

Using birds as indicators to inform oak and aspen restoration in the Scott Valley: 2019 progress report

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Introduction

Klamath Bird Observatory is partnering with EcoTrust Forest Management (EFM), the Scott River Watershed Council (SRWC), and Quartz Valley Indian Community (QVIC) to use birds as indicators to inform forest planning, evaluate project outcomes, and improve restoration through adaptive management in oak, aspen, and meadow habitats in the Scott Valley. We are using standardized bird monitoring techniques to quantify avian response to oak and high elevation aspen and meadow restoration. Birds are widely recognized as excellent ecological and management indicators because they are closely associated with different components of vegetation structure and composition, they respond quickly to habitat change at multiple spatial scales, and they are relatively easy and cost-effective to monitor. Avian monitoring data will be used as metrics of habitat integrity and ecosystem function, to measure the success of restoration actions. By studying a suite of bird species' responses to restoration, we can quantify whether or not land management has reached its desired conditions on the ground. For instance, a different suite of bird species will be expected to use oak or aspen stands with conifer encroachment compared to oak or aspen stands restored via conifer thinning. Using data on wildlife utilization of the restored habitats provides a more meaningful and multi-dimensional assessment of restoration success than vegetation metrics alone. KBO staff have extensive experience in using birds as management indicators to aid in conservation planning and evaluate outcomes of restoration actions.

EFM has recently acquired 40,000 acres of former industrial timberlands in the Scott River headwaters. They are transitioning to a sustainable timber harvest (Forest Stewardship Council-certified) and a more conservation- and restoration-oriented ownership. Because of their ecological importance, conservation partners including EFM, SRWC, and QVIC have identified oak habitats as a high priority. EFM and SRWC have also identified high elevation aspen stands as a priority to restore, via thinning to reduce conifer encroachment and cattle exclusion to enhance aspen recruitment, on a total of 22 acres around Big Meadows (Figure 1). EFM has invited KBO and QVIC to participate in wildlife monitoring and restoration planning, an important opportunity to reverse the limited participation QVIC previously had in management of these ancestral lands. It is a priority for QVIC to begin a wildlife monitoring program that will assist in restoration planning, and this project will contribute to a much-needed assessment of culturally important species on Tribal lands and the surrounding landscape. This project will

leverage impact in a cluster of ongoing and proposed local restoration projects in multiple habitat types, foster collaborative partnerships, and improve restoration of oak and aspen habitats of demonstrated ecological significance in this watershed.

Progress towards project goals

Aspen monitoring

In 2019, KBO completed surveys of the baseline (pre-restoration) bird community at a planned aspen restoration site at Big Meadows. We visited the site three times during the songbird breeding season (early June – mid-July at this high elevation meadow), and conducted two sets of surveys each visit. We used a combination of point count surveys in the meadow ($n = 5$) and area search surveys in the aspen stands ($n = 4$) (see map in Figure 1). During point count surveys, a trained observer recorded every bird seen or heard, as well as its distance from the observer, for standardized 5-minute survey periods (Stephens et al. 2010). We placed point count stations randomly throughout the meadow using GIS tools, enforcing a minimum distance of 200 m apart, in order to reduce overlap of individual birds detected at multiple stations. Area search surveys were used in the four main aspen stands; these habitat patches were generally too small for a point count route. During area searches, a trained observer spent 20-45 minutes within a defined polygon (~25 min./ha), recording the number and species of all birds seen or heard in the study plot (Stephens et al. 2010). Species checklists were also kept, recording every bird species detected during the survey day, but not within standardized point count or area search periods. We also completed relevé vegetation surveys at all point count stations, and at the centroid of each aspen stand area search plot, on two of the three visits using two different surveyors.

Oak habitat scouting

We used maps of potential oak habitat sites derived from KBO's species-centric distribution modelling, stand typing layers from EFM, and local knowledge from EFM staff, to identify 8 priority areas to verify the presence of oak habitat: lower Shackleford Creek, middle and lower Patterson Creek, Whiskey Creek, Ruffey Gap, lower Clark Creek, upper Miner's Creek, and middle Sugar Creek (Figure 2). We developed an oak prioritization form to assess the restoration potential of these sites. A KBO biologist spent time walking around these areas, filled out an oak restoration field form for each of the 8 predetermined sites (as well as 3 additional areas of oak habitat encountered while in the field), delineated oak stands using GPS, and took habitat photographs to assist with site prioritization.

Ground-truthing species distribution models

KBO's species-centered distribution modelling approach uses unclassified remote sensing imagery and large existing bird monitoring datasets to produce high resolution species distribution models that relate remote sensing data to bird occupancy. The distribution models of several bird species associated with a given habitat (for instance, oak woodlands) are then stacked on top of each other to create maps of the probability of oak woodlands being present in a certain pixel on the map, based on the model-predicted occurrence of suites of bird species

that are closely associated with oak habitats. We took advantage of an opportunity to leverage our surveyor's time in the field to achieve additional objectives related to these innovative distribution models. We developed a habitat ground-truthing field form and conducted additional habitat surveys at sites on EFM lands – a number that were predicted to be oak habitat, and number that were predicted to be conifer habitat – these data will be used to further validate and refine the models using data collected on the ground.

Results

Bird monitoring at Big Meadows

During the three survey visits, we recorded 35 bird species during point count and area search surveys, and an additional 3 on species checklists only. The most abundant species at point count locations were Oregon Junco, Lincoln's Sparrow, Lazuli Bunting, Warbling Vireo, and American Robin (Table 1). The most abundant species in aspen stand area search plots were Oregon Junco, Warbling Vireo, Western Wood-Pewee, Lazuli Bunting, and Dusky Flycatcher (Table 2). At Big Meadows, we recorded five species considered to be of cultural importance by QVIC, and one that is a Species of Special Concern in California (Tables 1 and 2). There is no bird conservation plan written specifically for high elevation meadows or aspen stands in northwestern California, but Lincoln's Sparrow is considered to be a focal species for wet meadows in the habitat conservation plan for landbirds in coniferous forests of western Oregon and Washington (Altman & Alexander 2012), which is applicable to this geography.

Oak habitat scouting

KBO biologists spent time in the field on EFM lands in fall 2019 to verify oak presence and assess restoration potential. Many areas had an understory of smaller oaks with a conifer canopy where conifers and/or oaks had previously been harvested – in these areas the young oaks seemed to be regenerating well on their own and are thus a lower priority for oak restoration. Several areas with larger oaks and/or multiple generations of oaks that are either highly encroached by conifers, or are becoming encroached, have potential for future restoration efforts. Sites in the areas of lower Shackleford Creek (Figure 3), upper Miners Creek, and lower Patterson Creek ranked the highest on our oak restoration prioritization forms. These areas have older, larger diameter oak trees that are being overtopped by conifers, and in many cases have dead limbs caused by this shading. Integration of practices to promote oak health into EFM's Forest Management Plan will include potential for enhancing oak habitat across a gradient of ages and conditions - including the sites with small, healthy oaks - but the sites with large, old oaks that are currently encroached upon are higher priorities for restoration.

Next Steps

Integration of oak bird conservation plans with EFM's Forest Management Plan

We have reviewed existing documents created by us and our Klamath-Siskiyou Oak Network partners regarding best practices for conifer thinning for oak restoration in a wildlife-friendly manner, and have discussed with EFM what format will best integrate into their forest planning

in a way that will be used. These documents include guidelines such as removing shrubs and conifers 10-30 ft. out from the canopy footprint of large, single-stemmed oaks, and not pruning dead limbs from oak trees as these provide wildlife habitat. We also recommend that in areas of naturally occurring mixed oak-conifer woodland, conifer canopy cover should be <20% with the emphasis on retaining primarily medium-to-large diameter conifers (>15 in. dbh), and preferably in pockets not encroaching on oaks. This type of information will be synthesized and most likely provided as an appendix to EFM's current draft Forest Management Plan. EFM is also planning to initiate restoration actions at the highest priority oak site (lower Shackleford Creek; Figure 3) as soon as this winter. Funding from Bella Vista will allow us the opportunity to comment on habitat prescriptions written for conifer thinning for purposes of oak restoration at this site, and potentially visit the site to review the trees marked for retention.

Analyze ground-truthing data

KBO's species-centered habitat probability values provide spatially explicit predictions of where specific habitat conditions exist on the ground. This winter we will compare model predictions to habitat data collected on the ground at EFM sites to validate the models. Ground-truthing these models will increase our capacity to deliver species-centered distribution models as a conservation planning tool for EFM and other partners.

2020-2021 bird monitoring

This winter, we will design an avian monitoring plan, using primarily point count methodology, to survey oak habitats on EFM lands in the Scott Valley. In spring 2020, we will complete the first round of these surveys to gather a baseline inventory of birds using oak habitats on this property, with an emphasis on species identified as culturally important by the QVIC. We will also complete post-restoration bird monitoring on two other oak woodland sites in the Scott Valley where KBO previously completed pre-restoration monitoring, and that have now been restored through the Klamath-Siskiyou Oak Network. We have also received matching funds from the U.S. Fish and Wildlife Service via SRWC to conduct post-restoration bird monitoring at Big Meadows in 2021. At all of these survey points, we will also conduct relevé vegetation surveys and record species checklists (as in the 2019 surveys; see description above).

Train QVIC biologist

In spring 2020, a biologist from QVIC will attend KBO's annual point count training session, and then accompany an experienced surveyor on point count surveys in the Scott Valley. This will increase QVIC capacity to conduct their own inventory and monitoring in the future by training a staff biologist in standard bird and vegetation monitoring methods.

Conclusion

In 2019 significant progress was made towards our overall project goals, including strengthening our partnerships with EFM and QVIC, completing baseline surveys in high elevation aspen and meadow habitats planned for restoration, and scouting oak sites to determine the potential for future oak restoration on EFM property in the Scott Valley, CA. This

project will continue in 2020 with pre-restoration bird monitoring at EFM oak sites prioritized for restoration, post-treatment surveys at two (non-EFM) restored oak sites, and increasing QVIC capacity to conduct their own inventory and monitoring activities in the future. We will continue to work with EFM to select the highest priority sites for oak restoration, and provide input on conifer thinning prescriptions for restoration purposes.

Acknowledgements

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References

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- Rosenberg KV et al. (2016) Partners in Flight landbird conservation plan: 2016 revision for Canada and continental United States. Partners in Flight Science Committee
- Shuford WD, Gardali T, eds. (2008) California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Western Field Ornithologists and California Department of Fish and Game, Camarillo, CA and Sacramento, CA
- Stephens JL et al. (2010) Klamath Network landbird monitoring protocol. U.S. Department of Interior, National Park Service, Natural Resource Report NPS/KLMN/NRR-2010/187, Fort Collins, Colorado

Table 1. Mean abundance per point of each species recorded (within 75 m of survey stations and excluding flyovers) during breeding season point counts at Big Meadows in 2019, listed in descending order of abundance. SE gives standard errors. Additional column denotes whether species was identified as culturally important by QVIC. No birds detected during point counts are listed as California Species of Special Concern (Shuford & Gardali 2008), nor are included on the Partners in Flight Continental Watch List (Rosenberg et al. 2016).

Common Name	Scientific Name	Mean	SE	Culturally Important
Oregon Junco	<i>Junco hyemalis oregonus</i>	1.200	0.389	
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	0.800	0.226	
Lazuli Bunting	<i>Passerina amoena</i>	0.733	0.067	
Warbling Vireo	<i>Vireo gilvus</i>	0.733	0.287	
American Robin	<i>Turdus migratorius</i>	0.600	0.221	
Brown-headed Cowbird	<i>Molothrus ater</i>	0.400	0.245	
Chipping Sparrow	<i>Spizella passerina</i>	0.400	0.194	
Dusky Flycatcher	<i>Empidonax oberholseri</i>	0.267	0.067	
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	0.267	0.067	
Western Wood-Pewee	<i>Contopus sordidulus</i>	0.267	0.125	
Mountain Chickadee	<i>Poecile gambeli</i>	0.200	0.133	
Northern Flicker	<i>Colaptes auratus</i>	0.200	0.082	X
Green-tailed Towhee	<i>Pipilo chlorurus</i>	0.133	0.082	
Hammond's Flycatcher	<i>Empidonax hammondii</i>	0.133	0.082	
House Wren	<i>Troglodytes aedon</i>	0.133	0.082	
Audubon's Warbler	<i>Setophaga coronata auduboni</i>	0.067	0.067	
Hermit Warbler	<i>Setophaga occidentalis</i>	0.067	0.067	
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	0.067	0.067	
Steller's Jay	<i>Cyanocitta stelleri</i>	0.067	0.067	
Tree Swallow	<i>Tachycineta bicolor</i>	0.067	0.067	
Western Tanager	<i>Piranga ludoviciana</i>	0.067	0.067	

Table 2. Mean abundance per plot of each species recorded during breeding season area searches of aspen stands at Big Meadows in 2019, listed in descending order of overall abundance. Additional column denotes whether species was identified as culturally important by QVIC, listed as California Species of Special Concern (1st, 2nd, or 3rd priority; Shuford & Gardali 2008), or are included on the Partners in Flight Continental Watch List (Y = yellow; “species with population declines and moderate to high threats”) (Rosenberg et al. 2016).

Common Name	Scientific Name	Area search plot				Culturally Important	CDFW	PIF
		AS01	AS02	AS03	AS04			
Oregon Junco	<i>Junco hyemalis oregonus</i>	2.333	4.000	2.667	6.000			
Warbling Vireo	<i>Vireo gilvus</i>	4.000	5.333	3.333	2.333			
Western Wood-Pewee	<i>Contopus sordidulus</i>	2.667	4.333	2.667	2.333			
Lazuli Bunting	<i>Passerina amoena</i>	1.667	2.000	2.333	1.333			
Dusky Flycatcher	<i>Empidonax oberholseri</i>	2.000	3.000	1.000	0.667			
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	1.333	2.667	1.000	0.333			
Mountain Chickadee	<i>Poecile gambeli</i>	1.333	1.000	1.667	1.333			
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	1.667	1.667	0.667	0.667			
House Wren	<i>Troglodytes aedon</i>	2.000	2.333	0.000	0.000			
American Robin	<i>Turdus migratorius</i>	0.667	1.000	0.000	0.667			
Chipping Sparrow	<i>Spizella passerina</i>	0.333	1.667	0.000	0.000			
Red-breasted Nuthatch	<i>Sitta canadensis</i>	0.333	0.000	0.667	1.000			
Northern Flicker	<i>Colaptes auratus</i>	0.667	1.333	0.000	0.000	X		
Steller's Jay	<i>Cyanocitta stelleri</i>	0.333	0.000	1.333	0.333			
Golden-crowned Kinglet	<i>Regulus satrapa</i>	0.333	0.333	1.333	0.000			
Brown-headed Cowbird	<i>Molothrus ater</i>	0.667	0.667	0.000	0.000			
Western Tanager	<i>Piranga ludoviciana</i>	0.000	0.000	0.667	0.667			
Hairy Woodpecker	<i>Picoides villosus</i>	0.000	0.667	0.333	0.333			
Wild Turkey	<i>Meleagris gallopavo</i>	0.000	0.000	1.333	0.000			
Audubon's Warbler	<i>Setophaga coronata auduboni</i>	0.667	0.000	0.333	0.000			
Sooty Grouse	<i>Dendragapus fuliginosus</i>	0.333	0.333	0.333	0.000	X		Y
Hammond's Flycatcher	<i>Empidonax hammondii</i>	0.667	0.000	0.000	0.000			
Cassin's Finch	<i>Haemorhous cassinii</i>	0.667	0.000	0.000	0.000			Y
Calliope Hummingbird	<i>Selasphorus calliope</i>	0.667	0.000	0.000	0.000			

Hermit Warbler	<i>Setophaga occidentalis</i>	0.333	0.000	0.000	0.333	
MacGillivray's Warbler	<i>Geothlypis tolmiei</i>	0.000	0.000	0.333	0.333	
Brown Creeper	<i>Certhia americana</i>	0.333	0.000	0.000	0.000	
Rufous Hummingbird	<i>Selasphorus rufus</i>	0.333	0.000	0.000	0.000	Y
Western Bluebird	<i>Sialia mexicana</i>	0.333	0.000	0.000	0.000	
Wilson's Warbler	<i>Cardellina pusilla</i>	0.000	0.333	0.000	0.000	
Olive-sided Flycatcher	<i>Contopus cooperi</i>	0.000	0.333	0.000	0.000	2nd Y
Tree Swallow	<i>Tachycineta bicolor</i>	0.000	0.333	0.000	0.000	
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	0.000	0.000	0.000	0.333	
Pine Siskin	<i>Spinus pinus</i>	0.000	0.000	0.000	0.333	

Table 3. Additional bird species recorded at Big Meadows in spring/summer 2019 during survey days, but outside of standardized point count or area search periods (or detected >75 m from a point count station or as flyovers). All three are identified as culturally important by QVIC. None of these additionally detected birds are listed as California Species of Special Concern (Shuford & Gardali 2008), nor are included on the Partners in Flight Continental Watch List (Rosenberg et al. 2016).

Common Name	Scientific Name	Culturally Important
Mountain Quail	<i>Oreortyx pictus</i>	X
Pileated Woodpecker	<i>Dryocopus pileatus</i>	X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X

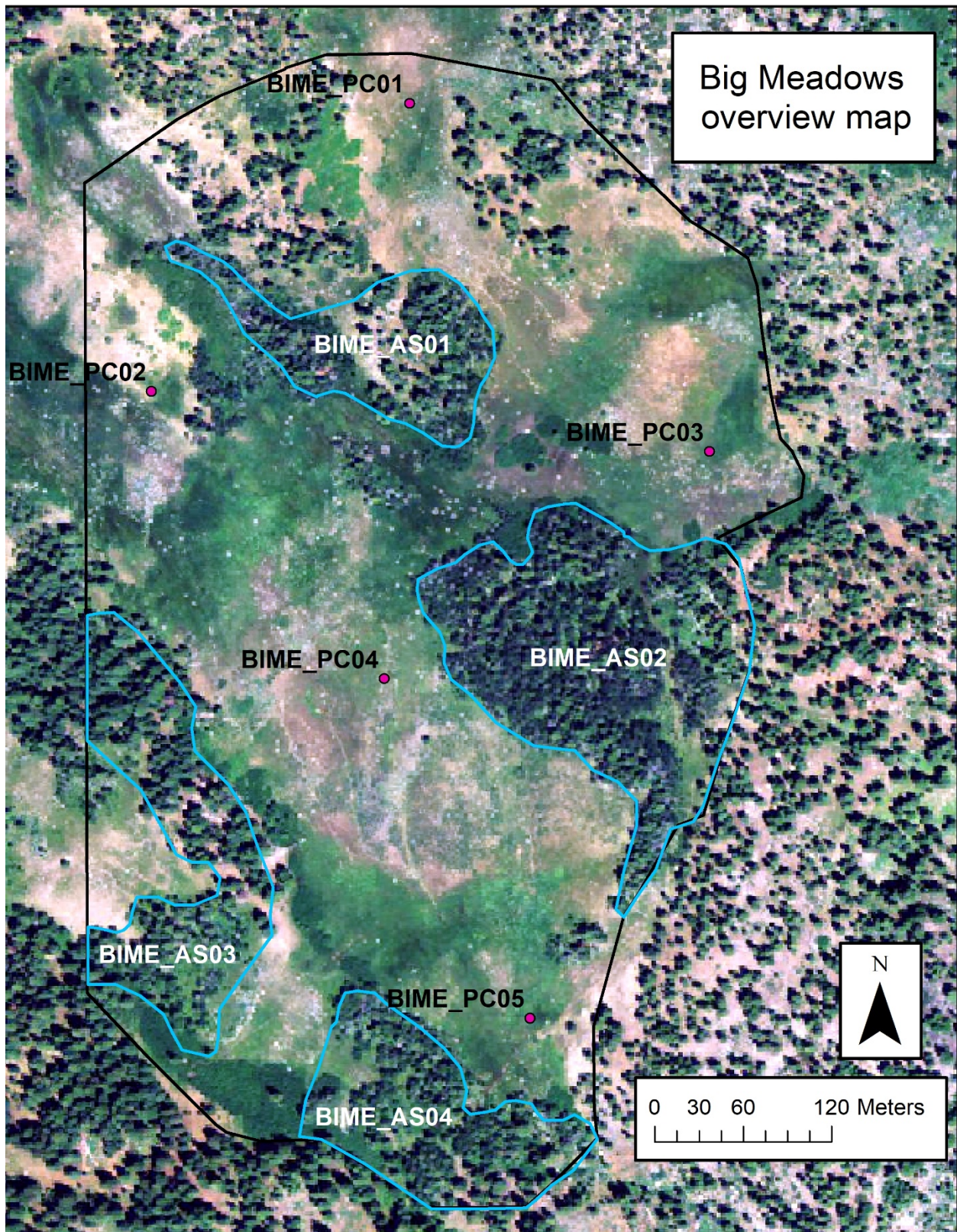


Figure 1. Study design for bird monitoring in high elevation wet meadow (point count stations: pink dots) and aspen stands (area search plots: blue polygons) at Big Meadows, Scott Valley, CA.

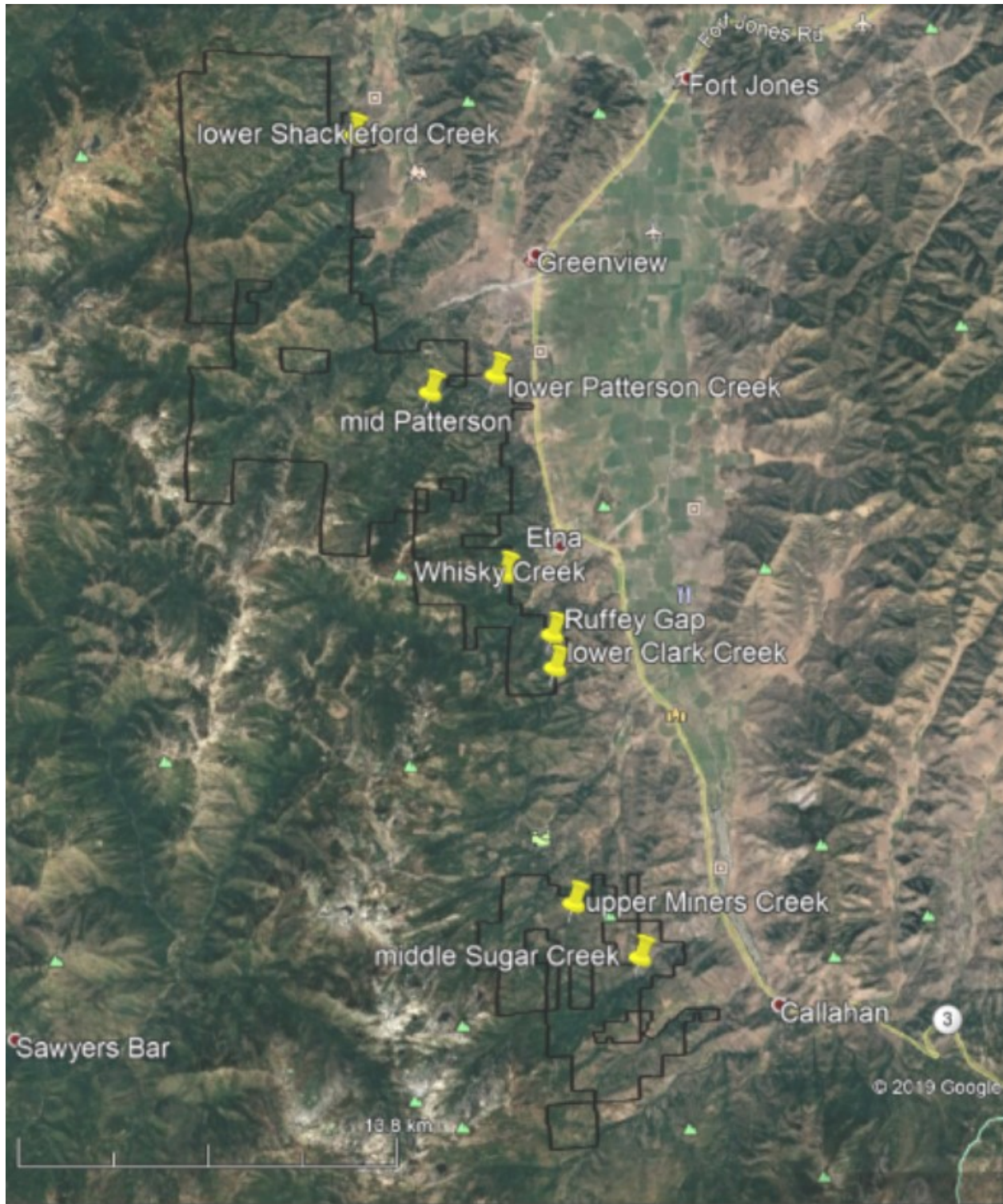


Figure 2. Priority areas identified to survey as potential oak restoration sites on EFM property between Fort Jones and Callahan on the west side of the Scott Valley, CA. Several of these sites were determined to have good potential for oak restoration actions.

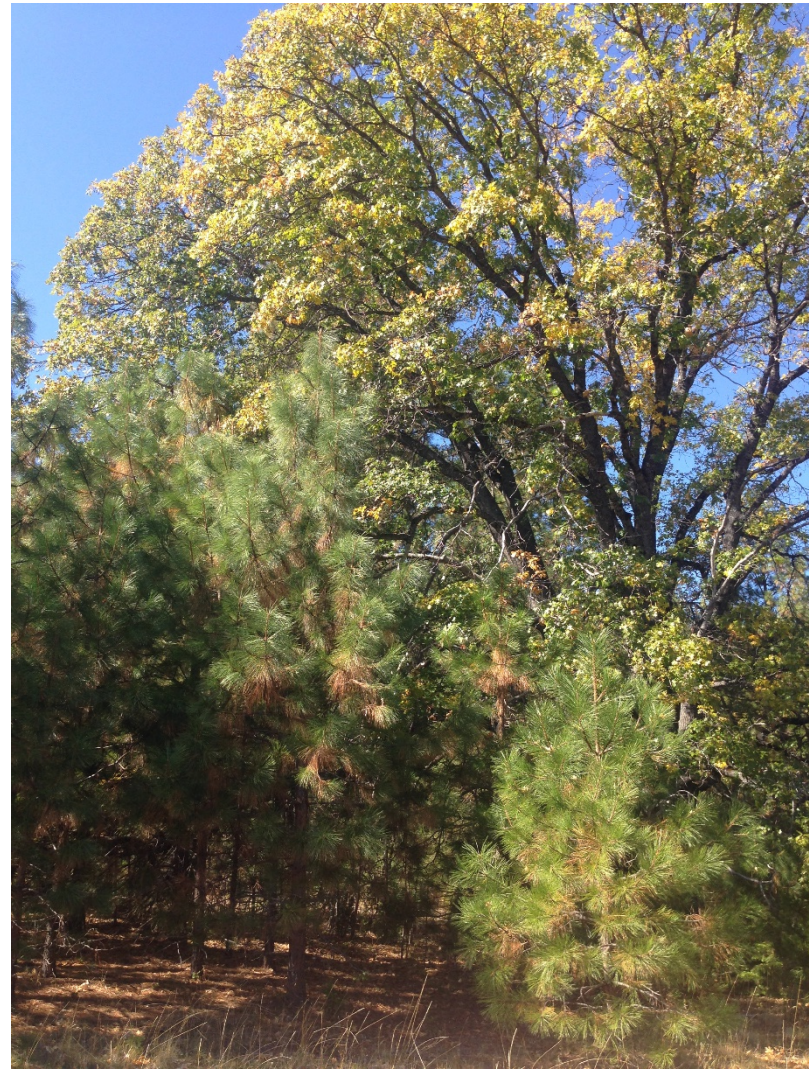


Figure 3. Larger oaks encroached upon by conifers at the Lower Shackleford Creek site, Scott Valley, CA. Conifers grow much faster than oaks, and in the absence of natural fire regimes, smaller ones are likely to eventually shade out nearby oak trees. Competition for sunlight and other resources is detrimental to the oak's health. This site had the greatest number of large, legacy oaks that we encountered on EFM property, and it was determined to be the highest priority area for oak restoration.