Avian Acoustic Monitoring: Spring and Fall Migration 2014

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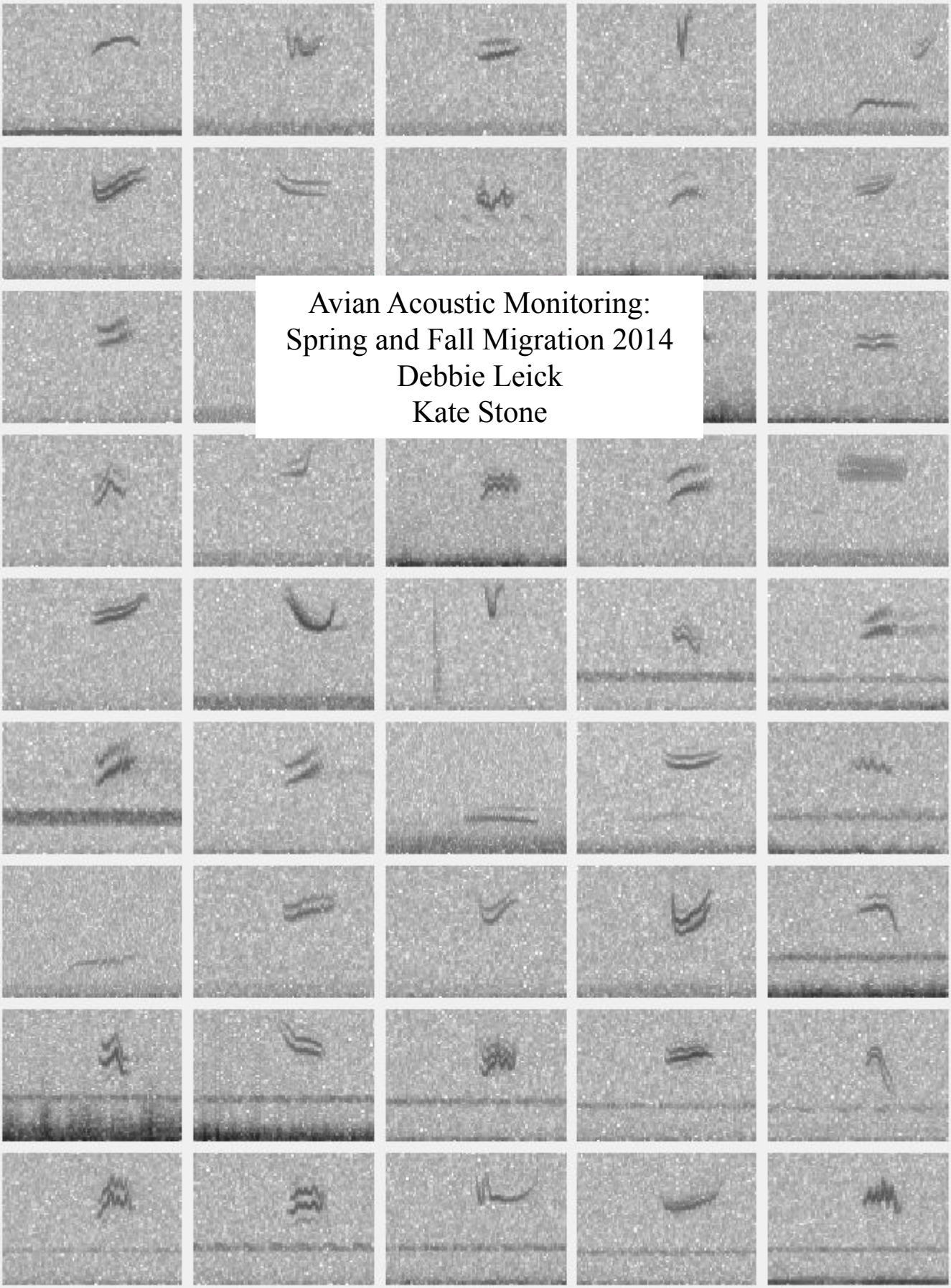


Nocturnal Flight Call Spectrograms

Table of Contents

Summary 3

Methods 4

Nocturnal Flight Calls: Annual & Seasonal Differences 6

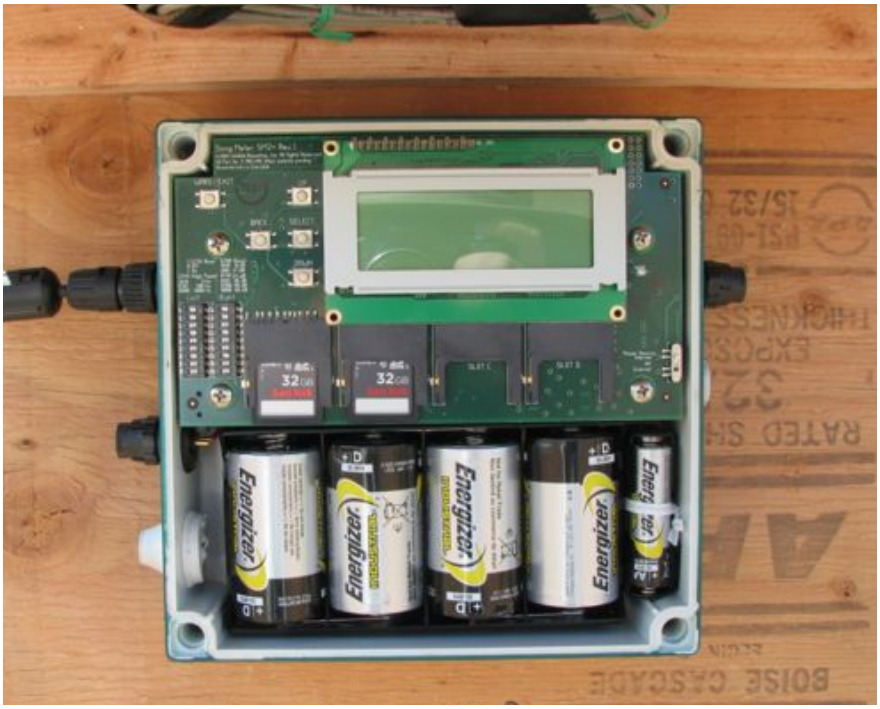
Nocturnal Flight Calls: Fall Weekly Trends 7

Nocturnal Flight Calls: Fall Nightly Detection Times 8

Nocturnal Flight Calls: Monitoring Site Differences 9

Future Direction 10

Conclusion 10



Wildlife Acoustics SM2+ Autonomous Recording Unit

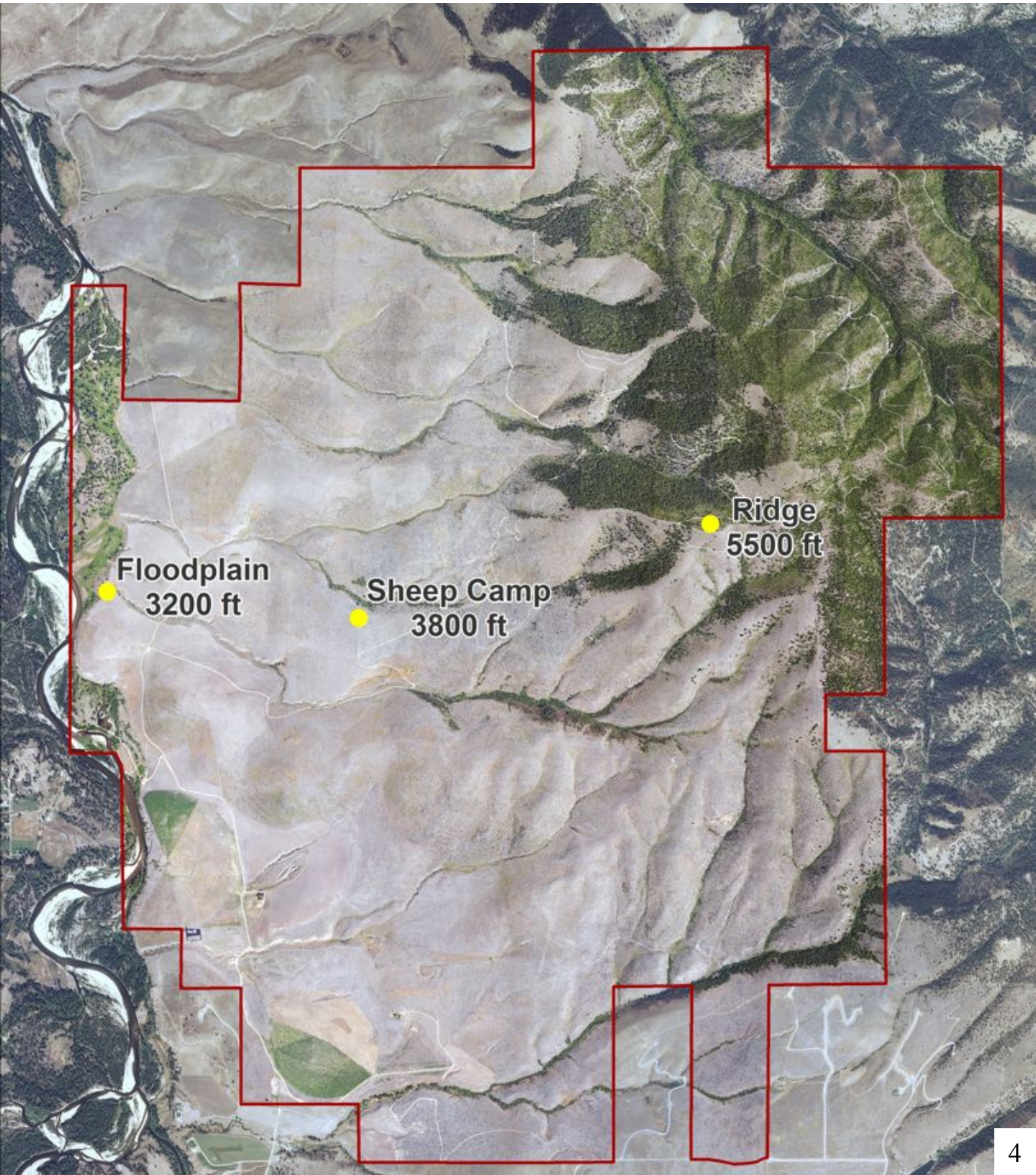
Summary

This report summarizes the avian acoustic monitoring efforts for spring and fall migration in 2014. We continued to observe temporal (e.g., annual, seasonal, weekly, nightly) and spatial (e.g., monitoring site) patterns in nocturnal flight call emissions.

- We detected more nocturnal flight calls in both spring and fall of 2014 compared to 2013.
- We documented more nocturnal flight calls in fall than in spring.
- We saw temporal differences in nightly detection times when comparing “tseep” and “thrush” calls.
- Across the three monitoring sites, the mid-elevation Sheep Camp unit (below) continued to record the most nocturnal flight calls during fall migration.

Methods

We obtained call data from autonomous recording units installed at the low-, mid-, and high-elevation sites. Each unit recorded daily from approximately sunset to sunrise in the spring (late April through May) and fall (August through mid-October). We extracted and analyzed calls from over 400 gigabytes and 3000 hours of audio files.



The audio review followed the same methods used for the 2012 pilot study and the 2013 recordings. To extract calls, we used automated software detectors, “tseep” and “thrush” (Old Bird, Inc.). The “tseep” detector extracts short bursts of high-frequency calls (6 - 10 kHz) from warblers and sparrows like the Vesper Sparrow (below).

“Thrush” detects longer duration, mid-frequency (2.8 - 5 kHz) calls from tanagers, buntings, shorebirds, and *Catharus* thrushes like Swainson’s Thrush (below). Once extracted, we sorted the calls (GlassOFire from Old Bird, Inc.) to eliminate false positives, noise, and duplicate call files. Call totals represent a minimum number of individual birds.

Nocturnal Flight Calls: Annual & Seasonal Differences

A comparison of nocturnal flight calls showed annual and seasonal differences. Total calls increased from 2013 to 2014; during both years, fall continued to outnumber spring totals (Figure 1). Fall "tseep" calls almost doubled from 2013 to 2014. We do not know the exact cause for this increase, but suspect that more unsettled weather contributed to it. We previously showed that precipitation events in August 2014 coincided with increases in nocturnal flight calls (Bird Field Note 9/21/14). Potential explanations for the large differences in nocturnal flight calls between spring and fall migration include the following hypotheses:

1. Fewer birds return in the spring due to mortalities during migration and on the non-breeding grounds.
2. Seasoned spring migrants emit fewer nocturnal flight calls than inexperienced or hatch-year fall migrants.
3. Migrants employ circular or looped migration strategies which involve a different route in the spring than in the fall.

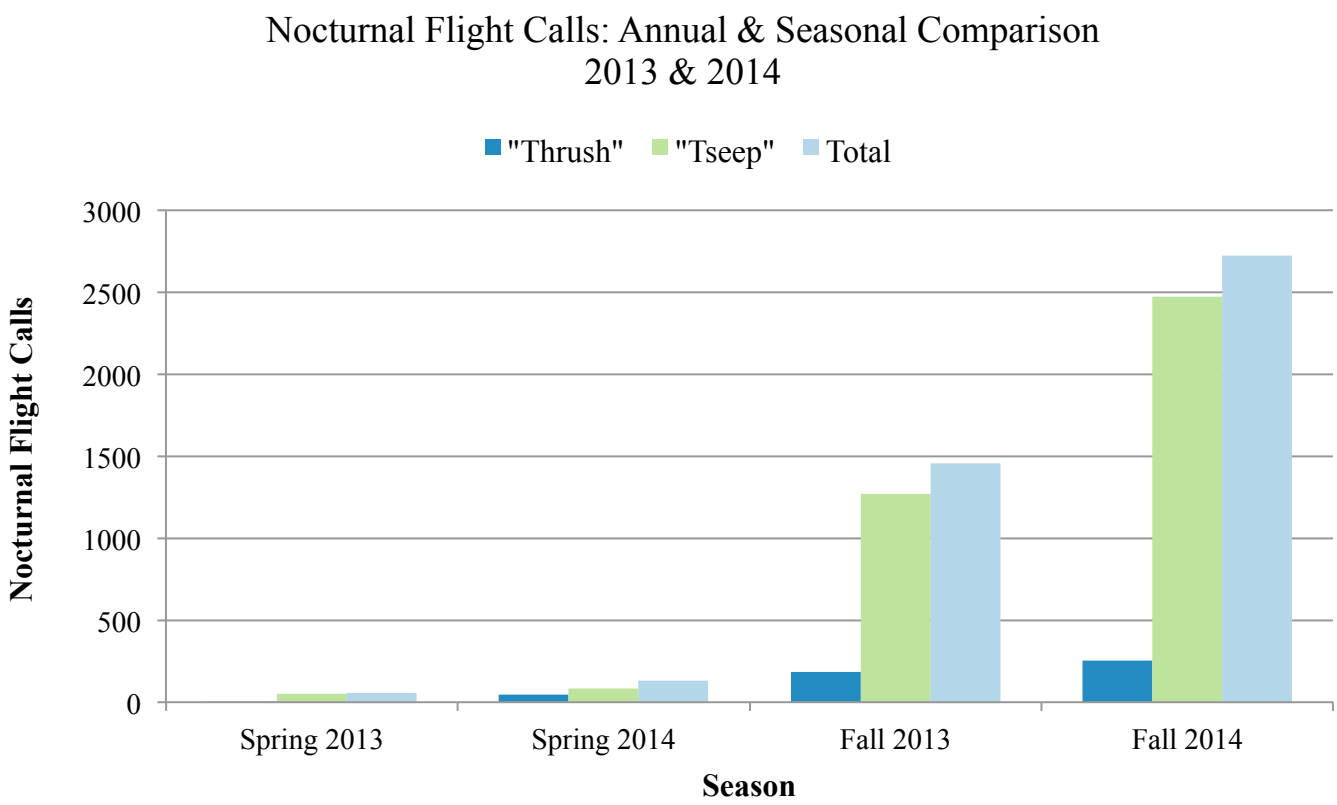


Figure 1. "Tseep" and "Thrush" nocturnal flight call totals by year and season.

Nocturnal Flight Calls: Fall Weekly Trends

A comparison of weekly, fall nocturnal flight call totals showed patterns between 2013 and 2014 (Figures 2 and 3). As previously discussed, Fall 2014 "tseep" calls showed a substantial increase during mid- to late August, presumably due to more unsettled weather. Fall 2013 "tseeps" showed low initial activity until detections peaked in late August. Both years, "thrush" calls peaked in late August to early September. For both "tseep" and "thrush" calls, detections decreased by mid-September and declined through the rest of the season. We expected this pattern since the bulk of nocturnal flight call emitting species migrate before that time.

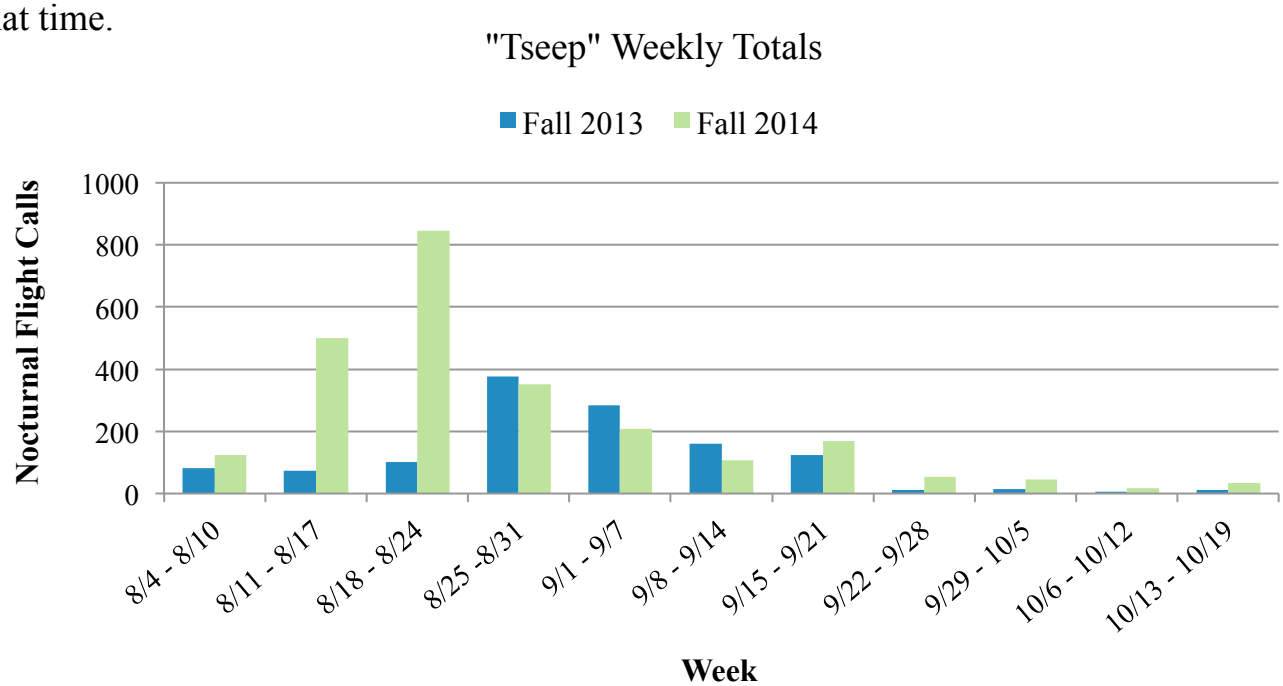


Figure 2. "Tseep" weekly nocturnal flight call totals for Fall 2013 and 2014.

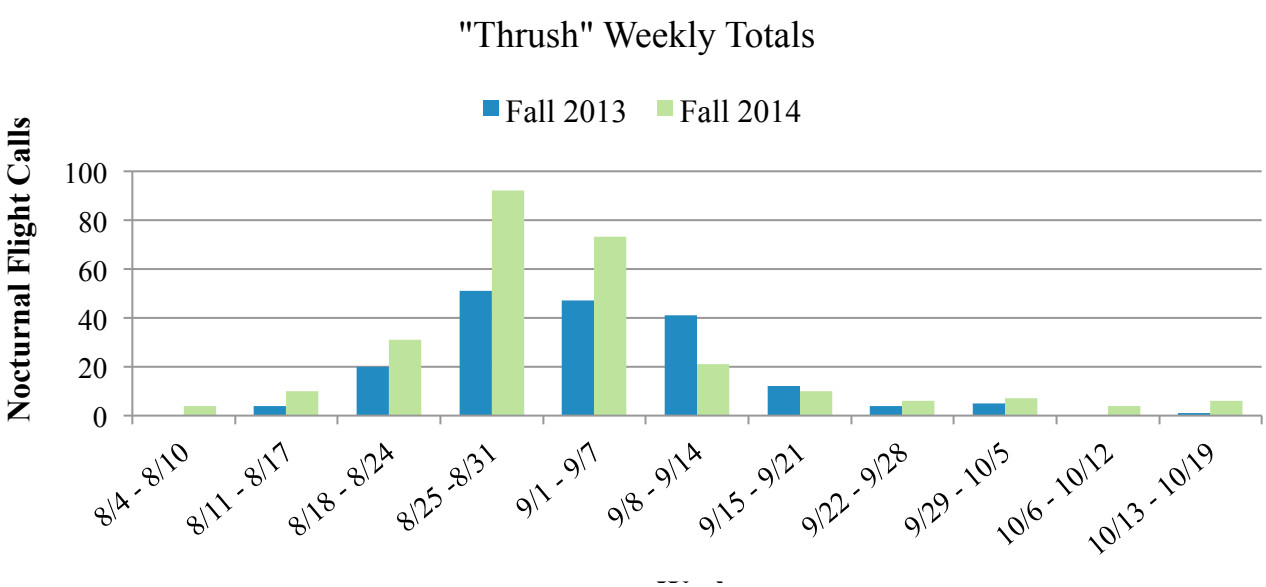


Figure 3. "Thrush" weekly nocturnal flight call totals for Fall 2013 and 2014.

Nocturnal Flight Calls: Fall Nightly Detection Times

Temporal patterns emerged when we graphed fall nightly detection times. “Tseep” calls displayed a bimodal pattern where the first peak occurred between approximately 1:30 am and 3:00 am; a second peak occurred before sunrise (Figure 4). We do not know the reason for this pattern, but suspect that different species may use nocturnal flight calls differently and/or descend at different times. Thrush-like calls peaked just before dawn during both 2013 and 2014 (Figure 5). This suggests these birds migrate at altitudes too far from the microphone and we detected their flight calls during a pre-dawn descent.

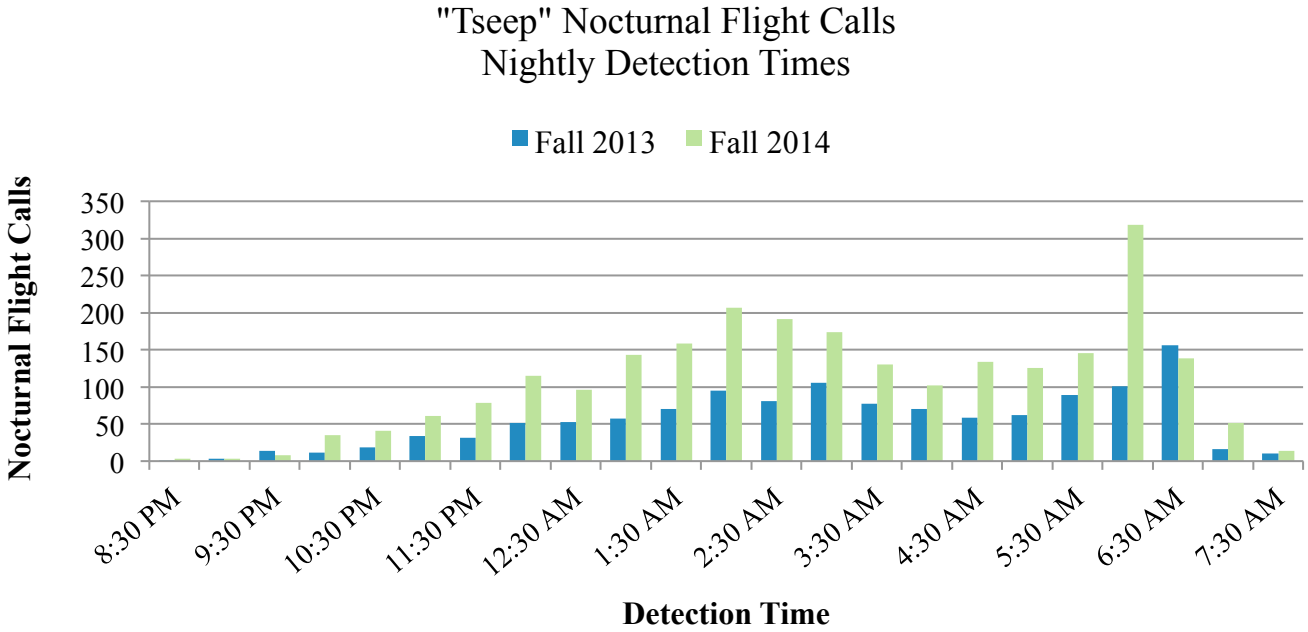


Figure 4. “Tseep” Nightly Flight Call Detection Times for Fall 2013 and 2014.

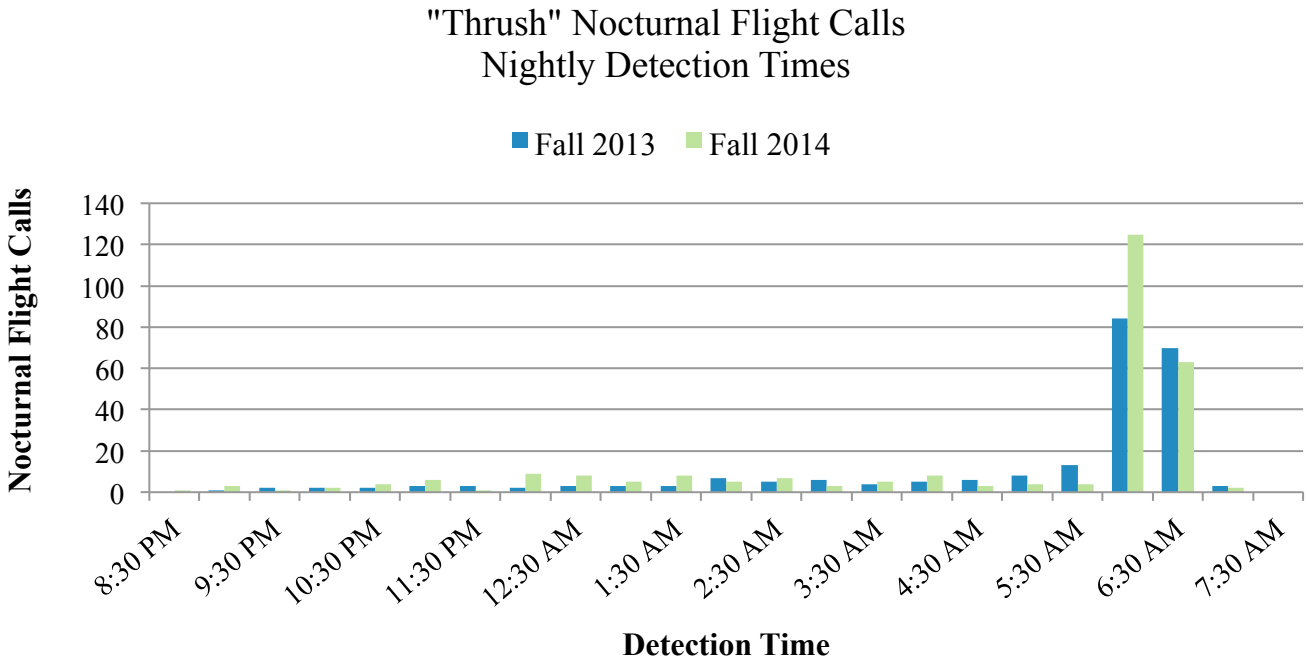


Figure 5. “Thrush” Nightly Flight Call Detection Times for Fall 2013 and 2014.

Nocturnal Flight Calls: Monitoring Site Differences

We compared flight call totals between monitoring sites to look for differences. The spring season accumulated relatively few calls compared to fall and no clear trends emerged. During fall, the Sheep Camp monitor continued to record the most nocturnal flight calls (Figures 6 and 7, and Table 1). We do not know whether birds favor nocturnal migration over this area because of the habitat, or if topography and atmospheric conditions push them there.

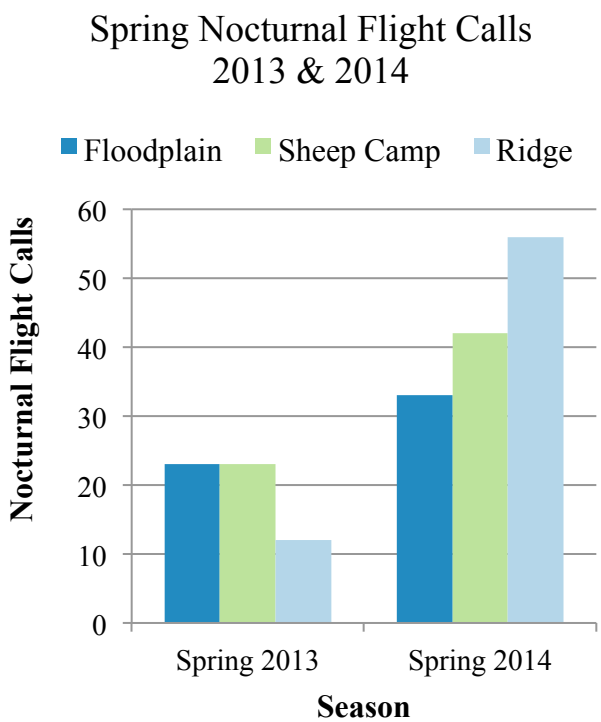


Figure 6. Spring Nocturnal Flight Call Totals for 2013 and 2014.

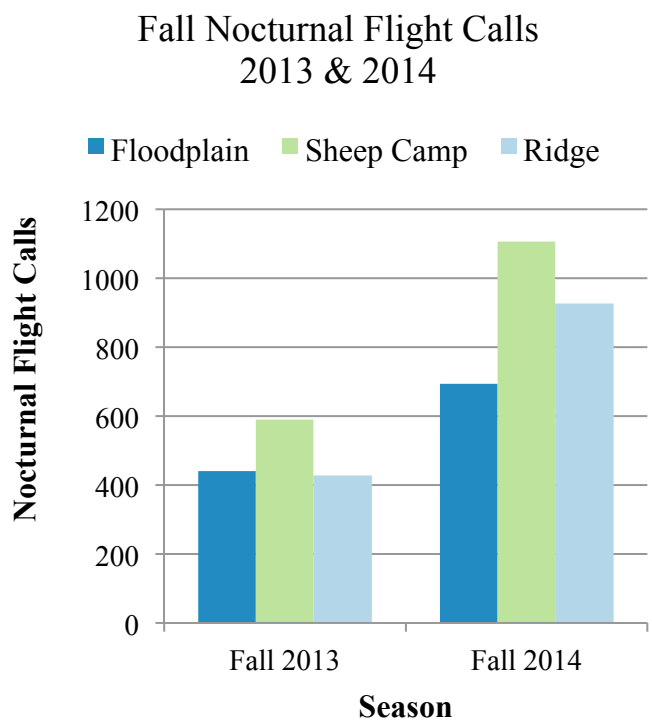


Figure 7. Fall Nocturnal Flight Call Totals for 2013 and 2014.

Table 1. Nocturnal Flight Call Totals by season, year and monitoring site.

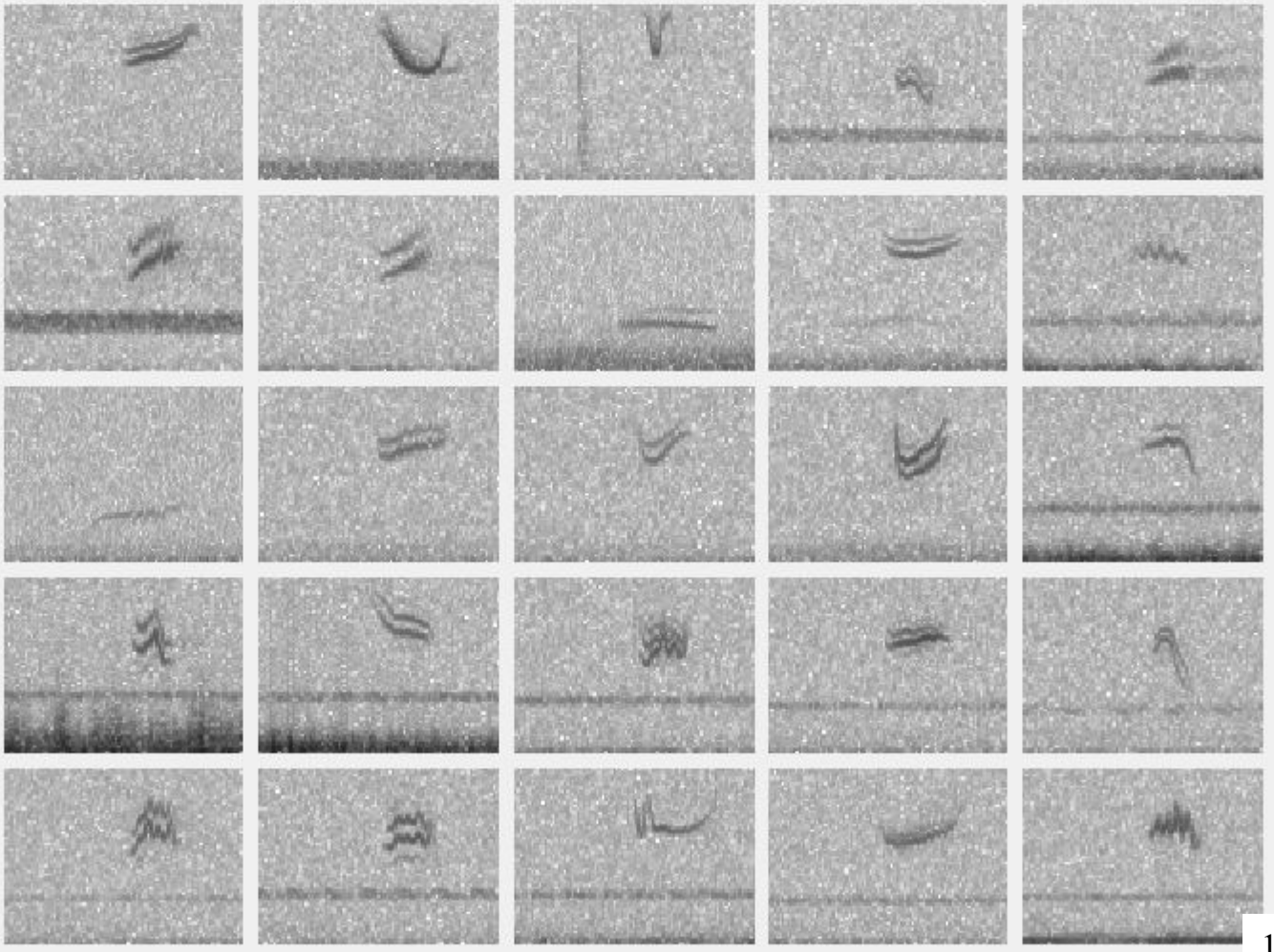
Nocturnal Flight Calls: Monitoring Sites					
	Spring 2013	Spring 2014	Fall 2013	Fall 2014	TOTAL
Floodplain	23	33	440	693	1189
Sheep Camp	23	42	591	1106	1762
Ridge	12	56	428	927	1423
TOTAL	58	131	1459	2726	4374

Future Direction

We will continue to analyze the nocturnal flight call data and plan to complete and submit reports on the following:

- Finish the species-level classification for the 2014 data and compare it to the 2013 results.
- Compare fall and spring nocturnal flight call data to our shrubby draw survey data.
- Compare fall nocturnal flight call data to fall migration banding data.

In 2015, we plan to continue spring and fall migration monitoring to verify the current patterns persist. A third year of monitoring will provide a solid baseline to monitor future population trends and migration pathways.

Conclusion

Many avian species migrate under the cover of darkness, limiting our ability to study migration phenomena. Nocturnal flight call monitoring provides a reliable, passive, and unbiased way to document the spatial and temporal components of nocturnal migration. Our data show that we can track annual, seasonal, weekly, and nightly trends as well as patterns between monitoring sites.