

Oak Woodlands: The Importance of Prescribed Burns in Restoration

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Problem Statement:

An estimated one third of California forests including oak woodlands have been lost since 1850 (Wayburn, 2002). Due to the loss of a natural fire regime, conifers have been encroaching upon oak woodlands and out-competing the naturally occurring oak species. Reintroduction of fire into oak woodland ecosystems would reduce the threat of encroachment and reduce fuel loads (Holmes, 2006). By increasing education for both landowners and the general public, fire as a restoration tool can be used to save oak woodlands.

Background:

North Coast Regional Land Trust:

The North Coast Regional Land Trust (NCRLT) is a nonprofit that operates in Humboldt, Del Norte and Trinity counties. It was founded in 2000, "by a diverse group of people with backgrounds in land use planning, ranching, farming, fisheries, forestry and others concerned with protecting the North Coast's extraordinary environment and quality of life" (North Coast Regional Land Trust, 2013). Today the NCRLT assists landowners, by providing them with conservation easements on their deeded land. Another service they provide is restoration in particular landscapes (NCRLT, 2013).

Education and outreach is integral to their mission of protecting the natural environment of the North Coast region. A current issue, in which the NCRLT would like to increase public

understanding, is that of conifer encroachment within oak woodlands (Shayne Greene, personal communication). By working with the NCRLT, we hope to bring this goal to fruition.

Oak Woodlands:

Oak woodlands are an important component in California's landscape. (Bernhardt, 2001). Oak woodlands provide valuable ecosystem services such as the reduction of soil loss, purification of air, and conservation of water (NCRLT, 2011). Healthy oak woodlands provide important habitat as well as a source of food for numerous flora and fauna (NCRLT, 2011).

California oak woodlands are an ecologically rich and diverse ecosystem. They have the greatest biodiversity of any ecosystem in California; containing 300 vertebrate species, 1,100 vascular plants, 370 fungal species, and 5,000 arthropods, all of which depend on oaks to survive (Bernhardt, 2001). There are a number of sensitive or endangered plants that can be found within oak woodlands including the Veiny monardella (*Monardella douglasii ssp., Venosa*) and the Paronychia ahartii (*Ahart's paronychia*) among others (Butte Environmental Council's Endangered Species, 2013).

There are over twenty-five native oak species present in California which include the interior live oak (*Quercus wislizenii*), huckleberry oak (*Quercus vaccinifolia*), sadler oak (*Quercus sadleriana*), leather oak (*Quercus durata*), and scrub oak (*Quercus berberidifolia*) (NCRLT, 2011). These species are not as prevalent within the North Coast region and all are shrubs, except for Interior live oak (NCRLT, 2011). Within the North Coast region of California, particularly Humboldt County, Oregon White Oak (*Quercus garryana*), California Black Oak (*Quercus kelloggi*) and Canyon Live Oak (*Quercus chrysolepis*) are the most predominant oak species (NCRLT, 2011).

Fire Regime Background:

Native California oaks have evolved with fire being an integral component of the ecosystem (McCreary, 2004). Fire regimes within California oak woodlands are estimated to have had frequency intervals ranging from every 30-50 years, with major fires occurring every 40-100 years (McCreary, 2004).

Cultural Values of Oak Woodlands:

Oak woodlands provide a number of cultural and social benefits to the North Coast region. They provide firewood, food, and reduce carbon emissions through carbon sequestration (NCRLT, 2011). Many people of the region consider oak woodlands to be an integral viewscape of California (Sacramento County, 2013). Oak woodlands are of particular cultural importance to the Native Americans of the area (Blackburn, 1993). Native Americans used oak woodlands for a variety of goods and services (McCarthy, 1993). Particularly, they harvested acorns from the trees, and ground them to make acorn meal (McCarthy, 1993).

Oak woodlands are characteristic of much of Humboldt County's working landscape. Many ranches in Humboldt County depend on oak woodlands for adequate grazing of their livestock (NCRLT, 2011). Deer hunting is economically and socially important as well, and takes place often in oak woodlands (NCRLT, 2011).

Threats to Oak Woodlands:

The threats to oak woodlands are numerous. Climate change presents a lot of uncertainty regarding the management of oak woodlands (NCRLT, 2011). The presence of Sudden Oak Death in the area is a significant concern (NCRLT, 2011). However, the suppression of fire

within oak woodlands has had a very significant impact to the overall health of oak woodlands (NCRLT, 2011). By removing fire from the oak woodland ecosystem other species, particularly conifers have been able to out-compete oaks (NCRLT, 2011). This has caused conifer encroachment within oak woodlands (NCRLT, 2011). Without management succession will occur in these ecosystems, resulting in a loss of oak woodlands (NCRLT, 2011).

Constraints on the use of Fire in Oak Woodlands:

While there are benefits to the use of prescribed burns in oak woodlands, there are also constraints that hinder the efficiency of doing so. Prescribed burns need to be managed correctly, or else there could be catastrophic damages including out of control wildfires (CEPA, 2010). Humboldt was once mostly oak woodlands and prairies managed by Native Americans using prescribed burns as a tool to open the land (Shayne Greene, personal communication). Unlike the past land management of Native Americans in using prescribed fire, landowners now have to follow many regulations if they decide they want to use prescribed burns (CEPA, 2010).

Landowners have to investigate if their land is eligible for prescribed burns. There are some oak woodlands where the use of prescribed burns would not be appropriate. For example, if there are invasive species on the land that are either fire resistant or resilient, then prescribed burns would be more damaging to the land than progressive (Devine et al, 2007). If a landowner goes through all the precautions and regulations to do a prescribed fire, and does it, the land will be open for growth of both oak woodlands and more invasive species (Devine et al, 2007).

Currently, the California State Board of Forestry requires the replanting of conifers when they are removed from a parcel of land (Erin Kelly, personal communication). There is currently no exemption for the restoration removal of conifers from oak woodlands (Erin Kelly, personal

communication). In oak woodlands that have a number of large marketable conifers encroaching the forced replanting of conifers is a significant barrier to allowing mechanical removal of conifers from the area (Richard Hansis, personal communication) However, it is likely that the California State Board of Forestry will create an exemption in their 2014 rules to address this issue (Erin Kelly, personal communication).

Objectives:

Overall Objective:

The prevailing objective of this project is to provide the NCRLT with educational materials that discuss the use of prescribed burns as a tool for restoration. These materials will be used to educate the general public and landowners about the benefits, constraints, risks, and alternatives associated with prescribed burns. They will also contain information about the ecological importance of oak woodlands to California, along with this issues that oak woodlands are facing. The educational material is intended to have prescribed burns be more accepted, and allow them to be used more frequently.

Project Objectives:

Project objectives will be undertaken to maintain clarity of the overall goals of this project. The first objective is to gather a sufficient amount of current research regarding the use of fire in oak woodlands. This information will consist of both issues regarding the legality of fire as well as the barriers and benefits of using prescribed burns. The informational material gathered will also include the reasons why oak woodlands are significant to California's ecosystems, and alternative restoration methods to prescribed burning.

The second project objective will be to use the gathered research to create educational material that will inform the general public, landowners, and land managers about oak woodlands and the process of prescribed burning. The educational material, upon completion, will be given to the NCRLT to distribute to interested parties. The first section of the educational material will be an eye-catching poster, with enough information to encourage people to grab a pamphlet. The poster and the pamphlet are meant to complement each other. The poster will contain general information, and the pamphlet will have more details about the legalities behind doing a prescribed burn.

Constraints:

Ecological Constraints:

The first constraint to using fire as a restoration and management tool for oak woodlands is the occurrence of Sudden Oak Death, which has the potential to severely limit the effectiveness of restoration efforts (Sanchez, 2003). Sudden Oak Death is caused by a water mold, *Phytophthora ramorum*, which eats the inner cambium of oaks, effectively killing the tree and as of now has no known cure (Sanchez, 2003). Conifers that have encroached on an oak woodland stand can be removed with prescribed burns, but if the site is contaminated with Sudden Oak Death the likelihood of having a successful restoration is lowered. The dead standing oaks can lead to crown ignition (Lee, 2009). Although prescribed burns have been used as a means to reduce the spread of *P. ramorum*, it does not completely eliminate the disease from an area, so it is not a preferred management tool (Lee, 2009). The priority in some areas may need to be the control of Sudden Oak Death so managing conifer encroachment may need to come second.

The second constraint to restoring oak woodlands with fire is that climate change can potentially impact oak woodlands by changing biotic communities (SB 1334 Senate Bill, 2004). Ecosystems generally adapt to changes in climate, which in return changes the trajectory and ecological niche that an environment adheres to. Climate change affects the successional trajectory of all ecosystems, with up to two thirds of California native species vulnerable to an 80% reduction of their current range, oak woodlands included (California Oaks, 2010). With global warming, current environments that oaks inhabit may no longer be suitable (California Oaks, 2010). As seen in a study of both blue oaks (*Quercus douglasii*) and valley oaks (*Quercus lobata*), because of climate change their range will move north essentially shrinking their habitat area by half (Fry L D, 2008). Although managing oak woodlands is important, the need to re-vegetate oak woodlands stands in ranges that are more suitable to climate change may outweigh the efforts of removing encroaching conifer stands from established oak woodlands.

Management Constraints:

Regulations can be lengthy, time consuming, and confusing for landowners if they do not know the correct steps to follow all of the legal processes. Prescribed burns release smoke into the air, which can harm the health of the community around the burn site and emits pollutants in the air. Workers that do burns and air quality enforcement work together to help landowners do prescribed burns with less harm on the environment and the community (CEPA, 2010). The California Air Resource Board created the State Smoke Management Guidelines, which are the guidelines landowners must abide to if they plan on doing prescribed burns (CEPA, 2010). The steps include registering the burn with the local air quality district, obtaining a permit from the air quality district, giving the air district a smoke management plan, and finally getting approval

from the air quality district (CEPA, 2010). After the approval is given, the landowners must get all supplies needed for the burn, inform the residents around the burn site, contact the air quality district at least 96 days before the burn, and get approval for a day that has a satisfactory forecast (CEPA, 2010). Landowners are encouraged to find alternatives to controlled burns, and pursue them if possible.

Here is a basic step by step process for obtaining legal approval to conduct a controlled burn in California, from the Air Resource Board website:

1. Section off an oak woodland site in your land that you wish to restore.
2. Look into alternate options before deciding on doing a prescribed burn. Only do the burn if it is the best option.
3. Inform the community around the burn site that there could potentially be a prescribed burn.
4. Once all community members are okay with the burn, register the burn with the local Air District.
5. If the registration is Okayed by the air district you will obtain the burn permits from the Air District or Fire Regulation.
6. Complete and submit a Smoke Management Plan (SMP) to the Air District, and a fire management plan to the local fire regulation. A SMP can be lengthy depending on the size and complexity of the burn, so allow a sufficient amount of time to complete it.
7. Obtain approval for the Smoke Management Plan from the Air District.
8. Obtain all the resources needed to proceed with the prescribed burn.
9. Inform the public and other stakeholders about the specifics of the burn, and the timeline it may take place in.
10. Contact the Air District and Air Resource Board up to 96 hours before the desired time for the burn, to obtain approval for sufficient forecast and air quality to safely proceed with the burn.
11. Keep in constant contact with the Air District and Air Resource Board to update them on Forecast and pollution conditions. Approval for the burn will be given no more than 24

hours before the planned time of the burn.

12. Once the burn is started all workers must ensure that the burn stays within the approved SMP boundaries. If the burn goes over the boundaries the individual in charge must work on mitigation efforts described in the SMP.

The last constraint to prescribed burning is that it needs to continuously occur. The purpose of a prescribed burn is to clear up brush and litter that can cause a large wildfire, kill unwanted vegetation, and open space for desired species (Devine, et al, 2007). If the post burned site isn't monitored after the prescribed burn, then invasive species can grow in the newly opened space, causing the site to be more damaged than it was originally. Prescribed burns need to happen relatively frequently to remove newly grown invasive saplings (Devine et al, 2007). Over time if the burns are done correctly and frequently the seedbed for the invasive species should diminish. The health of oak woodlands can increase with prescribed burns, but can also be harmed if not executed properly (Devine et al, 2007). In other words, if a prescribed burn is not executed and monitored correctly it can have more damaging effects on a land than beneficial.

Project Constraints:

A significant constraint encountered in the process of working on this project was not having access to the appropriate technology for the creation of our educational materials, particularly the pamphlet. However, we were able to overcome this constraint by creating our own template in Microsoft Word. Due to this technological barrier the formatting of the pamphlet was very time consuming and difficult. Finding photos and citing them correctly was also very difficult but we were able to find Public Domain sources to use. A second constraint encountered during work on this project was the difficulty in gathering a coherent understanding

of the process that must be followed to restore oak woodlands using prescribed fire. We were able to overcome this barrier through finding additional sources among local agencies to assist us in understanding the requirements of using prescribed burning in oak woodlands. We also found it difficult to find assistance or continue contact with sources during the government shut down. Lastly, it was difficult to condense a semester's long amount of research into our educational materials. Working to overcome constraints of this project was of great value in making this process rewarding.

Alternative Options to Prescribed burning:

There are many risks to prescribed burns, so alternative options should be considered before deciding on conducting a controlled burn. One way to manage and restore oak woodlands is by using herbicides on young saplings, but herbicides are not very effective on more developed conifers (Jones & Stokes, 2004). Complete manual removal and thinning of canopy coverage can also be used to help halt encroachment by conifer species (Jones & Stokes, 2004). Biological control is a known method that can help with restoration efforts, such as goats and other livestock (Jones & Stokes, 2004). There is also re-vegetation of oak species in ranges that can support their particular biological niche (California Oaks, 2007). A combination of different restoration methods can also be used along side with prescribed burning, to help better the likelihood of oak survival.

Implementation Plan:

Timeline for poster and pamphlet:

- September 12th- Contact NCRLT.

- September 30th- Complete research and summarize.
- October 15th-Creation of initial rough draft of pamphlet and poster, decide which program to use in creation of educational materials.
- October 30th-Complete first draft of poster and pamphlet.
- November 12th-Complete second draft of pamphlets and poster.
- November 14th-Submit finished project to Allison for initial review.
- November 19th-Revise project with the inclusion of feedback.
- November 21st-Submit revised project to the NCRLT.
- December 4th-Submit revised project to Jennifer Tarlton for final review.
- December 15th-Deliver final products to the NCRLT.

Initially, we plan to contact the NCRLT to identify the project need by September 12th. We will then complete research and summarize these materials by September 30th. By October 15th we will have finished an initial rough draft of our project, and decided upon which computer software to use. Then By October 30th we will have completed our first draft of the pamphlet and poster. We plan to finish to finish our second draft of the pamphlets and poster by November twelfth. Next, we will meet to implement the feedback on the 19th of November, and to revise our posters. We will send the revised products to the NCRLT by the twenty first of November. After receiving this additional feedback, we will revise the educational materials. Finally, Jennifer Tarlton will look over them by December fourth. Once they are all completed, they will be printed and given to the NCRLT for distribution.

Evaluation:

1. We will coordinate with the NCRLT to print a specific number of brochures, and to record the number of brochures taken by individuals. The purpose of this project is to inform these stakeholders about the importance of oak woodlands and their restoration through the use of prescribed fire. The success of this project will be determined by how well the educational material helped the landowners and agencies, and how it presented information to the general public. Evaluating how successful the educational material was to the NCRLT, landowners, the general public, and other agencies is crucial to the learning process of all parties involved. A simple method that will provide a basic metric for the pamphlets' effectiveness will be a tally of how many brochures are taken by individuals within a set time period. Additionally, this is a measure of effectiveness that requires a minimal time commitment from the NCRLT, and so is likely to be effectively implemented.
2. A survey will be designed following acceptable protocol, and used to assess landowners and land managers views on the use of fire to restore oak woodlands. The surveys will be constructed using a structured non-disguised format (Rubin, 2011). They will be an effective tool for recording the attitudes of both landowners and land managers. NCRLT employees will distribute the surveys to two distinct groups: Landowners of oak woodlands already involved with the NCRLT, and land managers from various state and federal agencies. The objective of these surveys is to provide the NCRLT with information regarding the attitudes and needs of both the landowners and land managers in regards to the use of fire in oak woodlands. This information will be useful in

improving communication among individuals, agencies, and the NCRLT regarding oak woodland restoration.

The surveys are modeled after surveys used in a master's thesis called, "Landscapes In Transition: Private Lands Oak Woodland Management In The Klamath Siskiyou Bioregion" (Koski, 2012). This master's thesis focused upon surveying both landowners and land managers regarding their views on oak woodland restoration. Some questions from this thesis were used in our survey as well. The survey questions used in the master's thesis were reused in our survey due to their unbiased nature. A copy of these surveys can be found below in appendix A and B.

What we learned:

This project has given us useful experience in our field of Environmental Science; as well as new experience in Environmental Interpretation. Although we are comfortable collecting data and performing research, creating an interpretational sign and pamphlet was a new experience for us all. A lot of effort goes into these education materials, which we were unaware of before this project. Working with a group has taught us cooperation, as well as organization which was necessary in order to formulate our project successfully. We also had to learn to prepare for many unforeseen circumstances, such as communication barriers, which we could not allow to hold up our project timeline. Overall, this project was a very useful learning experience that helped us create an end result that we are proud of, as well as giving us experience that will be helpful in the future.

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Appendix A

Landowner survey*

1. Are you planning to conduct any restoration or management activities specific to oak woodlands in the next five years on your land? (check one)
 Yes No

2. What is the largest barrier you face in your oak woodland management?

Please rate the degree to which you agree or disagree with the following statements about wildfire safety and ecology.	Strongly Agree	Agree	Disagree	Disagree/Don't
Fire of any kind poses a threat to my property and safety.				
Fire of any kind is a threat to the ecological condition of my property.				
My property would be ecologically healthier with a regular fire regime.				
Prescribed fire could be a benefit to the safety and ecology of my property.				
It is my responsibility to plan and manage for fire on my property.				
I would be interested in conducting prescribed burning on my property if there were more financial resources and/or technical assistance available.				
The permitting process required for prescribed fire is an obstacle.				
Fire is a required process for maintaining oak health on the landscape.				

* Adapted from survey in Koski, 2012.

Appendix B

Land Manager Survey*

1. What organization or agency do you work for?

2. In an average year, how often do you communicate with landowners about oak woodland management or restoration, for any reason?

Please rate the degree to which you agree or disagree with the following statements about oak woodland management:	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Oak trees are an important ecological and cultural resource.					
Fire of any kind is a threat to the ecological health to forest ecosystems.					
If managed and planned for properly, prescribed fire could be a benefit to landowner safety and property.					
I am aware of incentives and share of cost programs that my agency or others may be able to provide landowners to assist with their oak woodland restoration.					
I understand the obstacles landowners face in restoring their oak woodlands.					
My agency provides accessible information to landowners regarding the use of prescribed burning to restore oak woodlands.					
The permitting process required for prescribed fire is an obstacle.					
Fire is a required process for maintaining oak health on the landscape.					

* Adapted from survey in Koski, 2012.

What are the barriers to prescribed burning?

- Fire as a restoration tool is limited by funding availability
- Lack of a streamlined process is frustrating to both landowners and government officials
- Landowners are discouraged to conduct prescribed burns because of the uncertainty around funding, permitting, and allowable burn conditions
- Prescribed fire must reoccur frequently



Successful prescribed fire in an oak woodland.
Source: Tom Brock, Pleasant Valley Conservancy, Wisconsin State Natural Area

What are the risks of prescribed burns and how to address these risks?

- Many people worry about prescribed fire being dangerous
- With adequate planning and safety measures prescribed fire has limited risks
- Legal and financial liability for damages from fires that burn out of control

For more information contact the North Coast Regional Land Trust at:

PO Box 398
Bayside, CA 95524

Physical address:
901 Samoa Blvd
Arcata, CA 95521

Phone:
(707) 822-2242

Fax
(707) 822-5210

General email:
info@ncrlt.org

For more information on prescribed burns please visit:

<http://www.arb.ca.gov/smp/smp.htm>
and
<http://www.fire.ca.gov/>

If you are interested in doing a prescribed burn:

Please call the Air Resource Board at:
(800) 952-5588

Or view guidelines at:

<http://www.arb.ca.gov/smp/regs/RevFinRegwTOC.pdf>



Burn it or Lose it? Restoring Oak Woodlands with Prescribed Burns

Created by: Kelsey Carter, Hannah Isaacs, and Sage Gang-Halvorson
(Humboldt State University)

Why are Oak Woodlands important?

- One of the most diverse ecosystems in California
- Contain 1,770 different plant and wildlife species
- Provides food and habitat for wildlife
- Prevent soil loss, purify air, and conserve water



A healthy oak woodland.
Source: North Coast Regional Land Trust

What is impacting Oak Woodlands today?

- Loss of fire in oak woodlands allows for conifer encroachment
- Without the use of prescribed fire, forest health is reduced, and the likelihood for catastrophic wildfires increase
- Fire suppression policies have interrupted the natural fire regime in oak woodlands
- Public outcry and policy regulations have interrupted the natural fire regime within the ecosystem

Basic ten-step process for prescribed burning approval in California:

1. Section off an oak woodland site in your land that you wish to restore
2. Look into alternate options before deciding on doing a prescribed burn
3. Inform the public
4. Register the burn with the local Air District and obtain permits
5. Complete and submit a Smoke Management Plan (SMP) to the Air District and wait for approval
6. Obtain all the resources needed to proceed with the prescribed burn
7. Inform the public of the day the burn will take place
8. Contact the Air District and Air Resource Board up to 96 hours before the desired time for the burn; ideal forecast is required
9. Keep in constant contact with the Air District and Air Resource Board to update them on Forecast and pollution conditions; approval for the burn will be given no more than 24 hours before the planned time of the burn
10. All workers must ensure that the burn stays within the approved SMP regulations



Are there any alternatives to prescribed burning?

- Herbicides
- Biological-control methods
- Removing trees manually
- Recognize that a combination of different options can be used



Conifer encroachment in an oak woodland.
Source: North Coast Regional Land Trust

Why should I try prescribed burns on my land?

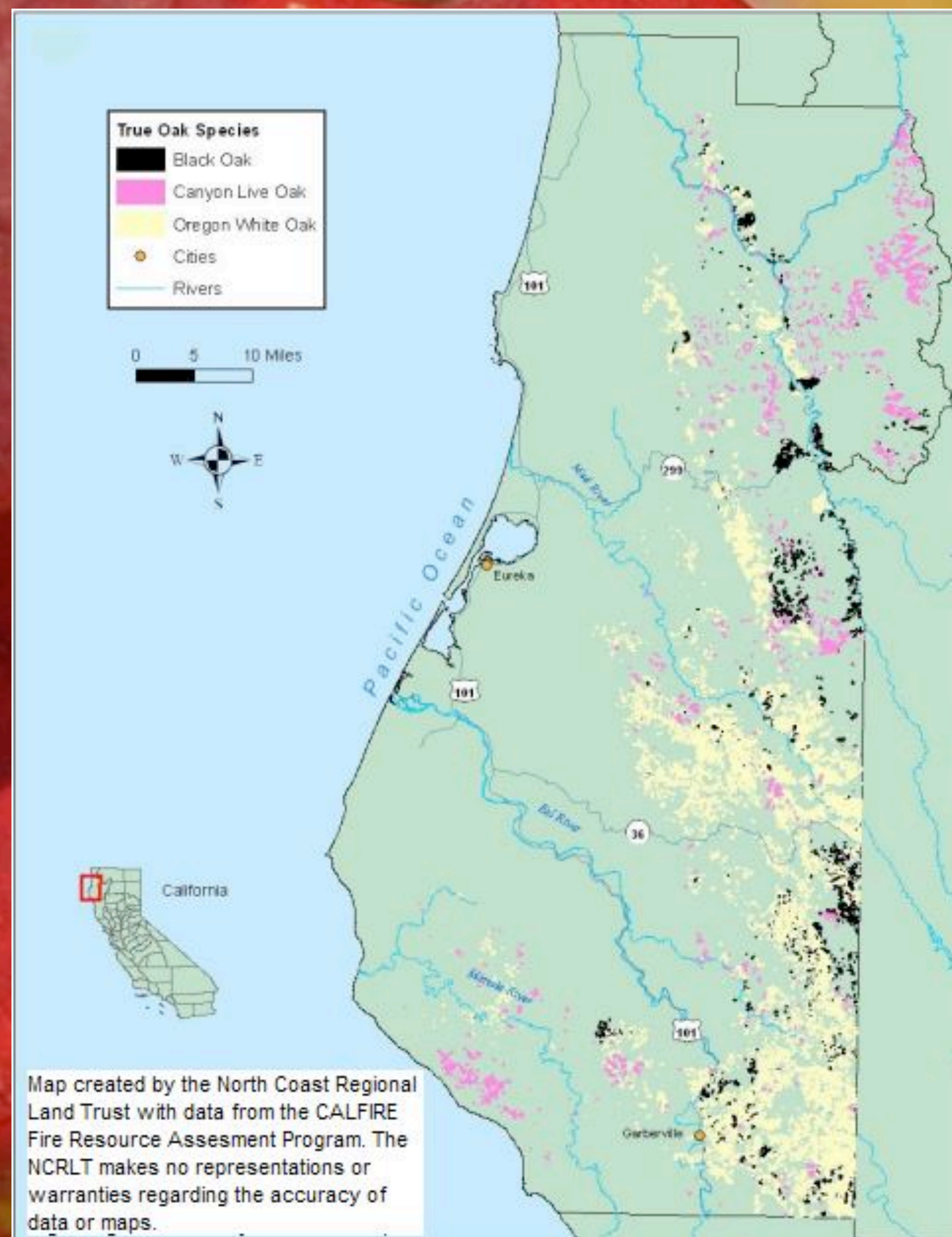
- Fire is the most effective and least labor intensive approach
- Reduction in conifer encroachment, and an overall improvement in forest health
- Prescribed fire is a cost effective tool to use in the restoration of oak woodlands

Burn it or Lose it?

Restoring Oak Woodlands with Prescribed Burns

Why are oak woodlands important?

- One of the most diverse ecosystems in California
- Contain 1,770 different plant and wildlife species
- Provides food and habitat for wildlife
- Prevents soil loss, purify air, and conserves water



Why are oak woodlands declining?

- Loss of fire in oak woodlands allows for conifer encroachment
- Without fire, forest health is reduced, and the likelihood for catastrophic wildfires increases
- Fire suppression policies have interrupted the natural fire regime in oak woodlands

Are there any alternatives to prescribed burning?

- Herbicides
- Biological control methods
- Removing trees manually
- Recognize that a combination of different options can be used



Conifer encroachment in an oak woodland stand.
Source: North Coast Regional Land Trust

What are the barriers to prescribed burning?

- Fire as a restoration tool is limited by funding availability
- Lack of a streamlined permitting process is frustrating to both landowners and government officials
- Landowners are discouraged to conduct prescribed burns because of the uncertainty around funding, permitting, and allowable burn conditions
- Prescribed fire must reoccur frequently

What are the risks of prescribed burns and how to address these risks?

- Many people worry about prescribed fire being dangerous
- With adequate planning and safety measures prescribed fire has limited risks
- Legal and financial liability for damages from fires that burn out of control



Successful prescribed fire in an oak woodland.
Source: Tom Brock, Pleasant Valley Conservancy, Wisconsin State Natural Area

Why should I try prescribed burns on my land?

- Fire is the most effective and least labor intensive approach
- Reduction in conifer encroachment, and an overall improvement in forest health
- Prescribed fire is a cost effective tool to use in the restoration of oak woodlands

For more information on prescribed burns please visit:

<http://www.arb.ca.gov/smp/smp.html>

and

<http://www.fire.ca.gov/>

If you are interested in doing a burn please call the Air Resource Board at (800) 952-5588 or view guidelines online at:

<http://www.arb.ca.gov/smp/regs/RevFinRegwTOC.pdf>