

Chapter 3. Resident and Neotropical Migratory Bird Monitoring in Mountain Meadows: 2009 Report



Ryan D. Burnett
PRBO Conservation Science

Background and Introduction

Mountain meadows are among the most important habitats for birds in California (Siegel and DeSante 1999, Burnett and Humple 2003, Burnett et al. 2005); they support several rare and declining species and are utilized at some point during the year by almost every bird species that breeds in or migrates through the Sierra Nevada. Meadows also perform a vital role as watershed wetlands that store and purify drinking water for millions of Californians. And yet, most of these meadows are in a degraded state and their value for water storage and as critical habitat for birds and other wildlife has been dramatically reduced.

In the Sierra Nevada, meadows have been heavily degraded or lost due to well over a century of human activities including flooding, diversions, vegetation removal, and overgrazing (SNEP 1996, Siegel and DeSante 1999). As far back as 1869, John Muir lamented about the destruction of Sierra meadows by man, "...but as far as I have seen, man alone, and the animals he tames, destroy these gardens." Indeed few, if any, meadows in the Sierra remain unaltered by human activities. The meadows that do remain are in a compromised state and they are owned by a diverse set of interests including private industry and utilities, state and federal agencies, and private ranches.

Though they have been altered, a number of meadows in the Feather River watershed support populations of many declining and threatened riparian meadow bird species, including Sandhill Crane, Swainson's Thrush, Yellow Warbler, and Willow Flycatcher. The area also supports breeding populations of 11 of the 16 California Partners in Flight Riparian Focal Species (Humple and Burnett 2004, RHJV 2004). With its high diversity and abundance of meadow bird species, including the largest population of Willow Flycatcher in the Sierra Nevada region (Humple and Burnett 2004), the Feather River watershed is a conservation hotspot for meadow birds.

Meadow conservation and management in the Feather River watershed and throughout the Sierra Nevada will require a collaborative effort between different land management agencies, county government, non-governmental organizations, and private landowners. In order to manage for breeding bird populations, especially listed meadow-dependent species such as Willow Flycatcher and Sandhill Crane, the Forest Service

needs to with the other meadow landowners in the area in order to ensure the long-term viability of these and other bird species.

In this chapter we summarize results from point count surveys from meadows in the Feather River watershed in 2009, including three new sites in the Last Chance Creek watershed and one new site on the Eagle Lake Ranger District (ELRD). We use a suite of meadow focal species to compare abundance and richness metrics between meadows and provide recommendations for improving habitat for these and other species. We also briefly report on our breeding and post-breeding mist-netting efforts at wet meadow sites in the region.

Methods

Site Selection

Several considerations went into selecting meadow sites we sampled. Following an inventory of 16 meadows in the Almanor Ranger District (ARD) of the Lassen National Forest (LNF) between 2000 and 2001 we selected a subset of those sites to continue long-term meadow monitoring within. We were interested in surveying sites that supported or could support a riparian deciduous shrub (willows/alders) bird community and especially those sites that had recently undergone management changes (e.g. active restoration and/or removal of grazing). With these two considerations in mind we attempted to choose sites that represented a range of elevations and habitat conditions. With this strategy, we believe the sites selected are not totally representative of the range of meadow conditions in the ARD area but represent some of the higher quality riparian meadow bird habitat in the area. Sites within the Last Chance Watershed were added within areas that have been restored or are slated to be restored in the next couple of years. The Pine Creek Valley transect was established at the request of the ELRD in order to investigate the difference in the avian community within and outside of a grazing enclosure.

Point Count Censuses

Point count data allow us to measure secondary population parameters such as relative abundance of individual bird species and species richness. This method is useful for making comparisons of bird communities across time, locations, habitats, and land-

Figure 1. PRBO Northern Sierra meadow point count sites surveyed in 2009.



use treatments. Standardized five-minute multiple distance band point count censuses (Reynolds et al. 1980, Ralph et al. 1995) were conducted at each of 94 stations along nine transects in 2010 within the greater ARD area, 54 points in the Last Chance Creek Watershed in eastern Plumas County, and 15 points in the Pine Creek Valley on the ELRD for a total of 162 point count stations (Table 1). Point count stations were a minimum of 50 meters from meadow edges where feasible; if the riparian corridor was less than 100 meters wide, points were placed equidistant from each edge, and in most cases points were located within 50 meters of stream channel (where they existed). At each site points were spaced between 200 and 250 meters apart and were configured in a manner that maximized spatial coverage of sites.

Table 1. PRBO Northern Sierra meadow point count transects with transect codes, year established, and dates surveyed in 2009.

Transect	Code	# of points	Year established	2009 1st Visit	2009 2nd Visit
Alkali Flat	ALFL	18	2009	19-Jun	27-Jun
Carter Meadow	CAME	7	2004	16-Jun	30-Jun
Clark's Creek	CKCR	18	2009	29-May	20-Jun
Fanani Meadow	FAME	8	2003	28-May	17-Jun
Gurnsey Creek	GU CR	10	1997	1-Jun	16-Jun
Humbug Valley	HUVA	17	2003	10-Jun	26-Jun
Lower Last Chance Creek	LLCH	18	2009	13-Jun	25-Jun
Pine Creek Valley	PCVA	15	2009	13-Jun	22-Jun
Robber's Creek	ROCR	14	2004	12-Jun	29-Jun
Soldier Meadow	SOME	7	2001	28-May	17-Jun
West Shore Lake Almanor	WSLA	13	2004	2-Jun	18-Jun
Yellow Creek Riparian	YCRI	12	2001	5-Jun	19-Jun
Yellow Creek PG&E	YCPGE	6	2008	5-Jun	19-Jun
Total		163			

All birds detected at each station during the five-minute survey were recorded. Detections were placed within one of six categories based on the initial detection distance from observer: less than 10 meters, 10-20 meters, 20-30 meters, 30-50 meters, 50-100 meters, and greater than 100 meters. Birds flying over the study area but not observed using the habitat were recorded separately, and excluded from all analyses. The method of initial detection (song, visual or call) for each individual was also recorded. Counts began around local sunrise and were completed within four hours. Each transect was visited twice each year between late May and the end of June. With the exception of

Lower Last Chance Creek, Alkali Flat, and Clark's Creek, all surveys were conducted by the author who has been conducting point counts in the Sierra Nevada for over a decade. The three other sites were surveyed by two experts in Northern Sierra bird identification that passed a double observer field test with the author prior to conducting counts. An electronic range finder was used by all observers to assist with distance estimation at each point count station.

Statistical Analysis

Point count analysis was restricted to a subset of the species encountered. We excluded species that do not breed in the study area as well as those species that are not adequately sampled using the point count method (e.g., shorebirds, waterfowl, raptors, and swallows). For a number of the analyses we used a suite of meadow focal species that represent a range of meadow bird habitat conditions and as a group are likely to provide a better measure of the quality of meadow habitat than all species (Chase and Geupel 2005; Table 2).

Table 2. Avian focal species (listed in taxonomic order) for meadow monitoring in the ARD and their conservation status. California Partners in Flight Riparian Focal species are noted in bold (RHJV 2004).

Species	Conservation Status ¹
Sandhill Crane	State Threatened
Red-breasted Sapsucker	Declining in the Sierra ² ; NTMB
Willow Flycatcher	State Endangered, USFS Sensitive, NTMB
Warbling Vireo	NTMB, Declining in the Western U.S.
Swainson's Thrush	USFS Priority Land Bird Species, NTMB
Black-headed Grosbeak	NTMB
Yellow Warbler	State Species of Special Concern, NTMB
MacGillivray's Warbler	NTMB
Wilson's Warbler	Significant Decline in Sierra ² , NTMB
Song Sparrow	None
Lincoln's Sparrow	NTMB

¹NTMB = Neotropical Migratory Bird

² from Sauer et al. 2008.

Species richness

The species richness index used here was obtained by summing the species detected within 50 meters of the observer across both visits to each point count station and then averaged across all points in the transect. Similarly, focal species richness is the same calculation but limited to the list of species in table 2. Presenting the mean species richness, as is done herein, allows for comparisons between transects or habitats consisting of different numbers of point count stations but does not provide a measure of the total number of species across an entire transect.

Indices of Abundance

An index of total bird abundance, defined as the mean number of individuals detected per station per visit, was calculated for each transect. This number is obtained by dividing the total number of detections within 50 meters of the observer by the number of stations and the number of visits. The same method was employed for creating focal species abundance (the total number of individuals of all focal species combined) and for each individual focal species. Note that Sandhill Crane was did not occur within 50m of observers but would not have been included in these indices if it had as it is not adequately sampled using point counts (large territories and shy).

Results

Song Sparrow was the most abundant meadow bird focal species detected from 2003 – 2009 at the Almanor area meadows with an index of abundance of 1.17, followed by Yellow Warbler at 1.04 (Figure 2). In the Last Chance Creek watershed these two species were also the most abundant focal species with indices of abundance of 0.97 and 0.74 respectively (Figure 3). Willow Flycatcher, a Forest Service sensitive and state threatened species, had an index of abundance of 0.08 in the Almanor area while this species along with Wilson's Warbler and Lincoln's Sparrow were not detected in the Last Chance watershed.

Figure 2. The mean abundance (+/- standard error) of nine meadow focal species per point count visit from 2003 – 2009 across all sites combined in wet riparian meadows in the Almanor Ranger District.

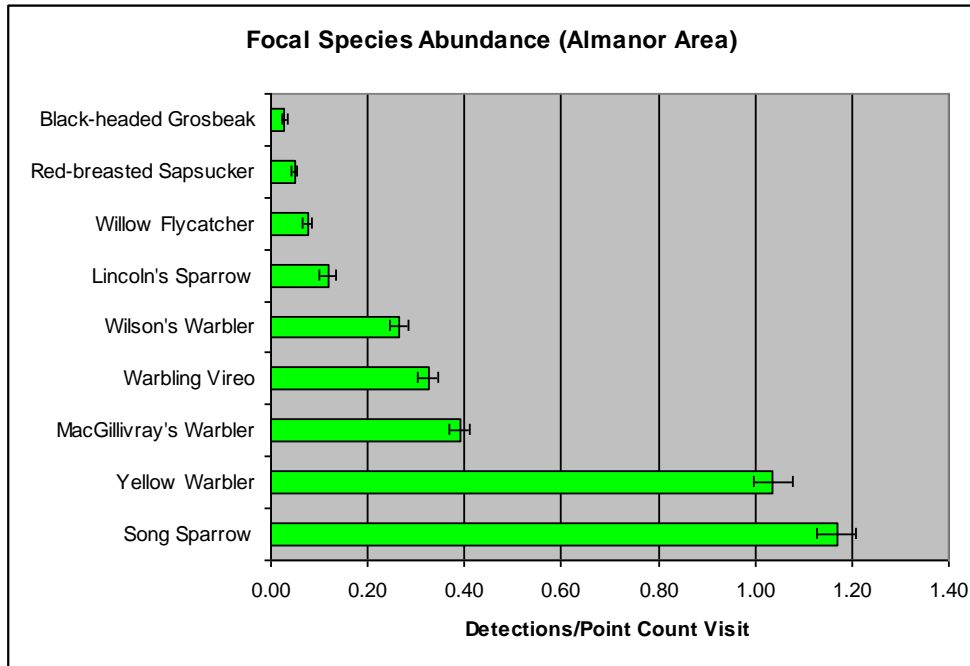
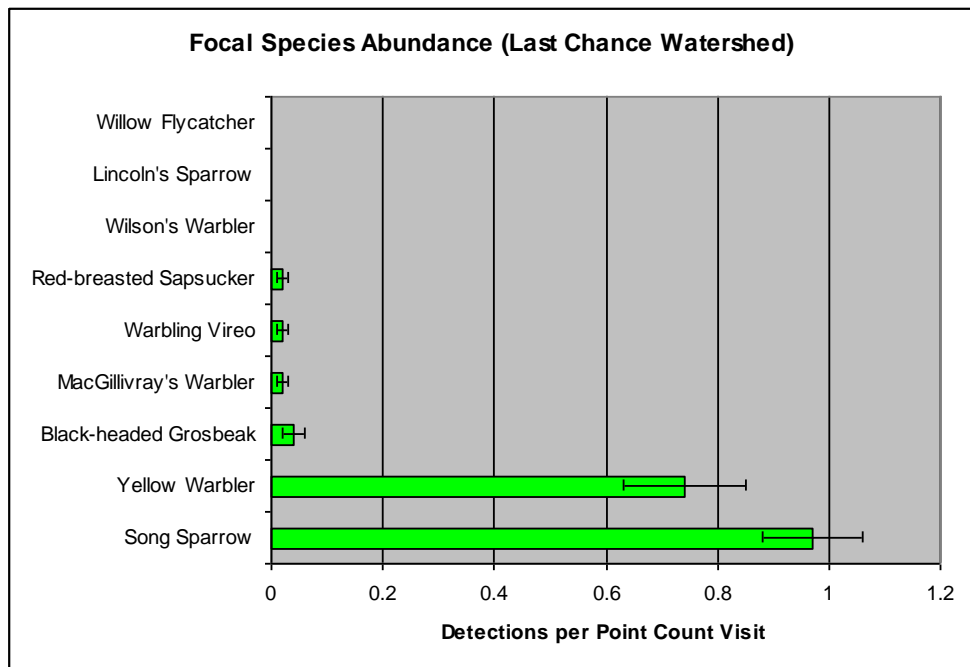


Figure 3. The mean abundance (+/- standard error) of nine meadow focal species per point count visit in 2009 across all sites combined in the Last Chance Creek watershed. Note Willow Flycatcher, Lincoln's Sparrow, and Wilson's Warble were not detected here in 2009.



Meadow Comparison

I compared species richness, total bird abundance, focal species richness, and focal species total abundance across all sites in 2009. The mean species richness for all sites combined was 6.09. Carter Meadow had the highest avian species richness with 8.86 species per point (Figure 4). Carter Meadow was followed closely by Robber’s Creek and Yellow Creek at 8.79 and 8.75, respectively. All three of these sites had overall species richness significantly higher than the average for all sites combined. The lowest species richness was for Yellow Creek PG&E with 1.5 species per point. Other sites with significantly lower species richness than the average for all sites combined were Pine Creek Valley, Lower Last Chance Creek, Soldier Meadow, and Alkali Flat. The mean total bird abundance in 2009 for all sites combined was 6.02. Total bird abundance was highest at Carter Meadow with 9.14 detections per point per visit (Figure 5). The only other site with significantly higher total bird abundance than the mean for all sites combined was West Shore Lake Almanor at 8.35. Sites with significantly lower total bird abundance than the 2009 average were Yellow Creek PG&E at 1.5, Soldier meadow at 2.71, Pine Creek Valley at 3.20, and Lower Last Chance Creek at 3.64.

Figure 4. Avian species richness (per point per year detections <50m) at 12 meadow sites in the Northern Sierra Nevada in 2009 with 95% confidence intervals. The dashed line represents the mean for all sites combined. Four letter site codes are defined in Table 1.

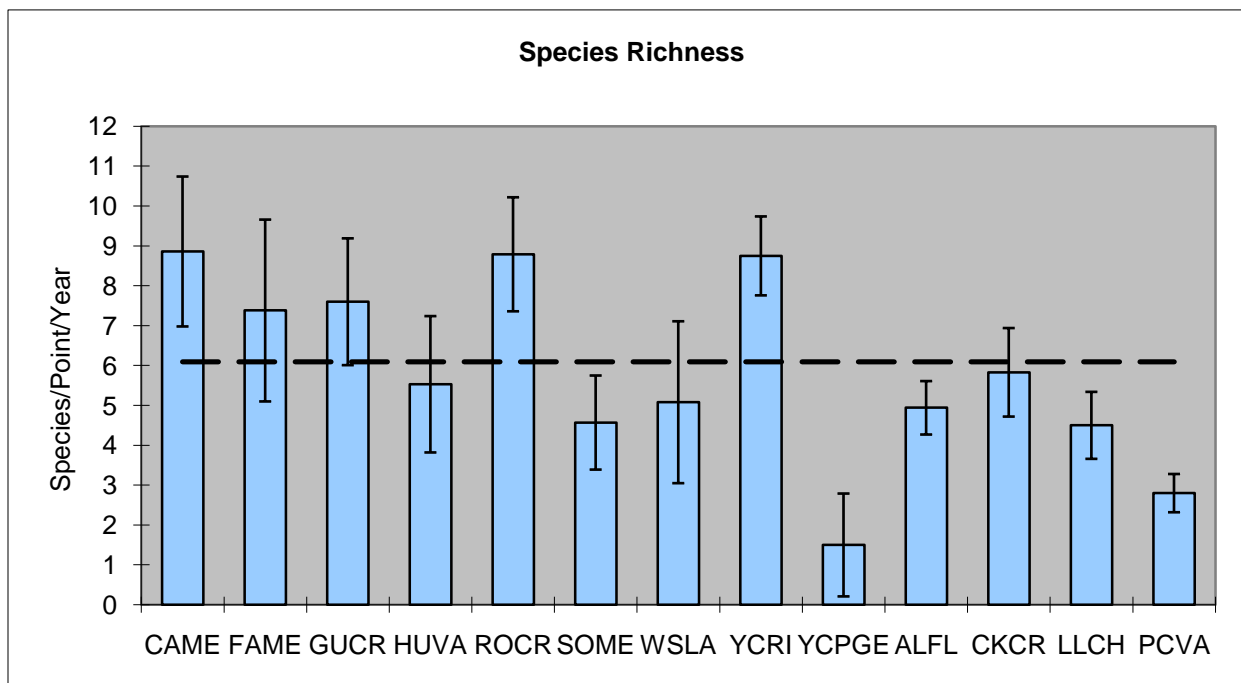
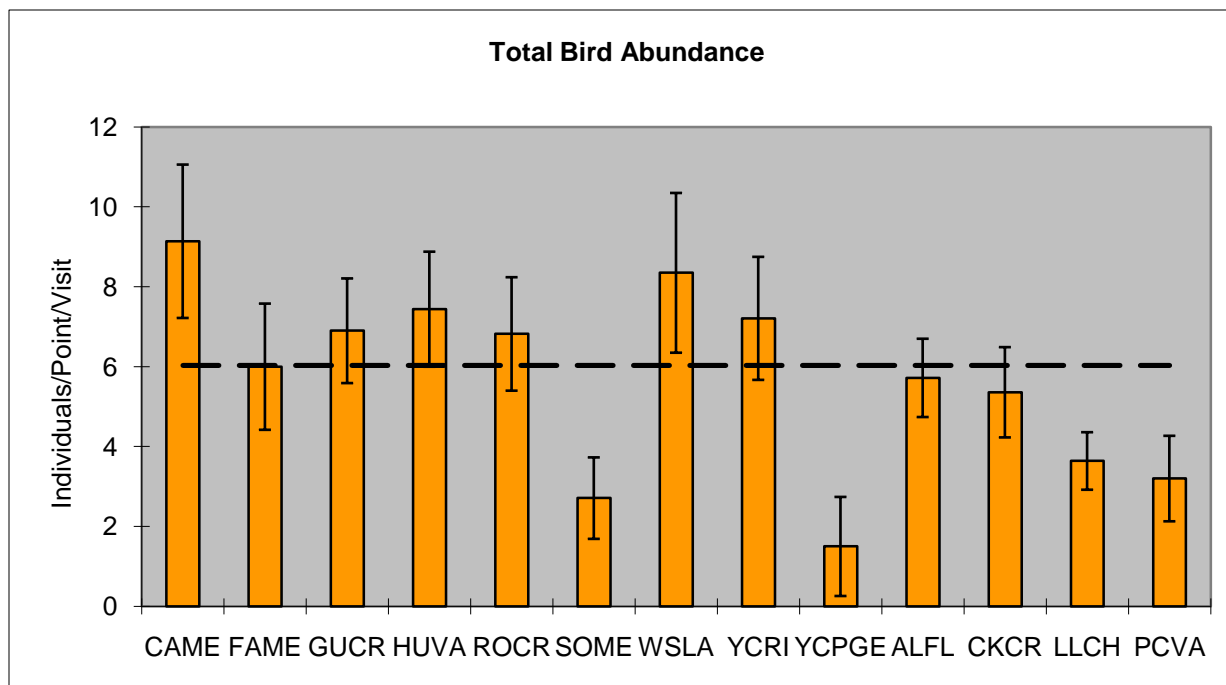


Figure 5. Total bird abundance (per point per visit detections <50m) at 12 meadow sites in the Northern Sierra Nevada in 2009 with 95% confidence intervals. The dashed line represents the mean for all sites combined. Four letter site codes are defined in Table 1.



The mean focal species richness for all sites combined in 2009 was 2.38. Focal species richness was highest at Fanani Meadow with 4.38 species per point (Figure 6). The only other sites with focal richness significantly higher than the 2009 average were Gurnsey Creek with 4.0 and Carter Meadow at 3.43. Lower Last Chance Creek (1.72), Alkali Flat (1.17), Yellow Creek PG&E (0.0), and Pine Creek Valley (0.0) all had focal richness significantly lower than the average.

The mean focal species abundance for all sites combined in 2009 was 2.81. Focal species abundance was highest at Gurnsey Creek with 4.55 detections per point per visit followed by West Shore Lake Almanor with 4.19 (Figure 7). These meadows were the only two with significantly higher focal species abundance than the average from all sites combined. The meadows with significantly lower focal species abundance than the 2009 average were Lower Last Chance Creek (1.75), Alkali Flat (1.56), Soldier Meadow (0.93), Yellow Creek PG&E (0.0), and Pine Creek Valley (0.0).

Figure 6. Avian meadow focal species richness (per point per year detections <50m) at 12 meadow sites in the Northern Sierra Nevada in 2009 with 95% confidence intervals. The dashed line represents the mean for all sites combined. Four letter site codes are defined in Table 1.

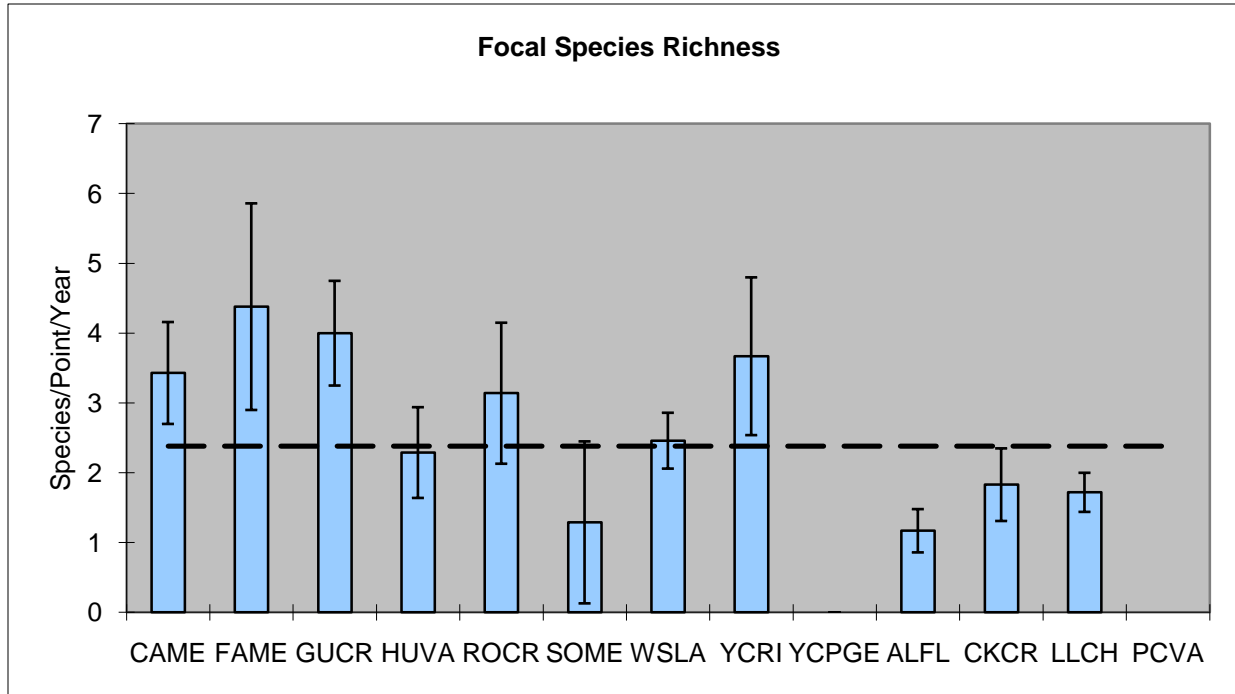
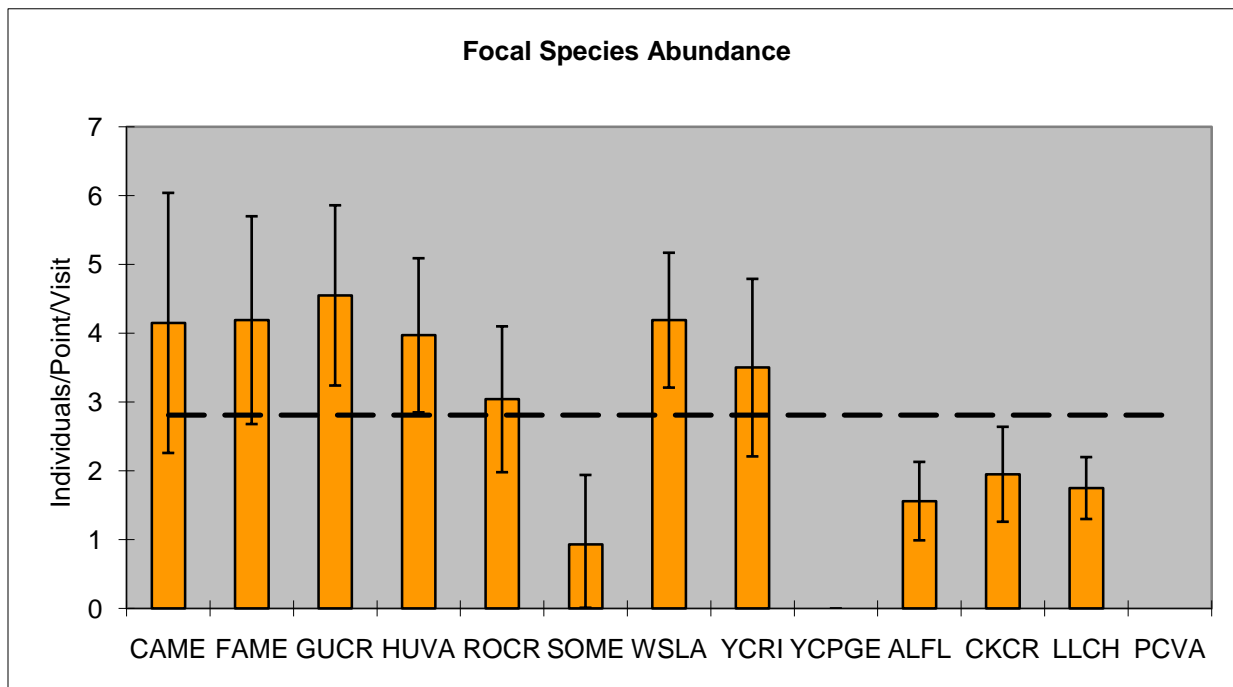
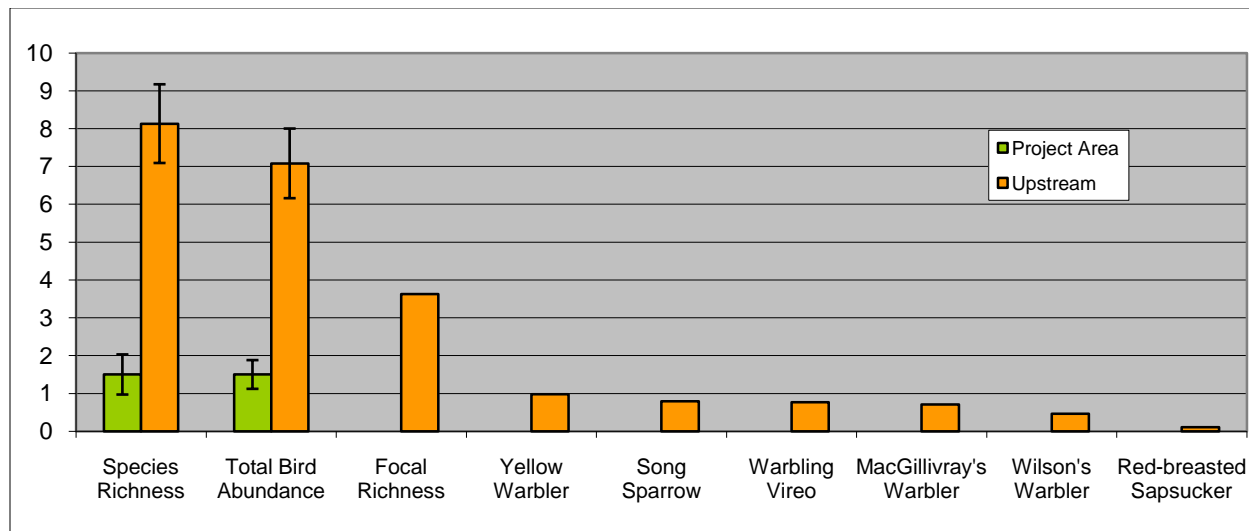


Figure 7. Meadow focal species abundance (per point per visit detections <50m) at 12 meadow sites in the Northern Sierra Nevada in 2009 with 95% confidence intervals. The dashed line represents the mean for all sites combined. Four letter site codes are defined in Table 1.



PG&E and its partners have been considering restoring a portion of Yellow Creek where it enters the valley floor in Humbug Valley. We have been monitoring birds upstream of this area on Yellow Creek since 2003. In 2008, an additional six point count stations were added at the downstream end of the existing transect in order to sample the project area (YCPGE). Using data from 2008 and 2009, I compared several avian metrics between the project area and the Forest Service land immediately above the proposed project area (Figure 8). Species richness, total bird abundance, focal richness, and the abundance of six focal species were all significantly lower in the project area. In fact, we did not detect a single focal species in two years within the project area. The primary species detected in the project were Horned Lark and Savannah Sparrow, two species associated with drier grassland habitat.

Figure 8. Avian indices along Yellow Creek comparing the proposed Feather River CRM-PG&E restoration reach with Forest Service land upstream in 2008 and 2009. Error bars are 95% confidence intervals. Note no meadow bird focal species were detected in the proposed project area in either year.

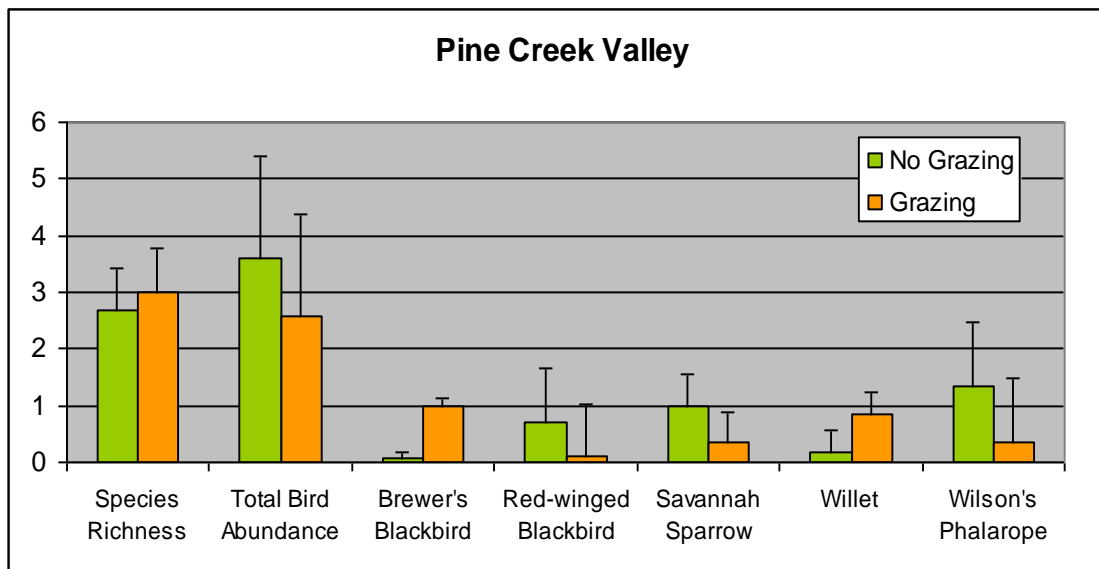


Pine Creek Valley Grassland Grazing Exclosure

At the Pine Creek Valley site, species richness was slightly higher outside of the grazing exclosure and total bird abundance was greater inside the exclosure, although neither of these differences was statistically significant (Figure 10). Only the abundance of Willet and Brewer's Blackbird – more abundant outside the exclosure - and Savannah Sparrow – more abundant inside the exclosure - were statistically significant. Wilson's Phalarope were more than four

times more abundant inside of the enclosure than outside though due to the relatively limited sample size (n=15) this difference was not quite statistically significant.

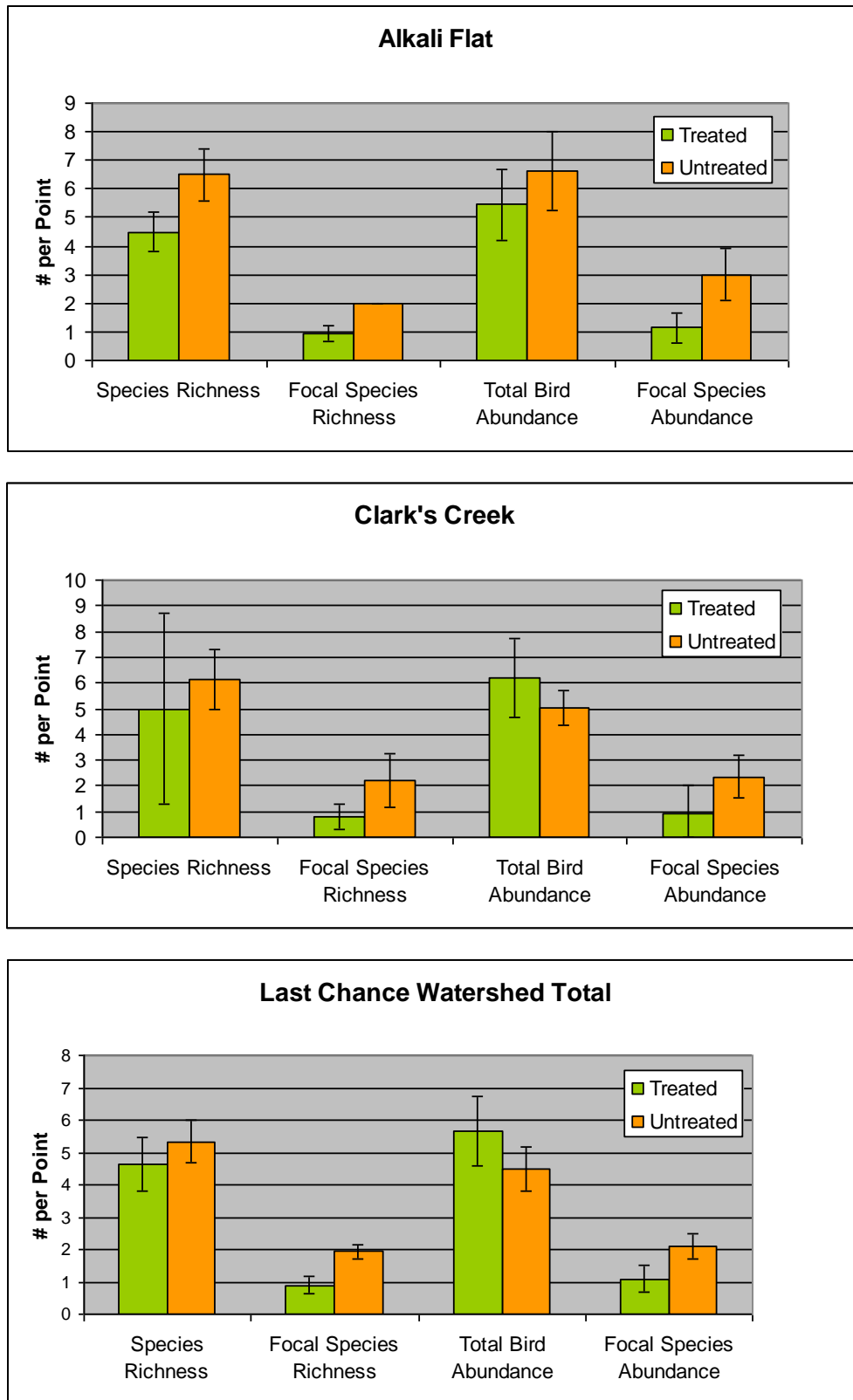
Figure 10. Species richness, total bird abundance, and an index of the abundance of five species per point count station in the Pine Creek Valley grassland within and outside of a grazing enclosure in 2009. Error bars represent the 95% confidence interval.



Last Chance Creek Restored vs. Unrestored

I compared species richness, focal species richness, total bird abundance, and focal species abundance at restored and untreated sites in the Last Chance Creek watershed in 2009. Along the Alkali Flat transect, eleven point count stations were within areas that have been treated while five points fell within treated areas on the Clark's Creek transect. Seven of the restored sites at Alkali Flat were restored in 2003 with the remaining three restored in 2007. All five of the restored points at Clark's Creek were restored in 2001. All four metrics were higher at untreated sites along the Alkali Flat transect, with species richness, focal species richness, and focal abundance significantly so (Figure 9). For Clark's Creek, species richness, focal species richness, and focal species abundance were all higher at untreated sites while total bird abundance was higher at treated sites. Only focal species richness and abundance were significantly different between restored and un-restored points at Clark's Creek in 2009. When all sites in the watershed were combined - including the 18 untreated points along the Lower Last Chance Creek transect - focal species richness and abundance were significantly higher at untreated sites. Species richness was higher at untreated sites while total bird abundance was higher at treated sites but these differences were not significant.

Figure 9. Per point species richness, total bird abundance, meadow focal species richness and meadow focal species abundance at restored and un-restored point count stations at Alkali Flat, Clark's Creek, and all sites combined in the Last Chance Creek watershed in 2009 with 95% confidence intervals.



Post-breeding Meadow Use

During the 2009 breeding season, we continued bird banding at the Gurnsey Creek mist-net station, the 13th consecutive year this site has been monitored (Appendix A). Single visit post-breeding mist-netting also continued at four meadows in the ARD: Hay, Swain, Spenser, and Carter. Capture rates at these meadows in 2009 were very high with between 3.21 – 5.97 captures per net hour compared to 1.15 captures per net hour, the breeding season average at Gurnsey Creek suggesting a relatively good productivity year for a number of species in the area.

Discussion

Wet meadows with extensive riparian deciduous vegetation support rich and abundant breeding bird populations and are used extensively following the breeding season by the majority of upland breeding species in the Sierra. Since wet meadows represent less than 1% of National Forest land in the Sierra Nevada, and have been heavily degraded over the past century, meadow restoration and conservation should be among the highest priorities of land managers in the Sierra Nevada. As meadows are arguably the single most important habitat for birds in the Sierra Nevada (Siegel and DeSante 1999), and birds are a cost-effective tool to help guide ecological restoration, avian monitoring and the management recommendations generated from it should be seen as an integral tool to achieving meadow restoration in the Sierra Nevada.

The ARD area meadows support higher bird abundance than any other habitat type in the Lassen region we have surveyed. Only aspen habitat (see Chapter 2) has slightly higher species richness. Meadows in the greater ARD area are among the most important for meadow birds in the Sierra Nevada. Yellow Warbler, a California Bird Species of special concern, reaches its greatest reported density in the state here (RHJV 2004, Heath 2008). The area also harbors more Willow Flycatcher than any other similarly sized area of the Sierra Nevada as well as a breeding population of the state threatened Greater Sandhill Crane. With a wealth of mountain meadows and many in a degraded state, the Feather River watershed should be considered an ideal location to focus restoration actions to benefit these and other meadow dependent bird species.

Though many of our meadows sites, especially in the ARD, support relatively diverse and abundant bird populations, it appears that many meadow sites (including a number we surveyed) could benefit from some additional restoration actions. For many of the sites (Robber's Creek, Gurnsey Creek, Soldier Meadow), removal of encroaching conifers and

planting of willows could ensure the long-term health of these sites. Both Humbug Valley and Yellow Creek have sections of stream channel that have been isolated from their floodplains and may benefit from more significant restoration actions that restore a wet meadow condition. An increase in riparian deciduous vegetation (e.g. *Salix*, *Populus*, and *Alnus* spp.) at many of these sites would greatly enhance their value to meadow birds (e.g. Soldier Meadow, Last Chance Creek restored sites).

There is currently little habitat value for wet meadow bird species within the Yellow Creek proposed project area. In fact, the site had the lowest avian indices of any meadow site we surveyed in 2009. In contrast, the 2 kilometers of meadow upstream from the project area support a diverse and abundant meadow bird community, including recent detections of Swainson's Thrush and Willow Flycatcher – the two rarest meadow birds in the Sierra Nevada. Additionally, this area supports an abundant population of Yellow Warbler, a California Bird Species of Special Concern (Shuford and Gardali 2008). On Humbug Creek, 1 kilometer across the valley from the project area, there are approximately eight Willow Flycatcher territories as well as a large number of Yellow Warbler territories. Restoring Yellow Creek within the proposed project area to a wet meadow with a substantial willow component is likely to have substantial benefits to all of these meadow species of conservation interest as well as a host of other meadow dependent focal species.

Unlike Yellow Creek, unrestored areas within the Last Chance Creek watershed do support populations of several meadow focal species, especially Song Sparrow and Yellow Warbler. Interestingly, we found that most avian metrics were higher at unrestored sites than restored sites in the watershed in 2009. The higher total bird abundance at restored sites is primarily due to Red-winged Blackbird being 28 times more abundant at restored sites, the species that has clearly benefited the most from restoration actions thus far. Since we do not have pre-treatment data for the areas that have been restored, it is difficult to determine how restoration has affected the rest of the avian community at these sites. However, with some of the lowest avian indices of any meadow sites we surveyed in 2009 and the fact that restored sites have lower indices than unrestored sites, it appears that additional restoration actions (e.g. willow planting) should be considered at restored sites to improve habitat for wet meadow dependent birds. Where appropriate conditions exist to support riparian deciduous shrubs and trees, creating dense clumps of these plants should improve habitat for meadow birds. Existing willow clumps

within the watershed that support Yellow Warbler and Song Sparrow could be used as a template for creating suitable habitat in restored meadow areas. Alkali Flat sites 1-4 and Clark's Creek sites 10 and 11 had the highest density of these two species on these two transects. Additional considerations during the design phase of restoration projects may also help improve habitat for meadow birds in the first 10 years after restoration.

The Pine Creek Valley grassland is a distinctly different meadow than most of the sites we have surveyed. Indeed it is more of a wetland with ponded water in many years well into June with an undefined stream channel. Thus, the habitat is more suitable for bird species such as waterfowl, shorebirds, and Sandhill Crane. We documented relatively large numbers of both Wilson's Phalarope and Willet at this site, both of which we believe breed here based on timing of their occupancy and behaviors. Additionally, a pair of Sandhill Crane was observed on both visits within and outside of the grazing enclosure. A complete list of species and their breeding status is presented in Appendix B. In 2009 the majority of the wetland area we surveyed in Pine Creek was inundated with water and therefore not actively being grazed by cattle. Thus, the differences in habitat inside and outside of the grazing enclosure did not appear great. However, we did find that Wilson's Phalarope, Savannah Sparrow, and Red-winged Blackbirds were all substantially more abundant inside of the enclosure while Willet and Brewer's Blackbird were more abundant outside of the enclosure. The Willets were primarily associated with the small hummocks that provided upland islands within the flooded wetland. This feature was unique to the area outside of the enclosure and may explain why the majority of Willet were found outside of the enclosure and species richness was higher here.

A priority for meadow bird conservation in the Feather River watershed should be protecting and enhancing the largest wet meadows, especially for Sandhill Crane, Willow Flycatcher, and Yellow Warbler. However, our results also show that species such as Lincoln's Sparrow, Wilson's Warbler, and Warbling Vireo are much more abundant in smaller and higher elevation meadows, such as Carter. Several other higher elevation meadow sites such as Robber's Creek, Hay Meadow, and Spenser Meadow (where we have conducted post-breeding banding), also support breeding Lincoln's Sparrow. Thus, we recommend managing the larger meadow complexes at lower elevations (3500 – 5500 feet) for species such as Sandhill Crane, Willow Flycatcher, and Yellow Warbler (Childs Meadow, Battle Creek Meadow, Deer Creek Meadow, Humbug Valley, West Shore Lake Almanor) while also protecting and, where

necessary, enhancing higher elevation sites to support species such as Lincoln's Sparrow and Wilson's Warbler as well as provide critical post-breeding habitat for the majority of migratory birds that breed in the Sierra Nevada. Additionally, wetland habitats which generally support far lower abundance and diversity of meadow birds are important as they provide unique habitat for uncommon species such as Sandhill Crane, shorebirds, and waterfowl.

Conclusions

With the loss and degradation of riparian meadow habitat and its disproportionate importance to birds, restoration and prudent management of meadows in the Feather River watershed should be among the highest priorities of land managers here. Increasing the function and resiliency of wet willow-filled meadows should result in improved meadow bird habitat; however, active measures such as willow planting is likely necessary to ensure habitat is provided sooner rather than later. Meadow restoration in the Feather River watershed requires partnerships between the U.S. Forest Service, local government agencies (e.g. Feather River Coordinated Resource Management Group.), and non-profit organizations (e.g. The Nature Conservancy, Feather River Land Trust, PRBO Conservation Science). Working together these groups have the potential to dramatically increase the value of meadow habitats for birds in this region.

Acknowledgements

Funding for our meadow bird project is provided through Lassen National Forest wildlife monitoring funds and a grant from the Resources Legacy Family Foundation. I wish to thank Colin Dillingham and David Arsenault for their many hours of volunteering to collect all of the bird data for the three Last Chance Creek transects. Additionally I would like to thank Tom Frolli, Bobette Jones, Tom Rickman, and Mark Williams from the Lassen National forest and Leslie Mink, Kara Rockett, and Jim Wilcox of the Feather River Coordinated Resource Management Group for their assistance and support of this project.

Literature Cited

Burnett, R. D., and D. L. Humple. 2003. Songbird monitoring in the Lassen National Forest: Results from the 2002 field season with summaries of 6 years of data (1997-2002). PRBO report to the U.S. Forest Service.

Burnett, R.D., D.L. Humple, T. Gardali, and M. Rogner. 2005. Avian Monitoring in the Lassen National Forest. 2004 Annual Report. PRBO report to the U.S. Forest Service.

Chase, M.K. and G.R. Geupel. 2005. The use of avian focal species for conservation planning in California. *In* Proceedings of the 3rd International Partners in Flight Conference. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

Heath, S.K. 2008. Yellow Warbler (*Dendroica petechia*) *In* Shuford, W.D. & T. Gardali (eds.), California Bird Species of Special Concern. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento.

Humple, D.L. and R.D. Burnett 2004. Songbird monitoring in Meadow and Shrub habitats within the Lassen National Forest: Results from the 2003 Field Season. A PRBO progress report to the USDA Forest Service. PRBO Contribution # 1173.

Muir, J. 1911. My first summer in the Sierra. The Riverside Press, Cambridge, MA.

Ralph, C.J., Droege, S., Sauer, J.R., 1995. Managing and monitoring birds using point counts: standards and applications. *In*: C. J. Ralph, J. R. Sauer and S. Droege (Eds.), Monitoring bird populations by point counts. USDA Forest Service, General Technical Report PSW-GTR 149, 161-169.

Reynolds, R.T., J.M. Scott, and R.A. Nussbaum. 1980. A variable circular plot method for estimating bird numbers. *Condor* 82:309:313.

RHJV (Riparian Habitat Joint Venture). 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. <http://www.prbo.org/calpif/pdfs/riparian.v2.pdf>.

Shuford, W.D., Gardali, T. (Eds.), 2008. California Bird Species of Special Concern. Studies of Western Birds No. 1. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento.

Siegel, R.B. and D.F. DeSante. 1999. Version 1.0 The draft avian conservation plan for the Sierra Nevada Bioregion: conservation priorities and strategies for safeguarding Sierra bird populations.

SNEP (Sierra Nevada Ecosystem Project) 1996. Sierra Nevada Ecosystems. Volume 1, chapter 1. Regents of the University of California. http://ceres.ca.gov/snep/pubs/web/PDF/v1_ch01.pdf

APPENDIX A. Summary of 2009 meadow mist-netting in the Almanor Ranger District with dates, net hours, captures, and capture rates.

Site	Date	Net Hours	Captures	Captures/ net hour
Gurnsey Creek	5/20/2009	45	50	1.11
Gurnsey Creek	5/30/2009	40	49	1.23
Gurnsey Creek	6/9/2009	45	37	0.82
Gurnsey Creek	6/20/2009	43.92	52	1.18
Gurnsey Creek	6/27/2009	44.5	63	1.42
Gurnsey Creek	7/9/2009	43.5	78	1.79
Gurnsey Creek	7/17/2009	45	62	1.38
Gurnsey Creek	7/29/2009	45	33	0.73
Gurnsey Creek	8/5/2009	45	58	1.29
Gurnsey Creek	8/17/2009	45	21	0.47
Gurnsey Creek Total (Summer)		441.92	503	1.14
Gurnsey Creek	8/24/2009	44.5	35	0.79
Gurnsey Creek	9/1/2009	45	31	0.69
Gurnsey Creek	9/8/2009	45	27	0.60
Gurnsey Creek	9/15/2009	45	30	0.67
Gurnsey Creek	9/22/2009	45	64	1.42
Gurnsey Creek	9/28/2009	42	123	2.93
Gurnsey Creek Total (Fall)		266.5	310	1.16
Hay Meadow	7/30/2009	36	215	5.97
Swain Meadow	7/31/2009	36	209	5.81
Carter Meadow	8/3/2009	33	166	5.03
Spenser Meadow	8/4/2009	34	109	3.21

APPENDIX B. Breeding status of all bird species detected during two visits to the Pine Creek Valley wetland in 2009. Breeding status codes: 1 = confirmed breeder, 2 = likely breeder, 3 = no suitable nesting habitat within the wetland for this species probably just foraging here.

Common Name	Scientific Name	Breeding Status
American Robin	<i>Turdus migratorius</i>	3
Barn Swallow	<i>Hirundo rustica</i>	1
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	2
Brewer's Sparrow	<i>Spizella breweri</i>	2
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	1
Common Raven	<i>Corvus corax</i>	3
Horned Lark	<i>Eremophila alpestris</i>	2
Killdeer	<i>Charadrius vociferus</i>	2
Mallard	<i>Anus mallardi</i>	2
Mountain Bluebird	<i>Sialia currucoides</i>	2
Mourning Dove	<i>Zenaida macroura</i>	2
Northern Pintail	<i>Anas aculta</i>	2
Northern Shoveler	<i>Anas clypeata</i>	2
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	1
Sandhill Crane	<i>Grus canadensis</i>	2
Savannah Sparrow	<i>Passerculus sandwichensis</i>	2
Spotted Sandpiper	<i>Actitis macularia</i>	2
Vesper Sparrow	<i>Pooecetes gramineus</i>	2
Western Meadowlark	<i>Sturnella neglecta</i>	2
Willet	<i>Catoptrophorus semipalmatus</i>	2
Wilson's Phalarope	<i>Phalaropus tricolor</i>	1
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	2