Introduction

he Santa Cruz Sandhills is a rare and unique habitat found only in ntral Santa Cruz County, California. There are two distinct mmunities that make up the habitat: Sand Chaparral and Sand rkland which comprise of less than 4,000 acres of Sandhills bitat. These two communities are home to many endemic organisms at are adapted to the climate the habitat makes. Because of this iqueness and rarity, the Santa Cruz Sandhills has been a topic of udy in many different areas of science. However, one area lacks nsiderably: birds and avian ecology. Very little information is known out the birds of the Sandhills. It has been loosly proposed that eir presence is influenced by adjacent habitats, mixed evergreen d Coastal Redwood forest, but no study has been done to confirm deny this. This led us to ask "What are the 'birds of the Santa uz Sandhills', and do they form an independent community within e habitat?" In September 2010, we began monitoring three ndhills sites (one each of Sand Parkland, Sand Chaparral, and a re of mixed communities) to determine if the distribution of birds en within the Sandhills was influenced by their adjacent habitats. rough a process of monitoring three times a week in area count rm, we were able to determine what and how many birds are in ch community of the Sandhills, and then compare that to the jacent habitats to see if there is any similarity between avian life.

Santa Cruz Sandhills Distribution

Hypothesis

cause of their overall rarity and uniqueness, the Santa uz Sandhills retains a distinct community of birds that e not influenced by adjacent habitats. This population ructurally varies between the three main habitats: Sand rkland, Sand Chaparral, and a mix of the two.

Procedure and Materials

Day and location on which surveys would take place was found using a random number generator. At the begining of each survey day, a fair coin was tossed to determine which habitat (Sandhills or Adjacent) the first survey will take place in. In the first habitat to be surveyed, monitors proceeded to Point 1 and then Point 2. After completion, monitors proceeded to the second habitat but began surveying at Point 2 then proceeded to Point 1.

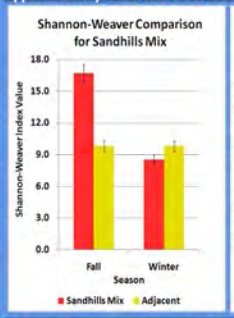
1. Survey all three habitat pairs once a week
2. Count and record all birds detected within a 50 meter radius of each point for 10 minutes (after a 5-minute "settling" period)
3. Record temperature (°C) and wind speed (mph)
4. Enter data into Excel and in

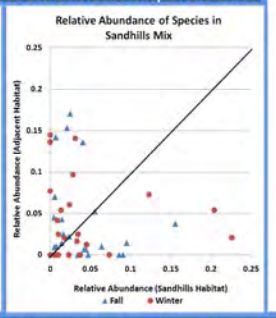
Location: Lower San Lorenzo Valley
(see map upper left)
= Sandhills Points
Sandhills habitat

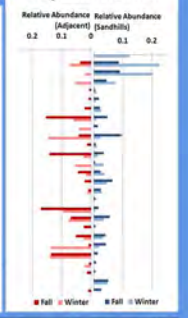
Data

Sandhills Mix

Sandhills Mix is a combination of both Sand Parkland and Sand Chaparral habitats. Points in Sandhills Mix are comprised of approximately 50% Sand Parkland and 50% Sand Chaparral habitat.



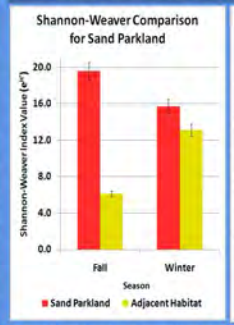


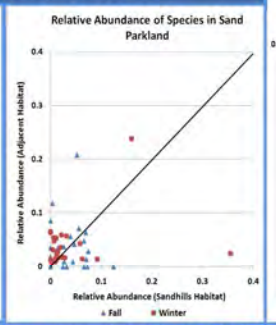


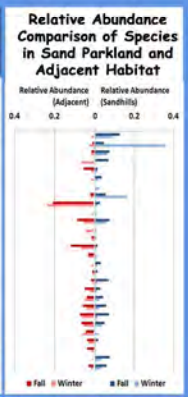
One way to compare community differences is through the Shannon-Weaver Diversity Index. In the Fall, Sandhills Mix had a high diversity level, but it then dropped down in the Winter. Relative abundance is also another way to determine community differences.Looking at the scatter plot, it is evident that there are three groups of species: ones that are present primarely in Sandhills habitat, primarely in adjacent habitat, or equally in both.

Sand Parkland

Sand Parkland is a very open habitat that has sparsley scattered Ponderosa Pines (*Pinus ponderosa*), low-growing herbacious shrubs, and endemic herbs that cover the open sandy terrain.



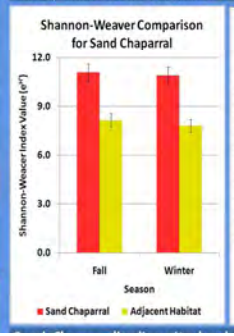


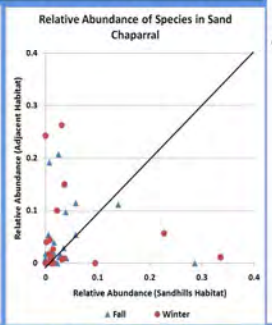


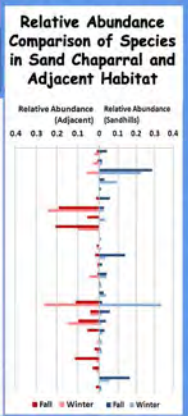
Sand Parkland's diversity levels were originally high in the fall, but then dropped in the Winter. The opposite happened to the adjacent habitat's diversity levels. When looking at the scatter plot, there is a strong pattern of many species in the Sandhills in Fall, but then those same species left in the Winter and were present in the adjacent habitat. This suggests a seasonal movement of species between Sand Parkland and adjacent habitat.

Sand Chaparral

Sand Chaparral is densley covered with Bonny Doon Manzanita (*Arctostaphylos silvicola*) and scattered with Ponderosa Pine and Knobcone Pine (*Pinus attenuata*). There is very little to no open area, unlike Sand Parkland.





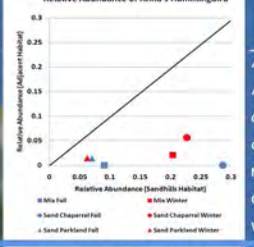


constant in both seasons. The scatter plot and bar ween the three groups of bird species describes in t is relatively compact, but Sand Chaparral's is more two can be seen in Sandhills Mix's scatter plot.

Results

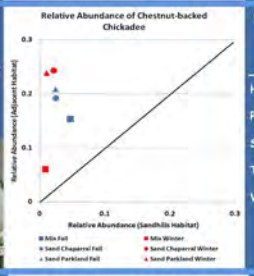
It is clear that the Sandhills and adjacent habitats have different diversity levels seasonally. From the scatter plots and bar graphs, w can see that some birds *only* occur in Sandhills habitats. These are the 'birds of the Santa Cruz Sandhills'. However, there are birds th occur in *both* Sandhills and adjacent habitats. It can be seen that species distribution generally falls into three categories: primarely Sandhills, primarely adjacent, and relatively equal in both Sandhills adjacent habitat. To analyze this further, we can caluclate the rela abundance of each "both" species to see if they are skewed in favor one of the three distribution categories. Below are three example species in the three distribution categories. By looking at the relativ abundance between Sandhills and adjacent habitat, we can also comp the distribution between the three habitats within the Sandhills in e season as well.

Anna's Hummingbird is primarily found in Sandhills habitat. This makes it a 'bird of the Santa Cruz Sandhills'.



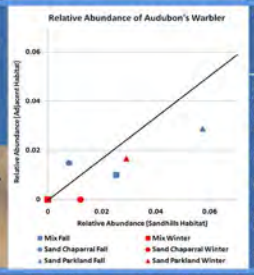
Other Spec with Simil Relative Abundanc
Acorn Woodpe
American Robi
California Tow
Cedar Waxwing
Northern Flick
Oak Titmouse
Western Scrub

Chestnut-backed Chickadee is primarily found in adjacent habitat, not making it a bird of the Santa Cruz Sandhills.



Other Spec with Simil Relative Abundanc
Hermit Thrush
Purple Finch
Steller's Jay
Townsend's Wa
Varied Thrush

Audubon's Warbler was found in almost equal numbers in both habitats so it is considered a generalist species.



Other Spec with Simil Relative Abundanc
Bewick's Wren
Dark-eyed Ju
Hairy Woodpe
Hutton's Vireo
Lesser Goldfi
Pygmy Nuthat
Ruby-crowned Kinglet
Spotted Towh

It can be seen that each of these species' relative abundance vari between season, but it also varies between habitat type. An exam of this is the Anna's Hummingbird chart above. There is a noticabl difference between its relative abundance in Sand Parkland and Sa Chaparral, and the Sandhills Mix points are right between these t (acting as an average).This is indicative of two different avian communities in the Santa Cruz Sandhills.

Conclusion

It is clear that there is a difference between avian life in the Sandhills and their adjacent habitat. Diversity levels show difference in communities, while relative abundance levels show differences between species and can also show structural differences within the Sandhills habitats, Sand Parkland and Sand Chaparral. Because the data of the Sandhills Mix habitat was about the average of Sand Parkland and Sand Chaparral habitats (and also not forgetting that Sandhills Mix was 50% Sand Parkland and 50% Sand Chaparral) we ca conclude that there are two distinct communities of birds within the Santa Cruz Sandhills: Sand Parkland birds and Sand Chaparral birds. This just gives one more reason to conserve and protect the rarity a uniqueness of the Santa Cruz Sandhills and will hopefully promote future research in what roles these birds play in the Sandhills ecosyst

Birds of the Santa Cruz Sandhills

Acorn Woodpecker	Bushtit	Cedar Waxwing	Wester
American Goldfinch	California Quail	Golden-crowned Sparrow	Scrub-
American Robin	California Thrasher	Northern Flicker	
Anna's Hummingbird	California Towhee	Oak Titmouse	Wrenti