



Point Blue
Conservation
Science

California Oak Planting Guide

Working together to restore iconic
and essential species





California Oaks

Unique, Important, and Under Threat

This guide is intended for landowners and land managers who would like to plant oaks on their land. We provide a framework to consider where and when to plant, and a step by step guide to help you succeed with oak regeneration depending on your budget and goals.

The iconic oaks of California provide food, cover, and nesting habitat for over 300 species of birds, mammals, and reptiles. Numerous insects, fungi, and plants are associated with oaks. Oaks sequester carbon, provide shade, protect soil from erosion, and maintain water quality in our streams and rivers. Human communities value oaks for their beauty, with many indigenous peoples considering oaks as central to their culture.



Ancient Oak!

The oldest oak tree in California (and perhaps the world) is known as Wi'áaşal, or the Pechanga Great Oak Tree, and is a Coast Live Oak dated to be about 2,000 years old.

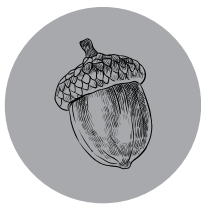


Blue oaks
dying from
drought



In Trouble...

Oaks are in trouble in California from extensive clearing and development, especially within the southern part of the state, the Central Valley, and foothills of the Sierra Nevada and coastal ranges. In some areas, oaks are not producing seedlings to replace older trees as they die, especially blue, valley and Engelmann oak. This is due to a variety of causes, many of which are not well understood. More recently, drought and climate change are causing extensive dieback of some species. Oaks need our help to regenerate so they can continue to provide their important ecological and cultural functions.



Considerations for Planting

Where to plant?

Look around your land for oak trees and seedlings. Take note of the conditions they occur in naturally. Consider planting where there are little to no young oaks and in areas that will not be developed and continue to be stewarded. You can also protect existing oak seedlings with a browse cage. If you have livestock, plant oaks in fields that need shade trees. Consider planting along creeks and riparian corridors to create linkages for tree-dwelling species. Plant outside the dripline of a mature oak.

After Fire

If you're in a burned area, look for oaks that sprouted after the fire and consider thinning to 2-3 sprouts when the sprouts are 8 feet or taller and caging if it is heavily browsed. If you lost the oaks on your property and they are not sprouting or greening up, try planting acorns from those oaks that did survive.



Sprouting live oak after fire

Climate Change & Microrefugia

In the context of climate change, will your land continue to function as an oak woodland? Look for "microrefugia" or places on your land that may be cooler and wetter during future heatwaves and drought. Areas with afternoon shade during the hottest months of the year and lower elevations on your property where cool air sinks at night are two different options.

Gophers and Voles and Deer, Oh My!

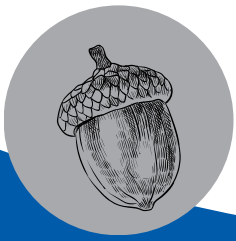
Birds may eat your acorns, gophers may damage oak roots, and deer and livestock can heavily browse seedlings, causing stunted growth or death. Avoid areas with high activity or plan to use seed baskets and browse cages.

When to plant?

Once the rains start in the fall through March and even later in cooler coastal areas are good times to plant. The later you plant in the water year, the more you will need to irrigate.



Our seed basket stopped this gopher



Which Species?

Planting a variety of species is ideal to boost biodiversity and ensure acorns will be available to wildlife throughout the year. Learn about the oak species and habitats where they occur in your area and plant species well suited to your site conditions.

There are about 15 oak species native to California, and many of them hybridize with each other. When choosing a species, consider what naturally occurs in your area and the types of conditions it needs to survive. Some common oak species include:

To find out which oaks would thrive in your locality, try Calflora's 'What Grows Here' tool



www.calflora.org/entry/wgh.html



Blue oaks are deciduous and drought-tolerant.



Live oaks are evergreen but susceptible to Sudden Oak Death.



Valley oak thrives along riparian corridors and deeper soils.



Black oak is adapted to colder, wetter parts of the state.

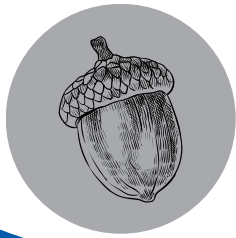
Acorns vs. seedlings

Both acorns and seedlings are good options to start your oak plantings. Although acorns may be more successful in the long term, they take longer to establish. If it's more convenient to buy seedlings, talk to your local plant nursery to understand where the acorns were gathered and if it is climatically and locally similar to your planting area. Better to have acorns or seedlings from nearby areas that are hotter and drier (even a southwest-facing slope on your own land) so they may be better adapted to future climatic conditions.



Mast Year!

Many species of oak will simultaneously produce unusually large amounts of acorns every 2-5 years in what is called 'masting'. It is not known what causes masting, but it is theorized that the extra acorns overwhelm predators, leaving some leftover acorns to seed the next generation of oaks.

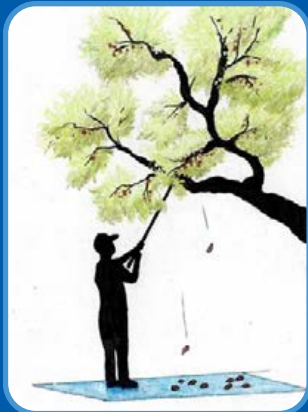


Gathering Acorns



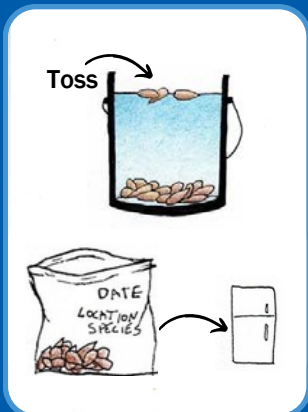
Step 1: Find a tree with ripe acorns

- Find a safe area to collect acorns. Try to collect from trees that may be locally adapted to hotter, drier areas. That could be slightly lower elevation or southern aspect.
- Different species are ready at different times and this can vary geographically. Generally late August through October is ideal timing.
- Collect from multiple trees of different ages to increase genetic diversity and adaptability. Avoid collecting from trees that may have been planted or are of unknown origin.
- Acorns are ripe when they easily separate from their caps. If they're too difficult to remove, consider returning in a few weeks.



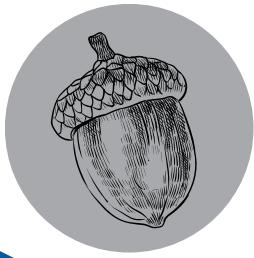
Step 2: Knock or pick acorns

- Collect acorns off trees by gently pulling acorns from their caps. You can also lay a tarp under a tree and knock acorns off with a long pole.
- If branches are still too high, try backing a truck up to the tree and standing in the truck bed. If the ground is flat, you could use an orchard ladder. Climb the tree but only if you feel comfortable.
- You can collect acorns off the ground but they will have much lower chances of germination. Acorns that have been laying on the ground, even short term, are highly susceptible to fungal and insect pests that affect their viability.



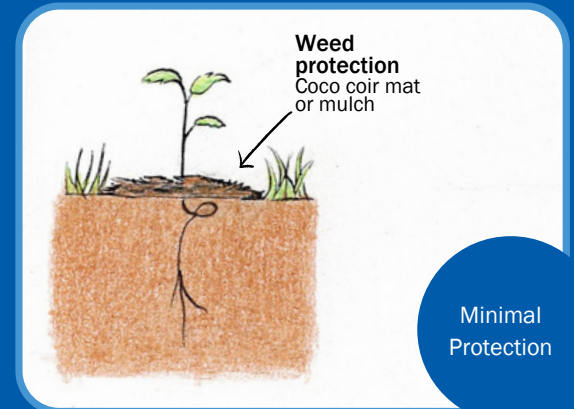
Step 3: Test and store until planting or germination

- After collecting acorns, fill a bucket with water and do the float test (sinkers are viable, floaters can be discarded). The float test will separate viable seeds from those that may be infected by insects, disease, or fungi.
- Let acorns dry and then store in labeled bags in the refrigerator. Write down species, location and date collected. Leave bags slightly open to allow air flow. Check for mold and sprouting.
- Acorns from some species will start to sprout earlier in your refrigerator (blue and valley oak); others will keep much longer (live and black oak) and will stay viable later into the winter.

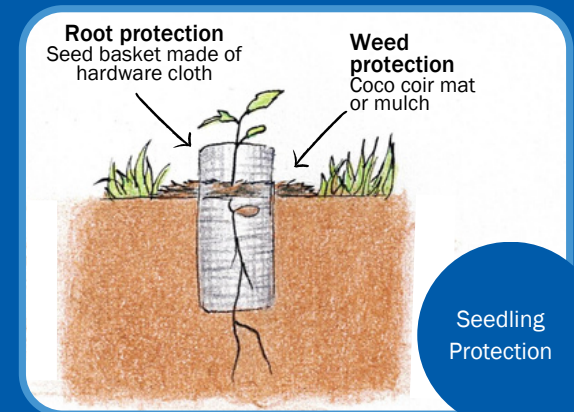


Planting Approaches

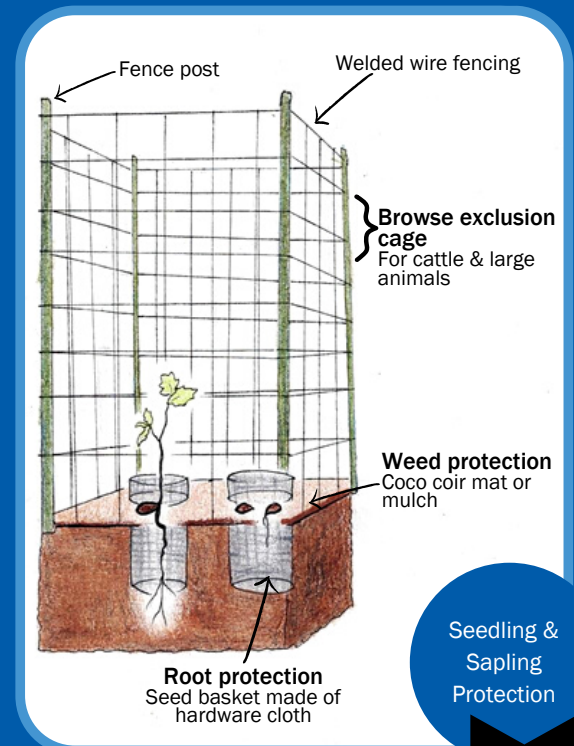
Planting oaks can be as simple and inexpensive as placing an acorn in the ground or you can spend over \$100 on supplies and time to ensure your acorn sprouts and grows into a healthy sapling. Below we show a range of options with cost and time estimates. You can use these techniques on your own, or recruit help for digging holes and building the seed and browse cages. We recommend using durable and reusable materials, and avoiding the use of plastic.



Minimal Protection

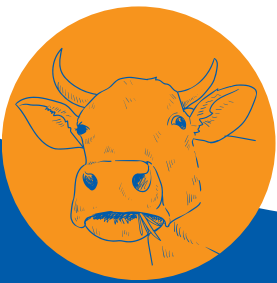


Seedling Protection



Seedling & Sapling Protection

| Approach | Cost & Time | Materials & Expected Survival |
|-------------------------------|----------------------------|---|
| Minimal Protection | Very Low | You can plant hundreds of acorns and a few may survive to the seedling stage, especially in wet years and if you provide weed protection. Only recommended if time and money are major limitations. |
| Seedling Protection | \$\$-\$ 1 hour | Preparing your planting area, using a seed cage and providing weed protection will increase seedling survival substantially. Costs for materials and tools are low, but these tasks are time-consuming. Consider for areas with low browse pressure. |
| Seedling & Sapling Protection | \$\$\$-\$\$\$ 1-2 hours | Using both a seed basket and a browse cage will provide longer term protection from the seedling to sapling stage. Fencing and tools costs are higher and you will need to factor in more time to build a browse cage. If your survival goals are high, we recommend this approach. |



Acorn, Root and Stem Protection

Birds and squirrels can (and will) eat your acorns. Insects, gophers, and ground squirrels may damage oak roots and girdle and defoliate seedlings. We recommend planting your acorns or seedling in a seed basket to protect against damage and acorn loss.

You can build a seed basket by using tin snips or heavy duty scissors to cut a 2 x 2 foot piece of hardware cloth with 1/2 inch holes or smaller. Fashion it into a tube and secure the ends and middle with wire or crimp it closed. Plant half the tube in the ground with the upper half protruding above. Cut an 8 inch square piece of chicken wire for the bottom of your hole (to allow the tap root to grow deep through it) and for the top so birds do not fly in and eat your tasty acorn.

Browse Protection

Oak seedlings can be heavily browsed especially if there is no other green vegetation nearby. While this may not cause immediate death like root damage can, your seedling could have stunted growth and may eventually die. A seed basket will protect against browse for 1-5 years if your seedling is especially slow growing.

Planting your seedling within a blackberry patch, shrubby area, or brush pile can reduce browse pressure, however it may grow slowly due to shading.

To speed up growth, build a browse cage using a sheet of 4-foot x 5-foot welded wire field fencing fashioned into a cylinder by overlapping and securing the short ends. This cylindrical cage can be secured over the seedling with three 5-foot pieces of 3/8-inch diameter rebar pounded into the ground with a mallet or hammer. This way you can slide the cage up and down to easily weed your seedling. This type of cage is sufficient to protect against deer and small browsers and may also protect against sheep, but you can use T-posts to reinforce your cage.

If you are in an area that is grazed by cattle, we recommend building an exclusion cage that can stand-up to the weight of a full grown cow. You can use 8 foot x 50 inch heavy duty cattle panels fashioned into a cylinder or square and secured with two to four T-posts.



Building a seed basket



Wildlife browse cage



Livestock exclusion cage



Weed Control

To help control grass competition, retain soil moisture, and provide protection from solar radiation, we recommend using a weed control method around the planting site. There are many effective options including landscape fabric, cardboard, and mulch. Coco coir fiber weed mats are effective, last multiple growing seasons, and are easy to use but are more expensive than other alternatives. Secure the weed control method using landscape staples if needed.



Mulch and coco fiber mat used for weed protection

Sudden Oak Death

Sudden Oak Death is an invasive plant pathogen that is currently spreading across the northern California coast, and is estimated to have killed over 1 million trees in the past decade. Sudden Oak Death can infect many plant species, but its worst effects are visible in humid and wet coast live oak, black oak, and tanoak forests. The disease is easily spread through the transport of infected plant parts including acorns, mulch, and soil.

To prevent the spread of Sudden Oak Death, you can rinse acorns that have not yet sprouted in a solution of 1/2 cup bleach in 1 gallon of water. Let stand for one minute, then rinse acorns at least 2 times in pure water and allow to completely dry and store in the refrigerator.

Mulch & Beneficial Fungi

The beneficial relationship between oaks and ectomycorrhizal fungi in the soil can help your acorn germinate and survive to the seedling stage. You can read more about inoculating your soil on our website:

<https://www.pointblue.org/tools-and-guidance/research/inoculant-supported-restoration>.



If you are outside areas affected by Sudden Oak Death, you could also collect decayed oak mulch from underneath nearby trees and this may provide the same benefit. We do not recommend moving mulch in areas affected by Sudden Oak Death.



Micorrhizal fungal networks (white) interconnecting roots (brown)



Planting Acorns & Seedlings



Step 1



Scrape your planting area with a hoe to remove herbaceous grasses and weeds. Scrape down to the soil surface to help remove invasive seeds.

Step 2



Dig a hole 12 inches deep and place an 8 inch square piece of chicken wire on the bottom. Place your seed basket in the hole and backfill with soil to ground level.

Step 3



Plant acorns directly on the backfilled soil at ground level either on their side or tip down if they are already sprouted. Be careful not to damage the root that is emerging. Plant 2-3 acorns per hole.

Step 4



For seedlings, break up the rootball if it is compacted. Dig a hole 6 inches deeper than your seedling rootball and back fill your hole with loose soil, filling in air holes. Make sure the seedling is planted with the tap root fully extended.

Step 5

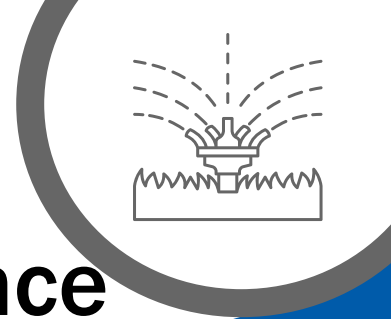


Lay your mulch or coir mat over the planting area, covering a 2 foot radius around your seed basket. Cover acorns with inoculant or mulch and place an 8 inch square of chicken wire over the top of your seed basket.

Step 6



If needed, build a browse protection or livestock exclusion cage around the planting.



Irrigation & Maintenance

Irrigation

Plant survival will increase if irrigation is provided regularly during the dry season for 2-3 years, or until plants are established. A minimum of 1 gallon per week for seedlings in wetter areas, and 2 gallons per week for seedlings in drier areas is a good baseline. Irrigation can be provided by hand or drip irrigation. Supplemental watering will depend on annual rainfall, local climate, site and soil conditions, and the species and timing of planting. Use resources and observations to learn about what's best for your site. Generally, oaks planted from acorns early in the rainy season need less irrigation than container plants.



Irrigation is not necessary, but you can increase plant survival by irrigating for 2-3 years.

Maintaining Seedlings

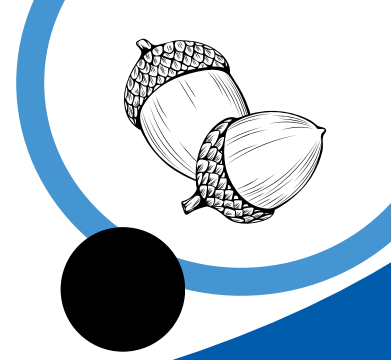
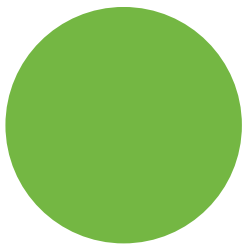
If multiple acorns germinate, allow them to establish for 1-2 years, then select the most robust seedling and clip the others. Hand pull all weeds within the cages in spring until the seedlings are taller than the herbaceous vegetation. Cut out the seed basket material as your seedling grows bushier and taller and becomes established. Maintain the browse or exclusion cage until the oak saplings are out of browse height.



Visit your seedling each summer to remove weeds such as yellow star-thistle

Allow plants to establish for 1-2 years





Resources

Buying Seedlings.

CA Native Plant Society chapter sales can have locally-adapted seedlings. Find a local native plant nursery https://calscape.org/plant_nursery.php



Seedling Protection

Hardware cloth, chicken wire, field fencing, re-bar, T-posts, and cattle panels can be purchased at local hardware and feed supply stores. You can also purchase pre-made seed baskets, often labeled 'gopher baskets'.

Weed Protection.

Coir or coco weed mats can be purchased from online suppliers. Mulch can often be purchased or procured for free from local waste managers and arborists.

Repurposing Materials.

You can build gopher baskets out of old chicken wire by layering and wrapping the wire around a shovel such that the holes are less than 1/2-inch in diameter. Any fencing material and posts, rebar, etc., can be used for deer browse cages. Cardboard with mulch piled on top will also help suppress weeds for 1-3 years.

Web Resources for more Information:



Calflora What Grows Here Tool
www.calflora.org/entry/wgh.html



UCANR Living Among the Oaks
<https://anrcatalog.ucanr.edu/pdf/21538.pdf>



UCANR Regenerating Rangeland Oaks
<https://oaks.cnr.berkeley.edu/wp-content/uploads/2018/09/Regenerating-Oaks.pdf>





Point Blue

Conservation science
for a healthy planet.

Get Connected With Us

Alissa Fogg, Working Lands Ecologist

afogg@pointblue.org

Isaiah Thalmayer, STRAW Program

ithalmayer@pointblue.org

www.pointblue.org

We can assist with acorn collection, oak planting and connect you with funding to establish oaks on your land.



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Art by Qaim Naqvi.

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