

Tribal Native Plant Materials Program Development Plan for the Confederated Tribes of Grand Ronde



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Prepared by Rebecca Currin, Peter Moore,
and Andy Neill
Institute for Applied Ecology



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PREFACE

This project is coordinated by the Institute for Applied Ecology (IAE) and is funded by the Oregon Watershed Enhancement Board. IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research, and education. IAE provides services to public and private agencies and individuals through development and communication of information on ecosystems, species, and effective management strategies. Restoration of habitats, with a concentration on rare and invasive species, is a primary focus. IAE conducts its work through partnerships with a diverse group of agencies, organizations, and the private sector. IAE aims to link its community with native habitats through education and outreach.



Questions regarding this report or the Institute for Applied Ecology should be directed to:

Thomas Kaye (Executive Director) or
Rebecca Currin (Habitat Restoration Program Director)
Institute for Applied Ecology
563 SW Jefferson Ave
Corvallis, Oregon 97333-4602

phone: 541-753-3099
fax: 541-753-3098
email: tom@appliedeco.org or rebecca@appliedeco.org

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(Confederated Tribes of Grand Ronde Natural Resources Department)

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1 INTRODUCTION

1.1 Project history

1.1.1 Overview

The Confederated Tribes of Grand Ronde (CTGR) have long been interested in reestablishing the collection and utilization of native plant materials for culturally important purposes such as food, art, and spiritual practices. Certain plant materials can be challenging for CTGR members to access on their own, and various CTGR departments (Natural Resources Department, Historic Preservation Department, Culture Department, etc.) often provide different levels of support when appropriate. Plant materials have traditionally been gathered from CTGR's ceded lands and Usual and Accustomed Areas, but gathering locations have become fewer, less accessible, and farther away from Grand Ronde. Currently, the Natural Resources Department purchases plant materials needed for restoration efforts, but the availability of many culturally important species is limited, and those that are available are expensive. Consequently, the need for a CTGR plant materials program has been building for several years.

1.1.2 Plants for People

In 2013, the Institute for Applied Ecology (IAE) partnered with CTGR, the Oregon Parks and Recreation Department, the Oregon Department of Fish and Wildlife, the City of Corvallis, and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to apply for an Oregon Watershed Enhancement Board restoration grant. The resulting "Plants for People" project focuses on enhancing restoration activities through utilizing culturally significant plants, applying Traditional Ecological Knowledge to restoration, and establishing a CTGR plant materials program. As part of the latter aspect of the project, and building on the early stages of plant production, IAE and CTGR committed to creating a development plan for an expanded tribal native plant materials program. This plan is a result of that collaboration.

1.2 Confederated Tribes of Grand Ronde background

1.2.1 Tribal background

The CTGR are the descendants of tribes and bands from western Oregon, southwest Washington, and northern California. These tribes and bands include but are not limited to the Tillamook, Clackamas, Rogue River, Molalla, Kalapuya, Umpqua, Nestucca and Chasta Tribes. The ancestors lived along the coast and interior valleys of Oregon for more than 14,000 years before the arrival of the first European explorers and settlers. The CTGR were decimated by several epidemics as a result of their first contact with Europeans.

Several treaties were ratified between CTGR and the U.S. Government, which resulted in the relocation of Grand Ronde ancestors to a Reservation near Grand Ronde, Oregon between 1855-1875. The original Reservation was established in 1857 under executive order, encompassed an area of more than 60,000 acres, and was located on the eastern side of the Coast Range at the headwaters of the Yamhill River, approximately 25 miles east of the Pacific Ocean.

Only a small portion of the original Reservation was held in common by the CTGR in 1954 when Congress terminated the Government's relationship with CTGR. Though stripped of their lands,

the CTGR never went away in heart, and in 1983, their status was restored by the Government. In 1989, the Natural Resources Department of CTGR was created to manage the land.

1.2.2 Tribal organization

Several different groups or departments residing within CTGR have an interest in developing a native plant materials program. Below is a brief description of the stakeholders who are, or will be, involved with the development of the program.

- **Tribal Council and General Manager:** The Tribal Council is a nine member board having final decision making authority and responsibility for approving budgets and providing long range direction for CTGR resources. The Council directs the General Manager who supervises CTGR programs, such as the Natural Resources Department.
- **Natural Resources Department:** The Natural Resources Department engages in responsible management and stewardship of natural resources important to CTGR members. It will be the lead department in planning and managing the infrastructure for a plant materials program.
- **Cultural Resources Department:** The Cultural Resources Department is able to support a plant materials program through transfer of relevant ethnobotanical knowledge.
- Other relevant groups, departments, programs not yet involved:
 - Tribal elders
 - Education Department (youth programs)?
 - Social Services (prevention programs)
 - Health and Wellness Department (nutrition programs)
 - Food Programs
 - Community Garden (growing food)

1.2.3 Tribal lands restoration

CTGR owns and manages 10,212 acres of Reservation forestland (Fig. 1). Non-Reservation trust land holdings total approximately 523 acres and fee land holdings total approximately 1,641 acres. CTGR also owns over 1,000 acres of conservation properties in the Willamette Basin. Each of these ownership types and locations has a unique purpose and management plan, with goals that include restoration and native plant use. However, the specific focus of the restoration efforts and plant needs will be determined and outlined in the ongoing planning process. For instance, the Reservation is a working forest, therefore the majority of the plant needs will be for reforestation following a timber harvest. There will be a minor need for plant needs in meadows and riparian restoration projects on the Reservation. In contrast, the management plans for the conservation properties will focus efforts to restore habitat for fish and wildlife.

The Natural Resources Department manages the natural areas for the following uses:

- Oak savanna
- Wildlife habitat
- Fish habitat
- Threatened or endangered species

- Other rare plant species
- Recreation
- Education

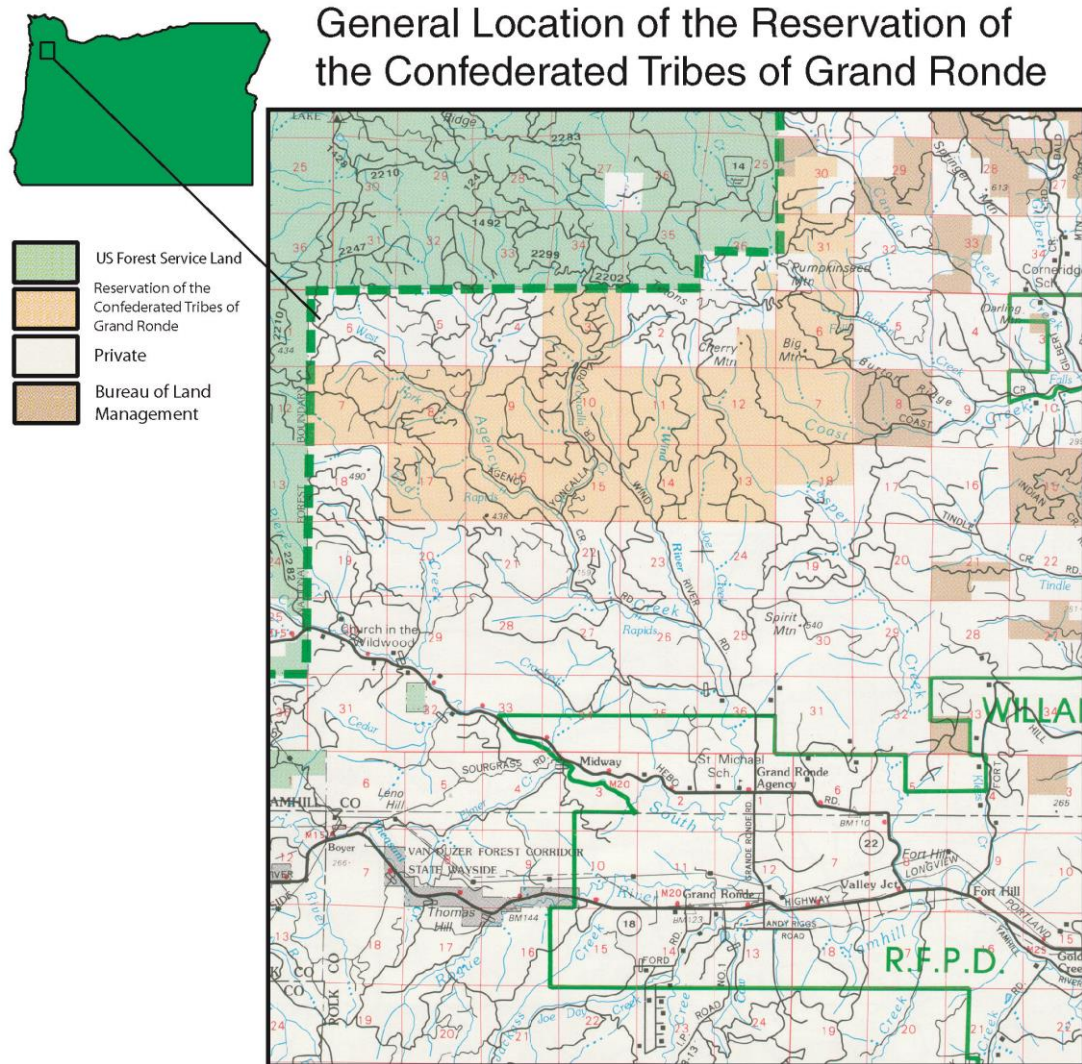


Figure 1. General location of the Reservation of CTGR

1.2.4 Tribal use of culturally significant plant materials

Native plants are essential to the traditional and current tribal lifeways, economy, and wealth of the CTGR people. Plants were, and still are, used for food, clothing, housing materials, hunting, fishing, cooking, medicines and many other things.

The following CTGR groups use or have an interest in culturally significant native plant materials:

- Individual members that gather cultural plants for a variety of purposes, including foods, arts, and ceremonies
- Departments and Programs
 - The Cultural Resources Department for hosting cultural education classes and cultural events
 - Social Services Department for hosting events that include cultural components
 - Natural Resources Department staff engaging in habitat restoration efforts

1.2.5 Current tribal plant materials resources

As part of the Plants for People grant, CTGR and IAE have already implemented a pilot plant materials program:

- **Raised beds:** two 60' x 5' raised beds were built adjacent to the Natural Resources Department building in Grand Ronde during July 2014 (Figs 2, 3). CTGR members and staff helped plant these beds with 1200 large camas (*Camassia leichtlinii*) bulbs (Fig.2) harvested and donated from the NRCS Corvallis Plant Materials Center and 1200 Gardner's yampah (*Perideridia gairdneri*) tubers donated by City of Eugene and harvested from Heritage Seedlings during fall of 2014. These species were supplemented with additional native plants, including Tolmie star-tulip (*Calochortus tolmiei*) (Fig. 3), crown brodiaea (*Brodiaea coronaria*), narrowleaf onion (*Allium amplexans*), and barestem biscuitroot (*Lomatium nudicaule*), purchased from Sevenoaks Native Nursery during fall of 2014 and 2015.



Figure 2. Left: Gabe Clift, Jeremy Ojua (Natural Resources Department), Guy Banner, and Peter Moore (IAE) building raised beds, July 2014; Middle: Filling the beds with soil; Right: Tribal Council member Jon George blessing camas bulbs held by Guy Banner, October 2014.



Figure 3. Left: Large camas in raised beds in at Natural Resources Department; Middle: Rebecca Currin beside the Gardner's yampah raised bed, August 2015; Right: Tolmie star-tulip at the raised bed.

- Cutting beds:** Two 60' x 6' cutting beds were prepared at the Natural Resources Department during fall of 2014. Cuttings of six tree and shrub species, including Lewis' mock orange (*Philadelphus lewisii*), Pacific ninebark (*Physocarpus capitatus*), redosier dogwood (*Cornus sericea* ssp. *sericea*), Pacific willow (*Salix lucida*), Indian plum (*Oemleria cerasiformis*), and ocean spray (*Holodiscus discolor*) were collected and donated from the NRCS Corvallis Plant Materials Center and installed at the cutting beds in December of 2014 and 2015 (Fig. 4).



Figure 4. Left: Jeremy Ojua spreading bark mulch on the tree cutting beds, June 2015; Right: Pacific willow cuttings, June 2015.

- Production beds:** In 2014, the IAE seed crew collected seed for three culturally significant species, coast tarweed (*Madia sativa*), barestem biscuitroot and cow parsnip (*Heracleum lanatum*), for the purpose of establishing seed production fields for these species. A coast tarweed bed was established at the Corvallis Plant Materials Center in spring 2016 and a single harvest of seed occurred in the fall of that year. A cow parsnip bed was established at the Natural Resources Department in spring 2016, and seed will be available in 2-3 years. Barestem biscuitroot plugs were grown in 2016, ready for transfer to a production bed in a new IAE facility in fall 2016. This latter bed will be shared with the Willamette Valley Native Plant Materials Partnership.

- **Plant propagation workshop:** In January of 2015, IAE hosted a native plant propagation workshop for CTGR members in Grand Ronde (Fig. 5). Participants learned how to collect and store native seed, prepare planting media, plant seed and care for germinating seedlings, and plant bare root cuttings. Species planted included farewell-to-spring (*Clarkia amoena*), denseflower willowherb (*Epilobium densiflorum*), Oregon sunshine (*Eriophyllum lanatum*), bigleaf lupine (*Lupinus polyphyllus*), selfheal (*Prunella vulgaris*), and sea blush (*Plectritis congesta*).



Figure 5. Left: Stacy Moore (IAE) demonstrates how to prepare tree cuttings during the plant propagation workshop at Grand Ronde, January 2015; Middle: Stacy Moore and Greg Archuleta planting tree cuttings in a pot; Right: Sowing native seeds in planting trays. Photos by Michelle Alaimo/Smoke Signals.

In addition, the Natural Resources Department has purchased a 20' x 30' hoop-style greenhouse with other grant funds. The greenhouse is being established near the raised beds (Fig. 6) and will have electricity and access to water.



Figure 6. Left: Greenhouse being constructed at Natural Resources Department, December 2015); Right: Completed greenhouse in March 2016.

1.3 Why establish a Tribal Native Plant Materials Program?

Given this background information, a clear interest and need for a CTGR-managed plant materials program exists at Grand Ronde. Having such a program would allow CTGR members and department staff to:

- Obtain low cost native plant materials, including culturally significant species, for land restoration projects
- Acquire plant materials to be used for educational purposes
- Harvest culturally significant plants for use as food, arts, and/or ceremonies in an appropriate manner
- Improve native plant species availability
- Better control native plant material quality (i.e. locally adapted, free of herbicides, etc.)
- Build on in-house knowledge base

Along with restoration partners, the tribal native plant materials program will contribute to ecosystem scale restoration and the reestablishment of native and culturally important plants in the Willamette Valley.

This development plan outlines the goals of such a program, and describes possible steps needed to achieve these goals.

1.4 Plan development process

1.4.1 Tribal input to Plants for People grant proposal

During preparation for the Plants for People grant proposal, considerable input was provided by the former iterations of what is now the Cultural Resources Department, particularly David Harrelson (Cultural Resources Department Manager), who created a list of culturally important species that could be used for restoration and/or production. This input and advice has continued with the involvement of Jordan Mercier (Cultural Education Coordinator).

1.4.2 Visits by tribal elders to Plants for People restoration sites

In October of 2014, elders and staff toured the two Plants for People restoration sites: Champoeg State Park and Herbert Farm and Natural Area. Discussions about historical cultural uses of the sites, ways that sites might be used in the future, culturally-significant plant species that tribal members would like to see at the site, and restoration approaches, design, and special considerations ensued. Input was incorporated into the overall restoration plans for each site.

During these visits, the need for culturally significant plant materials was discussed. Input was solicited regarding high priority plant species, native plant material uses, and cultural and community needs addressed by access to high quality, culturally significant plant materials. These comments were incorporated into this plan.

1.4.3 Meetings

In January and August of 2015, IAE staff met with staff from the Natural Resources and Land and Culture departments to discuss the development of a plan for establishing a plant materials program. The following topics were discussed:

- Tribal plant materials program goals
- Current available resources
- Economic aspect
- Scale of operations
- Funding

1.4.4 Tribal community forum

A tribal community forum may be an avenue to explore community input and interest in the program.

1.4.5 Draft plan review process

IAE staff completed a draft Plant Materials Program Development Plan during fall of 2015. Further drafts were completed in 2016. Drafts were reviewed by staff from the Natural Resources and Cultural Resources departments. The draft plan followed an internal tribal review process including: appropriate Departments, Tribal Planning Department, General Managers Office and Tribal Council. Technical expert reviewed by Kasten Dumroese (USDA Forest Service; Intertribal Nursery Council).

2 NATIVE PLANT MATERIALS PROGRAM PURPOSE AND GOALS

2.1 Purpose

The purpose of the CTGR Native Plant Materials Program is to provide locally-adapted, high quality, cost-efficient, and accessible native plant materials for restoration and cultural uses.

2.2 Program assumptions

The following assumptions guide the development of this plan:

- Only native plant species will be produced
- Plant production will occur on tribal lands and in partnership with other nurseries
- A tribal plant program will integrate restoration and cultural plant needs where possible while recognizing there can be different goals and opportunities.
- The program will incorporate multiple methods of propagation (i.e., seed production fields/beds, cuttings, container plants, bulbs, and divisions, etc.) and will be based Traditional Ecological Knowledge and available science and expertise.

2.3 Goals and objectives

2.3.1 Short-term goals

The following short-term goals will be achieved within the first five years of establishment of the CTGR Native Plant Materials Program:

Goal 1: Create a plant materials program that provides locally-adapted, high quality, cost-efficient native plant materials that meet a significant portion of the Natural Resources Department's habitat restoration plant materials needs.

Objective 1.1: Continue to implement the current pilot program in Years 1 and 2 of program implementation (see Section 1.2.4).

Objective 1.2: Implement larger-scale production of at least three high priority species used in habitat restoration on CTGR lands within five years.

Objective 1.3: Develop infrastructure, such as greenhouses, shade houses, and associated facilities.

Goal 2: Create or enhance accessible CTGR gathering and harvesting locations for high quality native plants of cultural significance.

Objective 2.1: Create a local, accessible, cultivated source of three culturally significant plant species: tall camas, Gardner's yampah, barestem biscuitroot.

Objective 2.2: Create or augment populations of culturally significant plant species at two natural area sites that are available for gathering plant materials within 60 miles of Grand Ronde.

Objective 2.3: Create a network of agencies, and other landowners, who are supportive of utilizing cultural plants in restoration and the potential of cultural harvest in the future.

Goal 3: Generate tribal interest in Traditional Ecological Knowledge and transfer that knowledge among tribal members.

Objective 3.1: Sponsor two culturally significant plant materials gathering workshops or field trips within the first five years.

Objective 3.2: Support restoration efforts at two natural areas (one CTGR-managed site and Champoeg State Park) by organizing at least two volunteer work parties per year.

Objective 3.3: Organize at least two CTGR celebrations or events that involve planting, harvesting and/or utilizing culturally significant plant materials within the first two years. Support First Foods Celebration and Food Bank.

Objective 3.4: Develop partnership between the CTGR Plant Materials Program and programs involving school-aged CTGR members.

Goal 4: Create work and volunteer opportunities for tribal members.

Objective 4.1: Employ at least two staff within the CTGR Plant Materials Program within five years.

Objective 4.2: Develop apprenticeship/internship/volunteer program for CTGR members interested in learning about plant materials production and/or joining the program.

2.3.2 Potential long-term goals

CTGR will revisit the goals during the fourth year of the program. At that time, the project decision making body will review short-term and potential long-term goals, and develop or update long-term goals and objectives.

Goal 5: Generate income through the commercial sale of native plant materials.

Goal 6: Develop partnerships with higher education institutions to create research opportunities.

Goal 7: Increase CTGR food sovereignty.

3 NATIVE PLANT MATERIALS PROGRAM DEVELOPMENT STRATEGY

3.1 Overview

Many choices need to be made before beginning a plant materials development program. Decisions regarding species selection, propagation systems, propagation methods, resource allocation, and many other factors need to be aligned with the overall project goals and objectives. It is easy to think big with a project like this but getting too big, too fast, has been cited as a prevalent and persistent problem for plant materials programs because demand for plant materials tends to fluctuate yearly.

The Nursery Manual for Native Plants (Dumroese et al. 2009) outlines many of the factors that should be considered before setting up a plant production program. The Tropical Nursery Manual (Wilkinson et al. 2014) also provides useful information to help decision making.

“Every nursery is unique. The environmental, social, and economic context is different for each nursery. A wide variety of species and outplanting environments contributes to nursery diversity. In addition, each nursery has a distinct vision and purpose. The methods a nursery will use to bring people together, produce high-quality plants for the community, and share knowledge about those

plants will also be unique. With so many diverse factors to consider, no standard blueprint for how to design a particular nursery exists. On the contrary, the very best nursery design will be matched to a particular situation, resources, and objectives. Although outside resources may be consulted during the planning phase, ultimately it is the nursery team that best understands the place, the plants, and the community” (Dumroese et al. 2009).

The following steps are recommended in order to develop CTGR’s Native Plant Materials Program plan.

3.2 Review the current pilot program

Before embarking on an expanded plant materials program, the pilot program of the Plants for People project should be reviewed.

A review of the pilot program will answer these questions:

- Costs- were these anticipated accurately?
- Labor- did the project to date take more or less time than expected?
- Plants- what plants did or did not grow well?
- Knowledge – what have we learned that can be used for the Program?

CTGR’s restoration needs should also be reviewed, as outlined in Section 3.5.4.

3.3 A scoping process

3.3.1 Scoping

Learning from others and building on previous efforts will be the success of this program. The philosophy of the program is to build on what has been learned already in experiential, scientific, and commercial context. The Natural Resources Department will liaise with the following entities, as needed, to keep the program viable and to meet its goals:

- Tribal elders and members
- Education Department
- Tribal Nutrition Program
- Housing Department
- Cultural Resources Department
- Health and Wellness Department
- External advisor – e.g., Intertribal Nursery Council, IAE, the NRCS Corvallis Plant Materials Center, tribal nurseries and other nurseries

3.4 Select location(s) of operations

The location of the program will in part depend upon the species selected, the method of propagation, and the scale of operations. Because of this, all of these decisions will probably be made in conjunction with each other.

3.4.1 Develop list of possible locations

Create a list of possible locations. Some options are listed below:

- Land adjacent to CTGR Natural Resources offices
- Other Grand Ronde community locations
- Other Grand Ronde ownerships in the Willamette Valley
- Other nursery

3.4.2 Assess possible locations

This assessment will be completed in conjunction with determining species and scope of operations. Factors that should be considered when deciding where to locate a plant materials program include:

Tribal properties:

- **Ownership:** This plan assumes that all, or a significant portion, of the program will be located on CTGR lands.
- **Accessibility:** Site(s) should be accessible to CTGR staff and members.
- **Near staff/offices:** Locating operations centrally near the Natural Resources office allows easy access and efficiency.
- **Near CTGR members/residential houses:** Locating at least some operations near residential housing increases the likelihood of tribal member participation.
- **Soils analysis:** Consider soil type, depth, and nutrient levels at any site where seed production or cutting beds may be installed.
- **Hydrology:** Soil moisture and drainage will impact the type of species that can be grown at a site.
- **Accessibility of water:** If irrigation is required, a site will need to have access to water.
- **Climate:** Climate can play a large role in which species will grow and thrive at a location, and which will not. Average growing conditions, extremes (temperature, precipitation, frost days, etc.) can be site-specific, and should be investigated.

Nurseries:

- **Plant production:** The pilot program established one bed at the NRCS Corvallis Plant Materials Center and a second bed will be at a new nursery facility being established by IAE. Beds of other species could be established at these facilities, or at other nurseries such as Heritage Seedlings, to supplement production efforts at Grand Ronde.
- **Expertise:** The advantage of contracting with an existing nursery is that nursery managers have a wealth of knowledge, which increases the likelihood of success. A disadvantage is that CTGR staff and members are less likely to become fully engaged in plant propagation if they are not actively participating. Nevertheless, even when contracting with a nursery, valuable experience can be gained by learning techniques that can be used for CTGR's own nursery operation.
- **Existing infrastructure:** Utilizing nurseries with existing infrastructure could reduce some establishment costs if funds are limiting for start-up at Grand Ronde.

3.5 Select plant species

3.5.1 Overview

An assessment that identifies the potential demand for plant species and how many plants of those species are needed can improve the likelihood of success of a plant materials program. The Target Plant Concept (Dumroese et al. 2009) suggests that knowing what species are needed and the environment they are to be outplanted can influence how plant materials are propagated. See Section 3.5.4 below for a list of questions to ask when determining which species to include.

3.5.2 List desired native plants used in habitat restoration

See Appendix A for an initial list of plants used in habitat restoration.

3.5.3 List desired culturally significant native plants

Used for food, traditional arts, medicine, and ceremonies, see Appendix A for an initial list of culturally significant plants.

3.5.4 Analyze species

Answering the following questions will help determine the list of desired target species (adapted from Dumroese et al. 2009):

- What species are most appropriate for planned restoration projects by CTGR and other partner groups and agencies?
- What restoration objectives do the species meet (e.g. shade for salmon habitat, food, foraging habitat, ground cover, diversity, etc.)?
- Which of these species also fulfill cultural needs?
- What is the cultural significance of the species (e.g., food plant, artisanal material, tool making, etc.)?
- Are some high priority species of cultural significance not high priority habitat restoration species?
- What types of restoration does the Natural Resources Department anticipate implementing over the next five years (habitat type, # acres, etc.)?
- What ecological role does CTGR want target species to fill?
- What plant material propagation techniques of plant materials best fit selected species, restoration objectives, and site characteristics?
- What is the best season to outplant?
- What is the expected ease of establishment of target species in natural areas?
- How easy are target species to propagate?
- How many individuals of each species will be needed annually?
- Are target species known to be vulnerable to any pests, diseases, or herbivory?

Develop a template checklist/matrix for species selection analysis.

3.5.5 Research current commercial availability of high priority species

If appropriate plant materials are already commercially available for some of the high priority species, it is worth considering the cost/benefit analysis of growing your own vs. buying from an outside source.

The Native Seed Network (<http://www.nativeseednetwork.org/>) is a useful resource for locating vendors and exploring the availability and cost of seed, however, more up-to-date information should be obtained from the growers.

The following information might be particularly relevant:

- Source of plant material (e.g., local genetics)
- Availability
- Cost

3.5.6 Opportunities with the Willamette Valley Native Plant Materials Partnership

Some species of interest may already be under development by the Willamette Valley Native Plant Materials Partnership. As a member organization, CTGR can participate in production or purchase of seed. For more information, view the website <http://wvcoop.nativeseednetwork.org/>, or contact the Plant Materials Coordinator from IAE.

3.5.7 Select highest priority plants

In order to meet the first four objectives of the CTGR Plant Materials Program, three high priority restoration and three high priority cultural plants need to be selected. Ideally, some or all of the species selected will fall into both categories.

3.5.8 Determine appropriate propagation method for selected species

Species selected can impact the type of plant materials that will be grown (Withrow-Robinson and Johnson 2006). For example, annuals such as tarweed (*Madia* sp.) are best grown from seed, whereas willows (*Salix* sp.) and other shrubs may be best cultivated in cutting beds and outplanted as rooted and non-rooted cuttings.

For each high priority species, determine the best way to propagate that species to fulfill the restoration and/or cultural use needs. The most commonly used propagation methods are listed below.

3.5.8.1 Seed production in raised beds or production (increase) fields

Typical use: For species that establish well by seed (i.e. annuals, grasses) and when large areas must be restored.

Pros: Seeds are small and easy to handle, store for long periods, are easy to outplant by sowing or broadcast, and are generally less expensive than other propagation methods.

Cons: Considerable effort is needed to collect seed from wild sources. If more seed is required than what can be collected, then field production, requiring dedicated field space, harvesting equipment, and seed cleaning facilities are necessary. The process of increasing the seed can affect genetic diversity.

Steps involved: To produce seed for restoration purposes, seed is first collected from local sites and then increased by sowing seed from subsequent harvests until enough seed has been harvested for desired purposes. Depending on the species, the field may also be started from one-year-old plugs grown from the collected seed.

Other options: Direct purchase of seed from growers/brokers in the Willamette Valley, or, contract growing with local growers.

3.5.8.2 Container production

Typical use: For species that do not establish well by seed (i.e. slow-growing perennials) and when specific planting densities or compositions are required.

Pros: Plants of many sizes can be produced. Makes the most efficient use of seeds, especially those of limited supply or high value. Specific plant densities and compositions can be achieved. Can take advantage of nursery/greenhouse growing conditions and growing media. Handling and storage is less demanding than bareroot materials.

Cons: Nursery production requires constant attention and regular watering and fertilization. Depending on when outplanting occurs, plants may require special storage conditions. Require high quality and pure seeds. Higher costs to ship container seedlings and more labor intensive to plant compared to direct seeding or non-rooted cuttings.

Container type selection: Many types of containers, ranging from small plugs aggregated into blocks or trays to large multi-gallon containers are available. The correct container varies with expected root morphology, outplanting site criteria, and economics of the species selected. The most important factors to consider when selecting a container are volume, height, diameter, and shape. Volume determines the size of plant that can be grown, height determines the depth of the root system that will be planted, diameter relates the type of species being grown, and shape relates to the tools required for out planting (Dumroese et al. 2009). Descriptions of a variety of container options and handling techniques are available in Dumroese et al. (2009). Smaller containers are relatively easy to plant with traditional planting tools, such as hoedads, or dibbles, which can make a hole matched exactly to container shape.

3.5.8.3 Bulb/rhizome production

Typical use: For species with these structures that take a long time to establish by seed, have seeds that does not store well, are needed to increase native plant diversity of restoration site, or are culturally significant because the bulb or rhizome is the part of plant of interest. Either raised beds or production fields.

Pros: Relatively easy to establish, renewable resource of plant materials for restoration and cultural uses, can be stored under refrigeration, good survival after outplanting.

Cons: Can be very labor intensive to harvest and replant the propagules and may be less useful for large-scale restoration projects.

3.5.8.4 Bareroot production

Typical use: Tree or shrub species.

Pros: An efficient way to produce large numbers of plants and can be stored under refrigeration. Bareroot seedlings are typically less expensive to produce and ship than container seedlings.

Cons: Compared with container seedlings, bareroot seedlings require more attention during shipping and outplanting because the roots can be damaged more easily. Sizes of plant materials are limited compared to containers. Bareroot plant materials may not be the best option as the starting point for a plant materials program because it is difficult to locate appropriate soils for production and the start-up costs for equipment are high. (Note: Gail Redberg, nursery manager of the Confederated Tribes of the Umatilla Indian Reservation Tribal Native Plant Nursery, indicated they have bareroot equipment that they are not using and would be willing to part with).

3.5.8.5 Cutting production

Typical use: Shrubs that establish best from rooted or non-rooted cuttings, or for culturally significant species used in traditional arts such as basketry.

Pros: Renewable source of plant material for restoration, bank stabilization, and cultural uses. Outplanting non-rooted cuttings can be very cost-effective, especially compared with container seedlings. Large, pole-size cuttings can be produced for riparian restoration. Cutting beds can be established for future needs. Rooted cuttings can be grown in a variety of container types and sizes, and are a good option when seeds are unavailable or have complex dormancy.

Cons: Species that require rooting before outplanting can have additional, complicated steps. Care must be taken with dioecious species (male and female plants) to ensure both sexes are represented on the outplanting site.

3.5.9 Determine plant material sources

Appropriate native plant materials for restoration projects are suitable for the site, grown from locally adapted sources, and have a diverse genetic composition (Withrow-Robinson and Johnson 2006). This means collection of parent materials from a variety of sites, plant sizes, and morphologies is critical quality of plant materials for habitat restoration projects.

Steps:

- Research possible collection sites for each target species
- Determine type of plant material to be collected (i.e., seeds, cuttings, divisions, bulbs/rhizomes, etc.)
- Obtain permission to scout and/or collect at high priority sites
- Scout and map potential plant materials collection sites
- Develop collection protocols
 - Maintain genetic diversity
 - Do not over-collect/harm source population

- Collect plant material
- Store or implement propagation

3.6 Conduct pilot study to determine cultivation protocols for each species

3.6.1 Overview

A logical starting point for a plant materials program is to establish a pilot project that selects a small number of species and then produces a small number (500-1000) of plants of each species. As program operations streamline and propagation techniques improve, the pilot project could expand to produce more plants to fulfill a greater proportion of habitat restoration and cultural needs. Until enough plants can be cultivated, habitat restoration and cultural needs can be supplemented with purchases from local growers.

A second option is to select a few species and propagate a larger number of plants of each species using a variety of cultivation techniques. This will assess the feasibility of each technique and may also fulfill more of the habitat restoration and cultural use plant material needs in the short term.

Draw on knowledge from other growers (see Section 7).

Recommendation:

- Grow small amounts of 4-6 target species for first few seasons to supplement restoration projects and provide material for cultural uses
- Of the target species, select as many species as possible that meet both restoration and cultural use needs
- Assess time, equipment and material requirements
- Determine whether or not to:
 - Expand raised and cutting beds?
 - Grow using pots/cones/bareroot/plugs/non-rooted cuttings?
 - Create seed and/or cutting production beds.

3.6.2 Research cultivation needs and protocols

- Review species cultivation literature
 - Native Plant Network (<http://nativeplantnetwork.org>)
- Talk to local growers (e.g., NRCS, Heritage Seedlings, Sevenoaks Native Nursery)
- Talk to other tribal plant materials program staff.

3.6.3 Implement small scale operations for target species

Initiate small scale production of seed production beds, container species, and cutting beds. Record protocols followed, challenges, and results. If a species takes more than one year to produce seed or plants large enough for outplanting, focus on initial survival and vigor of plants rather than end product.

3.6.4 Revise target species list and/or protocols

Review pilot project results. For species not successfully grown, determine if the cultivation methodology can be adjusted to improve success. If challenges are too difficult or costly to overcome, consider selecting an alternative species.

3.7 Implement larger scale production

3.7.1 Determine annual yield needs

Project numbers of acres of restoration implemented, quantity of cultivated culturally significant plants needed, and numbers of tribal members intending to gather materials in natural areas each year.

3.7.2 Decide scale of production

Using desired annual yields, calculate scale of operations needed for each species in order to meet those needs, including:

- Seed production fields
- Container plants
- Cultivated raised beds and/or cutting beds
- Harvesting population size

3.8 Develop infrastructure

Once decisions have been made on location and plant species needs, and the pilot program has been evaluated, decisions about nursery infrastructure will be needed.

Chapters 1 (Planning a Native Plant Nursery) and 4 (Propagation Environments) in Dumroese et al. (2009), and the equivalent chapters in Wilkinson et al. (2014), offer excellent guidance when deciding on infrastructure. Most nurseries will start with a basic infrastructure and expand as funding allows.

Growing environments to consider:

- Field beds – e.g., cutting beds or seed production beds
- Raised beds
- Open growing compounds – for regular production and/or for hardening plants
- Cold frames – covered frames without heating
- Shade houses – shaded frames to protect plants from sun and wind
- Greenhouses – propagation structures with fully controlled environments. A great variety of type and sizes are available.

Equipment and other infrastructure to consider:

- Deer fences to protect plants from browsing
- Storage sheds and staff facilities
- Security
- Heating, ventilation, and lighting

- Water supply and greenhouse watering systems, including drainage, storage and recycling of water
- Irrigation for outside areas and beds
- Tractors and hauling and carrying equipment
- Cultivation and harvesting equipment
- Seed cleaning equipment
- Sterilizing equipment
- Shade cloth and weed mat
- Herbicides and pesticides
- Pots and other containers
- Weeding and propagation tools.

4 PROJECT TIMELINE

Table 1. Native Plant Materials Program development and implementation timeline.

Phase	Task	Who responsible	When
Phase 1: Planning	Determine decision-making structure	Planning group	Year 1
	Hold community forum	Historic Preservation and/or Lands Dept.	Year 1
	Select location	Natural Resources Dept.	Year 1
	Select species	Planning group	Year 1
Phase 2: Pilot project implementation	Select pilot species	Planning group	Year 1
	Research cultivation requirements	Natural Resources Dept.	Year 1
	Develop cultivation infrastructure	Natural Resources Dept.	Year 1
	Collect plant materials needed to start propagation	Natural Resources Dept.	Year 1-2
	Cultivate target species	Natural Resources Dept.	Year 1-2
Phase 3: Large-scale implementation	Determine annual needs for each species	Planning group	Year 2
	Implement larger scale cultivation	Natural Resources Dept.	Year 3-5
Phase 4: Program expansion/ long-term goals	Revisit goals and revise as needed	Planning group	Year 4
	Create objectives, tasks, timeline, budget, etc. for revised goals (update plan)	Planning group	Year 4
	Implement	Natural Resources Dept.	Year 5

5 PROJECT COST ANALYSIS AND BUDGET DEVELOPMENT

5.1 Cost analysis

Because cost efficiency is one reason for developing a plant materials program, it is a good idea to develop a cost analysis for plant production that examines the cost/benefit trade-offs of buying plants commercially, contracting with a grower, or growing on site as part of a CTGR plant materials program. Bear in mind, however, that many other reasons and benefits may be more important than economics for starting a nursery program, as outlined in Sections 1.1 and 1.3.

A sample cost analysis is provided for coast tarweed (Table 2). This species was selected as a species for seed production as part of the Plants for People project for a variety of reasons, including cultural significance, the fact that it is not currently available commercially (although it has been grown previously by Heritage Seedlings), and because it is an annual species, a harvest is available in the same year it is planted. Three other tarweed species were available from Heritage Seedlings in 2015 for \$76-132/pound for orders >10 pounds. The contract grow-out of coast tarweed at the NRCS Corvallis Plant Materials Center for the Plants for People project is \$2,500 for a 0.2 acre field –taking into account the seed collection costs, and projected yields of 99 pounds per 0.2 acre, each pound would cost approximately \$49 (Table 2). The equivalent estimates for growing a field at Grand Ronde is at least two times more expensive for one year of production, based on anticipated needs of staff time and supplies (Table 2). However, costs will be much lower in subsequent years if seed from the original collection is stored and re-used, and/or the field continues through self-sowing and field maintenance is reduced compared with the first year – under that scenario it is expected that the second year of production would result in a similar cost to the contract grower (Table 2). Additional start-up costs and new equipment have not been factored into this comparison, as the share of these costs would gradually be reduced over time with ongoing production. Production and management costs would also decrease with time as a result of improved infrastructure, bulk purchases, and efficiency gained through experience and increasing the scale of the operation.

Cost comparisons for other species or propagation methods will vary greatly. For example, perennial species, such as barestem biscuitroot, will take 2-3 years to mature before seed can be harvested. Consequently, a cost analysis would be required over a 5-year period. Other species, such as camas, produced in a raised bed, or shrubs produced in a cutting bed, have relatively low ongoing maintenance, yet continue to produce bulbs or cuttings for many years, providing very low-cost plant materials.

Approximate costs for the current pilot tribal plant materials program at CTGR and projected maintenance costs during 2017-19 are included in Table 3. Costs for the first two years (2015-16) included materials and labor for site preparation and bed construction, and the collection and purchase of plant materials. Projected annual maintenance costs in 2017-19 are lower than the first two years, as the infrastructure is largely set up, and most of the labor will be spent on watering, weeding and harvesting. Costs in Table 3 do not include any costs for expansion of the program, which will be outlined in a new grant proposal to OWEB, being prepared in late 2016.

Table 2. Estimated costs of coast tarweed seed purchased commercially, by contract grow-out on 0.2 acres, or equivalent costs at Grand Ronde, for one year of production.

	Commercial nursery	Contract grower e.g. PMC	Projected Grand Ronde costs ³ Year 1	Grand Ronde Year 2
Management		\$330	\$1,800	\$1,440
Seed collection		\$2,000	\$2,000	\$0
Field preparation, maintenance and harvesting		\$2,500	\$5,600	\$3,700
Supplies¹			\$800	\$400
Total Cost		\$4,830	\$10,200	\$5,500
Approx. pounds yield per 0.2 acres²		99 (range 10-340)	99 (range 10-340)	99 (range 10-340)
Cost per pound	Not available, but other tarweed cost \$76-\$132	\$49 (range \$14 - \$480)	\$103 (range \$25 - \$1,180)	\$56 (range \$13 - \$670)

¹ General supplies including weed mat, soil amendments, herbicides, tools etc. Costs for larger equipment for tilling, harvesting and cleaning seed have not been included.

² Based on data from Heritage Seedlings for coast tarweed (ranges are from yields for other *Madia* species grown at the NRCS Corvallis Plant Materials Center (PMC) (Bartow 2015).

³ Estimated costs – these would be refined during a pilot program.

Table 3. Approximate materials and labor costs of pilot tribal plant materials program at CTGR in 2015-16 and projected total maintenance costs for 2017-19.

5 Year Pilot Tribal Plant Materials Program Costs					
		2015	2016	2017-19 (3 year total)	5 year Total
Raised beds	Materials	\$5,600	\$400	\$450	\$6,450
	Labor	\$7,200	\$3,500	\$4,500	\$15,200
Cutting beds	Materials	\$400	\$400	\$450	\$1,250
	Labor	\$2,000	\$2,000	\$6,600	\$10,600
Greenhouse	Materials	\$7,000	\$250	\$750	\$8,000
	Labor	\$2,750	\$2,750	\$4,500	\$10,000
Plant Materials	Materials	\$3,600	\$450	\$900	\$4,950
	Labor	\$2,500	\$2,500	\$1,500	\$6,500
Total	Materials	\$16,600	\$1,500	\$2,550	\$20,650
	Labor	\$14,450	\$10,750	\$17,100	\$42,300
Grand Total		\$31,050	\$12,250	\$19,650	\$62,950

As an example cost analysis for production of a planting bed, if we assume an annual maintenance cost of \$825 for the camas bed, and if two pounds of seed are collected (at a commercial value of \$260) and 400 bulbs harvested, then the cost per bulb will be \$1.41. Commercially produced bulbs cost approximately \$0.90. Although the estimated cost is higher at the CTGR nursery, it is expected that over time, skills, efficiency and production will increase, resulting in a decrease in cost per bulb.

5.2 Budget

The budget for the development of a tribal plant materials program will depend on the results of all of the decisions mentioned earlier in this plan. The following budget categories should be considered when developing the project budget:

- Start-up vs. operating costs.
- Seed and plant material scouting and collection.
- Field preparation and maintenance.
- Infrastructure (e.g., greenhouses) and facilities.
- Equipment and tools.
- Weed and pest control.
- Planting/sowing.
- Growing (containers, water, fertilization, growing media).
- Transportation (of staff and plant materials).
- Hiring costs.
- Employee salaries and benefits.
- Training.

6 FUNDING OPTIONS

Once a program budget has been developed, funding can be solicited and acquired. There are a variety of potential funding sources for a tribal plant materials program.

6.1 CTGR general tribal funds

General funds are provided for through annual budget process. These limited funds serve many other needs and are not anticipated to provide a substantial portion of the operating costs for this program. The Natural Resources Department is funded through a variety of sources including general funds. During this pilot time period staff wages will indirectly support the project. If the project develops further and matching grant funds or direct staffing dollars are needed, NRD staff will make these request in the formal budgetary process.

6.2 Governmental grants

One of the most common sources of tribal native plant materials program start-up funding is governmental grants. Grant programs vary in their availability on an annual basis, so it is important to research what programs are currently available, and the submission deadlines for proposals.

- Search for opportunities on the Grants.gov website:
<http://www.grants.gov/web/grants/home.html>

- The catalog of federal funding sources for watershed protection is another useful website: <https://ofmpub.epa.gov/apex/watershedfunding/f?p=109:1:::NO::>

The following agencies have provided grant funding, or are potential funding sources, for tribal native plant materials programs:

6.2.1 Bureau of Indian Affairs

- www.bia.gov;
- Northwest Regional Office, Portland 503-231-6702;
- e.g., Forestry on Indian Lands Program.

6.2.2 Environmental Protection Agency

- www.epa.gov;
- Region 10 (Pacific Northwest) Seattle main office: 206-553-1200 or 800-424-4372, email: epa-seattle@epa.gov;
- A calendar for EPA community grants is available at <http://www.epa.gov/grants/epa-grant-competition-forecast-calendar-year-2016>;
- Indian Environmental General Assistance Program: <http://www.epa.gov/tribal/indian-environmental-general-assistance-program-gap>;
- Wetlands Program Development Grants: <http://www.epa.gov/wetlands/funding-and-other-resources>

6.2.3 US Fish and Wildlife Service (Department of the Interior)

- www.fws.gov;
- Oregon Fish and Wildlife Office, Portland, 503-231-6179;
- Tribal Wildlife Grant Program: <http://wsfrprograms.fws.gov/Subpages/GrantPrograms/TWG/TWG.htm>;
- Partners for Fish and Wildlife Program: <http://www.fws.gov/partners/>.

6.2.4 Natural Resources Conservation Service (Department of Agriculture)

- www.nrcs.usda.gov;
- There are a range of financial and technical assistance programs: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/>;
- Conservation Stewardship Program;
- Conservation Technical Assistance;

6.2.5 Rural Development (Department of Agriculture)

- <http://www.rd.usda.gov/programs-services>

6.2.6 Oregon Watershed Enhancement Board

- Small Grant Program, http://www.oregon.gov/OWEB/GRANTS/pages/smgrant_main.aspx
- Outreach grants: http://www.oregon.gov/OWEB/GRANTS/pages/education_grants.aspx

6.2.7 Bonneville Power Administration

6.3 Private foundations

6.3.1 Meyer Memorial Trust

- <http://mmt.org/>,

6.3.2 National Fish and Wildlife Foundation

- www.nfwf.org/whatwedo/grants/

6.3.3 Spirit Mountain Community Fund

- <http://www.thecommunityfund.com/funding>

6.3.4 Ecotrust

- Whole Watershed Restoration Initiative: <http://www.ecotrust.org/work/>;

6.4 Cost recovery & commercial plant sales

A self-sustaining business is not current goal of CTGR, however, cost recovery through growing plant materials for restoration projects would be appropriate. As outlined earlier in this document, Tribal lands are in need of restoration plants. If this program is successful the Tribes will not be purchasing the plants from commercial nurseries but will be purchasing these plants from their own nursery operation.

7 RESOURCES

7.1 Other tribal plant material programs

- Tribal Nursery Directory (<http://www.rngr.net/resources/directory>).

7.2 Federal and state

- USDA Forest Service:
 - Reforestation, Nurseries, & Genetics Resources (RNCR) website <http://www.rngr.net/> has many useful publications and resources, including a page on propagation protocols;
 - Intertribal Nursery Council, <http://www.rngr.net/inc/intertribal-nursery-council>;
 - Jeremiah Pinto (Tribal Nursery Specialist);
 - Kasten Dumroese (National Nursery Specialist).
- USDA Natural Resources Conservation Service (NRCS):
 - <http://plants.usda.gov/> website provides a plants database with links to factsheets on species of interest;
 - Corvallis Plant Materials Center – Amy Bartow and Tyler Ross;
 - Seed Production Manual (Bartow 2015).
 - Other PMC publications:
<http://www.nrcs.usda.gov/wps/portal/nrcs/publications/plantmaterials/pmc/west/orpmc/pub/#PU>.

7.3 Higher Education

Make use of current research at institutions such as Oregon State University, University of Oregon and Portland State University.

7.4 Other technical assistance

- Lynda Boyer of Heritage Seedlings provides several useful documents on the Prairie Oak Restoration Resources page of their website:
http://www.heritageseedlings.com/page_27_50/prairie-and-oak-restoration-resources.

8 REFERENCES

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9 APPENDICES

Appendix A: Potential plant species list, including culturally important species and priority restoration species

Form	Common name	Scientific name	Restoration use/Habitat	Cultural use
Herbaceous forbs	common yarrow	<i>Achillea millefolium</i>	Prairie, matrix, nectar	
	tapertip onion	<i>Allium acuminatum</i>	Prairie	food
	narrowleaf onion	<i>Allium amplexans</i>	Prairie	food
	crown brodiaea	<i>Brodiaea coronaria</i>	Prairie	food
	farewell-to-spring	<i>Clarkia amoena</i>	Prairie, nectar	
	Tolmie star-tulip	<i>Calochortus tolmiei</i>	Prairie	food, medicine
	large camas	<i>Camassia leichtlinii</i>	Wet prairie	food
	small camas	<i>Camassia quamash</i>	Prairie	food
	Oregon sunshine	<i>Eriophyllum lanatum</i>	Prairie, matrix, nectar	
	Puget Sound gumweed	<i>Grindelia integrifolia</i>	Prairie, structure, nectar	
	wild strawberry	<i>Fragaria virginiana</i>	Prairie	food
	cow parsnip	<i>Heracleum lanatum</i>	Riparian, wet	food, medicine, dye
	toughleaf iris	<i>Iris tenax</i>	Prairie, edge	cordage
	barestem biscuitroot	<i>Lomatium nudicaule</i>	Prairie	food, medicine, ceremony
	common tarweed	<i>Madia elegans</i>	Prairie	food
	coast tarweed	<i>Madia sativa</i>	Prairie	food
	Gardner's yampah	<i>Perideridia gairdneri</i>	Prairie	food, medicine
	Oregon yampah	<i>Perideridia oregana</i>	Prairie	food
	slender cinquefoil	<i>Potentilla gracilis</i>	Prairie, matrix, nectar	
	common selfheal	<i>Prunella vulgaris var. lanceolata</i>	Prairie, matrix, nectar	
	wapato	<i>Sagittaria latifolia</i>	Wetland	food
	yerba buena	<i>Satureja douglasii</i>		medicine
	dwarf checkermallow	<i>Sidalcea virgata</i>	Prairie, nectar	
	hyacinth brodiaea	<i>Triteleia hyacinthina</i>	Prairie	
	stinging nettle	<i>Urtica dioica</i>	riparian, understory	medicine, food, cordage
	narrowleaf mule's ears	<i>Wyethia angustifolia</i>	Prairie, structure	

Note – list includes commonly used restoration species. Other species can be added, depending on restoration needs for diversity and structure.

Form	Common name	Scientific name	Restoration use/Habitat	Cultural use
Graminoids	spike bentgrass	<i>Agrostis exarata</i>	Wet prairie, matrix	
	California brome	<i>Bromus carinatus</i>	Prairie, matrix	
	one-sided sedge	<i>Carex unilateralis</i>	Prairie, matrix	
	California oatgrass	<i>Danthonia californica</i>	Prairie, matrix	
	tufted hairgrass	<i>Deschampsia cespitosa</i>	Wet prairie, matrix	
	blue wildrye	<i>Elymus glaucus</i>	Prairie, matrix	
	meadow barley	<i>Hordeum brachyantherum</i>	Wet prairie, matrix	
	soft rush	<i>Juncus effusus</i>	Wet prairie	weaving
	poverty rush	<i>Juncus tenuis</i>	Wet prairie, matrix	
	Roemer's fescue	<i>Festuca roemerii</i>	Prairie matrix	
Shrubs	vine maple	<i>Acer circinatum</i>	Forest edge	tools, cooking stakes, fiber
	serviceberry	<i>Amelanchier alnifolia</i>	Understory, edge	food
	Indian hemp	<i>Apocynum cannabinum</i>	Riparian, understory	cordage
	redosier dogwood	<i>Cornus sericea occidentalis</i>	Understory	medicine, smoking, dye
	California hazelnut	<i>Corylus cornuta</i>	Understory	food, weaving, medicine
	ocean spray	<i>Holodiscus discolor</i>	Understory	medicine, tools, weapons
	Oregon grape	<i>Mahonia aquifolium</i>	Forest/woodland understory	food, medicine
	Indian plum	<i>Oemleria cerasiformis</i>	Forest/woodland understory	food, tea, anesthetic
	Oregon white oak	<i>Quercus garryana</i>	Oak woodland, oak savanna	food
	cascara	<i>Rhamnus purshiana</i>	Forest/woodland	medicine
	nootka rose	<i>Rosa nutkana</i>	Understory, edge	food, medicine, ceremony, crafts
	thimbleberry	<i>Rubus parviflorus</i>	Understory	food, medicine
	salmonberry	<i>Rubus spectabilis</i>	Understory	food
	Pacific willow	<i>Salix lucida</i>	Riparian	medicine, fiber, tools
	Elderberry	<i>Sambucus racemosa/cerulea</i>	Riparian, understory	
	Douglas spiraea	<i>Spiraea douglasii</i>	Wet	brooms, cooking tools
	snowberry	<i>Symphoricarpos albus</i>	Forest/woodland	medicine, soap, arrows

Form	Common name	Scientific name	Restoration use/Habitat	Cultural use
Trees	white alder	<i>Alnus rhombifolia</i>	Riparian	medicine
	red alder	<i>Alnus rubra</i>	Riparian	dye, medicine
	Oregon ash	<i>Fraxinus latifolia</i>	Riparian	tools, basketry
	Lewis' mock orange	<i>Philadelphus lewisii</i>	Riparian	tools, arrows, furniture, soap
	black cottonwood	<i>Populus trichocarpa</i>	Riparian	medicine, firewood, rope, traps, weaving, structures
	Pacific willow	<i>Salix lucida</i>	Riparian	medicine
	Scouler willow	<i>Salix scouleriana</i>	Riparian	
	Sitka willow	<i>Salix sitchensis</i>	Riparian	
	Pacific yew	<i>Taxus brevifolia</i>	Riparian	Tools, arrows, bows, digging sticks, fiber
	Western red cedar	<i>Thuja plicata</i>	Forest/woodland	planks canoes, weaving