State and Transition Models for California's Sierra Nevada Foothill Oak-Woodlands[1]

Melvin George,[2] Neil McDougald,[3] Dennis Dudley,[4] Larry Forero,[5] Bill Frost,[6] Jim Sullins,[7] and Roger Ingram[8]

Abstract

University of California Cooperative Extension and USDA Natural Resources Conservation Service are developing ecological site descriptions for the oak-woodlands in Major Land Resource Area 18 (Sierra Nevada foothills). Vegetation surveys conducted during the spring and summer of 2004 and 2005 determined woody plant canopy cover and density, and understory cover, production and species composition. Data from these surveys and soils data from SSURGO are being used to delineate sites based on woody plant species composition, understory productivity, soil texture, soil depth and precipitation. Extensive areas of oak woodlands in the central Sierra Nevada foothills are on soils (Ahwahnee, Vista and Auberry) developed from granitic parent material and will be grouped into a single ecological site. This site is dominated by blue oak (*Quercus douglasii*), interior live oak (*Q. wislizeni*), foothill pine (*Pinus sabiniana*), wedgeleaf ceanothus (*Ceanothus cuneatus*), manzanita (*Arctostaphylos* spp.), and poison oak (*Toxicodendron diversiloba*). Dominant species in each ecological site are being incorporated into vegetation state and transition models that will illustrate dynamics of the long-lived tree and shrub layers in response to fire and vegetation management.

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Rangeland Health Criteria for California's Oak Woodlands[1]

Melvin George[2] and Jon Gustafson[3]

Abstract

The 17 rangeland health criteria developed by USDA and USDI are each important in one or more rangeland ecosystems. In the oak-woodlands of California some of the 17 criteria such as rills, bare ground, gullies, litter amount and movement, functional/structural groups, plant mortality/decadence, and reproductive capability of perennial plants should be important indicators of soil/site stability, hydrologic function and biotic integrity on most ecological sites. Some parameters, such as waterflow patterns, pedestals/terracettes, wind scouring, soil surface resistance to erosion, soil surface loss or degradation, and plant community composition and distribution relative to infiltration and runoff will only be important indicators on some sites in the oak woodlands.

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Black Oak-Pine Habitat Enhancement on the Lassen National Forest[1]

Mark Williams,[2] Coye Robbins,[3] and Ryan Burnett[4]

Abstract

The composition and structure of western North American forests have been altered by fire-suppression, timber harvest, and perhaps climate change. In the Sierra Nevada Mountains of California, these factors have tipped the competitive balance in favor of shade tolerant conifers over shade intolerant pines and hardwoods. California black oak, a shade intolerant species, is particularly susceptible to encroachment of conifers in the disturbance limited ecological condition that exists. Thus, without management intervention, the health, extent, and eventually the long-term viability of the pine-black oak forest is threatened. In 2005, a pilot project was implemented to curb the decline and potential loss of black oak and other hardwoods and enhance wildlife habitat value on approximately 1000 acres of mixed conifer hardwood habitat in the Almanor Ranger District of the Lassen National Forest. Objectives of this project were to increase oak canopy and pine dominance, enhance shrubs and herbaceous understory, and reduce fuels to allow for future use of prescribed fire. As pine hardwood restoration is a relatively new management practice within higher elevation conifer/oak woodlands, monitoring and an adaptive management strategy were implemented in order to provide forest managers with scientific results to help guide future projects. Vegetation monitoring was implemented to investigate changes in stand composition and structure from the canopy to the forest floor as well as oak regeneration and growth. Point count stations for censusing breeding birds were established in all treated and adjacent reference stands. Land bird monitoring will provide information on a suite of species that occupy a wide range of niches within pine-hardwood habitat; allowing for a more ecologically based approach to pine-oak enhancement.

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An Assessment of Sudden Oak Death in California: Current Status and Trends[1]

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Abstract

Aerial surveys covering 23 counties in California were conducted in 2005 to map current host tree mortality and subsequently target ground-based sampling for early detection of *Phytophthora ramorum*, the cause of Sudden Oak Death. The intent of this survey was twofold: 1) to document mortality that has spread from areas within known infested counties not mapped for several years, and 2) to continue efforts to detect *P. ramorum* within relatively high risk, currently uninfested host habitats. This assessment will discuss 2005 accomplishments and look at how the disease has spread since our surveys began in 2001. Approximately 81,000 acres of hardwood mortality were mapped. Mapped oak mortality occurs primarily on private land, with a small percentage on US Forest Service and state land. To improve the efficiency of the ground-based sampling, polygons mapped as oak mortality were stratified by risk of establishment and spread of Sudden Oak Death as determined by Meentemeyer et al. (2004). Targeted ground surveys covered seven California counties with four new findings in Humboldt County expanding the known infested area into two watersheds. Although at present SOD remains undetected in Del Norte or San Luis Obispo counties, these counties, as well as several other coastal counties have significant land area at high risk for future infestation, with the majority of this under private ownership. Trends in mortality and SOD confirmations by host type suggest that vegetation types containing coast live oak have less mortality and fewer confirmations of SOD while those with a tan oak component appear to be increasing both in terms of mortality area and new confirmations. A more collaborative approach will be emphasized in 2006 by increasing efforts to coordinate our aerial and ground surveys with other monitoring and detection efforts.

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Effects of Prescribed Fire on Soil Properties in Oak Woodlands[1]

Alexandre Swarowsky,[2] Anthony O'Geen,[3] David Lewis,[4] Ken Tate,[5] and Randy Dahlgren[6]

Abstract

A large proportion of the State's surface water passes through oak woodlands as direct rainfall or snow melt from higher elevations. Oak woodlands are used extensively for cattle grazing, providing approximately 75% of the forage produced on California's rangelands. Vegetation management is needed in these landscapes to maintain open space, reduce fuel loads, and manage weed infestations. Prescribed fire is an effective vegetation management tool. Recently there has been a great deal of concern regarding the impacts of rangeland management on water quality. Transport of water quality contaminants to surface water bodies are of concern. The project objective is to document the effects of prescribed fire on biogeochemical properties of oak woodland soils. Prescribed fire treatments were completed in two oak woodland watersheds at UC Hopland and Sierra Foothill research and extension centers. The top 3-cm of soil was sampled before and after burning for nutrient analysis. Biomass was collected before the burn. Soil organic carbon did not change after prescribed fire and nitrogen increased. Under oak, 32% of biomass-N was supplied to soil after burning, corresponding to 20.2 kg ha-1 increase. The remaining 68% of biomass-N was lost through volatilization. In open grass, 34% of biomass-N was supplied to soil after burning, corresponding to a 14.6 kg ha-1 increase. The N returned to soil after fire was low, less than the amount supplied as manure at stocking rates of 3 cows per hectare. Phosphorus has higher volatilization temperatures (>500 C) compared to nitrogen (200 C), thus the relative amount of P returned to soil after burning was higher. Results suggest that prescribed fire will not increase nutrient supply to streams since very little N was released. This is likely the case for P because its mobility is limited in soil, however, transport by accelerated erosion may be amplified by fire.

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Residual Dry Matter (RDM) Disappearance on Hardwood Rangeland[1]

William Frost,[2] Kenneth Churches,[3] and James Bartolome[4]

Abstract

Residual dry matter (RDM) is a standard used by grassland managers for assessing the level of grazing use on annual grasslands and associated savannas and woodlands. It indicates the combined effects of the previous season's forage production and its consumption by grazing animals of all types. The standard assumes that the amount of RDM remaining in the fall, subject to site conditions and variations in weather, will influence subsequent species composition and forage production, in addition to providing soil protection and protecting against nutrient losses. While RDM is measured at the beginning of a new growing season, grazing does not always occur continuously up to this time. Managers do not have information to predict the disappearance of residual dry matter due to physical and chemical breakdown during a period of non-grazing. In this study we investigated the rate of RDM disappearance during the summer (non-growing) period on hardwood rangeland. Our results demonstrate that the amount residual dry matter, by weight, will average a decrease of 7% per 30 day period from the time of peak standing crop of annual herbaceous species to occurrence of the germinating fall rain. The time of peak standing crop is generally accepted to be the time at which the vast majority of annual species cease growth. With the information from this study, grassland managers will be able to determine the amount of herbaceous material that must be left at peak standing crop to insure adequate amounts of residual dry matter at the time of the first fall rains to provide for site protection. Thus, management of grazing animals can be altered to optimize the utilization of annual herbaceous production while maintaining the residual dry matter to provide site protection and insure long-term productivity.

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Riparian Revegetation Outcomes on California North Coastal Ranches[1]

Michael Lennox,[2] David Lewis,[3] Ken Tate,[4] Randy Jackson,[5] Stephanie Larson,[6] John Harper,[7] and Robert Katz[8]

Abstract

We are researching revegetation effectiveness and restoration trajectory of riparian habitat in coastal California. Our poster compares species specific results and vegetation groups using preliminary results from 102 sites surveyed in a cross-sectional post project analysis. Project sites of various ages have been characterized to compare site outcomes given the original methods of restoration utilized. Project sites selected were tributary stream corridors in Marin, Sonoma, and Mendocino Counties ranging from 4 to 40 years since revegetation was initiated. Oak woodland management has utilized riparian corridors for conservation and restoration. However, what is the long-term fate of these efforts and how do sites change over time? Preliminary results show the importance of collecting specific environmental data to assist the interpretation of a population response to management. Plot scale results show effects of revegetation method by landform class, or similar geomorphic features. For example, planted sites have greater density of juvenile oak trees than non-planted sites for the upper bank landform compared to floodplain plots. Successful oak establishment at planted sites on the upper bank landform is confirmed by an increase over time of both juvenile oak tree density and oak canopy cover. Incorporating time into our analysis offers adaptive management feedback and greater statistical power for understanding the effects of project design and maintenance on project performance. Validating desired outcomes and measuring unanticipated results is important for conserving California's oak populations. Our results indicate an increase in exotic cover over time. Vegetation management may be considered to ensure both weed management and broad participation in restoration efforts from watershed landowners. Specifically, how to reintroduce disturbance to riparian sites as a tool for optimizing floristic diversity while maintaining habitat value? This research project is a collaborative effort between resource agencies, consultants, private landowners, academics, and watershed groups working in north coastal California.

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Biologically-Based Means for Control of Oomycete Phytopathogens[1]

Michael Cohen,[2] Emiko Condeso,[3] Brian Anacker,[4] Nathan Rank,[5] and Mark Mazzola[6]

Abstract

We are investigating control of *Pythium* and *Phytophthora* spp. by zoospore-lysing bacteria, hyphae-consuming amoebae, and glucosinolate-containing seed meal. The bacterium *Pseudomonas fluorescens* strain SS101, which releases a surfactant that disrupts zoospore membranes, reduces infections by *Pythium* spp. in hydroponic plant culture (Appl. Environ. Microbiol. 69:7161, 2003). Detached leaves or seedlings of *Laurus nobilis* and *Umbellularia californica*, and seedlings of *Lithocarpus densiflorus* were sprayed with strain SS101 cell suspensions. In detached leaves inoculated with *P. ramorum* sporangia suspensions, efficacy of SS101 was highly variable with results ranging from 97% reduction in infection frequency to no significant reduction relative to the control. This finding may be due to variation in the proportion of sporangia that directly germinate into hyphae. The bacterial treatment conferred no apparent protection to seedlings placed in the understory of *P. ramorum*-infested *U. californica* trees during the rainy season. Current studies on foliar disease control are focusing on amoebae, isolated from *P. ramorum*-infection lesions of *U. californica* leaves, that exhibit hyphal feeding activity. For soil assays, cells of strain SS101 were inoculated into orchard soil, with concomitant addition of soy flour to stimulate amplification of resident *Pythium* spp. populations, and wheat seeds were sown. SS101 application resulted in substantial reductions in *Pythium* spp. root infection frequency and culturable *Pythium* spp. *propagules* in soil relative to the nontreated control. Incorporation of 0.5% (vol/vol) *Brassica juncea* var. Pacific Gold seed meal, which releases inhibitory 2-propenyl isothiocyanate, resulted in dramatic long-term reductions in culturable oomycetes in soils and prevented *Pythium* spp. infection of apple seedlings planted into the treated soil. We are presently testing the effectiveness of SS101 and seed meal treatments for the capacity to control other oomycetes, including soil-borne *P. ramorum*. Further development of biologically-based treatments may prove valuable for eliminating *P. ramorum* infestations in nurseries and ameliorating disease severity in landscapes.

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Objective Ordination and Practical Classification of California Hardwood Rangelands[1]

Emilio A. Laca,[2] Maximo Alonso,[3] Melvin George,[4] and Craig Schriefer[5]

Abstract

We sampled 457 100-m transects in California hardwood rangelands from Shasta to Ventura Counties, both in the Coastal and Sierra Foothill areas in the growing seasons of 2004 and 2005. The number of times the vertical canopy projection of each woody species was intercepted was used as a measure of composition. Woody plant densities were also described by distance to nearest tree, and herbaceous botanical composition was estimated using the species rank method. The goal of this work was to use ordination methods to organize and summarize the composition of woody plants, and to determine if objective groups or types of vegetation composition could be identified. Of the 457 transects, 260 intercepted woody plants. Data were analyzed by principal coordinate analysis and non-metric multidimensional scaling (NMDS). As expected, NMDS performed better. Stress equaled 10.8 for NMDS with 4 axes, and the correlations between original distance (manhattan) based on all 56 woody species and distance based on 2 and 3 axes were 0.87 and 0.93. Thus, ordination was successful. All transects with *Quercus agrifolia* were clearly separated from those with *Q. douglasii* and/or *Q. wislizeni* by the first axis. Based on all four ordination axes, no obvious discontinuous groups were present, but the scatter was well summarized with 10-15 groups. We conclude that non-metric scaling is a good method that can yield better, more objective ordination of hardwood rangelands. NMDS and correspondence analyses are further explored to determine if an improved, practical classification of California hardwood rangelands can be obtained.

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Grazing Impacts on Water Quality of California Oak Woodland Watersheds[1]

Kenneth Tate,[2] Randy Dahlgren,[3] E. Rob Atwill,[4] David Lewis,[5] John Harper,[6] and Barbara Allen-Diaz[7]

Abstract

Oak woodland-annual rangelands occupy three million hectares in California, and represent the landscape where California's urban-wildland-agricultural interface is most pronounced. Grazing and prescribed fire are the most cost effective vegetation management tools available to most rangeland managers. The objective of this study was to use a paired watershed design to determine the watershed scale effects of grazing intensity on water quality, hydrology, nutrient cycling and plant community dynamics on annual rangelands. We used the small watershed (<200 acres) as our experimental unit as management occurs on the small watershed scale making the results of this study directly applicable to managers. Following four years of pre-treatment calibration, we applied the following treatments at research stations in both the Sierra Nevada foothills and Coast Ranges: i) non-managed reference, ii) grazed to 1000 lbs/ac residual vegetative dry matter (RDM), and iii) grazed to 500 lbs/ac RDM. Grazing did not increase sediment, nutrient or pathogen concentrations in streamwater until residual dry matter levels were decreased to less than 1000 lbs/ac. Microbial pathogen parameters, such as fecal coliforms, can be elevated above water quality standards even in the complete absence of grazing, suggesting that wildlife provide an appreciable background level of some microbial pathogens. We found about 95% of all samples have Cryptosporidium parvum levels below our detection limit (5 oocysts/L) and only trace numbers (<10 oocysts/L) in positive samples. Further, our results indicate that fecal coliform concentrations are not a suitable indicator for C. parvum on grazed annual rangeland watersheds. However, turbidity might serve as an adequate, low cost indicator for E. coli and fecal coliforms. This study demonstrates that proper grazing practices result in minimal impact on nutrient, sediment and microbial pathogen export from the studied watersheds.

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Prioritizing Oak Woodland Conservation Through a Countywide Strategic Acquisition Plan[1]

Tom Robinson,[2] Emily Heaton,[3] Misti Arias,[4] and Kathleen Brennan Hunter[5]

Abstract

In 1990, residents of Sonoma County approved two measures, one to create the Sonoma County Agricultural Preservation and Open Space District, and a second to levy a 1/4 percent sales tax for 20 years in order to provide funding. The District's mission calls for the protection of Sonoma County's "community separators, scenic corridors, critical habitat areas, and biologically significant areas affected by development," all of which intersect with oak woodland. To implement the voters' mandate, the District periodically prepares a strategic acquisition plan to identify priority conservation areas. We present here a process of mapping core oak woodlands and demonstrate how the District uses these data to prioritize oak woodlands in Sonoma County for conservation. First, we used Geographic Information System (GIS) technology to map large patches of continuous tree cover that are at least 50m from land that is developed or in intensive agriculture. These core forest-woodland patches are assumed to provide relatively high quality habitat for wildlife, as well as important ecosystem services. Oak-dominated communities within core forest-woodland were then identified using a detailed vegetation map for Sonoma County. Finally, results from land-use change models provided information about core oak woodland that is threatened by residential and vineyard development. The District will use this information, as well as data layers that show land that is currently protected and other priorities for the District (e.g. priority viewsheds), to identify areas where protection of oak woodlands is most critical.

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Stoiochiometry of Carbon and Nitrogen Transfer in Blue Oak Seedlings[1]

Laura M. Suz,[2] Victoria Albarracin,[3] and Caroline S. Bledsoe[4]

Abstract

In California's oak woodlands, survival and growth of the dominant oak species depends on the symbiotic relationship between oaks and certain fungi that form ectomycorrhizae on oak roots. Ectomycorrhizal fungi (ECMF) are major players in carbon (C) and nitrogen (N) utilization and cycling, facilitating water and nutrient uptake from the soil into the plant, while the plant supplies carbon to their fungal partners. Little is known about whether nitrogen uptake is directly related to a high acquisition of carbon from the host. Our study explored this potential linkage between carbon and nitrogen flows in plant-ECMF interactions. We hypothesized that nitrogen and carbon fluxes are linked, so that mycorrhizal roots with more 15N will be stronger sinks for 13C from their oak hosts. We used the stable isotopes 13C and 15N to trace the fluxes of these two elements in oak seedlings, particularly in their fine ECM-roots. In a greenhouse study, we added 15NH4Cl to the soil in a pot containing blue oak (Quercus douglasii Hook and Arn.) seedlings. After 2 weeks, we added 13C glucose or 13C sodium bicarbonate to oak foliage. We sampled fine roots 1 and 4 days after the 13C source was added. After 12 days we harvested the entire seedling. We separated the plant into leaves, branches, stem and roots: tap-root, medium roots, fine and mycorrhizal roots. We analyzed the plant tissues for 15N and 13C. Preliminary results show that after 4 days 13C from glucose began to be detected in roots. Carbon as sodium bicarbonate was not detected in mycorrhizal roots even after 12 days. Nitrogen as 15N was detected in roots 15 days after and in leaves 27 days after soil application. The stoiochiometry of nitrogen and carbon in the roots can help explain the mycorrhizal sink strength for both elements in oak seedlings.

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Combined Development and Climate Change Impacts on Blue Oak Woodlands[1]

Nathaniel Snider,[2] Zachary Bradford,[3] Ryan Digiondomenico,[3] Sarah Graber,[3] Stephanie Hsia,[3] Lee Hannah,[4] and Chang Wan Seo[5]

Abstract

Development and climate change present threats to blue oaks (sp. *Quercus douglasii*) at short time scales and large spatial scales relative to the species life history and dispersal ability. We model several development and climate change scenarios for the Southern Sierra Foothills and determine the patterns of blue oak habitat reduction expected from each threat. We measure the percent of present-day habitat lost for three different time horizons and make recommendations for management of this ecologically and economically beneficial species. The human population in the counties of the Southern Sierra Foothills is expected to double in the next ten years, creating intense pressure for development. Depending on where development takes place, the resulting modifications to the landscape will impact blue oak woodlands to varying degrees. We examine different development scenarios reflecting realistic policy alternatives and evaluate the expected loss of blue oak woodlands under each case. Over the past 150 years, the ecology of blue oak woodlands has been dramatically modified, and climate change will produce even further ecological modifications. Blue oak regeneration is constrained by climatic conditions and other factors, which combine to produce the spatial distribution of blue oak woodlands. We use regional climate models in conjunction with soil types and observed species distributions to model the bioclimatic envelope of the blue oak. We then determine the expected shift in blue oak spatial distributions under a range of climate change scenarios. In order to ensure the continued vitality of blue oak woodlands in this region, planners will need to consider both the near-term pressures of development and the longer-term impacts of climate change. We evaluate the impacts of each threat for three different time horizons: 2010, 2025, and 2050. The combination of these threats may require a long-term plan that takes the dynamics of both threats into account.

[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Lessons Under the Oak Tree: A Writer's Perspective[1]

Karen Kluger[2]

Abstract

While walking among the oak groves near my home in Thousand Oaks, CA, I found much wisdom hidden in nature. The wisdom has always been there for humankind to find. About this same time, I learned Native Americans call people and trees the earth's only "Standing Ones." Respecting Native American's insights, I grew more observant of the connections people have to trees. I began to surmise that creation may consist of a limited number of building blocks ingeniously re-arranged, much like only ten numbers are re-arranged to create all the world's telephone numbers. For example, trees and people begin life either planned or unplanned. In the first category there are Christmas tree farms and orchards that are planned as surely as a couple that conceives with fertility drugs or in vetro. Yet, for all the planning humans do, most life starts as a wild thing. At night in bed a couple snuggles under the covers, things heat up. Only one sperm out of thousands needs to join a woman's egg for a new life to begin. Outdoors, a similar happening occurs, but more slowly. The male-like erect tree also releases thousands of seeds, yet few will sprout, which gives new meaning to the Biblical saying, "many are called, but few are chosen." After seeds litter the ground, autumn leaves fall forming a blanket on earth's bed. Then the rains come, as in foreplay, moistening the dry leaves. Under a blanket of composting leaves, heat is generated, encouraging germanation. The beginning of life is humble, silent. The seed sends out a root hair that connects it to mother earth, the same way the placenta connected each of us to our mother. When it's time for birth, the seed casing dilates, enabling a tender leaf to emerge, just as at birth, an infant with soft bones emerges through a dilated canal. When we stop to admire a lovely tree, on subconscious level, we are connecting to our own humble beginning and to nature's splendor that resides within ourselves. The insights in the grove became the book, "Lessons Under the Oak Tree." Topics include nature's balance and the danger of imbalance; the value of imperfections; the deeper meaning of sudden oak death; evolution, another name for freedom of choice; the wisdom for us in how trees heal after a serious loss, and forests of the future. Finally, the book is the story of how I learned that life can be as simple as a tree and not as complicated as the forest.

[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California

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Oak Decline, Experimental Weather Modification and Climate Change[1]

Rosalind Peterson[2]

Abstract

Many trees in Mendocino, Lake and Sonoma Counties (California), are in declining health. An entire suite of plant communities, including wide varieties of trees, are in decline. NOAA reports over 80 ongoing experimental weather modification programs in the Western States in 2005, that may have changed weather patterns in California and adversely impacted our trees. And now U.S. Senate Bill 517, a bill that would allow experimental weather modification by artificial methods and implement a national weather modification policy is soon to be passed. This bill does not include agriculture, natural resources, or public oversight. The appointed Board of Directors established by this bill does not include any agricultural, water, EPA, or public representatives, and has no provisions for Congressional, State, County, or public oversight of their actions or expenditures. In addition, NASA also notes (October 2005 Newsletter), that increasingly persistent contrails are "...trapping warmth in the atmosphere and exacerbating global warming..." NASA also goes on to say that "...Any increase in global cloud cover will contribute to long-term changes in the Earth's climate. Likewise, any change in Earth's climate may have effects on natural resources..." The overall impact of persistent jet contrails and man-made clouds changing our weather should be considered in any tree health studies. The 1999, EPA, SUBSONIC JET EMISSIONS REPORT, ENVIRONMENTAL PROTECTION AGENCY PA420-R-99-013 - Final Report "Evaluation of Air Pollutant Emissions from Subsonic Commercial Jet Aircraft", U.S. Environmental Protection Agency April 1999, details in depth crop and vegetation damage from these emissions. Are we taking into consideration the impact of jet fuel emissions when considering tree health decline? Weather Modification may adversely impact watersheds, trees, agricultural crops and water supplies. And who is going to decide the type of weather modification experimentation in the future and who it will benefit or adversely impact? When you add atmospheric heating (H.A.A.R.P.) and testing (NOAA CRRES / Barium & TMA / trimethyl aluminum), to over 80 weather modification programs, the mix will have a tremendous impact on tree and plant communities and micro-climates. It is important that we understand the complex nature of the items listed above and determine how they will impact the natural environment in which we live. We are dependent on our trees, agricultural crops, and water supplies. If they are being adversely impacted then we need to do the studies to see what impacts these changes are having on our environment. Our survival depends on our understanding the overall forces at work and being able to influence legislation to benefit all of us and ultimately to protect our food supplies, water, and the health of our trees.

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[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Bird Monitoring of an Oak Woodland Stream[1]

Gregory A. Giusti,[2] Robert Keiffer,[3] and Charles Vaughn[3]

Abstract

The results of nearly 15 years of avian monitoring will be presented. The data describes the occurrence of nearly 100 species, representing 20 families and 9 orders.

1 This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Fuel Dynamics in Oak Woodlands: Effects of Sudden Oak Death[1]

Travis Freed,[2] Scott Stephens,[3] and Maggi Kelly[4]

Abstract

The rapid accumulation of fuel due to SOD is a result of the death and structural failure of oak trees. In addition, canopy removal will likely change microclimatic variables such as wind speed and incident radiation. These changes will result in a shifting of understory composition in the longer term, likely favoring invasive species that increase fire return interval and fire intensity. In the short term, the increase in incident solar radiation will lower relative humidity and hasten the drying of fuels. These factors would increase the probability of a high intensity wildfire. Increased fire intensity and flame lengths will increase the likelihood of crown fire initiation. Larger more intense fires could cause changes that reduce the ability of an ecosystem to recover. A better understanding of what is causing fuel accumulation can help to improve the accuracy of fire modeling and help guide management decisions. The focus of this study is to understand the ecological factors associated with fuel accumulation in coastal oak woodlands. This study hypothesizes that sudden oak death (SOD) is the most significant factor in recent fuel accumulation in Marin County's coastal oak woodlands. To test this hypothesis, ecological and stand structure variables were measured to determine which variables most strongly predict fuel changes. Fuel measurements in 2002 and 2004 showed an increase in fuel levels. Plots were separated into those with a strong oak component and those with very little or no oak. The Oak group was then further divided between plots that showed signs of bleeding in 2001 and those with no signs of bleeding. The highest fuel levels were measured in forests that had oak trees with some bleeding in 2001.

[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Landscape-Scale Relationships Between Oak Recruitment and Livestock Management[1]

W. Stanley Harpole,[2] Katharine Suding,[2] Mitchel McClaran,[3] and Rebecca Aicher[4]

Abstract

There is concern that natural oak recruitment in California is not sufficient to maintain current populations. In particular, the inability of oak seedlings to transition to sapling and adult stages may often constrain recruitment. Grazing by cattle is often implicated as having potentially positive or negative effects on recruitment that may be dependent on the season of grazing. Grazing, in general, by removing litter, might promote seedling establishment. But grazing could also decrease survival and transitions to sapling and tree stages depending on whether grazing occurs during the dormant season or the growing season. Thus, we hypothesize that appropriately timed grazing may play a positive role in the recruitment of oaks in this system. Here we present results from a landscape-scale survey of blue oak (*Quercus douglasii*) seedlings and saplings at the Sierra Foothills Research and Extension Center. We found similar sapling density in dormant season grazed, growing season grazed, and ungrazed pastures. Seedling density, however, was greater in grazed pastures than in ungrazed pastures. We also present preliminary results exploring seedling survival in relationship to grazing season and plant community composition.

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State and Transition Models for California's North Coast Oak Woodlands[1]

John Harper,[2] Stephanie Larson,[3] Morgan Doran,[4] Michael Lennox,[5] Maximo Alonso,[6] Craig Thomsen,[7] and Melvin George[8]

Abstract

University of California Cooperative Extension and USDA Natural Resources Conservation Service are developing ecological site descriptions for the oak woodlands in Major Land Resource Area 15 which includes California's north and central coasts. Vegetation surveys conducted during the spring and summer of 2004 and 2005 determined woody plant canopy cover and density, and understory cover, production and species composition. On the north coast initial site delineation is based on understory productivity, density and canopy cover of the dominant blue oak (*Quercus douglasii*) and its associates coast live oak (*Q. agrifolia*), black oak (*Q. kelloggii*), valley oak (*Q. lobata*), manzanita (*Arctostaphylos* spp), and poison oak (*Toxicodendron diversiloba*). Blue oak savanna or woodland with a grass understory and few shrubs or understory trees is common and often intermixed with other oak woodland communities or shrub communities. While succession has not been extensively studied in oak-woodland ecosystems, state and transition models are being developed for the long-lived tree and shrub layers based on their response to fire, grazing and vegetation management. Shorter term dynamics of the annual plant dominated understory are also included in the state and transition models.

[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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State and Transition Models for California's Central Coast Oak Woodlands[1]

Royce Larsen,[2] Sheila Barry,[3] Theresa Ward,[4] Karl Striby,[5] Ken Oster,[6] Craig Schriefer,[7] and Maximo Alonso[8]

Abstract

University of California Cooperative Extension and USDA Natural Resources Conservation Service are developing ecological site descriptions for the oakwoodlands in Major Land Resource Area 15 which includes California's north and central coasts. Vegetation surveys conducted during the spring and summer of 2004 and 2005 determined woody plant canopy cover and density, and understory cover, production and species composition. Data from these surveys and soil characteristics from SSURGO are being used to delineate and name ecological sites. Ecological site descriptions include state and transition models that describe the dynamics of the dominant species. Central coast blue oak (*Quercus douglasii*) woodlands and coast live oak (*Q. agrifolia*) woodlands are often associated in a mosaic with coastal sage scrub, chaparral and annual grassland communities. Some researchers have correlated these mosaics with geological substrates and soil characteristics. However, other researchers have found each of these vegetation types on most geological and soil types suggesting that disturbance and biological factors, such as fire, grazing and competition, are important determinants of these mosaics. Fire and grazing are the primary disturbances in these vegetation types. Consequently fire frequency, recovery from fire and grazing are important themes in the state and transition model for the central coast vegetation mosaic.

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[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Historical Distribution of Oak Species in the Central and Northern Sierra Nevada[1]

Sarah Thrasher,[2] Jaquelyn Bjorkman,[2] Boynton Ryan,[2] and Rodd Kelsey[2]

Abstract

This poster presents the historical distribution of six tree and four shrub species in the genus *Quercus* for the central and northern Sierra Nevada Mountains. The species maps are derived from the Wieslander Vegetation Type Mapping (VTM) Project, which produced vegetation maps and vegetation plot data for California in the 1930s. Methods to render the archival versions of these maps to GIS-compatible digital versions were developed, and an area covering 49,500 km2, was developed. The GIS version of the maps were then queried for each oak species and summary information recorded. We present maps for each species, a summary of their spatial extents, elevation distribution, and a summary of the size class and structure of each species, as derived from the VTM plot data. The electronic versions of the individual species range maps will permit assessment of loss of oak habitats when compared with modern vegetation maps.

1 This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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Occupancy Estimation Models of Focal Bird Species in Sierra Nevada Foothill Woodlands[1]

Eric Wood,[2] Matt Johnson,[2] and Barrett Garrison[3]

Abstract

The California Native Plant Society Vegetation Monitoring Program (CNPS VMP) may provide habitat data useful for wildlife research. In 2004-2005, point counts for bird occurrences and Rapid Assessment (RAP) and Relevé vegetation surveys following CNPS VMP protocols were completed in the Sierra Nevada Foothill Blue Oak (*Quercus douglasii*) Woodlands of Yuba County, California. Occupancy estimation models were built for Acorn Woodpecker (*Melanerpes formicivorus*), White-breasted Nuthatch (*Sitta carolinensis*) and Ash-throated Flycatcher (*Myiarchus cinerascens*). Testing data were collected in 2006 and compared to the training models for validation. Estimates of occupancy were accurate at 90% of randomly selected re-sampled points for Acorn Woodpecker, 80% for White-breasted nuthatch and 85% for Ash-throated flycatcher. The results show both the Relevé and RAP protocols of the CNPS VMP include important habitat data useful for species-specific predictive bird modeling within Sierra Nevada Foothill Hardwood Rangelands. Further work should focus on continued validation of CNPS VMP models for different species in varying plant communities.

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UC Master Naturalist Program[1]

Julie Fetherston,[2] Adina Merenlender,[3] and Greg Giusti[4]

Abstract

Sustaining our natural resources requires increased understanding of science, adaptive management, and cooperation among diverse interest groups. In California as population increases, patterns of development and demographics are changing and we need an active and well informed public to participate in resource conservation. In an effort to provide meaningful service learning opportunities for this public and support to professional naturalists, scientists and educators we are developing a UC Master Naturalist program. This comprehensive statewide natural resources education program is modeled on the highly successful UC Master Gardener program and will provide adult volunteers with science-based training in ecology, natural and cultural history and interpretive techniques. The 40+ hour training course will be designed to produce a core of knowledgeable volunteers ready to participate in restoration projects, monitoring, research, educational outreach and community activities designed to enhance natural resource conservation. To begin we are establishing partnerships and support, developing curriculum, and implementing pilot chapters. Ultimately a self sustaining statewide program will benefit resource agencies, educational institutions, land managers and communities.

[1] This paper summarizes a poster that was presented at the Sixth California Oak Symposium: Today's Challenges, Tomorrow's Opportunities, October 9-12, 2006, Rohnert Park, California.

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