A study of landscape-level habitat relationships between birds and vegetation on the Modoc Plateau

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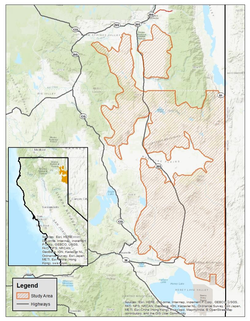
The California Department of Fish and Wildlife Vegetation Classification and Mapping Program has initiated research to examine the relationship between wildlife communities and vegetation. A long-held assumption closely ties wildlife to plant communities, yet this has not been widely tested. This research explores the correlations between bird species occupancy and vegetation attributes in the Modoc Plateau. The Modoc Plateau is an area of California with a low human population, yet it is strongly affected by human-caused disturbances and rapid changes in vegetation patterns. Vegetation classification and mapping of 1.2 million acres of this region began in 2016, providing quantitative spatially explicit vegetation information that will be co-analyzed with high-density bird survey data collected in the 2018 and 2019 field seasons.

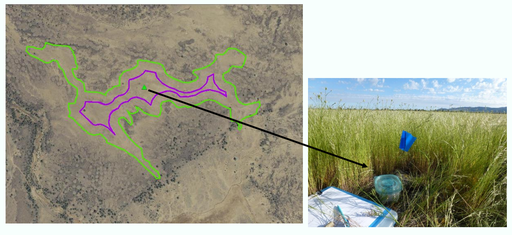
Beginning in April of 2018, field crews collected bird occupancy data using digital recorders at 158 sites. Sites were selected according to a stratified sample allocation covering 16 of the most common terrestrial and wetland vegetation types in the ecoregion. Additional sampling will be conducted in 2019 for a total of over 300 bird survey sites over two breeding seasons. These data will be used to build and test a series of occupancy models for birds of the area, including the declining Greater Sage-grouse, in order to clarify landscape-level habitat relationships between bird species and regionally important vegetation types. This study is expected to have a significant impact on statewide wildlife habitat assessment, and will revise and refine current habitat modeling practices and assumptions state-wide.



The Modoc Plateau is located in the northeast corner of the state. Our study area covers approximately 1 million acres across Modoc and Lassen counties.

Methods

- We conducted surveys at randomly allocated polygons from the Modoc-Lassen vegetation map, delineated by photo-interpreters at CSU Chico Research Foundation's Geographical Information Center.
- Survey locations within each polygon were chosen based on selecting a representative example of the vegetation in the polygon as well as being near the center of the polygon, to avoid edge effects for the bird survey .



Inside each allocated polygon (green) we created a 50m interior buffer (purple). Survey locations were located within the purple polygons to avoid edge effects.

- We collected vegetation data including structural characteristics (e.g., tree height and DBH) and composition and cover of the dominant and characteristic plant species.
- At each survey location, we set up digital recorders programmed to take three 5-minute recordings for three consecutive days. Recording sessions occurred at 30 minutes before sunrise, at sunrise, and 30 minutes after sunrise.
- To help calibrate the recordings, a 5-minute bird point count survey was conducted by field personnel simultaneously with an additional recording.
- Bird recordings are being interpreted by staff at the UC Davis Museum of Wildlife and Fish Biology.

Preliminary Results

After reviewing data from 158 bird point count surveys collected in 2018, we can begin to see both expected and unexpected relationships between vegetation type and structure and bird species occupancy.

Grasslands

The conversion of shrublands to non-native grasslands in the Modoc Plateau is of great concern. The bar graph below shows the number of observations of the six most abundant bird species in stands with low tree cover (<8% absolute cover) and low shrub cover (<10% absolute cover). Based on the preliminary information, the grassland avifauna of the Modoc Ecoregion appears depauperate, made up largely of two species: Western Meadowlark and Horned Lark. Dark-eyed Junco and Brewer's Sparrow are probably incidentals, at best, and have likely been recorded due to the proximity of woody vegetation adjacent to the grassland sampling site.

Left: Horned Lark.
Below: Western Meadowlarks in an open herbaceous stand.

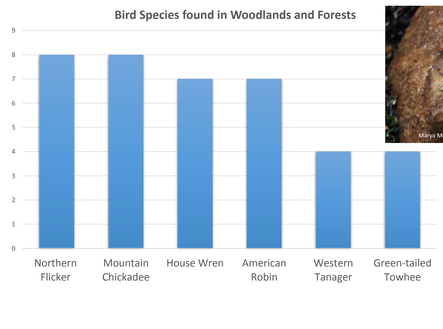
Left: Delineated *Ventanata dubia* stand.
Above: Photo of stand from the ground.

Western Meadowlark

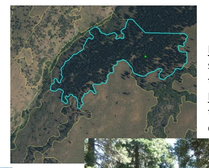
The Western Meadowlark is considered by the State Wildlife Action Plan (SWAP) to be a species that would benefit from conservation of preferred habitat in the Modoc Plateau (CDFW 2015). Our preliminary data shows that the Western Meadowlark is one of the most prevalent bird species found in Modoc Plateau. The bar graph below shows the number of times each bird species was observed in 158 point count surveys. Western Meadowlark is listed at the far left with 260 field observations, almost three times the number of observations as the next most common species. The pie chart indicates that 48% of the Western Meadowlarks observed were found in herbaceous habitats, 43% were found in shrublands, and only 9% were found in woodlands.

Forest and Woodlands

The most abundant bird species observed in stands with high tree cover (>10% absolute cover) are shown in the bar graph below. These species are generally predictable as woodland and forest species. Northern Flicker, Mountain Chickadee, and House Wren are cavity nesters while the American Robin, Western Tanager, and Green-tailed Towhee nest largely in woody vegetation. Analysis of the 2018 recordings along with data to be collected in 2019 will better clarify specific habitat preferences for vegetation type and structure, including tree size class, shrub density, and herbaceous cover.



Above: Western Tanager.
Below: Northern Flicker



Left: *Abies concolor* stand delineated in the vegetation map.
Below: A photo of the stand taken during the survey.

Western Juniper Woodlands

Juniperus occidentalis woodlands are an abundant and important component of the ecology of the Modoc Plateau and may be preferred habitat for certain bird species. Although a woodland vegetation type, some birds commonly found in *J. occidentalis* stands, such as Bewick's Wren, do not occur in other woodland or forest types. It seems to prefer lower-stature woodlands with a shrubby understory. Similarly, Green-tailed Towhee was one of the most commonly occurring species in woodlands (see graph above), yet it was only observed in juniper woodlands.

Left: Bewick's Wren.
Center: *J. occidentalis* woodland with a shrubby understory.
Right: Green-tailed Towhee

Next Steps……

- Survey a minimum of 150 additional sites in the spring and summer of 2019.
- Interpret avian recordings to identify bird species presence at each survey site.
- Analyze bird data with vegetation data to explore direct correlations between bird species occupancy and vegetation type and structure.
- Examine the relationship of bird species presence to the nearest-neighbor vegetation polygons to help us understand the correlation between broadly detectable birds, such as the western meadowlark, and neighboring vegetation types.
- Use the vegetation maps, survey data, and ongoing surveys of Greater Sage-grouse leks and nesting areas to explore correlations between vegetation characteristics and Greater Sage-grouse lek and nesting site preferences.
- Build and test a series of habitat occupancy models for birds of the area. Compare these models to statewide predictions based on standard WHR models.

References

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The National Audubon Society. https://www.audubon.org/field-guide/bird/western-meadowlark

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