

CHAPTER 5: SOIL AND VEGETATION MANAGEMENT

5.1 PURPOSE AND USE OF THIS CHAPTER

Soils and vegetation of the Lake Tahoe Region play a vital role in protecting and enhancing the lake's clarity. Healthy soils and vegetation directly influence water quality, all three of which are environmental threshold standards that drive the mission and work of TRPA. Soils support vegetation growth and mitigate human impact by filtering stormwater runoff before it reaches Lake Tahoe. Vegetation controls erosion by stabilizing soil, reducing raindrop impact, slowing the velocity of surface runoff and providing nutrient uptake. These represent only a few of the various soils and vegetation functions that make their protection, restoration, and management TRPA priorities.

Development practices in the Lake Tahoe Region over the past 150 years have impacted the region's soil and vegetation resources. Urban development has physically altered and shaped the landscape, resulting in soils being moved, compacted, and eroded. Changes to the region's vegetation patterns occurred not only through the removal of large areas of natural cover, but also from landscaping which removed many native plants and replaced them with turf and other non-native plants. These changes to the soil and vegetation resources resulted in increased surface runoff, accelerated erosion, nutrient runoff from developed lots, and the introduction of non-native species.

This chapter is organized into the following sections:

- **Section 5.2** provides general information on soil properties and soil management practices.
- **Section 5.3** provides general information on plant selection, lawns and turf, fertilizer, irrigation, pesticides, invasive weeds, and fire defensible space.
- **Section 5.4** discusses three typical project scales used in this BMP Handbook based on project size and land use to guide a project proponent in developing a revegetation and/or fertilizer management plan.
- Supporting resources at the end of the chapter include the Revegetation Plan Template, Fertilizer Management Plan Template, a description of common Revegetation Site Types, Site Type Recommended Species List, Site Type Recommended Seed Mixes, and TRPA Approved Plant Species Attributes Table.

5.2 SOIL

Soil is a complex living system involving the interaction of dynamic physical, chemical, and biological properties.

Soil compaction from construction activities, vehicular use, or any activity that applies high pressure to soil affects the physical properties of soil. These activities compress soil structure, remove soil pore spaces, and restrict water infiltration.

Physical Properties of Soil

Bulk Density - Measures the weight of a unit volume of dry soil and indicates how easily air, water, and plant roots can penetrate the soil.

Pore Space - The portion of unit volume of soil occupied by air and water and indicates specific aeration and drainage qualities.

Soil Texture - Soil texture describes the type and size (diameter) of individual soil particles. The common particle types are described as sand, clay, and silt.

Soil Structure - Describes the arrangement, shape, size, and stability of soil particle aggregates.

Oxygen Diffusion Rate - The rate oxygen can be replenished as it is used by respiring organisms and indicates soil aeration and the ability for oxygen to diffuse through the soil to replace carbon dioxide.

Field Capacity - The amount of water held in pore spaces after a fully saturated area of soil drains for 24 hours. Indicates the drainage qualities of the soil, where low capacity means water runs through soil quickly and high capacity means water remains in pore spaces too long.¹

Cation Exchange Capacity (CEC)

Negatively charged soil particles bind positively charged (cation) nutrients in the soil, making them less likely to be leached away to surface and ground water. The higher a soil's ratio of surface area to volume and the greater the amount of stable organic matter or humus, the higher the CEC and the more nutrients can be held and made available to plants.²

Chemical soil properties influence the supply of nutrients available to plants. Chemical interactions hold nutrients safe from leaching and convert them into forms readily useable by plants. Soil fertility depends not only on sufficient quantities of nutrients but their presence in a balanced form. While the addition of highly soluble chemical fertilizers feed plants, they may disrupt healthy soil ecosystems by killing soil microbes and can be leached away and transported to Lake Tahoe.

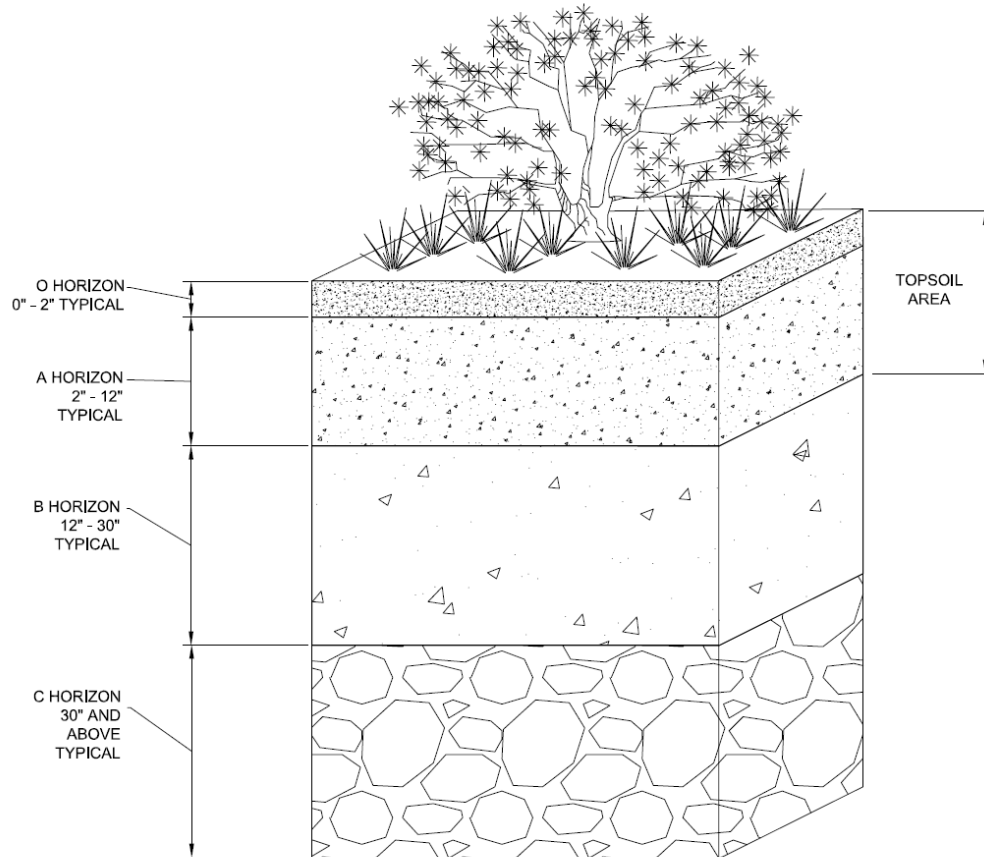
Biological soil properties constitute activities from all living organisms that form the soil community. From microorganisms such as nitrogen fixing bacteria, to decomposers such as earthworms, soil organisms, and their processes provide a vital link between mineral resources and plant growth by permitting nutrients to flow from soil to plants.

^{1,2,3} Smillie and Gershuny, 1999, *The Soul of Soil*, 4th Edition.

5.2.1 SOIL RESTORATION

Topsoil develops over many years and contains organisms and organic matter that are difficult to replace. Salvaging top soil before grading or soil disturbance preserves soil material with stable soil structure, organic matter, beneficial soil microorganisms, and native seeds. Retaining and reapplying topsoil improves the soil's ability to sustain itself, support healthy vegetation, and resist the erosive forces of wind and water.

Figure 5-a: Soil Horizons



Soil is made up of distinct layers or horizons revealed through a vertical cross-section known as the soil profile. Each soil horizon is the result of a number of geological, chemical, and biological processes that have been taking place for over many years and are identified on the basis of physical features, such as color, texture, and particle size. Soil composition ranges from the O horizon at the top, which contains the most organic matter, down to the C layer, or bedrock.

Physical soil treatments such as soil loosening, ripping, and tilling initiate the restoration of compacted soils. These treatments improve soil aeration and water infiltration and can be executed mechanically or by hand. No mechanical treatment should take place within the dripline of trees, where tree roots are encountered, or in Stream Environment Zones (SEZs) without first obtaining approval from the permitting and regulatory

Mycorrhizal Fungi

This mutually beneficial relationship between plant roots and fungi is significant for plants growing in poor soils. Fungi act as an extension of the plant root, substantially increasing surface area, and extracts nutrients from mineral particles making them available to plants. In turn, fungi receive direct access to carbohydrates from their host plants.³

Tilling green wood chips into the soil can temporarily make nutrients unavailable to plants and disrupt successful vegetative establishment. Use wood chips that have been aged for at least six months or preferably one year.

authority. Also avoid physical treatments when the soil is saturated as further damage to soil structure can occur.

Soils in the Lake Tahoe Region are typically nutrient poor and have limited water holding capacity. Adding organic soil amendments, such as compost, dry wood chips or other organic material to soils provides nutrients, aeration, and increases the rate that water can infiltrate into and move through the soil (i.e. Ksat).

5.2.2 SOIL STABILIZATION

As part of the soil restoration process, stabilizing loose or unstable soils with erosion control Best Management Practices (BMPs) protects the soil from erosion until vegetation becomes established. These BMPs provide physical or chemical means to keep soil particles together and prevent their mobilization and transport to Lake Tahoe. These practices, which include mulch, erosion control blankets, tackifiers, soil binders, and hydromulches, may also help soils retain moisture, moderate soil temperature fluctuations, and suppress weeds, thereby improving conditions for seed germination and vegetation establishment. Lava rock and shredded tires/rubber mulch are not allowed as BMPs, mulch or bare soil protection in the Tahoe region. On challenging sites, such as steep slopes, vegetation is often supplemented by mechanical and engineered slope stabilization techniques such as riprap and retaining walls.

5.3 VEGETATION

Vegetation physically protects the soil surface and holds soil particles in place with roots. It intercepts raindrop impact, slows surface runoff, and regulates soil moisture through shade and transpiration. Restoring vegetation on exposed disturbed soils greatly reduces soil erosion and sediment loading to Lake Tahoe. Revegetation of disturbed soils begins with selecting appropriate vegetation for the project.

5.3.1 VEGETATION SELECTION

Plants native to the Lake Tahoe Region tolerate nutrient-poor soils, harsh winters, and a short growing season. When used for revegetation, native plants may need water and nutrients to become established, but can thrive with no long term irrigation and minimal to no addition of fertilizer. Adapted plants are not indigenous to the region, but have evolved under similar climates or conditions.



Native and adapted plants integrated into a beautiful and functional backyard.

TRPA has developed resources listing native and adapted plants approved for planting in the Lake Tahoe Region. Any large scale revegetation projects in the Lake Tahoe Region must select plants from the Site Type Recommended Species List and/or TRPA Approved Plant Species Attributes Table located at the end of this chapter. The Home Landscaping Guide for Lake Tahoe and Vicinity contains a recommended plant list with both native and adapted plants intended for intensively managed urban and residential landscapes. Limit the selection of nutrient and water intensive plants, such as turf grasses and ornamentals, for use in close proximity to structures.

Select a combination of annual and perennial plants to revegetate a site. Annual plants establish quickly and provide short term soil stabilization while long-lived perennials have deeper roots that provide permanent stabilization once established. Be sure to factor planting requirements of each selected species into project planning and implementation. Native seed can successfully revegetate a site with little maintenance but may take several or many growing seasons to become fully established. Conversely, container plants offer immediate coverage and scenic screening but require greater care and irrigation until established. Without adequate maintenance and care, use of container plants can result in lower survival rates.

When selecting plant species for a project, consider localized site conditions (microclimates), anticipated uses, and regulations. Choose plants for urban sites that tolerate foot traffic or snow storage; choose plants for upland restoration that are drought tolerant; and choose plants for vacation homes that are low maintenance, do not require permanent or long-term irrigation, and need little to no fertilizers. TRPA restricts the use of lawns and ornamental vegetation (i.e. non-native plants requiring high fertilizer and water inputs) in sensitive areas such as SEZs and in shorezones to protect Lake Tahoe from direct input of nutrients. Only appropriate native plants selected from the Site Type Recommended Species List and TRPA Approved Plant Species Attributes Table are permitted for use in these sensitive areas. For more

Even though Lake Tahoe contains enough fresh water to cover the entire state of California with over a foot of water, most of the drinking water for Lake Tahoe Region's residents and visitors come from groundwater. Since a large part of summertime water use in the Lake Tahoe Region goes to landscape irrigation, plant native vegetation that requires little watering once established to help protect the Lake Tahoe Region's water resources.

information on revegetation or other project work in SEZ or Shorezones, refer to Chapter 7 Permitting.

Generally, no project or activity can occur in sensitive areas, such as SEZ and shorezones, which converts SEZ native vegetation to a non-native or artificial state. Consult with TRPA or local jurisdictions prior to initiating projects which may impact these sensitive areas.



Stream Environment Zones (SEZs) are sensitive water influenced areas that perform critical environmental functions. SEZs are protected and projects impacting them require special considerations and permits.

Rolled sod typically contains high amounts of clay, which can lead to less water infiltration and more runoff. Establishing lawn and turf from seed may require greater initial effort, but more readily allows rain and snow melt to soak into the soil.

5.3.1.1 LAWNS AND TURF

Most common lawn and turf grasses used for landscaping are not native to the Lake Tahoe Region. Many have high fertilizer and water needs, which can increase nutrient laden runoff that promote algae growth in the lake. In addition, the lack of deep roots to hold soil particles together does not adequately protect against erosion and may result in sediment loading to Lake Tahoe.

While lawns and turf are not encouraged for use in the Lake Tahoe Region, small, isolated areas may serve valued purposes, such as for active recreation or for fire defensible space. Lawns and turf are one option among other low-growing herbaceous plants, rocks, gravel, and other noncombustible materials to create a landscape that integrates BMPs and fire defensible space.

Before using turf on small commercial or residential projects, consider the following:

- Will the turf area be used for active recreation?
- Is the turf area in close proximity to structures, providing necessary fire defensible space?
- Is the turf area located well outside of SEZs, the backshore, and the associated setbacks?
- Is the turf area being used as accent vegetation?

If you answer “no” to these questions, consider more lake-friendly alternatives such non-turf bunchgrasses, wildflowers, and other native plants.

5.3.2 PROTECTING, ESTABLISHING, AND MAINTAINING VEGETATION

Vegetation establishment is challenging in a dry mountain climate, therefore it is essential to protect existing vegetation from disturbance to the greatest extent possible. Uncommon or sensitive species, such as SEZ vegetation, have special protection and should be protected from any site disturbance – see the TRPA Code of Ordinances for more detail.

Before construction, minimize the disturbance footprint by fencing off existing vegetation not intended for removal and prevent vehicle traffic permanently by installing parking and vehicle barriers.



Extend protective fencing to the width of the dripline to ensure adequate protection of roots.



Large boulders provide permanent vegetation protection from vehicles. Stagger and cluster boulders to mimic natural conditions.

Another method of retaining native vegetation found on site is to salvage, relocate, and transplant them in the revegetation project area. Before initiating project work, inventory existing vegetation on the project site for salvage and transplant. Temporarily relocate salvaged plant materials to a protected area and care for them until they can be incorporated back into the project. Be sure to transfer plants with as much root mass and soil in place as possible.

Relocating or transplanting native vegetation that is already adapted to site conditions is a cost-effective practice that should be employed whenever feasible. Using vegetative cuttings such as willows from the project site can also be a successful and cost-effective means of re-establishing native vegetation in disturbed areas.

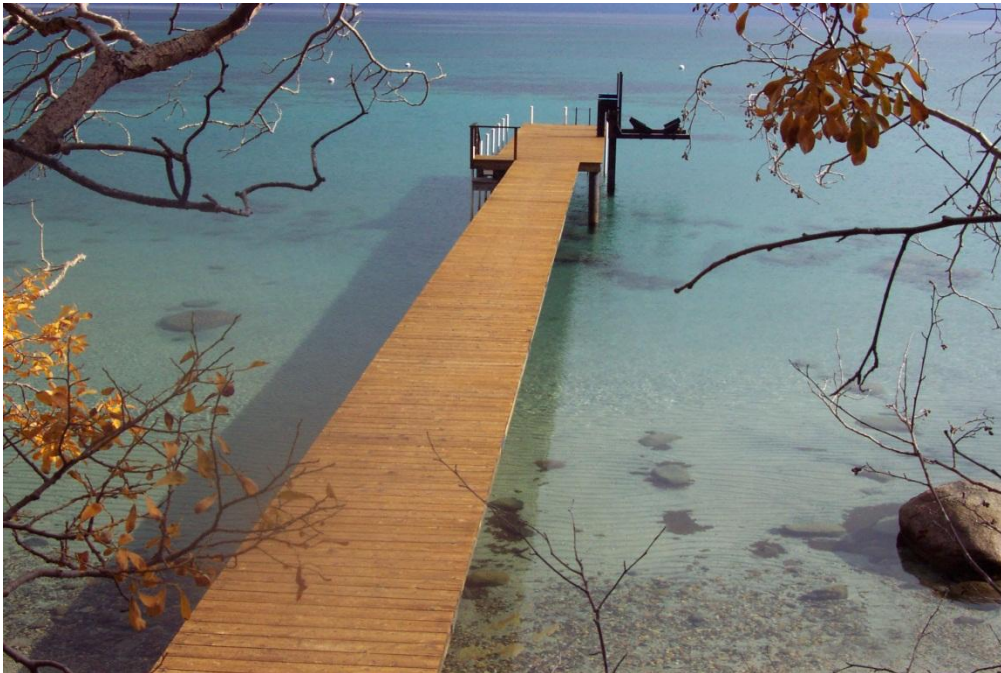
Following vegetation protection best practices, prepare the site for vegetation establishment by installing temporary BMPs and performing soil restoration treatments planned for the project.

Soil restoration (see Soil Restoration Section 5.2.1) is crucial to vegetation establishment and long-term growth because soil determines how much water and nutrients can get to the plants. Site preparation practices combined with proper seeding and planting techniques ensure that short term vegetation establishment leads to sustained vegetation growth and soil stability.

For both vegetation establishment and maintenance, consider fertilizer, irrigation, pesticide, and weed control needs, as well as fire defensible space requirements.

5.3.2.1 FERTILIZERS

Lake Tahoe is naturally ultra-oligotrophic, meaning its waters are very low in nutrients. This is responsible for the lake's famed clarity. The region's soils tend to be rocky and shallow, and are low in nutrients and organic matter.



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Lake clarity began to decline as human land uses in the region accelerated, contributing nutrients and sediment to the lake. The Lake Tahoe Total Daily Maximum Load (TMDL) identified nutrients as primary pollutants of concern, with fertilizer application in urban areas contributing a significant portion of phosphorus to the lake. Limiting fertilizer application reduces phosphorus at the source and plays an important role in restoring Lake Tahoe's clarity.



Nutrients such as fertilizers in Lake Tahoe provide food for algae growth, which reduces water clarity and changes the lake habitat for aquatic life.

To address this TRPA's Regional Plan restricts the application of fertilizer and encourages phasing out the sale and use of chemical fertilizer containing phosphorus for lawns, with limited exceptions.

Soil properties can vary even within a single parcel, creating different landscape zones that may require different types and/or amounts of fertilizer.

Before applying fertilizer, have soils tested for nitrogen and phosphorus through the Natural Resources Conservation Service (NRCS), the University of Nevada Cooperative Extension (UNCE), private consultants, or home test kits to determine if a nutrient deficiency exists. If soils lack nutrients, soil amendments may be needed to establish vegetation.

Soil amendments consisting of decomposed organic matter (e.g. compost) are the best way to enrich soils. As soil microorganisms break down organic materials over time, they make nutrients available to plants. Additionally, organic matter improves soil structure, helps to retain soil moisture, and assists in regulating soil temperature.

Limit the use of chemical fertilizers (both fast and slow release) for turf management. Too much chemical fertilizer can burn turf and kill beneficial soil microorganisms. Use organic soil amendments such as compost for flower beds and gardens.

In contrast to soil amendments, chemical fertilizers provide nutrients in a form readily available to plants, which can be easily leached to surface and ground waters. Additionally, chemical fertilizers are less desirable because they do not improve soil structure and damage living soil organisms. For these reasons, only use chemical fertilizers for managing established turf when soil testing results indicate a deficiency in one or more nutrients. Even then, augment only the nutrient(s) necessary. For example, if soils tested under the lawn show a deficiency in nitrogen but has plenty of phosphorus, select a fertilizer with 'o' in the middle of the formula (e.g. 10-0-5). Use organic soil amendments such as compost for flower beds and gardens.

Chemical fertilizers are commercially available in both fast and slow release types, but the conventional form is fast release. Fast release fertilizers provide nutrients immediately available for plant uptake, whereas slow release fertilizers make nutrients available over time.

Slow release fertilizers should only be applied in the late spring/early summer so that they are continually available over the course of the growing season. Apply fast release fertilizer early in the growing season as well, when vegetation is active and can immediately use the nutrients.

One or cumulative acres of lawn or turf on a property requires a fertilizer management plan. Additionally, surface and groundwater monitoring may be required in sensitive areas to determine compliance with nitrogen and phosphorus discharge standards.

After applying fertilizer to turf, water slowly to help incorporate fertilizer granules onto the soil. Only water until soil is moist as excess water will transport fertilizer away – potentially becoming polluted runoff that enters surface and ground waters. Never apply fertilizer to frozen ground, or before a rainstorm. Do not apply fertilizer in or near water – including sensitive areas such as SEZs and shorezones – and do not allow fertilizer to be spread over pavement.

5.3.2.2 IRRIGATION

Proper irrigation helps establish vegetation and will also maintain plants not adapted to the Lake Tahoe Region's climate. Vegetation establishment may require more frequent and/or intensive watering than maintaining healthy mature plants with deep, strong roots.

WATER APPLICATION METHODS

Drip irrigation is a method of irrigation using the slow application of water under low pressure through tube openings or attached devices just above, at or below the soil surface.

A bubbler is a water emission device that tends to bubble water directly onto the ground or that throws water a short distance. It is a more directed or targeted irrigation method than traditional sprinkler nozzles, enabling water to get to plants with increased efficiency. It is a suitable system for small landscaped areas.

Micro-irrigation systems include drip or trickle irrigation as well as micro-spray and other new devices operating at low pressures. Water is applied frequently just above, on or below the surface of the soil at low flow rates with the goal of placing a quantity of water in the root zone that nearly approximates the consumptive use of the plant. These systems conserve water but also support healthy plants by preventing overwatering.

Irrigation systems should consider the following four factors:

Delivery System and Application Rate - Adjust sprinkler nozzles to avoid watering paved areas or other spots not intended for watering. Use the right size nozzles – the size of the nozzle should be consistent with the size of the area it wets. Use an efficient irrigation system such as a drip irrigation system to avoid excessive leaching and runoff of nutrients.

Soils - Different soil types hold different amounts of water. Soils in the Lake Tahoe Region are mostly loamy sands and coarse sandy loams that can only hold 0.5 inches of water in the top foot of soil.

Root Zones - The roots of typical turf species are mostly confined to the first 12 inches below the surface. Watering beyond the root zone will result in wasted water and carry any applied fertilizers beyond the reach of roots, in turn resulting in less vigorous plants due to nutrient deficiency, increased costs for lawn maintenance and water, and potentially creating nutrient laden runoff that pollutes Lake Tahoe.

Water Use - Plants require different amounts of water at different times of the year, peaking in July and August. In general, deep (but not excessive) and infrequent watering produces healthier and more resilient plant roots than shallow, frequent watering.

For the soils typically found in the Lake Tahoe Region, the NRCS recommends applying ½ inch of water to turf and lawns. To measure this, place a container on the lawn and time how long it takes your sprinkler system to apply ½ inch of water. Water your lawn for that amount of time 2 or 3 times a week during the growing season. Note that constraints on water use may exist from water providers. In addition, the use of smart irrigation systems that sense rainfall, measure soil water content, and detect freezing conditions can be used to adjust flows to conserve water and reduce cost.

Local public utilities have water conservation ordinances that may restrict lawn watering to certain times of day and/or certain days of the week. Watering may also be prohibited when it is raining or snowing, or when air temperature is below 40 degrees F.



Directed irrigation systems such as the stream bubbler (pictured above) or micro-irrigation systems such as drip irrigation that operate at low pressure is a more efficient means of watering and may be exempt from day and time watering restrictions imposed by local jurisdictions - check with your local water provider.

5.3.2.3 PESTICIDES

A pesticide is any substance or mixture of substances intended for preventing, destroying, or repelling any pest, typically an animal, plant, or fungi. Types of pesticides include herbicides, insecticides, rodenticides, antifouling agents, and others. According to the Environmental Protection Agency (EPA), pesticides by their very nature are designed to kill or harm living organisms. This means that most pesticides create some risk of harm. On the other hand, pesticide use may be appropriate in certain circumstances to minimize ecological threat from pests when other control methods have proven unsuccessful and anticipated benefits outweigh risks.

Pesticides are regulated by the EPA and the states to minimize potential impacts to people, other non-target organisms, and the environment. To protect human health and water quality in the Lake Tahoe Basin, the water quality objectives in Lahontan Regional Water Quality Board's Basin Plan has been amended to set a region-wide waste discharge prohibition on pesticides with exemption criteria. Chapter 60.1 of TRPA's Code of Ordinance states that no detectable concentration of any pesticide shall be allowed to enter any stream environment zone unless the agency finds that application of the pesticide is necessary to attain or maintain the environmental threshold standards.

Pesticide use in the Basin has been discouraged by TRPA since the 1987 Regional Plan, which states that alternatives to chemical application should be employed where practical. The policy aims to prevent potential harm from the outset rather than manage it after the fact.

Before any pest control methods are employed, a basic tenet of integrated pest management (IPM) is to ascertain that there is actually a pest, and it has been correctly identified, before using any management tool. Factors that created the pest problem should be assessed to develop solutions. Otherwise, pests are likely to recur.

IPM practices include physical/mechanical, cultural, biological, and chemical methods. The different methods are often used in conjunction. Methods are tailored to the specific pest and its biology. Environmentally sound pest management tactics, including prevention – the most important - are preferred to a reliance on chemical applications alone.

Physical/mechanical methods (i.e. manual weeding, chainsaws, etc.) are often used for smaller scale infestations or in combination with other methods. Cultural methods include changing human behavior (e.g. plant pest-resistant species) or management to create healthy systems that are resistant to pests and resilient after disturbance. For instance, forests should be managed for healthy stands that are not overcrowded and susceptible to pests and diseases. This includes promoting vegetation diversity by planting different species, ages, and spatial arrangements to minimize pest problems.

Biological methods such as releasing natural predators to attack their hosts (i.e. the pest plant) have been successfully used for large-scale infestations in combination with other IPM methods. An emerging method is biopesticides, which are certain types of pesticides derived from natural materials such as animals, plants, bacteria, and minerals that control pests by low- or non-toxic mechanisms (e.g. pheromones).

Conventional chemical pesticides are generally synthetic materials that are directly applied to the pest. You must read and understand the pesticide label before you use a pesticide. The label is a legal document and is enforceable by law. It describes steps that must be taken to minimize chemical movement and contamination of surface and groundwater resources. Property owners should not use pesticides in or near water, while some pesticides are specifically designed for aquatic use; many pesticides are toxic to fish and aquatic invertebrates.

Pesticides can be degraded by sunlight, water, bacteria, and other chemicals. The ones which last the longest, called persistent pesticides, can move over long distances and can build up in the environment leading to greater potential for adverse effects to occur. For instance, glyphosate, the active ingredient in Roundup, the most widely used herbicide in the United States, has a half-life of 30 to 100 days. Generally, the pesticides that degrade most rapidly have less opportunity to move or have adverse impacts on people or other organisms. The volatility of a compound will determine how long it can travel by air from its source. Its solubility in water is a factor when the pesticide is carried off by rain or runoff to streams or the Lake or moved through the soil as a potential groundwater contaminant. There are other important factors that govern movement, such as adsorption, which is the propensity of a chemical compound to bind to soil.

From a general knowledge of these and other characteristics, it is possible to predict in a general sense how a pesticide will behave. But more precise prediction is often not possible because the environment itself is very complex. There are large gaps in the knowledge of pesticide movement and fate in the environment, so to err on the side of human safety and the environment, measures to minimize unnecessary release of pesticides into the environment is TRPA policy.

5.3.2.4 INVASIVE WEEDS

Invasive weeds grow aggressively, spread rapidly, and choke out native and other desirable plants. Weeds compete with native vegetation for water, nutrients, and sunlight, especially during vegetation establishment. They tend to produce prolific amounts of seeds and thrive because they lack natural predators. Noxious weeds are a subset of invasive weeds that are particularly destructive, competitive, and difficult to control. They are regulated in California and Nevada law and there are specific requirements for their control. The Lake Tahoe Basin Weed Coordinating Group (LTWCG) provides many resources that can help you identify weeds, prevent their spread, and develop appropriate management plans. See www.tahoeinvasiveweeds.org.

According to the LTBWCG, the most effective, economical, and ecologically sound method of managing invasive plants is to prevent their invasion in the first place. Most current infestations in the Lake Tahoe Basin are still small and controllable. Once weeds become established and widespread, considerable effort and expense will likely be necessary to control them.

Hand or mechanical methods are the best options for treating small-scale infestations of annual and biennial weeds. Loosen soil at the base of the weed in order to remove the entire plant including seeds and roots. Dig out as much of the root as possible. If the weed has flowered and seeds may be present, bag it securely and dispose of it in the trash. Do not compost weeds as seeds may still be able to germinate despite the breakdown of organic material. Seeds can germinate if the compost does not reach temperatures of 140-160 degrees for 3 or more days.

Perennial weeds regrow from the roots, and can be very difficult to control. Although TRPA discourages pesticide use generally, in the case of some perennial weeds, careful application of an herbicide may be needed to kill them. Contact LTWCG for recommendations and assistance.

All equipment used that comes in contact with weeds must be washed and all plant parts removed in order to prevent spread. The California Invasive Plant Council has produced a handbook specifically on BMPs for Land Managers to prevent the spread of invasive plants from one work site to another (see <http://www.cal-ipc.org/ip/prevention/landmanagers.php>).

Herbicides have potential human and water quality impacts. All other weed control methods should be considered and eliminated before chemical application is considered. If herbicides are used, application must be made according to label directions to protect applicators, others, and the environment. Herbicides should not be used near water or Stream Environment Zones (SEZs) except in consultation with TRPA to determine compatibility with the TRPA Code of Ordinances, Chapter 60.1.

Do not use “weed and feed” combination herbicide/fertilizer products. They typically lead to over-application of both herbicide and fertilizer and may harm adjacent trees, neither of which is desirable in the Lake Tahoe Region.



Herbicides are not generally recommended for use in the Lake Tahoe watershed. If herbicides are used, application should always be consistent with product labeling.

5.3.2.5 WILDFIRE DEFENSE

While nothing guarantees a property will withstand the threat of oncoming wildfire, preparing your property can help reduce its vulnerability to wildfire risk.

During a wildfire, homes can be threatened by:

- 1) *wind-blown embers*
- 2) *radiant heat*
- 3) *direct flame contact*

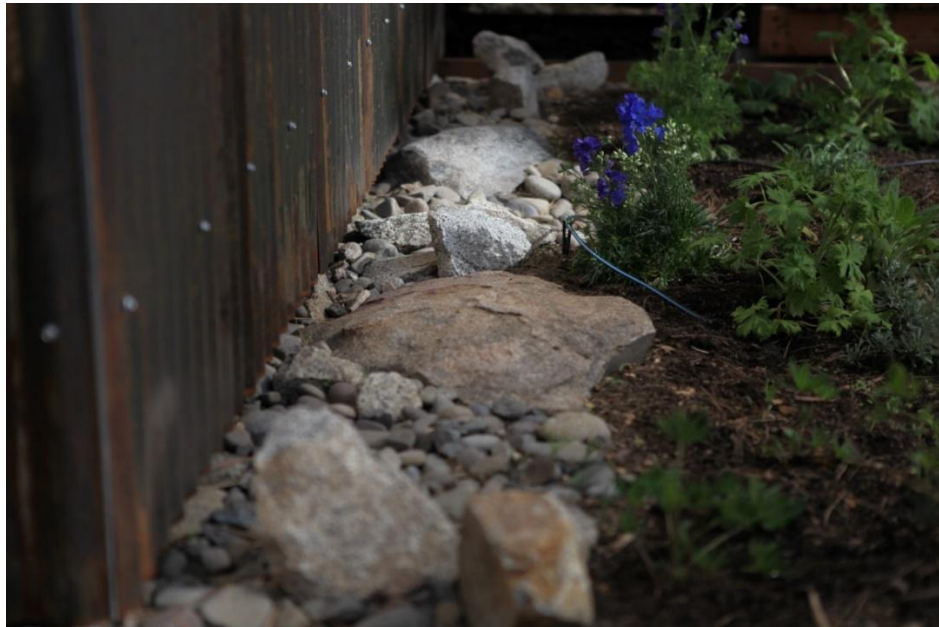
FIRE DEFENSIBLE SPACE

Fire defensible space is essential to improve your home's chances of surviving a wildfire. Fire defensible space is the buffer you create between a building on your property and the grass, trees, shrubs, or any other wildland area that surround it. This space is needed to slow or stop the spread of wildfire, and defensible space helps protect your home from catching fire – either from direct flame contact or radiant heat. Fire defensible space is also important to protect the firefighters defending your home. Combine Fire Defensible Space practices with soil and vegetation management and water quality BMPs to create an integrated landscape within 30 feet of any structure. Specific guidelines for each zone are described below and are also outlined in *Living with Fire*, a guidance document for the Lake Tahoe Region:

0-5-FOOT NONCOMBUSTIBLE PERIMETER

- No combustible materials, including woody vegetation or wooden borders for BMPs, are permitted within 5 feet of any structure.
- Routinely remove organic materials, such as pine needles and woody vegetation, which accumulate into this zone. Eliminating easily ignitable fuels near structures helps prevent burning embers from starting a fire near them.

- Use inorganic mulch or well irrigated herbaceous vegetation to stabilize the soil in this area. Should a fire ignite in this area, this practice will help keep the intensity low so not enough heat is generated to ignite the structure.
- Remove tree limbs that are within 10 feet of chimneys, decks, and roofs of structures.



Only noncombustible materials and irrigated herbaceous vegetation are permitted within 5 feet of any structure.



Although drought tolerant and able to withstand the Lake Tahoe Region's winters, junipers are highly flammable woody vegetation and can burn intensely if ignited. Junipers should not be planted next to structures.

5-30-FOOT ZONE

- Discontinuous patches of organic mulch separated by irrigated herbaceous vegetation, rock, or other noncombustible materials are permitted within 5-30 feet of a structure. Pine needles can be used as mulch in this zone, even in revegetation areas, as long as it follows these guidelines.
- Remove pine needles and vegetative litter to the duff layer annually by May 1 every spring and do not allow them to accumulate more than 1-2 inches in depth after May 1.
- Individual specimens or small groups of woody vegetation such as trees and native shrubs are permitted in this area as long as they are pruned to remove dead materials and would not allow a fire to travel rapidly across the area.
- Planting low growing irrigated herbaceous plants are preferred in this area. Small lawn areas within the lean, clean, and green zone should be interspersed with native grasses, flowers, and shrubs, transitioning to tended native vegetation beyond 30 feet.

30+ FOOT ZONE

- Organic mulch and vegetative litter shall not accumulate in excess of 3 inches in depth in areas more than 30 feet from a structure.
- Dense stands of shrubs and trees pose a significant wildfire threat and should be thinned to create space of at least twice the height of the average shrub between them. For example, shrubs with an average height of 2 feet should have distance of at least 4 feet from the branches of the next shrub or small clump of shrubs. When removing shrubs, clip vegetation down to the soil surface, but leave the root systems in place for erosion control.
- Tree canopies should be separated on average by 10 feet within this zone. Trees up to 14 inches diameter at breast height (DBH) can be removed without a permit. For trees larger than 14 inches DBH, contact your local fire protection agency or TRPA to have them evaluated and marked for removal.
- Ladder fuels consist of low lying or dead vegetation that can carry fire to taller vegetation. Remove dead and lower tree branches to a height of 10 feet without exceeding one-third of the total tree height and any woody vegetation growing under the tree dripline.

Check with your local or state fire official to determine the fire defensible space requirements of your area. In California outside of designated cities, defensible space requirements are mandated by law under California Public Resource Code 4291. Figure 5-b contains contact information for the local fire protection districts in the Lake Tahoe Region.

Figure 5-b: Fire Districts Map



HOME HARDENING

Using certain construction materials or design features of how materials are put together can affect a property's vulnerability to wildfire. This includes items such as:

- Roofing, Edging & Chimneys
- Rain Gutters
- Eaves, Vents & Siding
- Skylights & Windows
- Decking & Fencing
- Garages
- Exterior Doors

Learn more how to harden homes against wildfire through the [Wildfire Home Retrofit Guide](#)

EXTERIOR STRUCTURE SPRINKLER SYSTEM

TRPA may permit exterior structure sprinkler systems to help withstand the threat of wildfire, provided the system meets the following criteria:

1. Uses water only. Retardants, foams, surfactants, or other chemical fire suppressants are not allowed pursuant to TRPA Code Section 60.1.3.D.
2. The property either:
 - a) is connected to its own water source, such as an existing approved Lake intake, well, storage tank or cistern and the water is drawn from this source. If utilizing a tank or cistern, the tank or cistern can't be auto filled from the municipal water supply. Manual fill is acceptable. If a second water source is used on the property, then the owner must contact the water purveyor and comply with all cross-connection control regulations, or;
 - b) obtains written permission from local water purveyor allowing connection to the municipal water supply with any required conditions. This may include, but is not limited to, installation of a separate water meter from the domestic source, imposed flow rate limits, compliance with cross connection control regulations, shut off valve, and remote access to operate or shut down the system. During an evacuation scenario, no municipally connected water source should be left on continuously at the property.

Water storage tanks and cisterns are subject to TRPA's coverage requirements and should be located on or under legally existing coverage where feasible. Non-sensitive properties may be eligible for TRPA Coverage Exemptions that allows up to 120 square feet coverage for non-permanent structures.

FIRE RETARDANTS, SURFACTANTS, OR SUPPRESSANTS

Given the risks to biological and water resources, TRPA discourages the private use of fire retardants, foams, surfactants, or other chemical suppressants within the sensitive environment of the Lake Tahoe Basin. TRPA prohibits the discharge of toxic or hazardous waste in the Tahoe region. Detectable concentrations of these substances in any stream environment zone, surface water, or ground water are inconsistent with TRPA Code Section 60.1.3.D.

5.4 PROJECT SCALE REQUIREMENTS

Soil restoration, revegetation, and fertilizer management practices have different requirements depending on project size and complexity. Note that these project scales are illustrative only, and requirements for each site may vary depending on specific circumstances.

PROJECTS LESS < 1 ACRE AND ALL SINGLE FAMILY RESIDENTIAL (SFR)

Single family residential and small multi-family properties should generally follow the guidelines in the Home Landscaping Guide for Lake Tahoe and Vicinity. Projects at this scale requiring a permit may still need to submit a Revegetation Plan and/or Fertilizer Management Plan as part of the permit conditions if there are issues of concern (e.g. water quality, Stream Environment Zones (SEZs), shorezones, etc.).

PROJECTS 1 TO 5 ACRES AND ALL COMMERCIAL (CICU) < 5 ACRES

Projects on commercial and large multi-family properties requiring permits will generally need to submit a Revegetation Plan and/or Fertilizer Management Plan using the templates provided in this chapter due to their increased project size and complexity.

PROJECTS GREATER THAN 5 ACRES AND ALL ENVIRONMENTAL IMPROVEMENT PROJECTS (EIP)

EIP projects implemented by local jurisdictions for the purposes of this chapter are defined as Water Quality Improvement Projects (WQIPs) and ecosystem/habitat restoration projects. These large-scale soil restoration and revegetation projects are typically carried out by local jurisdictions in partnership with regulatory and funding agencies. Due to their size, complexity, and a need for consistency with funder and regulatory agency requirements, revegetation projects at this scale are developed through the Storm Water Quality Improvement Committee (SWQIC) Project Delivery Process. The SWQIC Project Delivery Process describes a process to achieve successful projects including development of goals and objectives, analysis of existing conditions, formulating and evaluating alternatives, selection of a recommended alternative, and development of a preliminary design. Revegetation plans developed through the SWQIC process will generally include at a minimum the information contained in the Revegetation Plan template provided in this chapter. If more than 1 acre of turf is proposed as part of an EIP, components of the Fertilizer Management Plan must be addressed as well.

5.4.1 REVEGETATION PLAN

The Revegetation Plan is a template for preparing revegetation specifications as part of a permitted project. The Revegetation Plan template is a resource available for use located at the end of this chapter. Plan components and guidance on how to complete them are explained in detail below.

5.4.1.1 SITE DESCRIPTION

The site description section provides context for the revegetation activities. Information needed includes location, site conditions such as soil type and Ksat rate, land capability,

vegetation types, extent of sun and shade, and presence of sensitive areas such as SEZs, rocky outcroppings, or backshore.

5.4.1.2 PROJECT GOALS AND OBJECTIVES

This section describes the reasons why the revegetation project is being undertaken and what the project will achieve. Project goals and objectives should directly relate to the problem the project is intended to address, and depict issues that will continue or result if the project is not implemented. These goals will guide the selection of success criteria. While the BMP handbook generally focuses on revegetation for the purposes of erosion control, other project goals and objectives include restoring vegetative diversity, creating wildlife habitat, fulfilling scenic screening requirements, and providing water quality treatment.

5.4.1.3 PROJECT SCHEDULE

Provide a detailed schedule for each element of the plan. The schedule will depend on the complexity and scale of the project, but at a minimum will typically include dates for temporary BMP installation, pre-grade inspection, topsoil salvage, soil loosening and amendments, seeding, planting, irrigation, weeding, removal of irrigation system, final inspection, etc. Please see Revegetation Plan Example Section C.

5.4.1.4 SELECTION OF PLANT MATERIALS

Use the description of common Revegetation Site Types, Site Type Recommended Species List, Site Type Recommended Seed Mixes, and TRPA Approved Plant Species Attributes Table at the end of this chapter to guide the plant selection process for any Lake Tahoe Region revegetation project. Once selected, list plant materials using the plant materials table provided in the Revegetation Plan template at the end of this chapter. Plant materials selected must be robust, free of disease and insect infestation, and have vigorous foliage and wood. Plants from the nursery should have been grown locally or in a similar zone. If plants have been grown in a different climate, they may have trouble flourishing in the Lake Tahoe climate. Seeds should be approved for purity, germination, and be weed free.

5.4.1.5 PROJECT INSTALLATION

A. CONTRACTOR REQUIREMENTS

List any contractor requirements or qualifications such as licenses, references, bonding, written guarantees, or submittals. List any specialized experiences required or desired, such as a landscaping background or experience establishing native plants in challenging conditions including steep slopes or poor soils. Please see TRPA Revegetation Plan Example Section E.

B. MEASURES TO AVOID OR MINIMIZE PROJECT IMPACTS

This section describes measures that will avoid or minimize impacts of this revegetation project on the physical environment. These measures include conserving native soil, protecting existing vegetation, minimizing soil disturbance during revegetation treatments, and preventing the introduction or spread of invasive, nonnative plant species.

C. SITE PREPARATION

Specific treatments will likely be necessary to prepare the site before attempting to establish vegetation. Information provided for this section should include the approach and schedule for site preparation and detail on any of the following applicable treatments:

- **Salvage Existing Native Plants for Transplanting** - Identify any vegetation on-site being salvaged for transplant, including the salvage of cutting materials, and describe specific measures taken, such as storage and care, to ensure survival.
- **Removal and Storage of Topsoil and Duff** - Salvage topsoil and duff for later project use. This helps preserve native seed stock contained in the topsoil and enhances revegetation success.
- **Grading and Slope Shaping** - Describe what grading or earth moving activities are required for the revegetation project. Land alteration activities involving more than 3 cubic yards must be permitted through TRPA. Soil preparation on slopes may require physical modification or surface roughening.
- **Soil Loosening** - Describe physical activities required to restore infiltration capacity and aeration to compacted soil areas. See Revegetation template and example (below) for guidance.
- **Soil Amendments/Fertilizer** - Describe the type, quantity, and application rate of any soil amendments or fertilizers used to improve physical, chemical, or biological properties of the soil.
- **Weed Control** - Describe measures necessary to eradicate and/or prevent the spread of weeds on-site. Provisions should include the method, frequency and extent of weed control activities. List noxious weeds potentially susceptible for the project area and train staff to identify and remove them before they can produce viable seed.

D. INSTALLATION OF PLANT MATERIALS

Describe installation methods and provide a plan to scale depicting density, arrangement, and locations of plant materials used. Proper handling and storage of plant materials should also be addressed here. Plant materials may include transplants of existing plants and cuttings salvaged during the site preparation process, containers of trees, shrubs, and herbaceous plants, as well as seed selected from the Site Type Recommended Species List, Site Type Recommended Seed Mixes, and TRPA Approved Plant Species Attributes Table provided at the end of this chapter.

E. IRRIGATION

Provide a description of the extent and irrigation methods necessary for vegetation establishment. Methods can include hand watering to drip, bubbler, and spray irrigation systems. Include the water source for the system(s). Describe system components, timing (including timing of removal, if applicable), application rates, and any maintenance needs to ensure systems are operational and effective.

F. SOIL STABILIZATION

Describe soil stabilization practices, which may include reapplication of salvaged duff material collected and stored during the site preparation process, bare soil protection

using inorganic and organic mulch, biotechnical treatments, and any use of tackifiers and soil binders.

5.4.1.6 REVEGETATION MAINTENANCE

List maintenance requirements necessary for vegetation establishment, such as weeding, pruning, watering, replacing dead plant material, and removing trash and debris. Include any adjustments needed to the irrigation system during the maintenance period as well as a process to “wean” plants off of irrigation by the end of the maintenance period. Provisions should include reapplication of mulches and amendments and replanting as needed.

Provide a timeframe for the maintenance and monitoring period (typically 2-3 years) and relate this to the revegetation performance requirements or success criteria.

Incorporate any long-term soil and vegetation maintenance activities into the BMP Inspection and Maintenance Plan, described in Chapter 6 – Inspection, Maintenance, and Monitoring.

5.4.1.7 SUCCESS CRITERIA AND PROJECT CONCLUSION

This section describes the vegetation that would result from successful project implementation and includes a description of a reference plant community or other standard used and the rationale for choosing this reference community or standard. Success criteria must reflect project goals and objectives and state the desired condition of the revegetated site. Criteria may include attributes such as percent vegetative cover, soil surface cover, plant survival, soil penetrability, and absence of any visual signs of erosion. If monitoring indicates that success criteria are not met, causal factors should be determined and remediation actions taken. This section must describe those remediation actions to be taken should the revegetation not meet the success criteria.

Additional items needed to conclude the project may include as-built drawings, clean up provisions, and scheduling final inspections to evaluate performance standards.

During the final inspection, inspectors will use the criteria listed in the approved Revegetation Plan in addition to visual assessments of vegetation establishment to determine project success. Please note that establishment of vegetation generally takes between two and three complete (May – September) growing seasons.

5.4.2 FERTILIZER MANAGEMENT PLAN

Large properties with over 1 cumulative acre of turf, existing or proposed, OR as needed to address current or anticipated impacts to water quality, SEZs, shorezone, and other sensitive areas, must account for their fertilizer use through a Fertilizer Management Plan. If more than 1 acre of turf is proposed as part of a revegetation project, incorporate elements of the Fertilizer Management Plan into the Revegetation Plan.

5.4.2.1 FERTILIZER MANAGEMENT PLAN ELEMENTS

TYPE(S) OF FERTILIZER

State the type and formula of fertilizer to be used. Organic and other slow release fertilizers are strongly encouraged over fast release or traditional fertilizers. Fertilizer

formula is typically expressed as a ratio of Nitrogen (N), Phosphorus (P), and Potassium (K).

SOILS TESTING

Provide soil analysis (from within two years) for nutrients (minimally phosphorus and nitrogen) that supports fertilizer use and justifies fertilizer formula. For example, if soils results show no phosphorus deficiency, chemical fertilizer formula should contain no phosphorus. Proposed phosphorus use for turf/lawn maintenance must be supported by soils analysis results.

RATES AND MEANS OF APPLICATION

State the rate fertilizer will be applied (pound/acre) and the means of application (e.g. fertilizer spreader). Fertilizer rate should be supported by soils analysis.

TIMING AND FREQUENCY

Describe the timing and frequency of fertilizer application. Fertilizer should only be applied in early summer when vegetation is actively growing.

WATERING

Describe irrigation system, watering schedule, and drainage of the site.

AVOID SEZS, SHOREZONES, AND SETBACKS

Identify these sensitive areas on site and describe how fertilizer management practices employed will avoid them. Common practices include maintaining a substantial buffer of native vegetation between turf and sensitive areas. Map turf areas, these sensitive features if present, including no fertilizer application zones, and include in Plan.

MONITORING

Surface and groundwater monitoring may be required in sensitive areas to determine compliance with nitrogen and phosphorus discharge standards. If monitoring of fertilizer management is required as a condition of project approval, include frequency and rate of application as a line item in the BMP Inspection and Maintenance Plan, described in Chapter 6 – Inspection, Maintenance, and Monitoring. Additionally, annual summary reports may be required, and if water quality impacts are occurring, changes to fertilizer management may be necessary.

5.4.2.2 STORAGE AND DISPOSAL

Briefly describe where and how fertilizers will be stored and disposed of.

TRPA Revegetation Plan Template

Soil restoration and revegetation activities required as part of a Project's permitted conditions must submit a complete TRPA Revegetation Plan:

A. SITE DESCRIPTION

Information needed includes location, land capability, site conditions such as soil type and infiltration rate, vegetation types, extent of sun and shade, presence of sensitive areas such as stream environment zones or backshore, and relevant site characteristics such as rock outcroppings.

Project Address:

Assessor's Parcel Number (APN):

NRCS Soil Map Unit: Max depth of Install: Ksat (in/hr):

Land Capability:

TRPA Permit Number:

Detailed Site Description:

B. PROJECT DESCRIPTION, GOALS, AND OBJECTIVES

This section describes the reasons why the revegetation project is being undertaken and what the project will achieve. Project goals and objectives should directly relate to the problem the project is intended to address, and depict issues that will continue or result if the project is not implemented. These goals will guide the selection of success criteria. While the BMP handbook generally focuses on revegetation for the purposes of erosion control, other project goals and objectives include restoring vegetative diversity, creating wildlife habitat, fulfilling scenic screening requirements, and providing water quality treatment.

C. PROJECT SCHEDULE

Provide a detailed schedule for each element of the plan. The schedule will depend on the complexity and scale of the project, but at a minimum will typically include dates for temporary BMP installation, pre-grade inspection, topsoil salvage, soil loosening and amendments, seeding, planting, irrigation, weeding, removal of irrigation system, final inspection, etc.

D. SELECTION OF PLANT MATERIALS

Use the description of common Revegetation Site Types, Site Type Recommended Species List, Site Type Recommended Seed Mixes, and TRPA Approved Plant Species Attributes Table to guide the plant selection process for any Lake Tahoe Region revegetation project. Once selected, list plant materials in the plant materials table. Plant materials selected must be robust, free of disease and insect infestation, and have vigorous foliage and wood. Plants should be from a reputable nursery and grown locally or in a similar climate. Seeds should be approved for purity, germination, and be weed free.

PLANT MATERIALS						
Species (Botanical Name)	Species (Common name)	Transplant	Container Size	Quantity	Planting Density / Spacing	Seed – pounds of pure live seed per acre
Total Pounds of Pure Live Seed Per Acre						

E. PROJECT INSTALLATION

1. Contractor Requirements

List any contractor requirements or qualifications such as licenses, references, bonding, written guarantees, or submittals. List any specialized experiences required or desired, such as a landscaping background or experience establishing native plants in challenging conditions including steep slopes or poor soils.

2. Measures to Avoid or Minimize Project Impacts

This section describes measures that will avoid or minimize impacts of this revegetation project on the physical environment. These measures include conserving native soil, protecting existing vegetation, minimizing soil disturbance during revegetation treatments, and preventing the introduction or spread of invasive, nonnative plant species.

3. Site Preparation

Specific treatments will likely be necessary to prepare the site before attempting to establish vegetation. Information provided for this section should include the approach and schedule for site preparation and details on these treatments as applicable:

(a) SALVAGE EXISTING NATIVE PLANTS FOR TRANSPLANTING

Identify any vegetation on-site being salvaged for transplant, including cuttings, and describe specific measures taken, such as storage and care, to ensure survival.

(b) REMOVAL AND STORAGE OF TOPSOIL AND DUFF

Salvage topsoil and duff for use later in the project. This also preserves native seed stock in the existing topsoil to enhance revegetation success.

(c) GRADING AND SLOPE SHAPING

Describe what grading or earth moving activities are required for the revegetation project. Land alteration activities involving more than 3 cubic yards must be permitted through TRPA. Soil preparation on slopes may require physical modification or surface roughening.

(d) SOIL LOOSENING

Describe physical activities required to restore soil infiltration capacity and aeration to compacted soil areas. To reduce soil compaction, first remove topsoil. Then loosen subgrade of compacted soil areas to an average depth of 12-inches. Soil loosening may be performed with hand tools (such as a pick mattock or Pulaski) or a mini excavator equipped with backhoe bucket. Soil should be loosened but not turned or inverted. Soil loosening should also be uneven in depth by at least 1-2 inches to reduce the chance of soil slumping. Avoid existing plants and tree roots.

(e) SOIL AMENDMENTS/FERTILIZER

Describe the type, quantity, and application rate of any soil amendments or fertilizers used to improve physical, chemical, or biological properties of the soil. Summarize soil testing results, including nutrients (e.g. phosphorus and nitrogen), with soil concentrations specified in the results and, if applicable, in the fertilizer management plan.

(f) WEED CONTROL

Describe measures necessary to eradicate and/or prevent the spread of weeds on-site. Provisions should include the method, frequency, and extent of weed control activities. List noxious weeds potentially susceptible for the project area and train staff to identify and remove them before they can produce viable seed. More information on weed identification and prevention can be found at the Lake Tahoe Basin Weed Coordinating Group website: www.tahoeinvasiveweeds.org.

4. Installation of Plant Materials

Describe installation methods and provide a plan to scale depicting density, arrangement, and locations of plant materials used. Proper handling and storage of plant materials should also be addressed here. Plant materials may include transplants of existing plants salvaged during the site preparation process, cuttings, containers of trees, shrubs, and herbaceous plants, as well as seed selected from the Site Type Recommended Species List, Site Type Recommended Seed Mixes, and TRPA Approved Plant Species Attributes Table.

5. Irrigation

Describe the irrigation methods necessary for vegetation establishment. Methods range from hand watering to drip, bubbler, and spray irrigation systems. Include where the irrigation water will come from. Outline system components, timing (including timing of removal, if applicable), application rates, and any maintenance needs to ensure systems are operational and effective.

6. Soil Stabilization

Describe soil stabilization practices, which may include reapplication of salvaged duff material collected and stored during the site preparation process, bare soil protection using inorganic and organic mulch, biotechnical treatments, and any use of tackifiers and soil binders.

F. REVEGETATION MAINTENANCE

List maintenance requirements necessary for vegetation establishment, such as weeding, pruning, watering, replacing dead plant material, and removing trash and debris. Include any adjustments needed to the irrigation system during the maintenance period as well as a process to “wean” plants off of irrigation by the end of the maintenance period. Provisions should include reapplication of mulches and amendments as needed. Incorporate any long-term soil and vegetation maintenance activities into the BMP Inspection and Maintenance Plan, described in Chapter 6 – Inspection, Maintenance, and Monitoring.

Provide a timeframe for the maintenance period (typically 2-3 years) and relate this to the revegetation performance requirements or success criteria.

G. SUCCESS CRITERIA AND PROJECT CONCLUSION

This section describes the vegetation that would result from successful project implementation and includes a description of a reference plant community or other standard used and the rationale for choosing this reference community or standard. Success criteria must reflect project goals and objectives and state the desired condition of the revegetated site. Criteria may include attributes such as percent vegetative cover, soil surface cover, plant survival, soil penetrability, and absence of any visual signs of rills or erosion. If success criteria are not met, causal factors should be determined and remediation actions taken. This section must describe those remediation actions to be taken should the revegetation not meet the success criteria.

Additional items needed to conclude the project may include as-built drawings, clean up provisions, and scheduling final inspections to evaluate performance standards.

During the final inspection, inspectors will use the criteria listed in the approved Revegetation Plan in addition to visual assessments of vegetation establishment to determine project success. Please note that establishment of vegetation generally takes between two and three complete (May – September) growing seasons.

TRPA Revegetation Plan Example

Soil restoration and revegetation activities required as part of a Project’s permitted conditions must submit a completed TRPA Revegetation Plan:

A. SITE DESCRIPTION

Project Address: ABC 123 Lane, South Lake Tahoe, El Dorado County, CA

Assessor’s Parcel Number (APN): APN: 123-45-678

NRCS Soil Map Unit: 7444 Max depth of Install: 24 inches Ksat (in/hr): 12.8

Land Capability: 1b and 4

TRPA Permit Number: BMPP0000-0000

Detailed Site Description:

The site comprises of an eroding slope from which runoff and sediment are transported across a compacted dirt area into SEZ. All areas are located in full sun. Existing vegetation on site ranges from dry shrubland species on the slope, to forbes and grasses at the base of the slope, to wetland species such as willow on the edge of and in the SEZ.

B. PROJECT DESCRIPTION, GOALS AND OBJECTIVES

Revegetation goals for this project are for the purpose of erosion control. The project intends to revegetate and stabilize the toe of the eroding slope, revegetate the flat compacted dirt area, and install a shallow vegetated infiltration basin upslope of the SEZ to capture and infiltrate surface water runoff originating from the site before it reaches the SEZ. Revegetation and erosion control treatments are installed to the lines and grade indicated on the Plans for BMPP0000-0000, as prescribed herein, and as directed by the engineer. Without revegetation of disturbed areas, erosion and sediment transport to the SEZ will continue.

C. PROJECT SCHEDULE

Dates	Action
August 10-15	Call before you dig 811 and contractor submittals (equipment cleaner receipts, seed labels and planting materials orders)
August 15	Install temporary BMPs
August 18	Pre-grade inspection
August 20	Topsoil salvage and hand removal of weeds using Pulaski
August 21-29	Grading, soil loosening, and soil amendments
August 29	48 hour notice to Engineer for plant delivery
September 1	Delivery and approval of plant and seed material
September 1-3	Seeding
September 4	Hole excavation and pre-wetting for plantings
September 5-10	Plant installation, native plant salvage and transplant, and soil stabilization
September 10-15	Hand watering and install temporary irrigation
September 15	Written Guarantee
September 15 to September 30 and June 1 to September 30 of the following year	Irrigation

Dates	Action
September 15 to October 15 and May 1 to October 15 of the following year	Weed maintenance
August 15 of the following year	Final inspection
September 30 of the following year	Remove and recycle irrigation system

D. SELECTION OF PLANT MATERIALS

PLANT MATERIALS						
Species (Botanical Name)	Species (Common name)	Transplant	Container Size	Quantity	Planting Density / Spacing	Seed - PLS pounds per acre
<i>Achillea millefolium</i>	Yarrow					1
<i>Arctostaphylos nevadensis</i>	Pinemat manzanita		1 gallon	6	Cluster 2-3 plants 5-ft on center.	
<i>Arctostaphylos patula</i>	Greenleaf manzanita		1 gallon	6	Cluster 2-3 plants 5-ft on center.	
<i>Artemesia tridentate</i>	Mountain sagebrush					1
<i>Festuca rubra</i>	California native Red Fescue					3
<i>Leymus triticoides</i>	Creeping Wildrye					3
<i>Lupinus argenteus</i>	Silver Lupine					1
<i>Populus tremuloides</i>	Quaking aspen		5 gallon	3	Clustered 5-ft on center.	
<i>Salix spp</i>	Willow	X		4		
<i>Ribes cereum</i>	Wax currant		1 gallon	6	Cluster 2-3 plants 5-ft on center.	
<i>Wyethia mollis</i>	Mountain mule ears					1
Total Pounds of Pure Live Seed Per Acre						10

E. PROJECT INSTALLATION

1. Contractor Requirements

The Contractor must possess a C-27 specialty license and have 5 years, minimum, experience in the installation and establishment of California native plant materials for revegetation erosion control projects. Experience must include temporary irrigation systems, seeding, and a plant establishment and maintenance period. The Contractor must also provide at least three references for past successful revegetation projects.

2. Measures to Avoid or Minimize Project Impacts

- Before project installation, the contractor shall call 811 "Call Before You Dig" to identify all utility lines on the project site.

- *All machinery must be clean before arrival on site and tools sterilized to prevent introduction and spread of weeds. Contractor to submit up-to-date cleaner receipts as proof of sterilization.*
- *Install vegetation protection fencing in accordance with BMP 4.5-e - Vegetation Protection, around all existing vegetation not to be disturbed as on the Plans. Fencing shall extend at a minimum to the extent of the vegetative dripline, with metal stakes located outside of the dripline. See the attached schedule for specific timing of this treatment.*
- *Install temporary erosion and sediment control BMPs in accordance with the Plans for BMPP0000-0000 and with BMP 4.5-r – Silt Fence and BMP 4.5-q - Fiber Roll. Install BMPs along the downhill edge of the area of disturbance to prevent any sediment from being transported off site and into the SEZ during disturbance and until vegetation becomes established. See the attached schedule for specific timing of this treatment.*
- *At no time will any soil rehabilitation operations be conducted if soil is saturated.*
- *The Contractor must have a copy of this Revegetation Plan and its attachments on site at all times throughout the duration of the project.*

3. Site Preparation

(a) SALVAGE EXISTING NATIVE PLANT FOR TRANSPLANTING

Plants identified on the Plans to be salvaged and transplanted shall be extracted taking as much of the root ball as possible and relocated to the receiving site locations indicated on the Plans. Plants shall be relocated to new locations within 4 hours of being extracted. If the site receiving the transplant does not have adequate soil moisture, the Contractor shall pre-wet the soil a day or two before transplanting. The receiving planting hole shall be twice the width and depth of the root ball. The rootball shall be planted in the excavated planting hole so that the root crown is 2-inches above existing grade. Use excavated soil to fill in the hole and gently compact soil to avoid settlement. Immediately following the transplant, water the hole to completely saturate each transplant root ball. See the attached schedule for specific timing of this treatment.

(b) REMOVAL AND STORAGE OF TOPSOIL AND DUFF

Following BMP 4.5-l – Topsoil Salvage, the Contractor shall salvage existing vegetative litter, duff and upper 3-inches of top soil from areas to be graded or disturbed on the project site before disturbance and store until such time it can be incorporated back into the revegetation project. Vegetative litter (e.g. pine needles, leaves) and duff can be stockpiled together, but away from topsoil in piles that are shallow and narrow as practicable. Protect stockpiles from precipitation according to BMP 4.5-n – Stockpile Management and at no time shall materials be stockpiled for more than 3 months without approval of the Engineer. See the attached schedule for specific timing of this treatment.

(c) GRADING AND SLOPE SHAPING

Areas to be graded or excavated and revegetated include the base of slope to accommodate a retaining wall and installation of the shallow infiltration basin as permitted through BMP Retrofit Permit BMPP0000-0000. For planting areas, scarify the top 6 inches of subgrade before fill placement. Subgrade depths plus specified depth of topsoil should equal finished grade. Contractor shall establish finished grades to blend with existing grades and eliminate uneven areas resulting from rough-grading operations. See the attached schedule for specific timing of these treatments.

(d) SOIL LOOSENING

To reduce soil compaction, loosen subgrade of compacted soil areas to an average depth of 12-inches. Soil loosening may be performed with hand tools (such as a pick mattock or Pulaski) or a mini excavator

equipped with backhoe bucket. Soil shall be loosened but not turned or inverted. Soil loosening shall be uneven in depth by at least 1-2 inches to reduce the chance of soil slumping. Avoid existing plants and tree roots wherever loosening takes place. See the attached schedule for specific timing of this treatment.

(e) SOIL AMENDMENTS/FERTILIZER

Apply aged wood chips to a depth of 1 inch on the surface of soil loosened areas.

Incorporate compost to a depth of 3-4 inches and organic phosphorous free fertilizer at a rate of 270 lbs per acre into areas where topsoil is to be replaced and into areas compacted during construction activities. Evenly spread compost and fertilizer on top soil and incorporate it within using hand tools or mini excavator. After fertilizer application, water area slowly to help incorporate fertilizer into the soil. Only water until soil is moist to avoid runoff as excess water will transport fertilizer away. See the attached schedule for specific timing of these treatments.

(f) WEED CONTROL

The Contractor is to conduct bi-weekly weed control practices to maintain a 3-foot diameter weed free area around each plant. Weeds shall be removed before reaching 4-inches in height and before the weeds produce viable seeds. Weed removal shall not cause disruption to the root systems and aboveground structure of the installed plants. Vegetation control shall be conducted using hand-pulling - at no time shall herbicide be used. The Contractor must be familiar with identification of the following expected noxious and invasive weed species that may occur in or near the project area:

Common Name	Scientific Name
Russian knapweed	<i>Acroptilon repens</i>
Cheat grass	<i>Bromus tectorum</i>
Hoary cress	<i>Cardaria draba</i>
Musk thistle	<i>Carduus nutans</i>
Purple starthistle	<i>Centaurea calcitrapa</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Spotted knapweed	<i>Centaurea maculosa</i>
Russian knapweed	<i>Centaurea repens</i>
Yellow starthistle	<i>Centaurea solstitialis</i>
Squarrose knapweed	<i>Centaurea squarrosa</i>
Rush skeleton	<i>Chondrilla juncea</i>
Canada thistle	<i>Cirsium arvense</i>
Bull thistle	<i>Cirsium vulgare</i>
Field Bindweed	<i>Convolvulus arvensis</i>
Scotchbroom	<i>Cytisus scoparius</i>
Teasel	<i>Dipsacus fullonum</i>
St. John's wort / Klamath weed	<i>Hypericum perforatum</i>
Tall whitetop / Perennial pepperweed	<i>Lepidium latifolium</i>
Ox eye daisy	<i>Leucanthemum vulgare</i>
Dalmatian toadflax	<i>Linaria genistifolia spp. dalmatica</i>
Yellow toadflax	<i>Linaria vulgaris</i>
Sweetclover	<i>Melilotus alba, Melilotus officinalis</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Scotch thistle	<i>Onoropordum acanthium</i>

Common Name	Scientific Name
Curlyleaf pondweed	<i>Potamogeton crispus</i>
Sulfur cinquefoil	<i>Potentilla recta</i>
Perennial sowthistle	<i>Sonchus arvensis l.</i>
Medusahead grass	<i>Taeniatherum caputmedusae</i>
Woolly mullein	<i>Verbascum thapsus</i>

4. Installation of Plant Materials

The Contractor is responsible for providing healthy plants for installation that are free of disease and insect infestation, are robust, and have vigorous foliage and wood. Prior to delivery, the Contractor shall submit copies of all planting material orders and any seed bag labels showing percent germination and purity for each species for approval. Labels shall show seed vendor's certification for required seed mixtures, and indicate percentage by weight and percentages of purity, germination, and weed seed for each species, as well as the date of testing. Seed mixes shall conform to the prescribed pure live seed rate of 90% purity and 80% germination. At all times, seed mixes shall be 100% weed free.

The Contractor shall provide the Engineer 48 hour advanced notice prior to delivery of plant materials and seed. Plant materials shall be delivered and stored at staging areas approved by the Engineer. At the time of delivery, the Engineer shall inspect the container plants for injury, disease, and insect infestation. Seed shall be delivered in unopened containers with the seed tag attached and is subject to observation and approval by the Engineer prior to installation. Plant and seed not approved by the Engineer shall be removed and disposed of according to State and local regulations and replaced within 24 hours at the Contractor's expense.

All plants materials shall be maintained in optimal health and protected from animal damage, vandalism, sun, wind, frost or any other conditions that would damage or reduce the viability of plant materials. Store all plant materials under a covering that allows air circulation and minimizes heat entrapment. Maintain moisture of plant materials at all times before planting.

The Contractor shall coordinate the placement of materials and equipment when necessary to complete the work as quickly and efficiently as possible. See the attached schedule for specific timing of installation activities.

Seeding operations in revegetation areas indicated on the Plan shall be conducted following site preparation procedures between September 1 and September 30, before any snow accumulation, ground freeze, and prior to container plant installation. The Contractor shall uniformly broadcast seed using hand-held seeders and lightly raked to incorporate to a depth of 1/4- to 1/2-inches. Seed shall not be left uncovered for more than 24 hours, unless otherwise approved by the Engineer. Seeding shall not occur when wind speeds exceed 5 miles per hour.

Following all site preparation procedures and seeding operations listed above, install container plant materials according to the Plans and following layout and density specifications on the Plant Materials Table. Plant layout shall occur somewhat irregularly to avoid existing vegetation and to mimic a natural layout. Plants shall not be laid out for more than one hour before planting. Planting holes shall be excavated by hand, pry bar, hydraulic bar with spade or chisel point or auger to the dimensions detailed on the Plans. The inside surfaces of all planting holes shall be scarified before backfilling with soil. Any large rocks, sticks or material greater 2-inches shall be removed from the backfill materials and discarded before backfilling holes. Remove plants from containers with the rootball intact and scarify to prevent the plant from becoming rootbound. Plants shall not be held by the stem, branch or in any way that damages the plant. Matted roots on sides shall be longitudinally sliced 1/8- to 1/4- inches deep at least once per side. Matted roots on the bottom of the rootball shall be sliced off to 1/4-inch deep. Insert plant into the hole

without bending or damaging roots and hold in place until backfilled and soil tamped solidly around rootball. The rootball shall be placed so the top is placed ¼-inch above the finish grade after settling. At no time shall backfill be placed over the top of the rootball. Plants should be thoroughly hand watered immediately after installation and continue to irrigate to maintain plants in a healthy condition until the end of the revegetation maintenance period. Check plants within 24 hours of installation for settling and correct as needed. If roots become exposed, place additional soil around the root crown.

All planting areas to be fine graded within 1-1/2 inches of paved areas, utility boxes, paving and curbs. Within 5 days of completing the plant installation work, the Contractor shall submit a written guaranty against defects resulting from poor installation or related materials to the Engineer for a period of 1 full growing season after the Engineer's acceptance of plant installation. For the purposes of this contract, a full growing season shall commence on October 16 of the plant installation year and end on October 15 of the next calendar year.

5. Irrigation

The Contractor bears full responsibility for watering plants to ensure plant health and vigor and promote plant establishment and growth. Watering and irrigation operations shall conform to local water conservation provisions for the duration of the irrigation period (e.g. STPUD only allows irrigation on Mondays, Wednesdays, and Fridays). The irrigation system shall be operated at a minimum for a period beginning on June 1 and ending on September 30, unless otherwise determined by the Engineer. Planting areas to be watered using spray irrigation systems as noted on the Plans shall be watered at a rate of 3-inches per week. Planting areas to be watered using bubbler irrigation systems as noted on the Plans shall be watered at a rate of 12-gallons per week. In order to "wean" plants off of irrigation by the end of the maintenance period, irrigation will become deeper and less frequent to help develop deeper and stronger roots.

6. Soil Stabilization

Replace topsoil in disturbed areas (from which top soil was removed before construction), spread to a uniform depth of 3 inches and gently compact into place. Top soil shall be dry and replaced during dry weather. All debris, roots, weeds, and other materials in excess of 1 inch in diameter shall be removed while topsoil is being spread.

Place wood chips to a 1-inch depth on the surface of loosened areas and incorporate during soil loosening.

After seeding, salvaged duff and wood chips shall be evenly applied to the soil surface to a 1 inch depth. Then apply pine needles to increase depth to 2-inches.

After duff replacement and wood chip and pine needle application, apply tackifier according to BMP 4.5-t – Hydromulch, Tackifier and Soil Binder and manufacturer's specifications in said area on same working day.

See the attached schedule for specific timing of these soil stabilization treatments.

F. REVEGETATION MAINTENANCE

Revegetation maintenance shall begin the first day following the plant installation phase and continue for a period of one full growing season after planting is completed. For the purposes of this contract, a full growing season shall commence on October 16 of the plant installation year and end on October 15 of the next calendar year.

During the revegetation maintenance period and until vegetation becomes established, the Contractor shall inspect and maintain temporary erosion and sediment control BMPs in accordance with BMP 4.5-r – Silt Fence and BMP 4.5-q - Fiber Roll.

The Contractor shall be responsible for weed control as previously described in all revegetation areas throughout the project site for the duration of the revegetation maintenance period. Weed control operations shall not damage installed plants or any native volunteers on the project site.

The Contractor shall provide all tools, labor, materials, equipment and incidentals necessary to water all plantings and to operate and maintain irrigation systems in a fully operational condition for the duration of the maintenance period. The contractor shall evaluate the site weekly to determine if watering applications are appropriate. For transplants and container plants, evaluations shall include inspections for signs of water stress (Caused by overwatering or underwatering) and stunted growth. Irrigation maintenance shall include, but is not limited to, routine examination of the irrigation system during the irrigation period to ensure spray nozzles and bubblers are operational, that pipes do not leak, and that no lines are blocked. If determined by the Engineer that the irrigation system is to remain in place over the winter, the Contractor shall winterize the system by closing off the shut off valve at the water service point, removing sprinkler risers with nozzles, and draining water from all irrigation pipes. The contractor shall make any repairs to the irrigation system as needed. Upon conclusion of the plant maintenance period, the Contractor shall completely remove and recycle the spray and bubbler irrigation systems off site according to State and local regulations.

As part of the maintenance period, the Contractor shall be responsible for any replacement planting if needed. Replacement planting and seeding shall be of the same species and size as originally specified on the Plant Materials Table and Plans, unless the Engineer determines in writing that substitutions of another species or size will be made. At no times will plants of larger size or seed mixes of greater pounds per acre than those originally planted be required. Tree and shrub material that has no easily observable, viable, above ground living material will be considered dead and shall be replaced at no additional cost. Herbaceous plants that fail to show new growth from its root system after one dormant period and within the first 9 months after planting will be considered dead and shall be replaced at no additional cost.

All trash and debris shall be removed from the site and disposed of following State and local regulations on an ongoing basis as needed.

Long term soil and vegetation maintenance and monitoring provisions extending beyond the 1 year maintenance period are included in the BMP Inspection and Maintenance Log and Monitoring Plan for TRPA permit BMPP0000-0000.

G. SUCCESS CRITERIA AND PROJECT CONCLUSION

The intent of the revegetation actions in this project are to have healthy and vigorous, persistent plants at the end of the plant maintenance period that can survive without irrigation or other maintenance actions. In addition to The Contractor shall be responsible for meeting or exceeding the following performance standards for the revegetation areas:

- **Erosion** – *No visible signs of on-going erosion such as rills exists on site.*
- **Plant Survivorship** – *For each revegetation area, container plants shall have a minimum of 90% survivorship at the end of the maintenance period. At the final inspection, the contractor shall reveal which of the final plantings consist of the original plant materials installed during the installation phase. If it is determined by the Engineer that 75% of the original plantings did not survive through the maintenance period because of Contractor negligence, the Contractor shall provide additional*

plantings to achieve 90% of the original plantings and provide a second year of vegetation maintenance as no additional cost. There are no plant survivorship requirements for transplants; however, the Contractor shall make every effort to establish healthy, vigorous and persistent transplanted plants.

- **Soil Surface and Vegetative Cover** – *Areas of disturbance on the site shall maintain at least 90% cover of mulch during and at the end of the maintenance period. Revegetation areas shall maintain 25% vegetative cover at the end of the maintenance period. 25% vegetative cover is consistent with undisturbed areas of native vegetation on similar aspects and slopes adjacent to the project site used as reference plant communities. Cover will be visually estimated by the Inspector. If deemed necessary by the Engineer, measurements of cover points along transects will be used to verify percent vegetative cover.*

Prior to final inspection, the Contractor shall clean-up the site to maintain a neat and orderly condition and be free and clear from debris and discarded material. Clean-up provisions may include but are not limited to disposal of all debris and recycling of all plant containers and other plastics according to State and local regulations, as well as hand-sweeping the access road to prevent vehicle tracking of sediment. Once the final inspection is passed and vegetation is established, temporary BMPs can be removed. The Contractor shall prepare as-built record drawings to document the completed revegetation work if substantially different than the permitted plans. Revegetation signage shall remain after the project is complete to ensure adequate protection of revegetation areas.

Attachment A. BMPs

- *BMP 4.5-e Vegetation Protection*
- *BMP 4.5-r Silt Fence*
- *BMP 4.5-q Fiber Roll*
- *BMP 4.5-l Topsoil Salvage*
- *BMP 4.5-n Stockpile Management*
- *BMP 4.5-t Hydromulch, Tackifier and Soil Binder*

Fertilizer Management Plan Template

This template is intended to assist the project proponent with Fertilizer Management Plan layout and instructions.

Any existing or planned property with 1 or more cumulative acres of turf, or those with existing or potential impacts to water quality, Stream Environment Zones (SEZs) or shorezone, must account for fertilizer use through a Fertilizer Management Plan. If more than 1 acre of turf is proposed as part of a revegetation project, the elements of the fertilizer management plan may be incorporated into the Revegetation Plan.

See the Tahoe Regional Planning Agency BMP Handbook – Chapter 5 on Soils and Vegetation - for additional fertilizer application guidance. This document is available online at: www.tahoebmp.org.

[red text] = Replace with project specific information.

Fertilizer Management Plan

Project Name

Address

Date

Prepared for:
Tahoe Regional Planning Agency
Stateline, NV

Prepared By:
Name and Title
Office Name and Location
Phone Number

I. PROJECT AND SITE DESCRIPTION

Describe project and turf uses. Give property and ownership information. Include contact name and information for the staff responsible for fertilizer management.

Describe the project site, including location or APN and general site characteristics such as topography, vegetation, soil types, infiltration rates (Ksat), land capability units, and other relevant information.

II. FERTILIZER APPLICATION

A. SOILS TESTING

Provide summary of soil analysis (from within two years) that supports fertilizer use and justifies fertilizer formula. Attach soil analysis results. Proposed phosphorus use for turf/lawn maintenance must be supported by soils analysis results. For example, if soils results show no phosphorus deficiency, chemical fertilizer formula should contain no phosphorus.

B. FERTILIZER TYPE(S)

State the type and formula of fertilizer to be used. Organic and other slow release fertilizers are strongly encouraged over fast release or traditional fertilizers. Fertilizer formula is typically expressed as a ratio of Nitrogen (N), Phosphorus (P), and Potassium (K).

C. RATES AND MEANS OF APPLICATION

State the rate fertilizer will be applied (pounds/acre) and the means of application (e.g. fertilizer spreader). Fertilizer rate should be supported by soils analysis.

D. TIMING AND FREQUENCY OF APPLICATION

Describe the timing and frequency of fertilizer application. Fertilizer should only be applied in early summer when vegetation is actively growing.

E. IRRIGATION

Describe irrigation system and watering schedule for turf that would avoid excessive nutrient runoff and conserve water.

F. STORAGE AND DISPOSAL

Briefly describe where and how fertilizers will be stored and disposed of.

III. SEZS, SHOREZONES, SETBACKS AND OTHER SENSITIVE AREAS

Identify these sensitive areas on site and describe how fertilizer management practices employed will avoid them. Common practices include maintaining a substantial buffer of native vegetation between turf and sensitive areas. Map any sensitive areas, and show on map the turf areas corresponding to distinct fertilizer application zones, including no fertilizer application zones.

IV. MONITORING

Surface and groundwater monitoring may be required in sensitive areas on a case by case basis to determine compliance with nitrogen and phosphorus discharge standards.

If monitoring of fertilizer management is required as a condition of project approval, include frequency and rate of application as a line item in the BMP Inspection and Maintenance Plan, described in Chapter 6 – Inspection, Maintenance, and Monitoring. Additionally, annual summary reports are required from the party named – under Section 1. Project and Site Description – responsible for fertilizer management. If water quality impacts are occurring, changes to fertilizer management will be necessary.

Fertilizer Management Plan Example

For:

ABC 123 Lane

South Lake Tahoe, El Dorado County, CA

APN: 123-45-678

April 21, 2011

Prepared for:

Tahoe Regional Planning Agency

Stateline, NV

Prepared By:

Jane Doe

XYZ Landscaping Consultants

Incline Village, NV

775-123-4567

I. PROJECT AND SITE DESCRIPTION

Golden Bear Condominiums is a six-acre lake-front community and vacation complex with 80 two and three bedroom units located in Incline Village, Nevada. The landscape is a matrix of turf, ornamental plants, and native vegetation. There are approximately 1.6 cumulative acres of turf on the property, which are all in common areas. The attached site map shows the location of these vegetation types.

The property is relatively flat, with an average of three-percent grade, and faces south with good sun exposure. Annual precipitation is 19 inches, with 16 inches occurring as snow. The native vegetation consists of jeffrey and sugar pines, manzanita, sagebrush, and other native shrubs, flowers, and bunchgrasses in the uplands. Coyote Creek runs through the southwestern portion of the property, supporting riparian vegetation including aspen trees and a variety of meadow plants.

There are two soil types on the property: Inville (7141-7143) and Watah Peat (7071). Inville encompasses the upland areas, and Watah Peak is located around Coyote Creek (see attached soils map). Inville has moderate soil infiltration, with a hydraulic conductivity of 4.7, while Watah Peat has a low soil infiltration at 1.3. There are two capability units on the property: Inville is Class 4, and Watah Peat and the beach are Class 1b.

This fertilizer management plan will be used to help maintain the health, functionality, and aesthetics of the turf while minimizing the potential for excessive fertilizer to enter the lake. The landscape manager, who is responsible for implementing this plan, is Jim Doe. He can be reached at 775-111-2222 or jdoe@abc.com.

II. FERTILIZER APPLICATION

A. SOILS TESTING

A soil analysis was conducted on the property on August 11, 2010. Three samples in each Zone (A and B) were collected. The report including recommendations is attached. The report indicates that the soils in Zone A have sufficient phosphorus but need some nitrogen and potassium. Zone B needs some phosphorus and a lightly higher amount of nitrogen than Zone A. The fertilizer formulas suggested in the soil analysis report will be used (as indicated below). Modifications to the fertilizer formulas may change in two years with the next soils analysis; this plan will be updated at that time.

B. FERTILIZER TYPE(S)

Zone A will receive a slow release fertilizer (10-0-5) as needed

Zone B, which includes the rest of the turf areas, will receive a slow release fertilizer (15-5-5) as needed. Grass clippings will be left on the turf to gradually decompose, returning nutrients to the soil. This is a form of organic fertilizer that will reduce the amount of chemical fertilizer needed.

C. RATES AND MEANS OF APPLICATION

Zone A, shown on the site map, are adjacent to the sensitive "No Fertilizer" zones (see site map). Zone A will receive a slow release fertilizer (10-0-5) as needed, applied sparingly up to a maximum rate of 1/2 pound of actual nitrogen per 1000 square feet of turf. Zone B, which includes the rest of the turf areas, will receive a slow release fertilizer (15-5-7) as needed, applied at a maximum rate of 1/2 pound of actual nitrogen per 1000 square feet of turf. A soil analysis conducted on August 11, 2010 (report attached) indicates that the soils in this zone need phosphorus. Both zones will be fertilized only as directed by nutrient needs from a soil test. Fertilizer will be applied with a fertilizer spreader, which will be checked for accuracy once a year before use.

D. TIMING AND FREQUENCY OF APPLICATION

If needed, fertilizer will be applied once a year at the start of the growing season after the ground has thawed.

E. IRRIGATION

A system of sprinklers are installed for turf on the property, with an ET irrigation controller to efficiently regulate watering and minimize nutrient-laden runoff. Turf should be watered lightly immediately after fertilizer application to move the fertilizer to the soil. No runoff should be visible. An irrigation audit will be completed every two years so that adjustments can be made to ensure property irrigation is being applied to the turf areas, without runoff occurring.

F. STORAGE AND DISPOSAL

All fertilizers will be stored in bins within the Garden Shed, location shown on the site map. Disposal will be according to the manufacturer's recommendations.

III. SEZS, SHOREZONES, SETBACKS AND OTHER SENSITIVE AREAS

Please see attached site map showing Coyote Creek and its riparian area, beach, turf, other vegetation types, and structures. This map indicates the boundaries of three distinct zones: a "No Fertilizer" zone, Zone A, and Zone B. Coyote Creek and the lake, including 25 foot buffers, are "No Fertilizer" zones as mapped. Native vegetation zones as mapped are also "No Fertilizer" zones.

IV. MONITORING

Water quality monitoring is not currently required for this property.

Table 5-1: Description of Revegetation Site Types

REVEGETATION SITE TYPES ^{1,2}	
Site Type Name	Site Type Description
Wetland ³	Sites that have saturated soils and may be inundated during part or all of the growing season
SEZ/Riparian-Wet Meadow ³	SEZ sites generally not inundated during most or all of the growing season but affected by perennial or intermittent water bodies (rivers, streams, lakes, or drainage ways)
Upland—Generic	Upland sites in partial shade to full sun (excluding dry sites in full sun)
Upland—Full Shade	Upland sites with full shade
Upland—Full Sun/Dry Site	Upland sites with full sun, coarse-textured or shallow soils, and southeast to south west aspect
Upland—High Disturbance	Upland sites frequently disturbed by human activities in undeveloped or developed settings
<p>Notes:</p> <p>1 – Backshore sites may be included in any one of these types based on local site conditions.</p> <p>2 – Site types do not include areas of maintained landscaping.</p> <p>3 – Site type may include but is not restricted to jurisdictional wetlands.</p>	

Table 5-2: Site Type Recommended Species List

SITE TYPE RECOMMENDED SPECIES LIST							
Scientific Name ^{1,2}	Common Name	Wetland	SEZ/Riparian- Wet Meadow	Upland—Generic	Upland—Full Shade	Upland—Full Sun/ Dry Site	Upland— High Disturbance
Grasses, Rushes, and Sedges							
<i>Achnatherum lemmonii</i>	Lemmon's needlegrass			•		•	
<i>Achnatherum occidentale</i>	western needlegrass			•		•	
<i>Agrostis exarata</i>	spike bentgrass		•				
<i>Bromus carinatus</i>	California brome		•	•		•	
<i>Bromus marginatus</i>	mountain brome			•			
<i>Calamagrostis canadensis</i>	bluejoint	•	•				
<i>Carex praegracilis</i>	slender sedge		•				
<i>Danthonia californica</i>	California oatgrass			•			
<i>Deschampsia caespitosa</i>	tufted hairgrass		•				
<i>Deschampsia elongata</i>	slender hairgrass		•				
<i>Elymus elymoides</i>	squirreltail			•		•	
<i>Elymus glaucus</i> ³	blue wildrye	•	•		•		
<i>Elymus trachycaulus</i>	slender wheatgrass,		•	•		•	
<i>Festuca brevipila</i>	hard fescue			•			•
<i>Festuca ovina</i> 'Covar'	sheep fescue, 'Covar'			•		•	•
<i>Festuca rubra</i> ³	red fescue		•		•		•
<i>Festuca rubra ssp. arenaria</i> ³	Boreal creeping red fescue		•		•		•
<i>Glyceria striata</i> ³	fowl mannagrass		•		•		
<i>Hordeum brachyantherum</i>	meadow barley		•				
<i>Hordeum brachyantherum ssp. californicum</i>	California barley		•				
<i>Juncus arcticus ssp. littoralis</i>	mountain rush	•	•				
<i>Juncus effusus</i>	common rush	•	•				
<i>Leymus triticoides</i>	beardless wildrye		•				
<i>Melica californica</i>	California oniongrass			•			
<i>Phalaris arundinacea</i>	reed canarygrass		•				
<i>Phleum alpinum</i>	alpine timothy		•				
<i>Poa ampla</i> , 'Sherman'	big bluegrass, 'Sherman'			•		•	•
<i>Poa secunda</i>	Sandberg bluegrass			•		•	•
<i>Thinopyrum intermedium</i>	intermediate wheatgrass			•			•
<i>Thinopyrum intermedium</i> 'Greenar'	intermediate wheatgrass, 'Greenar'			•			•
<i>Thinopyrum intermedium</i> 'Oahe'	intermediate wheatgrass, 'Oahe'			•			•
Forbs							
<i>Achillea millefolium</i>	common yarrow		•	•			•
<i>Aconitum columbianum</i>	Columbian monkshood		•				
<i>Agastache urticifolia</i>	nettle-leaf giant hyssop		•				
<i>Anaphalis margaritacea</i>	western pearly everlasting		•	•			

SITE TYPE RECOMMENDED SPECIES LIST

Scientific Name ^{1,2}	Common Name	Wetland	SEZ/Riparian- Wet Meadow	Upland—Generic	Upland—Full Shade	Upland—Full Sun/ Dry Site	Upland— High Disturbance
<i>Aquilegia formosa</i>	crimson columbine				•		
<i>Arnica cordifolia</i> ³	heartleaf arnica				•		•
<i>Artemisia douglasiana</i>	Douglas' sagewort		•				
<i>Balsamorhiza sagittata</i>	arrowleaf balsamroot			•			•
<i>Caltha leptosepala</i>	white marsh marigold		•				
<i>Chamerion angustifolium</i>	fireweed		•	•			•
<i>Delphinium glaucum</i> ³	mountain larkspur		•		•		
<i>Epilobium ciliatum</i>	fringed willowherb		•	•			•
<i>Erigeron compositus</i> ⁴	cutleaf daisy			•			
<i>Eriophyllum lanatum</i>	common woolly sunflower			•			
<i>Fragaria virginiana</i>	wild strawberry		•				•
<i>Geranium richardsonii</i>	Richardson's geranium		•				
<i>Geum macrophyllum</i> ³	big leaf avens		•		•		
<i>Geum triflorum</i>	old man's whiskers		•	•			
<i>Gilia capitata</i>	bluehead gilia			•		•	
<i>Heracleum maximum</i>	common cowparsnip		•				
<i>Ipomopsis aggregata</i>	scarlet gilia			•		•	
<i>Linum lewisii</i>	Lewis flax			•		•	
<i>Lotus nevadensis</i>	Nevada bird's-foot trefoil			•			
<i>Lotus unifoliolatus var. unifoliolatus</i>	American bird's-foot trefoil			•			•
<i>Lupinus argenteus</i>	silvery lupine			•		•	•
<i>Lupinus fulcratus</i>	greenstipule lupine			•		•	•
<i>Lupinus grayi</i>	Sierra lupine			•		•	•
<i>Lupinus lepidus</i>	Pacific lupine			•		•	•
<i>Lupinus polyphyllus</i>	bigleaf lupine		•				
<i>Mertensia ciliata</i>	tall fringed bluebells		•				
<i>Mimulus cardinalis</i> ³	scarlet monkey flower		•		•		
<i>Mimulus guttatus</i>	common monkey flower	•	•				
<i>Nasturtium officinale</i>	Watercress	•					
<i>Osmorhiza occidentalis</i>	western sweetroot				•		
<i>Oxyria digyna</i> ⁴	alpine mountainsorrel			•			
<i>Paeonia brownii</i>	Brown's peony			•			
<i>Pedicularis groenlandica</i>	elephant heads		•				
<i>Penstemon rydbergii</i>	Rydberg's penstemon		•				
<i>Penstemon speciosus</i>	royal penstemon			•		•	
<i>Phacelia ramosissima</i>	branching phacelia			•			
<i>Potentilla fruticosa</i>	shrubby cinquefoil		•				
<i>Potentilla glandulosa</i>	sticky cinquefoil		•				•
<i>Potentilla gracilis</i>	slender cinquefoil			•			
<i>Ranunculus occidentalis</i>	western buttercup		•				
<i>Rumex salicifolius</i>	willow dock	•	•				•
<i>Solidago canadensis</i>	Canada goldenrod		•	•			•

SITE TYPE RECOMMENDED SPECIES LIST

Scientific Name ^{1,2}	Common Name	Wetland	SEZ/Riparian- Wet Meadow	Upland—Generic	Upland—Full Shade	Upland—Full Sun/ Dry Site	Upland— High Disturbance
<i>Symphotrichum spathulatum</i> var. <i>spathulatum</i>	western mountain aster		•				
<i>Thalictrum fendleri</i>	Fendler's meadow-rue		•				
<i>Urtica dioica</i> ssp. <i>holosericea</i>	stinging nettle		•				•
<i>Wyethia mollis</i>	woolly mule-ears			•		•	•
Subshrubs, Shrubs, and Trees							
<i>Acer circinatum</i>	vine maple				•		
<i>Acer glabrum</i>	Rocky Mountain maple		•				
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder		•				•
<i>Amelanchier alnifolia</i>	western Serviceberry		•				
<i>Amelanchier utahensis</i>	Utah serviceberry			•			
<i>Arctostaphylos patula</i>	greenleaf manzanita			•		•	•
<i>Arctostaphylos nevadensis</i>	pinemat manzanita			•			
<i>Arctostaphylos uva-ursi</i>	bearberry			•			
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	mountain big sagebrush					•	
<i>Calocedrus decurrens</i>	incense cedar			•	•		•
<i>Ceanothus cordulatus</i>	whitethorn			•		•	•
<i>Ceanothus prostratus</i>	prostrate ceanothus, squawbush			•		•	
<i>Ceanothus velutinus</i>	tobaccobrush			•			
<i>Cercocarpus ledifolius</i>	curl-leaf mountain mahogany					•	
<i>Chrysolepis sempervirens</i>	chinquapin			•			
<i>Cornus sericea</i>	redosier dogwood		•				
<i>Ericameria nauseosa</i>	rubber rabbitbrush					•	•
<i>Eriogonum nudum</i>	naked buckwheat					•	•
<i>Eriogonum umbellatum</i>	sulphur-flower buckwheat			•		•	•
<i>Holodiscus discolor</i>	oceanspray creambush		•				
<i>Juniperus occidentalis</i>	western Sierra or Sierra juniper					•	
<i>Lonicera involucrata</i> ³	twinberry		•		•		
<i>Mahonia aquifolium</i>	Oregon grape				•		•
<i>Penstemon deustus</i>	hot-rock penstemon			•		•	
<i>Penstemon newberryi</i>	mountain pride		•	•		•	
<i>Pinus contorta</i> var. <i>murrayana</i> ⁵	Sierra lodgepole pine		•				•
<i>Pinus flexilis</i> ⁶	limber pine					•	
<i>Pinus jeffreyi</i>	Jeffrey pine			•		•	•
<i>Pinus monticola</i>	western white pine			•			
<i>Pinus ponderosa</i>	Ponderosa pine			•		•	•
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood		•				
<i>Populus tremuloides</i>	quaking aspen		•				•
<i>Prunus virginiana</i>	western chokecherry		•	•			
<i>Purshia tridentata</i>	antelope bitterbrush			•		•	
<i>Quercus vaccinifolia</i>	huckleberry oak			•	•		
<i>Rhus trilobata</i>	skunkbush			•			

SITE TYPE RECOMMENDED SPECIES LIST

Scientific Name ^{1,2}	Common Name	Wetland	SEZ/Riparian- Wet Meadow	Upland—Generic	Upland—Full Shade	Upland—Full Sun/ Dry Site	Upland— High Disturbance
<i>Ribes aureum</i>	golden currant		•	•			
<i>Ribes cereum</i>	wax currant			•		•	
<i>Ribes montigenum</i>	gooseberry currant			•			
<i>Ribes nevadense</i>	Sierra currant		•				
<i>Ribes roezlii</i>	Sierra gooseberry			•			
<i>Rosa woodsii</i>	Woods' rose		•	•			•
<i>Rubus parviflorus</i>	thimbleberry		•	•			•
<i>Salix exigua</i>	narrow leaved willow	•	•				
<i>Salix geyeriana</i>	Geyer's willow		•				
<i>Salix lemmonii</i>	Lemmon's willow		•				
<i>Salix lucida ssp. lasiandra</i>	Pacific willow	•	•				
<i>Salix scouleriana</i>	Scouler's willow		•				
<i>Sambucus nigra ssp. cerulea</i>	blue Elderberry		•				
<i>Sambucus racemosa</i>	red elderberry		•				
<i>Sorbus scopulina</i>	Greene's mountain ash		•				
<i>Spiraea douglasii</i>	rose spirea		•				
<i>Spiraea splendens</i> ³	rose meadowsweet		•		•		
<i>Symphoricarpos mollis</i>	creeping snowberry				•		

Notes:

- 1 – Nomenclature follows U.S. Department of Agriculture’s PLANTS Database.
- 2 – Names of nonnative species are displayed in bold font.
- 3 – Mesic shaded uplands only
- 4 – Talus, rocky alpine slopes only
- 5 – Invasive of wet meadows
- 6 – Subalpine sites only

Table 5-3: Site Type Recommended Seed Mixes

SITE TYPE RECOMMENDED SEED MIXES ¹							
Scientific Name	Common Name	Application Rate (PLS lbs./acre) ^{2, 3, 4}					
		Wetland ^{5,6}	SEZ/ Riparian- Wet Meadow	Upland— Generic	Upland— Full Shade ⁵	Upland— Full sun/ Dry Site	Upland— High Disturbance
Grasses, Rushes, and Sedges							
<i>Bromus carinatus</i>	California brome	–	3.00	–	–	4.00	–
<i>Carex praegracilis</i>	slender sedge	–	0.25	–	–	–	–
<i>Deschampsia cespitosa</i>	tufted hairgrass	–	0.50	–	–	–	–
<i>Elymus elymoides</i>	squirreltail	–	–	2.00	–	4.00	–
<i>Elymus glaucus</i>	blue wildrye	–	3.00	–	–	–	–
<i>Elymus trachycaulus</i>	slender wheatgrass	–	4.00	4.00	–	4.00	–
<i>Festuca brevilipa</i>	hard fescue	–	–	1.00	–	–	2.00
<i>Festuca ovina</i> , ‘Covar’	sheep fescue, ‘Covar’	–	–	1.00	–	–	2.00
<i>Festuca rubra</i> ssp. <i>arenaria</i>	Boreal creeping red fescue	–	0.50	–	–	–	–
<i>Hordeum brachyantherum</i> ⁷	meadow barley	–	5.00	–	–	–	–
<i>Juncus arcticus</i> ssp. <i>littoralis</i>	mountain rush	–	0.05	–	–	–	–
<i>Leymus triticoides</i>	creeping wildrye	–	2.00	–	–	–	–
<i>Poa ampla</i> , ‘Sherman’	big bluegrass, ‘Sherman’	–	–	1.00	–	–	1.00
<i>Poa secunda</i>	Sandberg bluegrass	–	–	–	–	0.50	–
Forbs							
<i>Achillea millefolium</i>	yarrow	–	–	0.10	–	0.10	0.10
<i>Eriogonum umbellatum</i>	sulphur buckwheat	–	–	1.00	–	1.00	2.00
<i>Linum lewisii</i>	Lewis flax	–	–	1.00	–	1.00	1.00
<i>Lupinus argenteus</i>	silver lupine	–	–	1.00	–	2.00	2.00
<i>Lupinus polyphyllus</i>	Tahoe lupine	–	2.00	–	–	–	–
<i>Mimulus guttatus</i>	common monkeyflower	–	0.10	–	–	–	–
<i>Potentilla gracilis</i>	cinquefoil	–	0.50	–	–	–	–
Shrubs and Trees							
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	mountain sagebrush	–	–	–	–	0.50	–
<i>Chrysothamnus nauseosus</i>	rabbitbrush	–	–	–	–	1.00	–
<i>Purshia tridentata</i>	antelope bitterbrush	–	–	1.00	–	1.00	–
<i>Ribes cereum</i>	wax currant	–	–	0.50	–	0.50	–
Total		–	20.90	13.60	–	19.60	10.10
Notes:							
1 – Composition of example mixes is based in part on commercial availability of plant cultivars, and because availability of cultivars frequently changes, cultivar substitutions may be necessary or desirable.							
2 – PLS = Pure Live Seed = (percentage purity)(percentage germination)/100							
3 – Although Noxious Weeds are prohibited, seed material may contain other weeds (e.g., up to 1.5% weed seed in Nevada, which corresponds to a large number of weed seed). Seed free of specified weeds (e.g., cheatgrass [<i>Bromus tectorum</i>]) and/or with a lesser amount of weeds is recommended.							
4 – Amounts assume broadcast (hand) application of seed, and have been designed for 80–100 PLS ft ² because greater seed densities may result in densities of competing seedlings sufficient to reduce growth and inhibit establishment.							
5 – Establishment of plant from seed is not recommended as the primary means of revegetating this type of site.							
6 – SEZ/Riparian-Wet Meadow seed mix may be applied to supplement plantings at wetlands that are not inundated for most of the growing season.							
7 – From 6,000 feet in elevation and higher							

Table 5-4: Attributes of Suitable and Available Species

TRPA APPROVED PLANT SPECIES ATTRIBUTES TABLE ¹														
Scientific Name ^{2,3}	Common Name	Growth Form ⁴	Mature Height (feet)	Nitrogen Fixation	Drought Tolerance ⁵	Saturation Tolerance ⁵	Shade Tolerance ⁵	Lifespan ⁵	Fire Hazard	Seed (Bulk per Pound)	Germination (% Typical)	Purity (% Typical)	Plant Material Type ⁶	Notes
Grasses, Rushes, and Sedges														
<i>Achnatherum lemmonii</i>	Lemmon's needlegrass	G - B	2	No	High	None	Intolerant	Long	–	95,000	–	–	S	
<i>Achnatherum occidentale</i>	western needlegrass	G - B	2	No	High	None	Intermed.	–	–	285,000	72	80	S	
<i>Agropyron desertorum</i> 'Nordan'	crested wheatgrass 'Nordan'	G - B	2	No	High	None	Intolerant	Long	–	194,120	80	95	S	
<i>Agrostis exarata</i>	spike bentgrass	G - R	3	No	Low	Med.	Intolerant	Mod.	Low	5,600,000	–	–	S	
<i>Bromus carinatus</i>	California brome	G - B	4	No	Med.	None	Intolerant	Short	Low	106,680	88	98	S	
<i>Bromus marginatus</i>	mountain brome	G - R	4	No	Med.	Low	Intolerant	Long	–	142,880	–	–	S	Synonym: <i>Bromus carinatus</i> var. <i>marginatus</i>
<i>Calamagrostis canadensis</i>	bluejoint	G - R	4.9	No	Low	High	Intolerant	Long	–	3,837,472	65	–	S, Sp	Seed purity can be low.
<i>Carex praegracilis</i>	slender sedge	G - R	2	No	Low	High	Intermed.	Long	–	–	90	95	S	
<i>Danthonia californica</i>	California oatgrass	G - MS	2	No	Med.	None	Intolerant	Short	–	90,000–165,000	93	97	S	
<i>Deschampsia caespitosa</i>	tufted hairgrass	G - B	3.4	No	Low	High	Intolerant	Long	Low	1,308,333	94	98	S	
<i>Deschampsia elongata</i>	slender hairgrass	G - B	3	No	Med.	Med.	Intolerant	Short	–	1,860,000	70	56	S	
<i>Elymus elymoides</i>	squirreltail	G - B	1.5	No	High	None	Intolerant	Long	Low	192,000	85	96	S	Seed lots often “weedy”
<i>Elymus glaucus</i>	blue wildrye	G - B	3.3	No	High	High	Tolerant	Mod.	Low	134,500	92	98	S	
<i>Elymus trachycaulus</i>	slender wheatgrass	G - B	3	No	High	Low	Intolerant	Mod.	Low	135,000	95	96	S	Attributes apply to the species, including <i>Elymus trachycaulus</i> 'Revenue' and <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> .
<i>Festuca brevipila</i>	hard fescue	G - B	0.5	No	High	None	Intolerant	Mod.	Low	591,920	–	–	S	
<i>Festuca ovina</i> 'Covar'	Covar' sheep fescue	G - B	0.5	No	High	None	Intolerant	Long	Low	530,320	95	98	S	
<i>Festuca rubra</i>	red fescue	G - R	2	No	Med.	None	Tolerant	Long	Low	454,087	80	98	S, So	
<i>Festuca rubra</i> ssp. <i>arenaria</i>	'Boreal' creeping red fescue	G - B	3	No	Med.	Low	Tolerant	–	Low	–	–	–	S	
<i>Glyceria striata</i>	fowl mannagrass	G - B	5.7	No	Low	High	Tolerant	Short	–	–	85	–	Sp	
<i>Hordeum brachyantherum</i>	meadow barley	G - B	2	No	Med.	High	Intolerant	Mod.	–	30,000	92	93	S	
<i>Hordeum brachyantherum</i> ssp. <i>californicum</i>	California barley	G - B	1.6	No	Med.	None	Intolerant	Short	–	30,000	–	–	S	Attributes vary with geographic origin of seed
<i>Juncus arcticus</i> ssp. <i>littoralis</i>	mountain rush	G - R	4	No	Low	High	Intermed.	Long	–	3,000,000	60	95	Cnt, Ct, S	Synonym: <i>Juncus balticus</i>
<i>Juncus effusus</i>	common rush	G - B	6.6	No	Med.	Med.	Intolerant	Long	–	45,359,242	70	95	Cnt, Ct, S	
<i>Leymus triticoides</i>	beardless wildrye	G - R	3	No	High	High	Intolerant	Long	–	170,304	90	95	S, Sp	
<i>Melica californica</i>	California oniongrass	G - B	4	No	Med.	Low	Intermed.	Short	–	300,000	74	90	S	
<i>Phalaris arundinacea</i>	reed canarygrass	G - R	5	No	Low	High	Intolerant	Long	–	537,920	80	–	S, Sp	
<i>Phleum alpinum</i>	Alpine timothy	H - B	1.4	No	Low	Low	Intermed.	Mod.	Low	1,044,689	24	–	S	
<i>Poa ampla</i> 'Sherman'	'Sherman' big bluegrass	G - B	3	No	High	None	Intermed.	Long	Low	1,046,960	84	97	S	

TRPA APPROVED PLANT SPECIES ATTRIBUTES TABLE ¹

Scientific Name ^{2,3}	Common Name	Growth Form ⁴	Mature Height (feet)	Nitrogen Fixation	Drought Tolerance ⁵	Saturation Tolerance ⁵	Shade Tolerance ⁵	Lifespan ⁵	Fire Hazard	Seed (Bulk per Pound)	Germination (% Typical)	Purity (% Typical)	Plant Material Type ⁶	Notes
<i>Poa secunda</i>	Sandberg bluegrass	G - B	1.4	No	High	None	Intermed.	Mod.	–	1,046,960	76	90	S	
<i>Thinopyrum intermedium</i>	intermediate wheatgrass	G - R	4	No	Med.	Low	Intolerant	Mod.	Low	80,080	90	98	S	Synonym: <i>Elytrigia intermedia</i> ; attributes apply to the species including <i>T. intermedium</i> "Greenar" and <i>T. intermedium</i> 'Oahe'
Forbs														
<i>Achillea millefolium</i>	common yarrow	H - R	3	No	Med.	None	Intermed.	Mod.	Low	2,852,012	98	85	Cnt, S, Sp	Small amounts of seed can be used (i.e., a low seeding rate).
<i>Aconitum columbianum</i>	Columbian Monkshood	H - SS	5	No	Low	Med.	Intermed.	Mod.	Mod.	–	–	–	Cnt, S	
<i>Agastache urticifolia</i>	nettle-leaf giant hyssop	H - R	5	No	Low	Low	Intermed.	Long	Low	–	–	–	S, Sp	Seed viability varies considerably, but generally 40–80 percent.
<i>Anaphalis margaritacea</i>	western pearly everlasting	H - R	3	No	Med.	None	Intermed.	Short	High	8,200,000	–	–	Cnt, S	
<i>Aquilegia formosa (caerulea for germination data)</i>	Crimson columbine	H - MS	3	No	Med.	Low	Tolerant	Short	Low	248,000	96	–	Cnt, S	
<i>Arnica cordifolia</i>	heartleaf arnica	H - R	1.5	No	Low	None	Tolerant	Short	Low	220,000	–	–	BR, Cnt, Co, S, Sp	
<i>Artemisia douglasiana</i>	Douglas' sagewort	H - R	2	No	Med.	Med.	Tolerant	–	Mod.	–	50	15	Cnt, S	
<i>Balsamorhiza sagittata</i>	Arrowleaf Balsamroot	H - MS	2	No	High	None	Intermed.	Long	Low	58,438	93	7	S	
<i>Caltha leptosepala</i>	white marsh marigold	H - SS	1	No	None	Med.	Intolerant	Mod.	Mod.	400,000	–	–	S	
<i>Chamerion angustifolium</i>	Fireweed	H - SS	9	No	High	None	Intolerant	–	Low	–	38	–	S, Cnt	Synonym: <i>Epilobium angustifolium</i> ; seed purity is generally low.
<i>Delphinium glaucum</i>	Mountain Larkspur	H - MS	8	No	None	Med.	Tolerant	Short	High	13,000	–	–	S	
<i>Epilobium ciliatum</i>	Fringed willowherb	H - MS	4	No	High	High	Intolerant	–	Low	7,558,579	–	–	S	Synonym: <i>Epilobium adenocaulon</i> ; includes <i>E. ciliatum</i> subsp. <i>ciliatum</i> and <i>E. ciliatum</i> subsp. <i>glandulosum</i>
<i>Erigeron compositus</i>	cutleaf daisy	H - SS	1	No	High	None	Intolerant	Mod.	Mod.	250,000	–	–	S	Talus, rocky alpine slopes only
<i>Eriophyllum lanatum</i>	common woolly sunflower	H - MS	3	No	Med.	Med.	Intermed.	–	Mod.	–	–	–	S, Cnt	
<i>Fragaria virginiana</i>	Wild strawberry	H - R	1	No	Med.	Med.	Intolerant	–	–	–	72	–	Cnt	
<i>Geranium richardsonii</i>	Richardson's geranium	H - R	3	No	Low	Low	Intermed.	Short	Mod.	40,000	–	–	BR, Cnt, Ct, S	
<i>Geum macrophyllum</i>	Big leaf avens	H - R	2	No	Low	Low	Tolerant	Mod.	Mod.	793,706	93	88	S	
<i>Geum triflorum</i>	old man's whiskers	H - R	1.5	No	High	None	Intermed.	Short	Mod.	449,554	90	–	BR, S, Sp	
<i>Gilia capitata</i>	bluehead gilia	H - MS	3	No	High	None	Intolerant	–	–	–	80	98	S	
<i>Heracleum maximum</i>	common cowparsnip	H - MS	8	No	Low	Med.	Intolerant	Short	Low	47,569	–	–	S	Synonym: <i>Heraculem lanatum</i>
<i>Ipomopsis aggregata</i>	scarlet gilia	H - SS		No	High	Low	Intolerant	Mod.		450,008	75	90	S	
<i>Linum lewisii</i>	Lewis flax	H - B	2.5	No	Med.	None	Intolerant	Mod.	High	294,848	80	99	S	
<i>Lotus nevadensis</i>	Nevada bird's-foot trefoil	H	1	Yes	Med.	Low	Intermed.	Short	–	–	–	–	S	
<i>Lotus unifoliolatus var. unifoliolatus</i>	American bird's-foot trefoil	H	1	Yes	Med.	Low	Intermed.	–	High	–	–	–	S	Synonym: <i>Lotus purshianus</i>

TRPA APPROVED PLANT SPECIES ATTRIBUTES TABLE ¹

Scientific Name ^{2,3}	Common Name	Growth Form ⁴	Mature Height (feet)	Nitrogen Fixation	Drought Tolerance ⁵	Saturation Tolerance ⁵	Shade Tolerance ⁵	Lifespan ⁵	Fire Hazard	Seed (Bulk per Pound)	Germination (% Typical)	Purity (% Typical)	Plant Material Type ⁶	Notes
<i>Lupinus argenteus</i>	silvery lupine	H - MS	1.5	Yes	Med.	None	Intolerant	Short	High	126,000	65	98	Cnt, S	
<i>Lupinus fulcratus</i>	greenstipule lupine	H - SS	2.5	Yes	High	None	Intermed.	–	–	–	–	–	S	
<i>Lupinus grayi</i>	Sierra lupine	H - MS	1	Yes	High	None	Intolerant	–	–	–	–	–	S	
<i>Lupinus lepidus</i>	Pacific lupine	H - MS	6	Yes	High	None	Intolerant	Short	Mod.	16,000	63	87	Cnt, S	
<i>Lupinus polyphyllus</i>	bigleaf lupine	H - SS	5	Yes	Low	High	Intermed.	–	Low	–	95	99	S	
<i>Mertensia ciliata</i>	tall fringed bluebells	H - R	2	No	Low	Med.	Intermed.	Mod.	Mod.	225,000	–	–	BR, Ct, S	
<i>Mimulus cardinalis</i>	Scarlet Monkey Flower	H - R	2.5	No	Low	Med.	Tolerant	Mod.	Mod.	4,000,000	–	–	BR, Cnt, S	
<i>Mimulus guttatus</i>	Common Monkey Flower	H - R	2.5	No	None	Med.	Tolerant	Short	Mod.	4,000,000	80	70	S, Sp	Seed purity varies considerably.
<i>Nasturtium officinale</i>	watercress	H - R	4	Yes	None	High	Intermed.	–	–	–	–	–	S, Cnt	Synonym: <i>Rorippa nasturtium-aquaticum</i>
<i>Osmorhiza occidentalis</i>	western sweetroot	H - SS	4	No	High	None	Tolerant	Mod.	Low	29,845	–	–	S	
<i>Oxyria digyna</i>	Alpine mountainsorrel	H - SS	1	No	Low	Low	Intermed.	Mod.	High	1,343,195	–	–	S	Talus, rocky alpine slopes only
<i>Paeonia brownii</i>	Brown's peony	H - SS	1.5	No	Med.	None	Intermed.	Mod.	High	–	40	95	Cnt	
<i>Pedicularis groenlandica</i>	Elephant Heads	H - SS	2.5	No	Low	Med.	Intermed.	Short	Low	175,000	NA	–	BR, S	
<i>Penstemon rydbergii</i>	Rydberg's penstemon	H - B	3	No	Low	None	Intolerant	Mod.	Mod.	131,900	90	75	S	
<i>Penstemon speciosus</i>	royal penstemon	H - MS	2.5	No	High	None	Intolerant	Long	Mod.	400,000	85	85	S	
<i>Phacelia ramosissima</i>	branching phacelia	H - MS	5	Yes	Med.	Med.	Intermed.		Mod.	–	–	–	S	
<i>Potentilla fruticosa</i>	shrubby cinquefoil	H - MS	2.5	No	Low	None	Intermed.	Long	High	1,000,000	–	–	BR, Cnt, S	
<i>Potentilla glandulosa</i>	sticky cinquefoil	H - R	1.5	No	Low	Low	Intermed.	Mod.	High	2,969,000	–	–	BR, S	
<i>Potentilla gracilis</i>	slender cinquefoil	H - MS	2.4	No	Med.	None	Intolerant	Mod.	High	1,711,698	92	84	BR, S	
<i>Ranunculus occidentalis</i>	western buttercup	H - St	1	Yes	Med.	Low	Intermed.	–	–	–	–	–	S	
<i>Rumex salicifolius</i>	willow dock	H - SS	2	No	Med.	High	Intermed.		High	–	–	–	S, Cnt	
<i>Solidago canadensis</i>	Canada goldenrod	H - R	3.5	No	Med.	Med.	Intolerant	Long	Low	4,600,000	–	–	BR, S, Sp	
<i>Symphotrichum spathulatum</i> var. <i>spathulatum</i>	Western mountain aster	H - R	2	No	Med.	Med.	Intolerant	–	Mod.	–	–	–	Cnt	
<i>Thalictrum fendleri</i>	Fendler's meadow-rue	H - MS	2	No	Med.	Med.	Intermed.	–	Low	–	97	–	Cnt	
<i>Urtica dioica</i> ssp. <i>holosericea</i>	stinging nettle	H - MS	3	No	Med.	Med.	Intermed.	–	Low	2,386,920	–	–	S	Stinging hairs
<i>Wyethia mollis</i>	woolly mule-ears	H - B	2.5	No	High	None	Tolerant	Long	Low	25,000	78	94	S	Seed viability varies considerably
Trees, Shrubs, and Subshrubs														
<i>Acer circinatum</i>	vine maple	T, S, V - SS	20	No	Low	None	Tolerant	Long	Low	4,620	19	–	BR, S	
<i>Acer glabrum</i>	Rocky Mountain maple	T, S - MS	30	No	Med.	Low	Intermed.	Mod.	–	13,663	–	–	BR, Cnt, Ct, S	Branches prone to crack and/or break from snow load.
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder	T, S - TF	20	Yes	Low	High	Intermed.	Mod.	–	675,000	45	–	BR, Cnt, S	
<i>Amelanchier alnifolia</i>	western Serviceberry	T, S - MS	15	No	Low	None	Intermed.	Short	–	60,051	66	98	BR, Cnt, Ct, S	
<i>Amelanchier utahensis</i>	Utah serviceberry	T, S - MS	15	No	High	None	Intermed.	Long	–	25,800	–	–	Cnt, S	

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Scientific Name ^{2,3}	Common Name	Growth Form ⁴	Mature Height (feet)	Nitrogen Fixation	Drought Tolerance ⁵	Saturation Tolerance ⁵	Shade Tolerance ⁵	Lifespan ⁵	Fire Hazard	Seed (Bulk per Pound)	Germination (% Typical)	Purity (% Typical)	Plant Material Type ⁶	Notes
<i>Arcotsaphylos nevadensis</i>	pinemat manzanita	S, Sb - St	2	No	High	None	Tolerant	Long	–	37,000	–	–	Cnt	
<i>Arctostaphylos patula</i>	greenleaf manzanita	S - MS	6	No	High	None	Intermed.	Long	High	18,000	20	–	Cnt	
<i>Arctostaphylos uva-ursi</i>	bearberry	S, Sb - MS	0.5	No	High	None	Intermed.	Long	–	42,400	60	95	BR, Cnt, Ct	
<i>Artemisia tridentata ssp. vaseyana</i>	mountain big sagebrush	T, S - MS	7	No	Med.	None	Intolerant	Long	High	1,973,117	–	14	BR, Cnt, S	Seed viability varies considerably.
<i>Calocedrus decurrens</i>	incense cedar	T - SS	100	No	Med.	None	Intermed.	Long	High	14,400	–	–	BR, Cnt, Ct, S	
<i>Ceanothus cordulatus</i>	whitethorn	S - MS	8	Yes	High	None	Intolerant	Long	–	166,000	70	98	Cnt	
<i>Ceanothus prostratus</i>	prostrate ceanothus, squawcarpet	S, Sb - Tf	0.5	Yes	High	None	Tolerant	Long	–	41,000	92	–	Cnt	
<i>Ceanothus velutinus</i>	tobaccobrush	T, S - Tf	10	Yes	Low	None	Intolerant	Mod.	High	107,919	75	–	Cnt	
<i>Cercocarpus ledifolius</i>	curl-leaf mountain mahogany	T, S - MS	20	Yes	High	None	Intermed.	Long	High	50,916	55	90	BR, Cnt, S	
<i>Chrysolepis sempervirens</i>	chinquapin	S - SS	15	No	Med.	None	Intermed.	Long	High	700	30	–	Cnt	Seed purity is high.
<i>Cornus sericea</i>	redosier dogwood	T, S - MS	12	No	Low	High	Intolerant	Long	–	18,400	57	95	BR, Cnt, Ct, S	Includes <i>Cornus sericea ssp. occidentalis</i> and <i>C. sericea ssp. sericea</i>
<i>Ericameria nauseosa</i>	rubber rabbitbrush	S, Sb - MS	4	No	High	None	Intolerant	Long	High	652,500	–	25	BR, Cnt, S	Synonym: <i>Chrysothamnus nauseosus</i> ; seed viability varies considerably.
<i>Eriogonum nudum</i>	naked buckwheat	Sb, H - MS	1	No	High	None	Intolerant	–	–	–	20	80		Seed viability varies considerably.
<i>Eriogonum umbellatum</i>	sulphur-flower buckwheat	S, Sb - MS	1	No	High	None	Intolerant	Long	–	209,500	30	60	BR, Cnt, S	Seed viability varies considerably.
<i>Holodiscus discolor</i>	oceanspray creambush	S - MS	12	No	Low	Med.	Intolerant	Mod.	–	5,307,000	84	–	BR, Cnt, Ct, S	
<i>Juniperus occidentalis</i>	western Sierra or Sierra juniper	T - SS	33	No	High	None	Intolerant	Long	High	11,930	–	–	BR, Cnt, Ct, S	
<i>Lonicera involucrata</i>	twinberry	S - SS	10	No	Low	Low	Tolerant	Long	–	343,500	83	–	BR, Cnt, Ct, S	
<i>Mahonia aquifolium</i>	Oregon Grape	S, Sb - R	8	No	High	None	Tolerant	Long	Low	33,000	83	–	BR, Cnt, Ct, S	
<i>Penstemon deustus</i>	hot-rock penstemon	Sb, H - MS	2	No	High	None	Intolerant	Long	Low	400,000	85	35	S	
<i>Penstemon newberryi</i>	mountain pride	Sb, H - St	1	No	High	None	Intermed.	Long	Low	1,500,000	60	20	BR, Cnt, S	
<i>Pinus contorta var. murrayana</i>	Sierra lodgepole pine	T - SS	99	No	Low	Low	Intolerant	Long	High	94,000	–	–	BR, Cnt, Ct, S	Invasive of wet meadows
<i>Pinus flexilis</i>	limber pine	T - SS	66	No	High	None	Intolerant	Long	High	4,400	–	–	BR, Cnt, S	Subalpine sites only
<i>Pinus jeffreyi</i>	Jeffrey pine	T - SS	180	No	Med.	None	Intolerant	Long	High	3,200	90	–	BR, Cnt, Ct, S	
<i>Pinus monticola</i>	western white pine	T - SS	200	No	Low	None	Intermed.	Long	High	27,040	–	–	BR, Cnt, Ct, S	
<i>Pinus ponderosa</i>	Ponderosa Pine	T - SS	223	No	High	None	Intolerant	Long	High	12,000	75	–	BR, Cnt, S	
<i>Populus balsamifera ssp. trichocarpa</i>	black cottonwood	T - SS	100	No	Low	Med.	Intolerant	Mod.	–	–	–	–	BR, Cnt, Ct, S	Synonym: <i>Populus trichocarpa</i>
<i>Populus tremuloides</i>	quaking Aspen	T - SS	65	No	Low	Low	Intolerant	Short	Low	3,248,000	–	–	BR, Cnt, Ct, S	
<i>Prunus virginiana</i>	western Chokecherry	T, S - MS	25	No	Med.	Med.	Intolerant	Short	–	4,971	77	–	BR, Cnt, S	
<i>Purshia tridentata</i>	antelope bitterbrush	S - MS	6	Yes	High	Low	Intermed.	Long	High	17,193	80	99	BR, Cnt, S	

TRPA APPROVED PLANT SPECIES ATTRIBUTES TABLE ¹

Scientific Name ^{2,3}	Common Name	Growth Form ⁴	Mature Height (feet)	Nitrogen Fixation	Drought Tolerance ⁵	Saturation Tolerance ⁵	Shade Tolerance ⁵	Lifespan ⁵	Fire Hazard	Seed (Bulk per Pound)	Germination (% Typical)	Purity (% Typical)	Plant Material Type ⁶	Notes
<i>Quercus vaccinifolia</i>	huckleberry oak	S - TF	1.3	No	Med.	None	Tolerant	Long	High	1,030	43	–	BR, Cnt, S	
<i>Rhus trilobata</i>	skunkbush	S - R	4	No	Med.	None	Intermed.	Mod.	–	25,790	76	–	BR, Cnt, S	
<i>Ribes aureum</i>	golden currant	S - R	10	No	Med.	None	Intermed.	Long	–	268,545	63	–	BR, Cnt	Ribes species are alternate hosts for white pine blister rust, but are abundant in natural vegetation of the Lake Tahoe Basin.
<i>Ribes cereum</i>	wax currant	S - MS	3	No	High	None	Intolerant	Mod.	–	277,500	72	–	BR, Cnt, Co, Ct	See note for <i>Ribes aureum</i>
<i>Ribes montigenum</i>	gooseberry currant	S - MS	1	No	High	None	Intermed.	Mod.	–	163,798	20	–	BR, Cnt, Ct	See note for <i>Ribes aureum</i>
<i>Ribes nevadense</i>	Sierra currant	S - MS	6	No	Low	Med.	Intermed.	Long	–	391,000	87	–	BR, Cnt, Ct	See note for <i>Ribes aureum</i>
<i>Ribes roezlii</i>	Sierra gooseberry	S - MS	5	No	High	None	Intermed.	Long	–	236,000	87	–	BR, Cnt	See note for <i>Ribes aureum</i>
<i>Rosa woodsii</i>	mountain rose	S - R	3	No	Med.	None	Intermed.	Long	–	50,967	–	–	BR, Cnt, S, Sp	
<i>Rubus parviflorus</i>	thimbleberry	S - R	4	No	Med.	Low	Intermed.	Mod.	Low	204,000	–	–	BR, Cnt, S, Sp	
<i>Salix exigua</i>	narrow leaved willow	T, S - R	10	No	Med.	High	Intermed.	Mod.	–	1,000,000	83	–	BR, Cnt, Ct	
<i>Salix geyeriana</i>	Geyer's willow	T, S - TF	15	No	None	Low	Tolerant	Mod.	–	9,072,000	–	–	BR, Cnt, Ct, S	
<i>Salix lemmonii</i>	Lemmon's willow	S - MS	14	No	Low	Low	Intermed.	Long	–	–	–	–	BR, Cnt, Ct, S	
<i>Salix lucida ssp. lasiandra</i>	Pacific willow	T, S - TF	53	No	Low	High	Intolerant	Short	–	–	25	25	BR, Cnt, Ct, S, Sp	Synonym: <i>Salix lasiandra</i>
<i>Salix scouleriana</i>	Scouler's willow	T, S - MS	50	No	Med.	Med.	Intermed.	Mod.	–	6,500,000	95	–	BR, Cnt, Ct, S	
<i>Sambucus nigra ssp. cerulea</i>	blue Elderberry	S, T - MS	23	No	High	Med.	Intermed.	Mod.	–	197,590	33	–	BR, Cnt, S	The name <i>Sambucus mexicana</i> has often been misapplied to this plant.
<i>Sambucus racemosa</i>	red elderberry	S, T - MS	10	No	Med.	Med.	Intermed.	Mod.	–	200,000-300,000	47	–	BR, Cnt, Ct	
<i>Sorbus scopulina</i>	Greene's mountain ash	T, S - MS	12	No	None	Low	Intermed.	Mod.	–	144,000	–	–	BR, Cnt, Ct, S	
<i>Spiraea douglasii</i>	rose spirea	S - R	7	No	Med.	High	Intolerant	Long	–	1,030,400	–	–	BR, Ct, S	
<i>Spiraea splendens</i>	rose meadowsweet	S	3	No	Low	Med.	Tolerant	–	–	–	–	–	Cnt	
<i>Symphoricarpos mollis</i>	creeping snowberry	S	2	No	Low	Low	Tolerant	Long	–	–	–	–	Cnt	Vine-like stems take root

Sources: USDA 2011, *PLANTS Database* (nomenclature, growth form, mature height, nitrogen fixation, drought tolerance, saturation tolerance, shade tolerance, lifespan, and seed per pound); Jepson Herbarium 2011, *Jepson Flora Project* (nativity); J. Coubourn, B. Carlos, J. Christopherson, S. Donaldson, W. Johnson, R. Post, J. Skelly, and E. Smith, 2006, *Home Landscaping Guide for Lake Tahoe and Vicinity*, University of Nevada Cooperative Extension Educational Bulletin 06-01 (fire hazard); Brown and Caldwell, *Seed Clearinghouse*, 2011, C. S. Schopmeyer, technical Coordinator, 1974, *Seeds of Woody Plants in the United States*, Agriculture Handbook No. 450. Forest Service, U.S. Department of Agriculture, Washington D.C.; K. C. Vories, 1981, *Growing Colorado Plants from Seed: A State of the Art*, Intermountain Forest and Range Experiment Station, U.S. Department of Agriculture, Ogden, Utah; David Gilpin, Pacific Coast Seed, 2011, personal communication; and, Ed Kleiner, Comstock Seed, 2011, personal communication (seed viability and seed purity).

- Notes:**
- 1 – Availability changes frequently.
 - 2 – Nomenclature follows U.S. Department of Agriculture's PLANTS Database.
 - 3 – Names of nonnative species are displayed in bold font.
 - 4 – Growth form types are B = bunch, G = graminoid, H = herb/forb, MS = multiple-stem, R = rhizomatous, S = shrub, Sb = subshrub, SS = single-stem, St = stoloniferous, T = tree, TF = thicket-forming, and V = vine
 - 5 – Abbreviations are med. = medium, intermed. = intermediate, and mod. = moderate
 - 6 – Plant material types are S = seed, Ct = cutting, Cnt = container, BR = bare root, Tu = tuber, bu = bulb, Co = corm, Sp = sprigs, So = sod