid Black-chinned X Broad-tailed Hummingbird adult male (Maryann Eastman)

Discussion Topics and Summary

Impacts of the 2011 Drought: Beginning in October of 2010, a lack of precipitation for the region and the state threw the climate into a severe drought cycle. In the mountains of west Texas east through the hill country conditions were exceedingly dry. From May 2011 through January 2012, Jeff Davis County received a paltry 5.5 inches of moisture (www.ncdc.noaa.gov), the driest on record. Late winter and spring of 2012 brought little relief. The two-year period produced only 16.4 inches of moisture, the driest such period since 1910. There is no doubt that the drought, along with three catastrophic fires that occurred during this event burning through much of the available montane habitat in the Davis Mountains, and drought induced outbreaks of western pine-bark beetles had a direct effect on several species. The fires were particularly impactful to RIHU nesting habitat in Madera Canyon on the Nature Conservancy's Davis Mountains Preserve. During the first four years of the study in upper Limpia Canyon prior to the drought event, 154 birds (61%) were caught and banded compared to 97 birds (39%) during the last nine years of the study.

Like other summer-resident hummingbirds, the drought had an adverse effect on BTMOs as well. During the spring and summer of 2011, birds were not found in their normal haunts in Boot Canyon and the higher elevations of the Chisos Mountains due to lack of insect and nectar resources. Birds congregated at the lone feeder site in the mountain range, in the Chisos Basin residential area (a restricted area) where 15 to 20 birds were taking advantage of the sugar-water feeders provided there. BTMOs do not breed in the vicinity of the Chisos Basin due to the habitat located there and its lower elevation. At least two birds wandered out of the Chisos Mountains and were found at feeder sites in the lower desert in the nearby Christmas Mountains; coincidentally, both study sites. Likely, more individuals followed suit that year but showed up at locations lacking knowledgeable observers. During normal years, do not expect this species to occur at lower elevation locations in spring, summer and fall.

Yet another interesting aspect of the effect that the drought was its impact on LUHU overall numbers and reproductive success. During 2011 and extending into the spring of 2012, nectar producing flowers were non-existent. Insect populations were extremely scarce as well. Considering the fact that the LUHU is a desert-adapted species, one might think that the drought had no effect at all on this hummingbird. Not so. If you just look at the new birds banded per year, some definite trends are apparent. First, it was somewhat unexpected to see the large number of adult birds congregating at the feeders, especially the number of adult males, just trying to survive the drought conditions. Also note that the number of new adult birds caught and banded in the year following the drought was just five. Second, we suggest that the number of birds moving up in elevation to our JDC study sites during the drought was a predictable trend. Third, the lack of reproductive success is clearly demonstrated in the banding totals. You can clearly see the trends in reproductive success in the banding data for the eight years of comprehensive efforts at our SBC study sites. Note that for the two highest total years, 2011 was due to 93% adult birds and 2015 was due to 72% juvenile birds. The following table presents the annual totals (from 2009 to 2016) for new birds that were banded in the SBC study area.

Table 6. SBC banding totals for LUHU—by year, age and sex

	AHY M	AHY F	HY M	HY F	TOTAL	% AHY	% HY
2009	15	15	23	12	65	46	54
2010	15	34	29	15	93	53	47
2011	49	66	7	2	124	93	7
2012	2	3	13	10	28	18	82
2013	11	11	32	12	66	33	67
2014	20	22	23	22	87	48	52
2015	33	17	82	45	177	28	72
2016	26	12	10	4	52	73	27

As with other species mentioned, BBLH numbers were also noticeably affected by the extreme drought conditions. Before that event in 2008, one of our study sites was hosting as many as five different individuals at the same time. Nesting likely occurred that year as a recently-fledged juvenile male was photographed in August. Nesting was fully documented there two years later in 2010 (see Bryan et al. 2014). Immediately after the drought occurred, only a few lone individuals were noted at scattered locations. Thankfully, by 2016 the species was showing signs of returning to its pre-drought status with sightings of multiple individuals at various locations, especially up in the Davis Mountains area. A female gathering nesting material in May of 2018 was a positive sign that additional nesting attempts might occur in the future.

Winter hummingbirds: Another situation that we were fortunate to experience during our study was an amazing presence of winter hummingbird abundance and diversity in the Study Butte area and at Lajitas during the winter of 2013/14. We added new sampling sites at these two areas in 2012 after trying several other potential locations in 2010 and 2011. Just as many species were showing signs of recovery from the drought of 2011 and early 2012, we noticed an increased winter presence in the lower desert and turned our attention to our three southernmost SBC study sites, in the southern rim of the Christmas Mountains, the Far Flung casitas in Study Butte and The Resort at Lajitas. Our timing could not have been better. In 10 days of winter season banding at these locations, we caught and banded 87 new birds of 8 species and caught an additional 37 individuals of 3 species that were previously banded. Most of the returns were banded in late fall, but many were banded the previous year (winter). We caught and banded one each: Blue-throated Mountain-gem, Lucifer Hummingbird, Black-chinned Hummingbird, Costa's Hummingbird, Allen's Hummingbird, and Broad-billed Hummingbird. In addition to those six individuals, we caught and banded 63 Anna's Hummingbirds and 21 Rufous Hummingbirds. We suggest that this example of winter season abundance and diversity represents the greatest ever documented for any given area of Texas and perhaps the US.

As compilations of regional banding efforts get published, we learn more about the movements of our hummingbirds across the US. Only when these data make an appearance in the public domain does the birding community receive the education that they might provide. Hummingbird populations are so dynamic, that it takes a combined effort across the US to fully understand what is going on. Often, we still do not completely understand. If you just looked at winter populations, movements and trends, that would be challenging enough. Certainly, the distribution of winter species here in west Texas that were documented by this study was significant, and one that was not well understood prior to our study. Twelve out of the eighteen species included herein were recorded during the winter months. This includes the Blue-throated Mountain-gem, Rivoli's Hummingbird, Lucifer Hummingbird, Ruby-throated Hummingbird, Black-chinned Hummingbird, Anna's Hummingbird, Costa's Hummingbird, Rufous Hummingbird, Allen's Hummingbird, Broad-tailed Hummingbird, Broad-billed Hummingbird, and Violet-crowned Hummingbird. The December 2009 record of Rivoli's Hummingbird was the first winter record for Texas, and the December 2013 record of a Lucifer Hummingbird was the first winter record for Texas and the US. Winter records for BTMO and RTHU were the first for the region. The twelve species recorded in winter during this study exhibits greater diversity than most regions of the US experience at any time of year. A comprehensive banding study of winter resident species in the southeast Gulf Coast region of Florida and Alabama over a ten-year period resulted in ten species being documented (Bassett and Cubie 2009). This in a region that, as recent as 50 years ago, mainstream ornithologists proclaimed had no significant winter hummingbird diversity.

Spring and fall migration: Similar to many western localities in spring, hummingbird migration in west Texas is, in reality, not very impressive. Some species, such as Lucifer Hummingbirds in the desert and Broad-tailed Hummingbirds in the mountains, can first appear the last week of February. March brings a "trickle" of birds into the region at most locations and even April and May are not much more dynamic for those individuals just arriving in the region or continuing their migration north of the region. Breeding activities definitely begin early in at least three species found here, in the Lucifer Hummingbird in the lower desert, the Broad-tailed Hummingbird in the mountains, and the Black-chinned

Hummingbird in almost all habitats. During the duration of this study, we were not able to document breeding success in the above three species (or any other species) prior to late May as evidenced by the appearance of the first juvenile birds the last week of the month. However, a similar train of thought cannot be expressed about fall migration. Simply stated, fall migration is extremely dynamic, especially in late July, August and early September. The greatest abundance of individuals occurs during that time frame in which numbers are dominated by Black-chinned Hummingbirds, Broad-tailed Hummingbirds, Rufous Hummingbirds and, at times, Calliope Hummingbirds. Abundance almost always declines by mid-September; however, we found that species diversity remains significantly high through October. This time-frame presents visiting birders with potentially great experiences given the cooler temperatures and greener landscapes provided that the monsoon season met expectations.

Uncommon nesting species: We previously listed the three most common nesting species for the region, the Lucifer Hummingbird, Black-chinned Hummingbird, and the Broad-tailed Hummingbird. Of these three, only the Lucifer Hummingbird's nesting distribution requires further study and better definition. In summarizing all of our data, we feel compelled to characterize the remaining species for which nesting has been documented by us or others. As previously stated, the Blue-throated Mountain-gem is a common nesting species in the Chisos Mountains of Big Bend National Park in southern Brewster County. Although nesting is suspected in both the Davis and Guadalupe Mountains, to date there is no documentation to support that suspicion. The Rivoli's Hummingbird is *the* large hummingbird nesting in the Davis Mountains and to a lesser extent in the Guadalupe Mountains as well. There are no known nesting records from the Chisos Mountains. The number of Rivoli's Hummingbirds in the upper elevations of the Davis Mountains was impressive prior to the drought of 2011 and the impacts of wildfires and pine bark beetle infestations. Perhaps with time and recovery, the upper elevation habitats will once again support those large summer-resident populations we experienced early in the study. The same can be said for the rarest nesting hummingbird species in Texas, the Broad-billed Hummingbird and the White-eared Hummingbird. As stated in the species accounts, the exact status of both species has been previously published (Bryan et al. 2014). We suggest that, with recovery of the montane habitat in the Davis Mountains, both species have the potential to return to their pre-2011 status, including more nesting activity. The upper elevations of the Davis Mountains are the only location in Texas where nesting has been documented in these two species.

Our eighth and final nesting species, the Anna's Hummingbird, undoubtedly has the greatest potential to become the next "regular" nesting species in the region and Texas. The species' irregular nesting cycle and its abundance most years during late fall and the winter months from November through January, make it a prime candidate for the discovery of additional nesting records. Our banding data provides evidence that some of these birds are staying extended periods of time in west Texas, and the birds that overwinter here are subject to nesting in January, February and March given adequate food resources and moderate weather conditions. The fact that they have a totally different breeding cycle than all of our other species, means that you do not wait until late spring or early summer to look for any nesting activity. In the Sonoran Desert nesting has occurred as early as November.

The first ANHU breeding record for Texas was a female photographed sitting on a nest in Musquiz Canyon near Fort Davis in April of 1976 (Schmidt 1976). It was not until 2000 that the second nesting record was found and photographed. It was in El Paso in February and early March, followed by another nesting attempt, also in El Paso in early March of 2007 in western portions of the city. More recently, two just fledged male ANHUs showed up at two of our JDC study sites. The first was a bird photographed on 1 June 2015 and the second bird was first photographed on 17 April 2018 and later captured and banded on 15 May. Both birds stayed an extended period of time. Finally, on 1 February 2019, Deb Manley found a female ANHU attending a nest in Cottonwood Campground in Big Bend National Park. The nest was monitored until the nestlings were ready to fledge. That was followed in early March by a second nesting very close by, presumably by the same female ANHU. The discovery and documentation of this nest record gives all of us renewed interest in looking a bit harder for more nesting Anna's Hummingbirds in future years.

Lucifer Hummingbirds: Although it was the White-eared Hummingbird that piqued our enthusiasm for this project, once we established a network of study sites in the SBC study area we were determined to learn all we could about the Lucifer Hummingbird. We were not disappointed with the data we were able to collect on this species. We gained new insight into the species' site fidelity, one that was much greater than we could have predicted compared to return data for other species. There will be additional papers on the Lucifer Hummingbird as a result of our extensive database. One providing detailed information on aging and sexing characteristics of adults and juveniles is already in the works. Another paper digging deeper into the entire database collected on the species, especially detailing all of the return statistics, may be in the works in the future. We found it immensely interesting the species' adaptation to annual climatic patterns and changes in food resources. Quite frankly, if not for the feeders provided at our study sites in addition to those provided by other residents of the Terlingua Ranch area, the mortality rate for this desert hummingbird could have been significant during the drought of 2011 and 2012. For the entire project, the number of Lucifer Hummingbirds that we were able to capture and band really surprised us. Prior to 2008, only seventeen birds were ever banded in Texas and only one-hundred and five birds were banded in the US (fide BBL). The fact that we were successful in banding 882 individual LUHUs continues to amaze the team.

Anna's and Allen's Hummingbirds: Two species encountered during the fall and winter seasons provided us with valuable data on their occurrence in the region, but never gave us any clues about their origins. The Allen's Hummingbird has an annual pattern of occurrence that aligns with most other western migratory species. It first appears in fall in July then migrates through the region in August, September and October. By November any individuals still around tend to overwinter at selected locations, except that none were noted at the highest elevation study sites in the JDC study area. Birds were documented in Fort Davis, Alpine and at several of our SBC study sites, especially at Lajitas. This pattern of occurrence was unknown prior to our current study. As stated in the species account above, it is unknown exactly where these birds originate from along the west coast of the US. Anna's Hummingbirds have a similar pattern except that they initiate their fall migration about three months later and normally exhibit a totally different breeding cycle, one that can start in December with females attending nests from January through March. As with the Allen's Hummingbird, it is unfortunate that we were not able to experience a foreign encounter considering the common occurrence of the species in west Texas in November, December and January. However, the fact that Anna's Hummingbirds are becoming more regular at other times of the year, albeit in small numbers, is a possible precursor to a major shift in occurrence for this species. The appearance and documentation of fresh juvenile birds in spring and early summer, along with occurrence of adult birds (both males and females) from June through early fall, supports events like the recent discovery of another confirmed nest in Texas. We predict that it is just a matter of time until the Anna's Hummingbird becomes a rare but regular nesting species in west Texas. It is possible that it already is!

White-eared Hummingbirds: As stated elsewhere in this paper, the drought of 2011, subsequent wildfires and significant outbreaks of western pine bark beetles in many areas of the range severely affected the status of several species of Davis Mountains hummingbirds. The WEHU was definitely one of those species. Prior to those events, WEHU populations had built up to a significant level with 15-20 birds present the summer of 2007, the same year we caught and banded six individuals. The breeding record was obtained two years later, in 2009, with a gravid female (carrying an egg in her ovary) caught and banded on 29 May and just fledged juvenile males caught and banded on 9 August and 8 September. An additional just fledged juvenile male was captured and banded at that same location on 30 June 2015, a year in which both male and female birds were present. Providing evidence that some of these individuals return to the same area in subsequent years, one of the male birds banded in 2007 was caught again on 3 July 2009, and another male, originally banded as a second-year bird on 20 August 2014, was recaptured in full adult plumage (after second-year plumage), on 25 June 2015. That same bird returned in 2016 and was present from at least 27 May through 9 August. Finally, a juvenile male originally banded on 30 June 2015 was still present and photographed three months later on 24 September.

One item of potential debate among hummingbird banders concerning this predominately Mexican species is aging characteristics. Similar to several other “borderland” hummingbird species, the bulk of the population in Mexico is resident. Only the northern portions of the species’ breeding population withdraw back into interior Mexico in winter. Therefore, our WEHUs exhibit an annual pattern much like other species that have a similar distribution (summer resident here, winter in Mexico). Our birds normally arrive in spring in May, spend the summer in west Texas and then migrate out (south) in early fall by the end of September. Our birds have a plumage and molt cycle similar to other species with basically the same annual occurrence patterns (the exception is the ANHU). We do not know precisely the breeding cycle of the resident portion of the population (especially, if they breed year-round); however, we do know our birds. Our experience with just twenty-one individuals of this species seems, based on everything we know about hummingbird plumage and molt cycles, to provide us with enough information to make the following statements. Juvenile birds in summer and fall always have fresh juvenile plumage (unlike adult plumage, especially in male birds), fresh unmolted flight feathers, and fully corrugated (grooved) upper mandibles. We caught three such birds during our study. Adult WEHUs exhibit older worn plumage by mid-summer, have ungrooved upper mandibles and most birds (if not all) begin their flight feather molt in Texas prior to migrating south in early fall. The problem is that adult birds with these last characteristics clearly have two plumage forms, especially in male birds. We suggest that our birds exhibiting incomplete adult plumage but clearly have worn plumage, ungrooved bills and are showing primary flight-feather molt have to be second-year (SY) birds. Therefore, birds in full adult plumage that otherwise exhibit those same characteristics should be aged after second-year (ASY) birds. This assumption seems to support, in part, the aging characteristics suggested by Pyle (1997). The only problem with this assumption is this. What if a WEHU that fledged in Mexico during winter decided to migrate to west Texas in spring? That bird would definitely have a different molt and plumage cycle. We suggest that that scenario has not occurred in our WEHU population.

Data on “Green-backed” Rufous Hummingbirds: One interesting aspect of male RUHUs, and one that is of keen interest among the birding community, is the amount of green, if any, in the backs of adult males. This issue is front and center to the proper identification in the field of green-backed RUHUs versus adult male ALHUs. A lot of discussion has occurred in the past on this issue; however, one primarily based on birder observations and/or photographic evidence. With today’s digital photography, the finer marks of identification in the tails of these adult male birds (and juvenile male birds) can often be confirmed given a proper tail spread photograph. However, as the project progressed, we decided to implement a protocol to judge the amount green, when present in the backs of adult male birds. That protocol was to estimate the percent of green from the base of the nape to the upper part of the rump. In a sample of almost three hundred adult male birds, we recorded the following results.

- <5% - 178
- 5 to 10% - 44
- 11 to 20% - 35
- 21 to 40% - 21
- >40% - 17

Out of the 178 birds with less than 5% green, 127 or 71% had no green at all (43% of the entire sample). Of the 17 birds with greater than 41% green, 6 had 60% or more. The photo below presents two birds for comparison; on the left is a male RUHU that had the most green (70-80%) of any bird caught during the twelve-year study, compared to a more typical RUHU with only one green back feather. These data should provide any serious reader of this work with a better perspective of this issue.



Figure 50. Comparison of a “Green-backed” Rufous Hummingbird with a typical bird (Kelly Bryan)

Site fidelity and selected significant return data: One remarkable aspect of our LUHU data was the number of returns we recorded. Normally, hummingbird banders can expect for approximately 10-15% of their banded birds to return and get recaptured in subsequent seasons and/or years. With this species, we experienced a remarkable return rate of previously banded individuals. Through the end of 2016 at just our SBC study sites, we recaptured 951 previously banded birds represented by 397 different individuals. Considering the fact that we banded 882 different LUHUs, that amounts to a 45% return rate. In the SBC study area, we were able to recapture two seven-year-old birds, the first a male (H47721) that was originally banded on 16 August 2009 (as an adult) and recaptured on 3 November 2015, and the second a female (H48590) that was originally banded as an adult on 7 May 2009 and recaptured on 7 July 2015; in the JDC area one male bird (P30109) banded on 20 August 2016, returned to the location where it was banded on 24 August 2019 as a four-year-old bird. Another remarkable statistic that seemed to defy expectations, we only exchanged one banded bird between the SBC study sites and the JDC study sites. A juvenile male caught and banded at the Davis Mountains Preserve on 12 August 2015, appeared thirteen days later in a trap at CMO.

We experienced two very interesting encounters with previously banded BCHUs. The first was an adult female that we first banded in upper Limpia Canyon of the Davis Mountains on 18 August 2008. That bird was found dead on a ranch just north of Mason, Texas on 7 April 2012. The distance between the Davis Mountains and Mason, Texas is approximately 300 miles, but more importantly almost due east of the original banding location. The second has a similar, but obviously, a reverse tale. On 8 May 2012, we banded an adult male BCHU while conducting some bander training in Christoval, Texas. That previously banded bird was recaptured in upper Limpia Canyon of the Davis Mountains on 9 July 2013. The distance between the banding site and the recovery site is approximately 220 miles, almost due west from the original banding location. These east-west and west-east movements of these two birds give us a new perspective on the dynamic nature of hummingbird migration and movements, one that we still have much to learn.

The ANHU is species that experienced a high degree of site fidelity back to our study sites, especially at our SBC locations. On 12 November 2013, we recaptured R99072 at CMO, an adult female that was originally banded at the same location as a HY (juvenile) bird on 30 October 2008. That bird was five years old at the time it was recaptured. Going a bit longer, R99063 another female was recaptured at CMO on 2 November 2014 and was originally banded as an adult on 30 October 2008. That time frame made this female at least seven years old. In the SBC study area, we experienced the following returns of one year or more; 21 birds at least one year after originally banding them, ten birds two years later, and five birds three years later. At our JDC study sites, we only caught two birds that were originally banded the previous year prior to their recapture. However, at one of our JDC study sites, an adult female wearing J31186, was initially captured and banded on 26 July 2016, and recaptured at the same location on 4 November 2016.

We also experienced a remarkable return rate of our banded RUHUs back to our banding sites, two-thirds of which were just passing through again during fall migration. In discussions with other hummingbird banders in the western US, most stated that recaptures of migrant RUHUs in subsequent years were not very common. Out of 64 birds that returned to one of our banding sites and were recaptured a year or more later, 42 were fall migrants and 22 were winter residents. Out of the 42 returning migrants, 24 were recaptured a year after they were originally banded; 11 two years later; 4 three years later; 1 four years later; and 2 five years later. Out of the 22 wintering birds, 17 were recaptured a year later; 3 two years later; and 2 four years later. These data show remarkable site fidelity in these individuals, especially in those birds that were simply passing through one of our study sites during fall migration.

We can add to the mix an interesting encounter with one of our banded ALHUs. It was first captured and banded as an adult male in a residential area of Alpine on 31 October 2009. Nine months later during the onset of fall migration, on 30 July 2010, it was recaptured by us during one of our regularly scheduled banding sessions in upper Limpia Canyon in the Davis Mountains. Thirty-three days later, we received a call from Carolyn Ohl that she had a banded adult male ALHU in her yard in Alpine. An attempt to capture him to verify his band number completely failed—he was wise to that ole trap on his feeder! Carolyn was determined to find out the bird's band number, so she proceeded to take a series of digital pictures of the band on the bird's leg from a nearby window of her house. Sure enough, it was that same individual we had encountered in the Davis Mountains just over a month prior. Two more returning birds provide evidence to the fact that many of these birds likely return year after year to the same locations. An adult male banded in Fort Davis on 7 August 2009 lingered through November then returned to the same feeder on 13 August 2010, lingering until 10 December. Yet another bird, banded as a juvenile in Alpine on 11 October 2010 returned as an adult on 11 August 2012 to the same location.

More on Rufous movements: We discussed above the remarkable return of 42 banded RUHUs back to our study sites where they were originally banded. Since the region as a whole is strategically located on the eastern edge of the “Rocky Mountains” flyway, the Davis Mountains are a convenient jumping off point for birds migrating due south in fall to traditional wintering areas in central and southern Mexico. Without a doubt, the bulk of the population takes this route. However, a great debate has materialized among hummingbird researchers and other ornithologists in general as to the origins of RUHUs ending

up east of this flyway. These birds, at some point during their fall migration, must turn southeast or even due east to arrive at winter destinations from central Texas, east along the Gulf Coast states all the way to Florida. Some have also speculated that individual birds could possibly enter Mexico only to turn back to the northeast and access eastern destinations by moving along the coastal plains of the eastern Mexico and the US. Perhaps these birds jump off to the Sierra Madre Oriental in eastern Mexico, a route that takes them close to the eastern Gulf Coast of Mexico. The only way to be sure exactly where these “eastern” wintering RUHUs originate from is through banding recoveries.

We were fortunate to be involved in four such encounters of banding birds to and from eastern locations. The first was a juvenile male RUHU wearing band number J07436 that was originally banded on 27 August 2013 at CMO. That bird was recaptured by Nancy Newfield and crew in Covington, Louisiana on 28 December 2013, some 800 miles due east of the original banding location. It seems unlikely that this bird took a 90-degree left hand turn at CMO and flew directly east to Louisiana. The second and third encounters are somewhat related as the following information will reveal. During normal banding operations at one of our study sites in upper Limpia Canyon, single juvenile male and female RUHUs hummingbirds (wearing J08747 and J08874) were banded on 20 and 24 August 2014. Both birds were recaptured in Lake Jackson, Texas by Sue Heath on 16 January and 23 January 2015 respectfully. Lake Jackson is approximately 540 miles east-southeast of the original banding location in the Davis Mountains. So, what route did these two birds take to end up on the upper Texas coast? Our final encounter of a banded bird east of our west Texas study sites was one that we caught in upper Limpia Canyon on 23 July 2018. This adult female (K14395) was originally banded by Fred Bassett on 23 January 2018 in Gulf Breeze, Florida, approximately 1,015 miles east of the Davis Mountains.

Final comments: Scientific publications strive to provide complete answers to the research-based hypotheses that initiated the investigations to begin with. Why conduct research on birds if we do not collect and analyze data to answer those questions? Hummingbirds present a particular challenge to ornithologists in this hemisphere when population studies are attempted. Most hummingbirds are very small and very fast, and occupy a unique niche within our natural world; their numbers make them a challenge to quantify by simple observation, not to mention the challenge of making correct identification of females and juveniles of both sexes. Utilizing banding as a tool to help solve some of the questions we have about hummingbird populations and movements, is just about the only way to overcome the shortcomings of observational studies on these unique species. Unfortunately, there are still some out there who only have a recreational approach to bird banding, including hummingbirds. If so, their potentially important data will unfortunately, never get into the public domain since they will never be published in any form. These data will simply forever hold a resting place in the memory banks of the hard drives at the banding lab. Perhaps, the efforts that were undertaken to collect those data were not based on or designed to answer scientific questions as the basis of the effort in the first place. We have undertaken considerable effort to collect the data that are the basis of this publication. To be sure, we have produced a wealth of data, most of which contains valuable information. Have we answered all of the questions we had going into this effort? No, but we have answered a lot, and perhaps we have provided a data rich baseline, in part, for future researchers interested in the hummingbirds of the west Texas region. We can only guess what changes might occur in the years to come.

Going into this project, we certainly entertained thoughts in the back of our minds of finding and documenting new species for the region and/or state. To be honest, our thoughts were concentrated on species like Canivet’s (Fork-tailed) Emerald, Azure-crowned Hummingbird, Plain-capped Starthroat, and/or Bumblebee Hummingbird, species that Texas birders have already predicted occurring in the state at some future time, or another Cinnamon Hummingbird, a species that came so close to occurring in Texas in 1993. Three species that we were fortunate to be a part of their discovery during our project cannot go unmentioned in our final summation. First, the fifth state record for Berylline Hummingbird was spotted on 25 August 2007 when the senior author, along with a visitor, were actually looking at the feeders trying to find something different. Indeed, they did. No attempt was made to capture and band that bird until the fifth day, only to find that it had left the area. The second species, one that was totally unexpected and not on anyone’s prediction list given the location it was found, was the Buff-bellied Hummingbird

at Christmas Mountains Oasis in October of 2012. Complete credit goes to Carolyn Ohl for spotting the bird and recognizing its importance. Our turnaround trip back down to the CMO the next morning provided us with an opportunity to capture and band this bird, and determine that it was a juvenile female in very fresh plumage. This bird wandered over 500 miles from the nearest area where the species nests in the Gulf Coast region of south Texas and eastern Mexico. Perhaps that record projects the possibility of Green-breasted Mango, the only species on the Texas list that we did not document during this study, occurring in west Texas at some future time. However, to be certain, the grand event of the period was the discovery of the Amethyst-throated Mountain-gem at one of our study sites on 14 October 2015 (Bryan and Floyd 2017). The Amethyst-throated Mountain-gem might have been on someone's list but it certainly was not on ours. Bryan and Floyd just happened to be "in the right place at the right time" when the bird first showed up in the early afternoon that day. For the record, we made no attempt to capture and band that bird during its short stay. So why did this individual wander out of Mexico and spend less than twenty-four hours in the Davis Mountains? Considering the fact that this species is primarily a sedentary species within its range in Mexico and Central-America, we simply have no clue. This species was only known to occasionally change elevation in reaction to seeking out new food resources. Only one other out-of-range occurrence had been documented (in Canada!). The addition of the Amethyst-throated Mountain-gem to the Texas list, brings the number of species on that list to nineteen. During this study we recorded eighteen, with the only Texas listed hummingbird not recorded by us being the Green-breasted Mango.

As we stated upfront, one of the justifications for implementing this study in the first place was an attempt to determine the exact seasonal status of all the hummingbird species of the west Texas region. Our research strategy was designed to do just that. We tried to stick to a banding schedule that was systematic, rotational as much as possible, and continuous, to an extent that any of our non-banding lives would allow. Once we recognized the importance of fully sampling winter season populations, especially in the SBC study areas, we made every attempt to give those birds our full attention. We documented that December diversity in the region was equal to May diversity, a statistic that we did not predict. The presence, at times, of twelve species in west Texas during the winter months demonstrates that we are still learning much about the occurrence patterns of these unique birds. We did know in advance that fall migration would be dynamic with high diversity and the greatest abundance of any season. In fact, we banded 17,448 birds in July, August and September, 81% of the entire sample of banded birds. Our final summary presented below shows the monthly occurrence of the eighteen species we encountered during this study.

So, what should a person reading this publication comprehend from our work? Hopefully, you will conclude that west Texas hummingbird populations are very complex from both a species diversity and seasonal abundance viewpoint. We hope that you will better understand seasonal movement dynamics and species occurrence, as well as timing of juvenile appearance and movements. Additionally, we hope that you will appreciate the importance of the region to winter season diversity and abundance. But most importantly, we hope that you now better understand west Texas hummingbirds, and when you come out to seek great hummingbird experiences in this land of mountain islands and desert seas, you will come with greater knowledge as a result of our efforts.

Table 7. Monthly occurrence of Hummingbirds recorded during this study

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mexican Violetear							√	√	√			
Rivoli's Hummingbird			√	√	√	√	√	√	√	√	√	√
Amethyst-thr. Mountain-gem										√		
Blue-throated Mountain-gem	√	√	√	√	√	√	√	√	√	√	√	√
Lucifer Hummingbird		√	√	√	√	√	√	√	√	√	√	√
Ruby-throated Hummingbird	√	√	√	√	√		√	√	√	√	√	√

Table 7. (Continued).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Black-chinned Hummingbird	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Anna's Hummingbird	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Costa's Hummingbird	✓	✓	✓					✓	✓	✓	✓	✓
Calliope Hummingbird					✓		✓	✓	✓	✓		
Rufous Hummingbird	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Allen's Hummingbird	✓	✓	✓				✓	✓	✓	✓	✓	✓
Broad-tailed Hummingbird		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Broad-billed Hummingbird	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
White-eared Hummingbird				✓	✓	✓	✓	✓	✓			
Violet-crowned Hummingbird	✓	✓		✓			✓	✓	✓	✓	✓	✓
Berylline Hummingbird								✓				
Buff-bellied Hummingbird										✓		
Species per month	9	10	11	11	12	10	14	16	15	15	12	12

ACKNOWLEDGEMENTS

All banding activities were conducted under the jurisdiction of governmental agencies at both the federal and state level, with valid permits issued by the USGS, Bird Banding Laboratory for Federal permits (Master Banding Permit 09835) and the Texas Parks and Wildlife Department for State Permits (Scientific Study Permit SPR-0311-088). All hummingbird banders are required to undergo specialized training under a recognized trainer and mentor prior to receiving authorization to band any species in this family group.

We are indebted to numerous persons who assisted along the way and/or shared their hummingbird observations with us. Our primary banding team often included Carolyn Ohl and Donna Bryan who made major contributions to our efforts. We recognize the following persons providing primary direct support, including Terry and Suzy Ervin, Bonnie Wulderlich, Rich and Brenda Gatchell, Carla Hallman, Barry and Carol Cummings, Jaden Verdooren, Deirdre Hisler and Tara Poloskey at the Davis Mountains Preserve, the staff at the Chihuahuan Desert Nature Center, the staff at Far Flung Casitas, and Laura Gold-Brainard at the Lajitas Resort. Others who provided assistance along the way include David and Linda Hedges, Madge Lindsey, Cecilia Riley and Michael Gray, Dan and Cathy Brown (Hummer House in Christoval, Texas), Bruce Peterjohn, Fred Bassett, Sam and Barbara House, Gary and Clare Freeman, the late Jody and Clay Miller, Bill and Jill Miller, Matt York, Heidi Trudell, Alex and Gerda Martinez, Mark Lockwood, Lee Hoy, Beth McBroom, Lorrie Lowrey, Janiece Ward, John Barrera, John Kiseda, Patti True, Tiffany Bryan-Johnson and Kandace Floyd.

Thanks to John Sproul, Jim Paton and Barry Zimmer and the El Paso/Trans-Pecos Audubon Society for sharing some of their hummingbird data from many years of compiling records in El Paso and Hudspeth counties.

We recognize Charles Eldermire, Director of the Bird Cam Lab at Cornell University for delivering our Davis Mountains hummingbirds to the world via the West Texas Hummingbird Cam.

We must recognize the late Pansy Espy for our introduction in 1993 to the hummingbirds in upper Limpia Canyon through the late Clyde and Ruth Ann Smith. This publication is dedicated to Martha Sargent and (the late) Bob Sargent of Clay, Alabama. Without the insistence, guidance and support of our banding mentors, this project would never have been accomplished.

We thank Bruce Peterjohn and Fred Bassett for providing critical review of our publication and providing suggestions to improve its content.

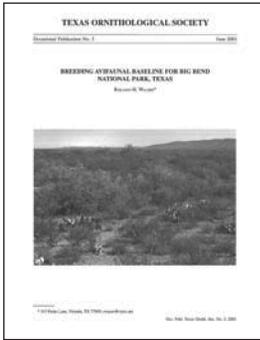
LITERATURE CITED

- AMERICAN ORNITHOLOGISTS' UNION. 1998. *Checklist of North American Birds*. 7th edition as currently supplemented. Ornithological Union, Washington, D.C.
- BASSETT, F. AND D. CUBIE. 2009. *Wintering hummingbirds in Alabama and Florida: species diversity, sex and age ratios, and site fidelity*. J. Field Ornithology 80(2): 154-162.
- BRYAN, K. B. 2004. *Diamonds in a Rough, Hummingbird Diversity in West Texas Highest in the State*. Eye on Nature pp. 1-3. Publ. Wildlife Diversity Branch. Texas Parks and Wildlife Dept., Austin, Texas.
- BRYAN, K. B. AND J. P. KARGES. 2001. *Recent Bird Records in the Davis Mountains*. Texas Birds 3(1): 40-53.
- BRYAN, K. B. AND C. O. FLOYD. 2017. *First US record of Lampornis amethystinus, the Amethyst-throated Hummingbird*. North American Birds 70(1): 12-16.
- BRYAN, K. B., M. EASTMAN AND M. EASTMAN. 2014. *Breeding Status of the Broad-billed and White-eared Hummingbirds in Texas*. Bulletin of the Texas Ornithological Society 47(1-2): 45-50.
- CARPENTER, E. 2019. *The Changing Seasons; Texas Region*. North American Birds 70(4): 352.
- CLARK, C.J., T.J. FEO AND K.B. BRYAN. 2012. *Courtship Displays and Sonations of a Hybrid Male Broad-tailed X Black-chinned Hummingbird*. The Condor 114(2): 329-240.
- QUILLEN, R. W. 1935. *New Bird Records from Texas*. Auk 52: 324-325.
- LASLEY, G. AND C. SEXTON. 1993. *The Changing Seasons; Texas Region*. American Birds 47(5): 1126-1127.
- LASLEY, G., C. SEXTON, M. LOCKWOOD, C. SHACKELFORD AND W. SEKULA. 1998. *The Changing Seasons; Texas Region*. Field Notes 52(1): 89, 139.
- LOCKWOOD, M. W. 2004. *The Changing Seasons; Texas Region*. North American Birds 57(4): 516.
- LOCKWOOD, M. W., R. PINKSTON AND R. WEEKS. 2007. *The Changing Seasons; Texas Region*. North American Birds 60(4): 551.
- LOCKWOOD, M. W., E. CARPENTER AND W. SEKULA. 2009. *The Changing Seasons; Texas Region*. North American Birds 63(3): 466, color photograph on 536.
- LOCKWOOD, M. W., R. PINKSTON AND R. WEEKS. 2009. *The Changing Seasons; Texas Region*. North American Birds 62(4): 586.
- LOCKWOOD, M. W. AND B. FREEMAN. 2014. *TOS Handbook of Texas Birds, second edition*. The Texas Ornithological Society, Texas A&M Press, College Station, Texas.
- LOCKWOOD, M. W. 2017. *The Changing Seasons; Texas Region*. North American Birds 70(1): 82-83
- OBERHOLSER, H. C. 1974. *The Bird Life of Texas*. Austin: University of Texas Press.
- PYLE, P. 1997. *Identification Guide to North American Birds*. Slate Creek Press, Bolinas, California.
- RUSSELL, S. M., R. O. RUSSELL, AND A. HILL. 2018. *The North American Banders' Manual for Hummingbirds*. North American Banding Council, Point Reyes Station, California.
- SCOTT, P. E. 1994. *Lucifer Hummingbird (Calothorax Lucifer)*. In: The Birds of North America, No. 134 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, PA.
- SCHMIDT, J. R. 1976. *First nesting record of Anna's Hummingbird in Texas*. Bull. Tex. Ornith. Soc. 9: 6-7.
- WAUER, R. 1996. *A Field Guide to the Birds of the Big Bend, second edition*. Gulf Publishing Company, Houston, Texas.
- YUYINI, L-V., J. F. ORNELAS, S. WETHINGTON AND K. B. BRYAN. 2018. *Pleistocene Range Expansions Promote Divergence with Gene Flow between Migratory and Sedentary Populations of Calothorax Hummingbirds*. Biological Journal of the Linnean Society 124: 645-667.



Leucistic Black-chinned Hummingbird juvenile female (Kelly Bryan)

Texas Ornithological Society
OCCASIONAL PUBLICATION SERIES



Breeding Avifaunal Baseline for Big Bend National Park, Texas

Roland H. Wauer

Occasional Publication No. 3, 2001

12 B&W photos, 6 tables, 31 pages



The Early History of Ornithology in Texas

Stanley D. Casto

Occasional Publication No. 4, 2002

6 line drawings, 24 pages

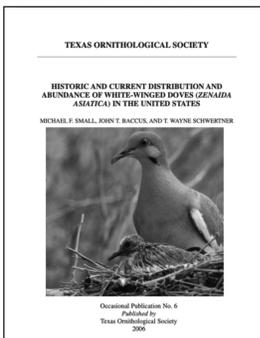


Records Accepted by the Texas Birds Records Committee (1987-2003)

Mark W. Lockwood, John Arvin, Keith Arnold, Kelly Bryan, Jim Paton, Petra Hockey, Mel Cooksey, Brad McKinney, and Randy Pinkston.

Occasional Publication No. 5, 2003

8 color photos, 64 pages



Historic and Current Distribution and Abundance of White-Winged Doves (*Zenaida asiatica*) in the United States

Michael F. Small, John T. Baccus, and T. Wayne Schwertner

Occasional Publication No. 6, 2006

5 Color Photos, 9 Figures and Tables, 23 Pages



Response Of Golden-Cheeked Warblers (*Dendroica Chrysoparia*) To Wildfires At Fort Hood, Texas

John T. Baccus, Maria E. Tollé, and John D. Cornelius

Occasional Publication No. 7,

13 Color Photos, 9 Figures and Tables, 41 pages

Finally, this project and publication were funded, in part, by West Texas Avian Research, Inc., a 501 (c)(3) non-profit organization, and assistance with printing costs graciously provided by Trans-Pecos Bird Conservation, also a 501 (c)(3) non-profit organization. Additional funding support for the banding efforts provided by the Hummer-Bird Study Group of Clay, Alabama and the Ed Rachel Foundation of Corpus Christi. Donations by numerous individuals to WTAR helped facilitate the data collection compiled in this publication of the Texas Ornithological Society.



Lucifer Hummingbird adult female (Maryann Eastman)

