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FOREST STEWARDSHIP SERIES 13

Threatened and Endangered Plants

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In common English usage the terms “endangered” and “threatened” are frequently interchanged, but these terms have specific legal definitions for regulatory purposes. They signify the perceived risk of extinction and determine the level of protection afforded a species. The formal definitions below are used in the federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA) or by federal agencies. Keep these legal definitions in mind as you read this publication.

Objective

Understand the laws, ecology, and current conditions of threatened and endangered (T&E) plant species in California and be introduced to management practices that can benefit these species.

Competencies

- Know the legal definitions of threatened and endangered plant species and associated regulatory requirements.
- Understand the causes of endangerment.
- Locate sources of information to identify threatened and endangered species.
- Learn how to protect threatened and endangered species.

Related Forest Stewardship Series Publications

- *Forest Vegetation Management*, ANR Publication 8236
- *Laws and Regulations Affecting Forests, Part I: Timber Harvesting*, ANR Publication 8249
- *Exotic Pest Plants*, ANR Publication 8244

DEFINITIONS

- **Endangered.** Any species, including subspecies, in danger of extinction throughout all or a significant portion of its range (the geographic area where the plant naturally occurs).
- **Threatened.** Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- **Candidate.** A species for which regulatory agencies have sufficient information on its biological status and threats to be proposed as endangered or threatened under the federal or state endangered species acts, but for which development of a proposed listing regulation has not yet been done. These species are not protected but are monitored to prevent their extinction while awaiting listing.
- **Proposed Species.** Species that have been proposed for regulatory protection.
- **Rare.** A rare species can be broadly distributed but never abundant where found; narrowly distributed but not abundant; or narrowly distributed and not abundant where found. “Rare” is a legal classification under California law.
- **Sensitive.** The U.S. Forest Service (USFS) uses this designation for plant species that are known to occur or are highly suspected to occur on Forest Service lands and that are considered valid candidates for federal threatened or endangered classification.
- **Special Status Plants.** A designation used by the Bureau of Land Management (BLM) to include federally listed and proposed species; federal candidate species; state-listed species; and sensitive species. Plants considered to be at risk by the California Native Plant Society that do not meet any of the first three criteria are also considered to be sensitive by BLM in California. Sensitive plants receive the same level of protection as federal candidate species.



Figure 1. Threatened and endangered plants are often associated with specific microclimates and topographic or geologic conditions. For example, in generally arid regions, rare plants are commonly found in riparian habitats such as the one shown in this photograph from the eastern slope of the Sierra Nevada. In forested settings, they are often found at seeps and springs and on soils of unusual rock types such as serpentine. *Photo:* Richard Harris.



CAUSES OF ENDANGERMENT

The main reason plants become rare or threatened with extinction is that their habitat is either lost or irrevocably changed (fig. 1). Many species are naturally rare because they are geographically restricted to very limited habitats such as vernal pools (fig. 2). They are therefore inherently susceptible to local extirpation or extinction even under natural conditions when exposed to phenomena such as prolonged drought or wild-fire. In some cases, plants may be associated with specific forest successional stages. Some species require early successional stages to survive: direct sunlight, low-growing plants, less competition. If there is a change in the natural disturbance regime, such as suppression of naturally occurring fire, these species may decline in numbers or disappear altogether from an area. Other species may depend on old-growth forest conditions. Loss of that successional stage eliminates their habitat and makes conditions unsuitable for their survival.

Figure 2. Vernal pool habitat supports a highly unique flora and fauna. Fifteen percent of the state's rare and endangered plant species inhabit vernal pools. *Photo:* Courtesy Loren Clark.



Other potential causes for endangerment include competition from other plants, predation, and even exploitation by humans, but the main cause that should concern a landowner is habitat change or habitat loss. Broadly interpreted, habitat change includes situations in which a natural habitat is altered by the introduction of exotic pest plants. Protection of habitat includes preventing exotic pest plant invasions (fig. 3).

STEWARDSHIP RESPONSIBILITIES

Although extinction is a natural process, the current rate of extinction around the world is one thousand times that which occurred before humans began to exert large-scale pressure on the world's ecosystems. And this rate is increasing. The major cause of these extinctions is habitat loss. The following are some of the many reasons for concern about the loss of plant species.

- **Natural diversity.** All living creatures, including humans, are part of a complex interdependent network. No species exists in isolation. We do not know enough about these complex systems to predict the consequences of extinction of any given species.
- **Medicine.** A large percentage of our medicines come from plant material or are synthesized from natural chemical compounds. For example, Taxol, a drug used in chemotherapy, is derived from western yew trees. Scientists have investigated only about 2 percent of the more than 250,000 known plant species for their possible medicinal values. Any species could be the key to effective treatment of disease.
- **Agriculture and industry.** Of the 80,000 species of edible plants, less than 20 produce 90 percent of the world's food. Some underutilized species could provide food, fuel, or goods for people of the world. Plants that have industrial uses include the jojoba, which produces oil comparable to that derived from sperm whale, or the guayule, a shrub that contains high amounts of natural rubber. In addition, some plants contain natural toxic compounds that can act as safe and inexpensive pesticides.

Figure 3. Exotic plants such as pampasgrass (*Cortaderia selloana*), shown here invading an open area along a forest road, can occupy disturbed areas and reduce the available habitat for threatened and endangered plants that also require forest openings to survive. *Photo:* Richard Harris.



- **Environmental barometers.** Some species can warn of environmental problems because they are sensitive to changes in environmental quality. For example, ponderosa pine is sensitive to ozone (air pollution) and responds to exposure with needle color changes and decreased vigor.
- **Moral considerations.** Many people believe that every creature has intrinsic value and has a right to exist independently of its value to humans.

Monterey Pine Forests

Monterey pine (*Pinus radiata*) forests today consist of five limited, separate populations in California, considered relicts of the formerly large, continuous forests that blanketed the West Coast (fig. 4). While this species is of little commercial importance in the United States, it is the most widely planted pine tree in the world, with vast plantations in New Zealand, Australia, and Chile, where it is called radiata pine. Lumber and wood products made of radiata pine are being imported into California. These five remaining native populations in California and Baja California contain the entire naturally occurring repository of genetic material for the species. In addition, the Monterey pine forests in the cities of Monterey and Cambria have a special aesthetic value that translates into economic value for the tourist industry. Currently, Monterey pine forests in California are encountering a variety of serious threats: development, diseases and pests, genetic contamination, fire suppression, and old age. While this species has not been officially listed by state or federal agencies, it is being monitored.

REGULATIONS

Federal Endangered Species Act

The Endangered Species Act (ESA) was passed by Congress and signed into law by President Richard Nixon in 1973. It was designed to slow or stop the human-caused extinction of plants and animals in the United States. The ESA is administered by the U.S. Fish and Wildlife Service (FWS) and, in the case of certain fishes, the National Marine Fisheries Service (NMFS).

In most cases, the ESA does not affect an individual's management of private property. It comes into play only when a project occurs on federal land or is a private action that requires a federal permit or federal funding. Only when one of these situations occurs is a consultation with the FWS required.

Threatened and endangered listing process

To determine if a species should be listed for protection under the ESA, the FWS evaluates five factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; and other natural or man-made factors affecting its continued existence.

Critical habitat

The FWS considers protection of habitat to be essential for successful species conservation. Critical habitat has two components. It may include specific areas within the geographical area occupied by a species where physical or biological features essential to the conservation of the species occur, or areas that may require special management consideration or protection; and/or specific areas outside the geographical area occupied by a species at the time of listing when such areas are determined to be essential for the conservation of the species.

Taking

In the regulatory context, to "take" a species means to harass, harm (including significant habitat modification or degradation), pursue, hunt, shoot, wound, kill, trap, capture, or attempt to engage in any such conduct affecting a listed species. The ESA prohibits taking of federally endangered wildlife, but plants are not protected against taking. Instead, plants are protected through the prohibition of collecting endangered plants from lands under federal jurisdiction, and removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation. It is also illegal to transport (interstate or internationally), import, export, or sell or offer for sale endangered plants.

Figure 4. Monterey pine (*Pinus radiata*). Photo: Gary Nakamura.



Recovery plans

The purpose of federal listing is to recover the species to the point where it no longer requires protection. To this end, the FWS develops recovery plans for endangered or threatened species. Recovery plans are blueprints that outline actions that can be taken by public and private agencies and individuals to help recover listed species. These recommendations are not binding. California recovery plans have taken a multispecies approach, treating a number of listed, proposed, and candidate species as well as some species of concern in a single plan.

Delisting

A successful recovery effort, discovery of new information, or extinction will result in delisting, in which a species is taken off the endangered list. According to the FWS, 7 plants and 26 animals had been delisted as of 2005. The Hoover's woolly-star (*Eriastrum hooveri*) has been proposed for delisting in California as new populations have been discovered.

California Endangered Species Act

The state of California maintains a separate list of endangered and threatened plant species. There are currently 218 species and subspecies of plants listed as rare, threatened, or endangered by the state. The California Department of Fish and Game (DFG) is responsible for conserving the state's threatened and endangered species.

The Native Plant Protection Act of 1977 gave the California Fish and Game Commission the power to designate native plants as endangered or rare, and to protect endangered and rare plants from taking. The California Endangered Species Act of 1984 expanded upon this and enhanced legal protection for plants. To align with federal regulations, the California Endangered Species Act (CESA) created the categories of threatened and endangered species. It converted all rare animals into threatened species, but did not do so for rare plants. Thus, there are three listing categories for plants in California: rare, threatened, and endangered.

Timber Harvest Effects

A timber harvest might have no effect, an adverse effect, or a beneficial effect on threatened or endangered plant species, depending on whether or not the timber harvest is evaluated and planned to take into consideration the species' ecological needs (fig. 5). For example, some plants requiring openings and disturbance to survive and propagate can benefit from timber harvesting. This is well illustrated by the Shirley meadows star-tulip (*Calochortus westonii*) which is endemic to Sequoia National Forest. The ecological requirements of this species suggested that selective thinning of dense conifers could be accomplished when the plants were dormant in the fall, thus creating the more open, parklike environment favored by this species. Numbers of Shirley Meadows star-tulips have increased markedly under this prescription.

CESA sets forth procedures by which individuals, organizations, or the DFG can request that a species, subspecies, or variety of plant or animal be added to, deleted from, or changed in status on the state lists of rare, threatened, or endangered species. The factors that contribute to determining the need to list a species include the present or threatened modification or destruction of habitat, competition, predation, disease, overexploitation by collectors, or other natural occurrences or human-related activities.

California Environmental Quality Act

California also has a strong law called the California Environmental Quality Act (CEQA), which provides protection of species and natural communities during the land use planning process. This law requires government agencies to consider and disclose the environmental impacts of projects and to avoid or mitigate these impacts wherever possible. CEQA comes into play in the case of timber harvest plans (THPs), wetland modifications, or other land use activities.

MANAGEMENT OF THREATENED AND ENDANGERED SPECIES

Landowners with vulnerable plants on their property (or potential habitat for those species) have a special opportunity to safeguard these unique species and in some cases actually contribute to the effort to avoid listing or to delist the species. Each species has its own unique needs and, therefore, requires its own specialized management approach. Typical management techniques may include removing invasive nonnative plants, excluding herbivores, restoring drainage patterns to an area, rerouting trails, changing the timing of livestock grazing, conducting prescribed burns, and other actions.

Within the scope of this section it is not possible to provide lists of all the threatened and endangered species that may occur in California's forested landscapes. A landowner can undertake research to develop a list of species potentially occurring on their property. The first step is to contact the DFG's California Natural Diversity Database (<http://www.dfg.ca.gov/bdb/html/cnddb.html>) to determine which species may be present around or on your property. From there, you can consult texts and plant identification manuals (such as the ANR Publication *Illustrated Field Guide to Selected Rare Plants of Northern California*, <http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=3395>) to familiarize yourself with the life history, habitat, and appearance of the species that may occur. Some manuals have photographic keys to help with identification. A landowner may also talk to botanists or other knowledgeable people to learn about the biology of those species and possible threats.

If threatened and endangered species are present on your property, you can take the following steps.

- Protect the physical and biological characteristics of their habitat, for example, by minimizing soil and water disturbance and changes to existing vegetation.
- Plan your activities to minimize direct and indirect impacts on the plants.
- Actively restore or enhance habitat to favor the species.
- Monitor the status of the species.

A landowner may enter into a Candidate Conservation Agreement, which is an agreement between the FWS and a property owner for proposed, candidate, and species likely to become candidates in the near future. The property owner commits to implementing voluntary conservation measures for the species covered in the agreement. In exchange, the property owner may receive assurances from the FWS that additional conservation measures will not be required and no additional restriction will be imposed if the species covered in the agreement become listed. The goal of these agreements is to reduce the need to list species.

Protection of rare plants may also be achieved through conservation easements. Certain state and federal programs will fund the purchase of conservation easements to protect important habitats. Conservation easements limit certain agreed-upon property rights, for example the right to develop, while allowing most other activities. They may provide a number of financial and tax benefits to the landowner.

Figure 5. English peak green-briar (*Smilax jamesii*), is a CNPS 1B plant, rare, threatened, or endangered in California and elsewhere, but it is not federally listed at this time. It is found along lakes and streams, in alder thickets, and moist mountain slopes at 4,000 to 8,000 feet elevation. Timber harvest practices in such locations can adversely affect the habitat for this plant.
Photo: Gary Nakamura.



In some circumstances there may be voluntary arrangements between the FWS and cooperating landowners known as safe harbor agreements. Because many endangered and threatened species exist largely or solely on private lands, the FWS offers limits to future regulatory requirements (a safe harbor from future regulations) in exchange for agreements to modify management practices to enhance the survival of the endangered or threatened species.

RESOURCES

California Natural Diversity Database

The DFG maintains a “special plants” list consisting of approximately 2,000 native plant species, subspecies, or varieties that are tracked by the department’s California Natural Diversity Database (CNDDDB, see <http://www.dfg.ca.gov/bdb/html/cnddb.html>). These plants are either state or federally listed, proposed, or candidate species, or other species, subspecies, or varieties that are of concern due to reasons such as rarity, threats, or the species’ close association with declining habitats; or they may be species for which more information is needed.

The CNDDDB provides government agencies and the private sector with information to assist with good land use and resource management decisions. Customers can access the CNDDDB in two ways: by purchasing RareFind, a menu-based program that allows access to all of the text information in the CNDDDB and allows searches for individual counties, quadrangles, or species; or request the text and graphic information for a particular area. These are presented as a transparent overlay to a specific topographic map along with an accompanying text report on the rare elements.

The CNDDDB is the primary means by which landowners can determine whether there are records of threatened and endangered species being present on or near their property. Foresters normally consult the CNDDDB whenever they prepare a timber harvest plan. Absence of a recorded species on a property does not preclude the possibility that some are present since most of California has not been surveyed for threatened and endangered plants. It is a starting point, however, and if such plants are found nearby, that could mean they are present on your property.

California Native Plant Society Inventory

The California Native Plant Society (CNPS) publishes and maintains the *Inventory of Rare and Endangered Vascular Plants of California* in both hard copy and electronic versions (see their Web site at <http://cnps.org/cnps/rareplants/>). The inventory assigns plants to the following categories:

- 1A: Presumed extinct in California
- 1B: Rare or endangered in California and elsewhere
- 2: Rare or endangered in California, more common elsewhere
- 3: Plants for which more information is needed
- 4: Plants of limited distribution

Additional rarity, endangerment, and distribution codes are assigned to each species. The CNPS inventory was the basis for the CNDDDB. The CNDDDB is constantly updated by reports of species occurrences (or losses) by CNPS members and others.

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