



Keeping Landscapes Working

A Newsletter for Managers of Bay Area Rangelands

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A newsletter provided by UC Cooperative Extension Natural Resources Program in the San Francisco Bay Area. This newsletter provides information to managers of both public and private rangelands. RANGELAND, which is land characterized by natural vegetation i.e., grass, forbs and shrubs and managed as a natural ecosystem, is the predominate source of OPEN SPACE in the San Francisco Bay Area.

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Grazing for Biological Conservation

It has been well established that grazing by domestic livestock modifies plant and animal communities. The assumption is often that this modification degrades habitat for native plants and animals. But as more threatened and endangered species are recognized in the west, an increasing number of these species occur in habitats grazed by domestic livestock. Researchers are no longer simply looking at grazing versus rest; instead they are evaluating grazing strategies that vary intensity, timing and/or species of domestic herbivore to achieve specific habitat conservation objectives. They are also identifying management tradeoffs: the positive versus negative impacts of grazing strategies on various conservation objectives.

The fact that properly managed livestock grazing and conservation can be mutually compatible is significant and completely changes the way conservationist frame and solve grassland conservation issues. Livestock grazing not only becomes another tool that can be used against the threats that degrade habitat, but is also an important strategy for conserving large landscapes across public and private lands. This past summer a symposium was held to address this new paradigm. It featured researchers from various disciplines and affiliations who have been studying the impact of grazing on specific conservation issues in the western United States. Their research provided valuable insight for the design of future of grazing/ conservation studies, and called attention to management considerations for conserving grasslands worldwide. This issue of *Keeping Landscapes Working* includes summaries from three presentations made at the symposium. A proceedings of the symposium is available on CD. Contact Sheila Barry, sbarry@ucdavis.edu if you would like to receive a copy.

Association of Vegetation Composition and Canopy Structure with Songbirds in California Valley Grasslands

Sasha Gennet, Michele Hammond, James Bartolome - UC Berkeley

Sasha Gennet presented a small component of a larger, long-term research project initiated in 2002 by James Bartolome, East Bay Regional Park District and UC Berkeley's collaborative grasslands monitoring program. The goal of the program is to investigate the effects of grazing management in addition to several environmental variables such as annual weather, soils, topography, and landscape characteristics on the plant, avian, and small mammal communities within East Bay Regional Park grasslands. The program aims to develop a better understanding of the driving factors and trends in these non-equilibrium grassland ecosystems. Sasha's presentation focused on the 2004 and 2005 data that was collected on the grassland songbird guild as part of the larger program.

Researchers aimed to determine whether grassland birds are associated with the structural complexity of the local plant community; variance in canopy height, presence of litter, and bare ground were the structural attributes quantified. Researchers also looked at the relationship between the abundance of native plants and grassland songbirds since the species likely coevolved an association. Scientists also investigated the key question regarding whether or not grassland songbirds preferentially utilize grazed sites in the park district. Researchers also classified specific identifiable plant communities within the Valley Grassland matrix to see whether there is any association between communities and songbird abundance.

The project area consists of eight study sites on East Bay Regional Park District lands, a patchwork of public lands totaling close to 100,000 acres in Contra Costa and Alameda counties. The project also includes a ninth site on army reserve land in Dublin. The region is characterized by a Mediterranean climate with cool winters and hot, dry summers, and averaging

fifty centimeters of rainfall annually. Valley grassland ecosystems of the East Bay have been heavily impacted and due to development have become islands of habitat in a sea of urban sprawl. Therefore, quantifying the effects of plant community composition, land use, and landscape characteristics on birds utilizing the remaining habitat is quite urgent. Four songbird species were studied as part of the grassland-dependent songbird guild. The species range from the Grasshopper Sparrow (*Ammodramus savannarum*), which is a habitat specialist and quite rare, to the Western Meadowlark (*Sturnella neglecta*), at the opposite end of the spectrum, which is a habitat generalist and is common in many grasslands across the country. The Savannah Sparrow (*Passerculus sandwichensis*) and Horned Lark (*Eremophila alpestris*) were the other two species researched and fall inbetween the aforementioned species in terms of abundance and special habitat requirements. Grasshopper Sparrows are of particular concern because they have experienced a widespread decline in recent years and are considered rare in California. Data is collected three times annually at each of 62 plots located at eight sites within the park district. During the breeding season from March 15 through June 15 three ten-minute point counts are conducted for songbirds utilizing the standard variable-radius circular plot method. Vegetation plots coincide with the bird count areas and data is gathered within plots 36 meters in diameter utilizing four line point transects with forty points per line. Species and height data as well as litter and bare soil are recorded along the vegetation transects.

As expected, data demonstrated that Meadowlarks were three to four times more frequently observed than Grasshopper Sparrows. Sasha noted that researchers presume that each sighting represents a breeding pair, as females tend to be quite

secretive during the breeding season. Since low numbers of songbirds were recorded the data was converted to a binary response variable indicating either the presence or absence of the songbirds. Analyses were run for all four songbirds together, and for each of the four species independently. The predictor variables in the full model for the logistic regression included: grazing (binary), percent native composition, coefficient of variation percent height (continuous), percent litter cover (continuous), percent bare ground or rock (continuous), and solar radiation (continuous). Classification of plant communities was accomplished using a cluster analysis to identify eight distinct plant communities that remained surprisingly consistent between years. An indicator species analysis was performed to provide an index of frequency and abundance in identified sub-groupings. A multi-response permutation procedure was then run to check the strength of the relationships. A non-parametric multiple group comparison was also utilized.

The results for all birds indicated that grassland-dependent passerines in Valley Grasslands within the East Bay Regional Park District, as an avifaunal guild, were not significantly associated with structure or plant composition. However, the guild was observed to be consistently positively associated with grazing, as expected.

Western Meadowlarks demonstrated no clear patterns, which is logical given this generalist's ability to do well in a variety of habitats. Although some variables pertaining to structure did demonstrate positive coefficients they could not be reliably separated and were therefore not included in the final model.

Numbers were too low to be statistically significant; however Horned Larks appear to associate with community composition and canopy structure, favoring a high degree of variation in canopy height. Furthermore, Horned Larks were only observed in grazed plots.

Results for Savannah Sparrows were similar to Horned Larks; the sparrows are strongly associated with community composition and

various measures of canopy structure. However some specific measures of structure really can't be separated, such as percent litter and percent bare ground. Savannah Sparrows were also observed to be associated primarily with grazed plots; one Savannah Sparrow was recorded in an ungrazed plot in 2005.

Grasshopper Sparrows were only observed on twenty-five occasions over two years, making it impossible to draw any statistically significant conclusions. However, qualitative evidence of the interaction between Grasshopper Sparrows and the study variables was evident. No ungrazed plots contained the sparrows in 2004 or 2005. An odds-ratio comparison was performed and indicated that plots with more than five percent cover of native plant species were 8.6 times more likely to contain Grasshopper Sparrows, and additionally, that grazed plots are 9.4 times more likely to contain more than five percent cover of native species. In summary, plots containing more native plants were more likely to contain Grasshopper Sparrows, and grazed plots were more likely to contain more native species.

Key findings include the strong preferential use of grazed plots by all four species studied. Excluding Western Meadowlarks all species demonstrated patchy, sparse distribution, possibly due to niche saturation. Horned Larks and Savannah Sparrows are associated with plant community composition. There were inconsistent responses among the four bird species to predictor variables of structure, and the presence of native plants.

In conclusion, there is no indication from this analysis that ongoing livestock grazing in East Bay Regional Park District grasslands is negatively impacting songbird populations. Also, songbird species had variable associations with measurements of structure and species composition, suggesting that a mosaic of landscapes is preferable for maintaining these species.

Endangered Amphibian Research within Grazed Grasslands

Joseph DiDonato, East Bay Regional Park District

Joseph DiDonato presented an overview of research since 1996 pertaining to amphibian populations in pond habitats. Although researchers gathered data on all amphibian species at all life stages and all macro-invertebrates at each pond surveyed, the results presented were focused on pond habitat for two endangered species; red-legged frogs and tiger salamanders. The presentation further focused on the inter-relationship of grazing as a habitat management tool for maintaining vegetation at appropriate levels in ponds and the surrounding uplands as part of species management in the East Bay Regional Park District. The East Bay Regional Park District is a patchwork of regional parks comprising close to 100,000 acres in Alameda and Contra Costa Counties. Most species of concern occur East of the very densely populated highway 80 corridor in Eastern and Southern Alameda and Eastern Contra Costa Counties; this was also the location of the study sites. Adjacent private lands also contain similar populations of these species of special concern.

Researchers wanted to entertain the management of habitat for red-legged frogs and tiger salamanders in conjunction with cattle grazing. They aimed to shed light on the management of these ponds for a variety of species, but have decided to use the two aforementioned species as an example to illustrate how utilizing livestock grazing and its' effects on ponds where these species breed and spend a significant amount of time is productive. The effects of grazing also enhance the habitat for other species most notably the California ground squirrel, which tends to be a keystone species in Valley Grassland environments; they serve to provide habitat development underground and as a prey species above ground. Many species in the District are

known to utilize these burrows as refuge sites, in this case most notably amphibians. It is important to understand that in the case of California tiger salamanders especially, ponds only play a role in part of their life cycle. Adult California tiger salamanders enter ponds after the first heavy rains in winter usually from about November through January. Tiger salamanders may enter ponds very infrequently; in fact they may only enter once in five years and take up to seven years to begin breeding. Joe further emphasized that although these ponds certainly play a critical role for tiger salamanders to compete the reproductive phase of their lifecycle, they spend the majority of their time in the surrounding uplands. During their time in the uplands it has been verified by spotlight

surveys that tiger salamanders are in and out of ground squirrel burrows and from under debris in the uplands. Joe also cited research done by (Dr. H. Bradley Schafer, UC Davis) on the life history of this species. Researchers have concluded that pond and upland habitat as well as cattle are important to the maintenance of these communities and will continue to integrate cattle management with these species to meet the needs of all.



Tiger Salamander

Pond data was collected utilizing dip-nets, seines, and other tools during the surveys. Out of a total of 275 ponds in the district 179 were surveyed in 1996, 210 in 2000, and 186 in 2004, not all of the ponds were full in any one year for a variety of reasons. Researchers evaluated pond vegetation in and around ponds; for this presentation percent submerged and percent emerged vegetation were focused on, and were categorized as zero percent, less than 15 percent, or more than 15 percent. The majority of the ponds evaluated were exposed to livestock grazing, very few are enclosed because

managers have realized the value of the habitat goes down and species of concern utilize the habitat less frequently when grazing is removed.

In the case of the California tiger salamander if they are present in the pond then they are definitely breeding. The number of ponds with breeding was compared to the number of ponds available for breeding in a given survey year to yield values for the percent of available ponds with tiger salamanders breeding. The number of ponds available varies annually, however results for 1996, 2000, and 2004 illustrate that approximately fifty percent of ponds within the range and with necessary requirements for tiger salamanders were occupied by them.

In the case of red-legged frogs, if a pond is occupied by them it does not necessarily mean they will breed that year. The number of ponds occupied by red-legged frogs was compared with the number of ponds with breeding to yield a value for percent of ponds with breeding. From 73 to 89 percent of ponds with frogs also had breeding in 1996, 2000, and 2004. Red-legged frogs were more consistently present at individual ponds from year to year than tiger salamanders.

Researchers examined the vegetation structure in ponds as a result of livestock grazing, and found that for California tiger salamanders to successfully breed they must have significantly reduced vegetative structure. Furthermore, they found that these ponds can support red-legged frogs and a variety of other species as well. Researchers also noted that the density of ground squirrel burrows was also higher around grazed ponds with less vegetative structure, and as noted earlier these burrows are critical refuge sites for tiger salamanders and a variety of species in the uplands. Results demonstrate that the relative frequency of California tiger salamander occurrence is negatively correlated with the percent emergent vegetation in the ponds. The majority of salamanders occurred in ponds containing very little emergent vegetation. In the case of red-legged frogs, the relative frequency of their occurrence was also demonstrated to be

negatively correlated with the percent emergent vegetation contained in the pond. The fact that 47 percent of detections were in ponds with five percent or less emergent vegetation demonstrates that not a lot of vegetation is required to sustain breeding populations of red-legged frogs. Joe acknowledged that these results may have been somewhat skewed due to reduced detection rates associated with increased vegetation density; these rates are likely variable with different amounts of vegetation.

One possible reason given for the above trend is that these amphibians may avoid ponds with lots of vegetation because they are more susceptible to predacious aquatic hexapods that presumably feed on their larvae. Researchers found that although California tiger salamanders do coexist with hexapods; there is a significant negative correlation between populations of predacious insects and the occurrence of tiger salamanders in the ponds. This trend is probably a result of the fact that these insects require vegetation to breed and prey from vegetative perches. Additionally, Joe mentioned that introduced fish and bullfrogs also cause severe problems for amphibians in local ponds.

In conclusion, livestock grazing is an effective tool for maintaining open grasslands and oak savannah communities. There appears to be a strong association between these grazed communities, burrowing rodents, and the presence of tiger salamanders. Furthermore, compaction and reduction of vegetation by livestock has been documented to increase the ponding duration of vernal pools and seasonal ponds. The creation of stockponds has created highly suitable reproductive habitat for tiger salamanders. On District lands tiger salamanders breed exclusively in seasonal and perennial stockponds. The district supports over 500 adult red-legged frogs, and the vast majority of water bodies that support red-legged frogs also provide water for livestock. These stockponds provide highly suitable habitat that has augmented the red-legged frog population in the East Bay.

In summary, red-legged frogs are certainly compatible with range management utilizing livestock as a tool. Amphibians evolved with disturbances associated with large herbivores and such animals continue to play an important role in these ecosystems. Furthermore, the USFWS recent 4d rule exempts routine grazing practices as part of the Endangered Species Act. It was also stressed that private lands highly complement public lands in long-term species management.

Chico State Beef Day
Saturday, February 17, 2007, 8:00AM-4:00PM
Chico University Farm Pavilion
Featuring Dr. Gary Smith of
Colorado State University.
Baxter Black will perform at 7:00 p.m.
For more information please contact
Sean Earley: searley@csuchico.edu
(530) 898-5777 or Dave Daley at
ddaley@csuchico.edu
(530) 898-4539.



Cattle Grazing Impacts on California Coastal Prairie and Associated Wildflowers over a Broad Geographic Range

Grey F. Hayes and Karen D. Holl, Department of Environmental Studies
University of California, Santa Cruz

Grey Hayes presented work done as part of his doctoral dissertation at the University of California, Santa Cruz in the Department of Environmental Studies. Grey acknowledged that Karen D. Holl was his major professor at the University and co-author of the published work presented here.

Most people have the preconception that grazing harms biodiversity, however the results of this study suggest otherwise at least with native annual wildflowers. The study was done on California coastal prairie ecosystems that range from the Channel Islands in Southern California to Southern Oregon. The California coastal prairie ecosystem is different from inland grasslands because the habitat is moderated by summer fog, which is an important driving influence related to the fact that California coastal prairies have demonstrated to be the most diverse grassland ecosystem in North America, and (related to Dr. Provenza's previous presentation) diversity may create more animal health and choices, providing more choices than any other grassland system in North America. Sadly, this ecosystem is also the most urbanized major habitat type in the United States; 24% of California coastal prairie has been lost to urban sprawl.

Grey Hayes began the project after a number of botanists suggested that he look into the disappearance of annual wildflowers on California coastal prairies with conservation work being done on the coast. Over the last 20-30 years one quarter

of the coastline has been set aside in conservation status. Once lands are set aside the removal and cessation of livestock grazing is often implemented. Now, annual wildflowers, many of which are rare and endangered are found commonly more on private lands adjoining conservation lands. The objective of this work was to investigate this pattern.

Despite the uniqueness of California coastal prairies with their huge abundance of wildflowers and forbs, most studies have focused on the grasses; both native perennial species and exotic annual grasses. One study done by Heady 1956, included a series of photographs with varying degrees of residual dry matter. The study indicated that with heavy litter there is an abundance of non-native annual grasses and also a taller canopy. When litter was removed the photographs showed several native wildflowers. These results were the impetus for the utilization of residual dry matter standards to maintain grassland productivity.

The resulting hypothesis of this study is that cattle grazing increases the diversity and abundance of native forbs by several mechanisms; decreased

vegetation height, decreased litter depth, and an increase in bare soil. The sites for the study consisted of paired plots in proximity and having similar slopes less than thirty percent, soils, and aspects. The sites must have been grazed only by cattle. The ungrazed sites must have been ungrazed for at least five years, and, because after 15-30 years ungrazed California coastal prairies almost all turn to coastal scrub, the study targeted ungrazed sights that hadn't been ungrazed for more than 25 years. Access was another important and challenging aspect of sight selection. Several sights were selected along the California coast ranging from as far south as the Mount Diablo nuclear power plant in the south to just north of Fort Bragg in Westport.

Each sight included five 50 meter transects. Line transect data was collected at one meter intervals. Any species touching a pin lowered through the canopy was recorded, if none were touching it was reported as bare ground; this method yielded data pertaining to bare soil and dominant plant community composition. At five meter intervals along the transects, vegetation height and litter depth were reported and soil samples collected for analysis. Since this study focused on annual wildflowers that are rare; researchers also centered a one meter wide belt transect on each line transect and looked for annual wildflowers. When found they recorded aerial cover, species, and in center litter depth and vegetation height were measured.

After two years of data collection in 2000 and 2001 the results demonstrate several important trends. First, annual forb species richness and cover increases significantly with grazing on the California coastal prairie sights analyzed. Other results pertaining to species richness guilds indicate that exotic annual grass trends higher on grazed sights, exotic annual forb richness is also higher on grazed sights, and that native perennial grass and native perennial forb richness trends higher on ungrazed sights.

The soil samples gathered at five meter intervals along the transects were analyzed as composites and compared with the characteristics of the

paired site. The pH, organic matter content, total kejeladahl nitrogen, cation exchange capacity, and phosphorous, potassium, calcium, and magnesium concentrations in the soil were found to be the same under grazed and ungrazed sites.

As expected the ungrazed sights demonstrated significantly deeper litter and taller canopies, and less bare ground compared to grazed sites. A regression analysis was done to compare litter and canopy with and without annual forbs and demonstrated that vegetation height is a very important variable pertaining to native annual forbs.

Several meaningful conclusions can be drawn from this study. First, grazing increases native annual forb diversity and abundance in California coastal prairies. This may be due to decreased vegetation height and litter depth. Grasses show mixed responses to grazing. Exotic forb abundance increases with grazing. Finally, native perennial forb abundance decreases with grazing; this is probably due to native coastal scrub incursion.

Some land management recommendations resulting from this study are that grazing should be considered as a management tool in mesic grasslands, and that disturbance regimes should be varied across the landscape.

Several other studies around the world that have looked at the same trend show a shift from perennial to annual species with grazing, and a benefit to forb species richness. Studies cited and their locations are included in the PowerPoint presentation given at the symposium.

Finally, Grey Hayes posed the question that maybe we should expand on the idea of residual dry matter minimums already in place, and consider implementing maximums as well. He asked managers and planners to consider the following question when conserving native annual wildflowers: What about vegetation height guidelines?



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