

**Western Area Offices**

**Incline Village/Washoe County**

John Cobourn, Water Resource Specialist  
865 Tahoe Blvd., Suite 110  
P.O. Box 8208  
Incline Village, NV 89452-8208  
Phone: (775) 832-4144  
Email: cobournj@unce.unr.edu

**Reno/Washoe County**

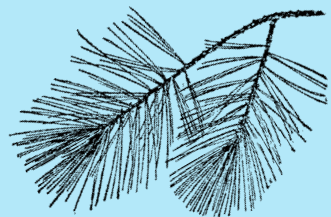
Kerrie Badertscher, Horticulturist  
Sue Donaldson, Water Quality Specialist  
5305 Mill St.  
P.O. Box 11130  
Reno, NV 89520-0027  
Phone: (775) 784-4848

**Douglas County**

Steve Lewis, Extension Educator  
Ed Smith, Natural Resource Specialist  
1329 Waterloo Lane  
Gardnerville, NV 89410  
P.O. Box 338  
Minden, NV 89423-0338  
Phone: (775) 782-9960

**Carson City/Storey County**

JoAnne Skelly, Extension Educator  
2621 Northgate Lane, Suite 15  
Carson City, NV 89706-1619  
Phone: (775) 887-2252



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# Home Landscaping Guide

for

# Lake Tahoe and Vicinity

## Home Landscaping Guide for Lake Tahoe and Vicinity

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Home Landscaping Guide for Lake Tahoe and Vicinity

## Acknowledgments

The authors wish to thank all the people and organizations who helped make this book a reality. A few of the major contributors are acknowledged below:

- ◆ **Reviewers.** We thank the reviewers for their painstaking efforts to improve the drafts of this publication. They include: Larry Benoit, Laird Blackwell, Pam Drum, Steve Goldman, Steve Harcourt, Jennifer Heath, Alan Heyvaert, Jon Hoefler, Michael Hogan, Jay Kehne, Lauri Kemper, Richard Kentz, Bob McDowell, John Pang, Dave Roberts, Jill Sarick, Jim Smitherman, Margaret Solomon, Jan Steinmann, Sherm Swanson, Paul Sweeney, Karen Terrill, Mark Walker, Bruce Warden, Daryl Witmore and Dan Yori.
- ◆ **Tahoe Regional Planning Agency.** We wish to thank the TRPA for their support from start to finish. In addition to Pam Drum, we received assistance from Marianne Boccuzzi, Jerry Dion, Brendan Ferry, Matthew Graham, Liz Harrison, Jesse Jones, Jon Paul Kiel, Joe Pepi, Doug Smith, Mike Solt, Jerry Wells and Birgit Widegren.
- ◆ **The Plant List Committee.** Thank you to the committee for devoting many hours to reviewing the TRPA Plant List. Its members include: Larry Benoit, Julie Etra, Michael Hogan, Wayne Johnson, Jenny Leach, Dick Post, JoAnne Skelly and Sara Trebilcock.
- ◆ **University of Nevada Cooperative Extension Staff and Former Staff.** Thank you to the following staff members who contributed to this project: Julie Bradt, Ella Chavez, Alice Good, Karen Hinton, Moureen Kiriaze, Heather Segale, Claudene Wharton and Greg Wilson.
- ◆ **Photographs.** Thanks to the following people who submitted photos: Laird Blackwell, John Cobourn, Michael Hogan, Wayne Johnson, Sven Krenvald, Christy Malone and Ed Smith.
- ◆ **Vendors.** We wish to thank Candice Kiel, the Write TYPE, for layout and design; Rick Cooper for graphics, and Bear Industries of Sparks, Nevada, for printing.

*Cover Photograph*  
by Imre de Pozsgay,  
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California Tahoe Conservancy .....	(530) 542-5580	<a href="http://www.tahoicons.ca.gov">www.tahoicons.ca.gov</a>
City of South Lake Tahoe Building Department .....	(530) 542-6010	<a href="http://www.cityofslt.us">www.cityofslt.us</a>
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El Dorado County Building Department .....	(530) 573-3330	<a href="http://www.co.el-dorado.ca.us">www.co.el-dorado.ca.us</a>
Lahontan Water Quality Control Board .....	(530) 542-5400	
Lake Tahoe Basin Management Unit, U.S. Forest Service.....	(530) 543-2600 ext. 0	<a href="http://www.fs.fed.us/r5/ltbmu">www.fs.fed.us/r5/ltbmu</a>
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.....		<a href="http://www.soils.usda.gov">www.soils.usda.gov</a>
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Tahoe Resource Conservation District.....	(530) 543-1501 ext.113	<a href="http://www.tahoercd.org">www.tahoercd.org</a>
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Nevada Division of Environmental Protection .....	(775) 687-4670	<a href="http://ndep.nv.gov">ndep.nv.gov</a>
Nevada Division of Forestry .....	(775) 849-2500	<a href="http://forestry.nv.gov">forestry.nv.gov</a>
Nevada Tahoe Conservation District .....	(775) 586-1610 ext.28	<a href="http://www.ntcd.org">www.ntcd.org</a>
Nevada Water Suppliers Association.....	(775) 832-1284	<a href="http://www.nevadatahoewater.org">www.nevadatahoewater.org</a>
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(material safety information, spills, leaks, etc.) .....	(800) 424-9300	<a href="http://www.chemtrec.com">www.chemtrec.com</a>
Tahoe Interagency Information Management System .....	(775) 588-4547 ext.208	<a href="http://www.tiims.org">www.tiims.org</a>
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University of Nevada Pesticide Information .....	(775) 784-1931	
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## Recycling and Household Hazardous Waste (See also Page 140)

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South Tahoe Refuse, South Lake Tahoe .....	(530) 541-5105	
Tahoe-Truckee Sierra Disposal, Tahoe City .....	(530) 583-0148	
WASTE NOT Hotline, Incline Village .....	(775) 831-8603	<a href="http://www.ivgid.org">www.ivgid.org</a>

►For Plant Materials, call a local nursery

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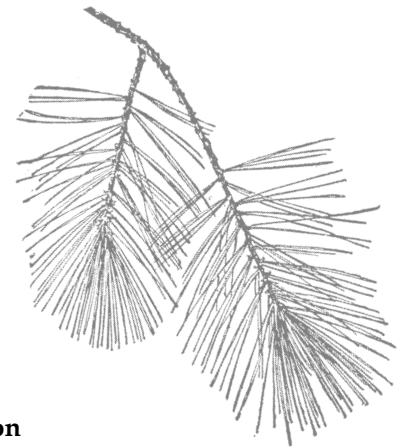
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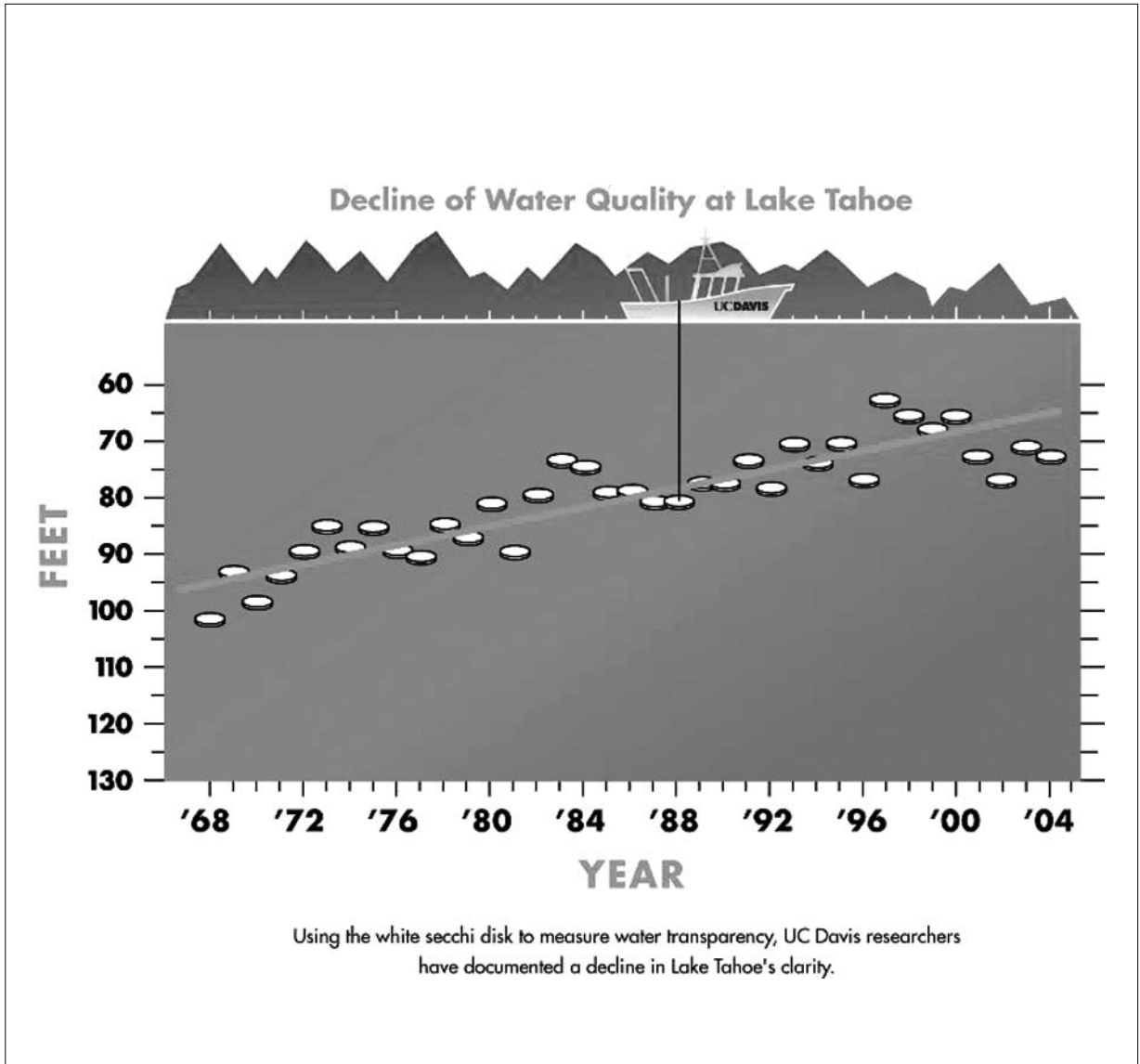
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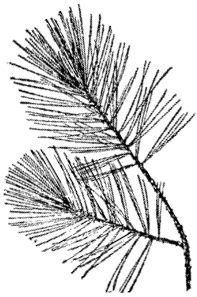


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*This graph shows the decline of lake clarity over time, measured as the depth at which scientists can see objects from a boat on the surface.*

# Develop great landscapes *and* improve water quality



*The Home Landscaping Guide for Lake Tahoe* has two primary objectives: to help you develop vibrant, healthy and low-maintenance landscapes, and to improve water quality within the basin, helping to preserve Lake Tahoe's unique clarity and beauty.

Landscaping at Lake Tahoe poses challenges not present in less extreme environments. If you want an attractive, functional landscape that is relatively fire-safe and environmentally friendly, you'll find this guide helpful. It applies to properties being landscaped for the first time and landscapes being renovated and improved. Whether you do the landscape design yourself or seek the advice of a professional depends on your expertise, budget and the amount of work you want to do.

*"A good design*

*incorporates a blend of solutions that meets all your needs and objectives"*

## **How the Lake interacts with its watershed and ecosystem**

Lake Tahoe's watershed is the natural drainage system that supplies the lake with water. From the high peaks and ridgelines all the way to the shore, rain and snowmelt flow in creeks or through the ground into the lake.

Water that is conveyed to a lake by an undisturbed watershed is usually quite pure, because the watershed's soils, plants and organisms act as a natural water purification system. In fact, in many undisturbed forests, more than 95 percent of rain and snowmelt percolates into the ground, where it is filtered on its way to the nearest stream.

The exceptional clarity of Lake Tahoe's water is a result of the relative absence of suspended sediment and free-floating, single-celled algae in the water. Very few plant nutrients are present in the water to feed algae. Given undisturbed conditions, the lake's water quality would be expected to change so slowly that the changes would be imperceptible over a human lifetime.

However, Lake Tahoe's water quality has deteriorated since settlers arrived in the mid-1800s. Its clarity has decreased by more than 33 percent since the 1960s. In 1968, scientists could routinely see objects lowered into the lake at depths of over 30 meters (100 feet). By the end of the twentieth century, they could see only about 20 meters (65 feet) into the lake's water. (See graph on facing page.)

Water quality deterioration has occurred primarily because we've disturbed the watershed by building roads and urban areas in the basin. The pavement, rooftops and other impervious (hard) surfaces we've created shed over 90 percent of all precipitation. Instead of being filtered by the soil, the water runs off the surface rapidly. Surface runoff typically concentrates in ditches and gullies, causing soil erosion. When these higher-than-natural flows reach streams, increased streambank erosion occurs.

The lake's natural biological cycle has been disturbed over the past 50 years due to these influences. Lake Tahoe suffers from increased loads of fine sediment and dissolved nutrients. The nutrient inflows, mostly phosphorus and

nitrogen, are literally fertilizers, which boost the growth of free-floating algae, diminishing water clarity. This process, called eutrophication, is accelerating from the increased input of nutrients.

This publication focuses on principles you can incorporate into your landscape management to simulate and restore its natural watershed characteristics. An important strategy for protecting Lake Tahoe is to create large areas of your property that absorb water from rain and snowmelt into the ground like a sponge. An attractive and functional landscape can be enjoyable, economical and environmentally friendly if you give a bit of forethought to its design, installation and maintenance. It also improves the value of your property.

### Elements of integrated landscape planning

Planning is the first step in creating a vibrant, healthy and environmentally sound landscape. Before turning any soil, draw a map of your property and come up with a vision of your fu-

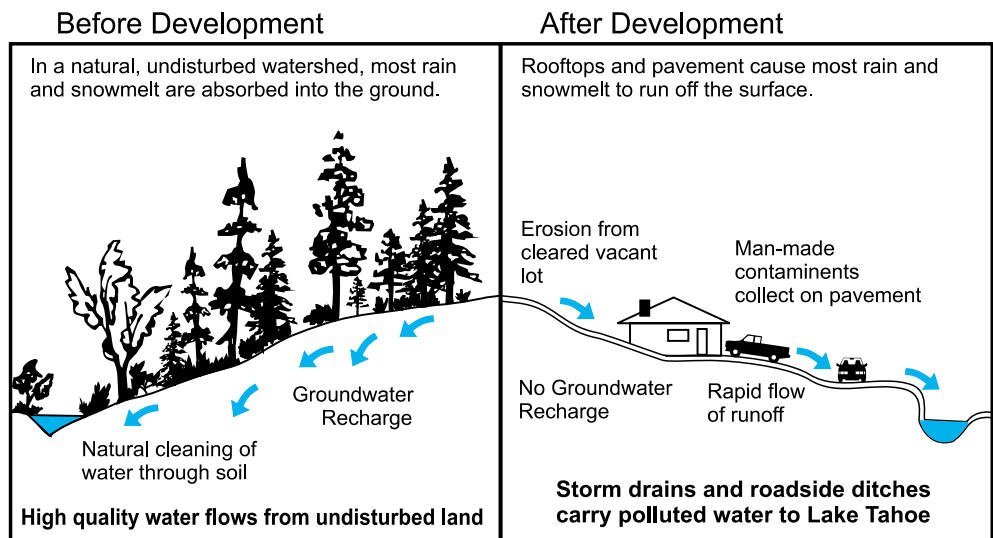
ture landscape. This is important whether you're starting with a new house or improving an existing landscape.

To achieve a satisfying, sustainable landscape design, incorporate the Guiding Principles of an Integrated Landscape (see facing page). An **integrated landscape** is one that is beautiful, functional, easy to maintain, environmentally friendly and relatively defensible from wildfire. The following chapters describe how to put these principles to work on your property.

During the planning and design phase, you have to make tough choices. For example, you might be accustomed to having a large lawn, but such a lawn would conflict with a desire for low maintenance or natural areas.

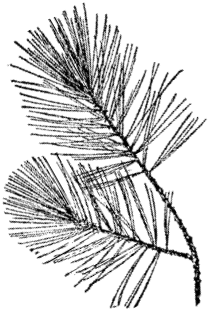
A good design incorporates a blend of solutions that meets all your needs and objectives. The design requires serious thought and a number of trial drawings, but the finished product will serve you and your family for many years to come.

*In many undisturbed forests, more than 95 percent of rain and snowmelt soaks into the ground. Pavement, rooftops and other hard surfaces cause water to run off the surface rapidly, carrying soil particles and other contaminants into nearby streams and eventually to the lake.*





## AN OVERVIEW



## The Guiding Principles of an Integrated Landscape

### 1. Consider the characteristics of your site.

What makes it unique? Map out slopes, low spots, sunny and shady areas, soil characteristics, permanent access, drainage features, stream environment zones, microclimates and important vistas. (Chapter 1)

### 2. Design your landscape to meet your needs.

Your landscape plan may include walkways, private areas, views, storage areas, natural areas, lawn for play areas, gardens, etc. Experts on Lake Tahoe recommend low-maintenance landscaping that requires little fertilization. (Chapter 2)

### 3. Use erosion-control techniques to protect water quality.

Use vegetation and mulch to promote infiltration of rain and snowmelt into the soil. (Chapter 3)

### 4. Plan for efficient water use.

Decide which areas need irrigation and which do not. Determine the most efficient method to irrigate each area of your landscape. (Chapter 4)

### 5. Plan defensible space for fire safety.

Identify the wildfire threat to your property. Consider how you can make the house defensible for firefighters. Manage vegetation to reduce fuel in key locations. (Chapter 5)

### 6. Maintain your native vegetation and animal habitat through backyard forestry.

(Chapter 6)

### 7. Choose plants for aesthetics, seasonal color, water requirements, fire safety and other objectives to achieve both beauty and functionality.

(Chapter 7)

### 8. Learn how to plant and nurture new plants.

(Chapter 8)

### 9. Determine how to improve your soils.

(Chapter 9)

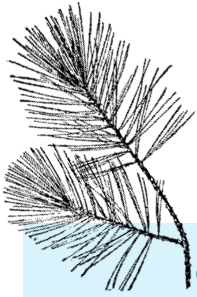
### 10. Plan ahead to minimize pesticide use by using Integrated Pest Management (IPM).

(Chapter 10)



*“An integrated landscape is one that is beautiful, functional, easy to maintain, environmentally friendly and relatively defensible from wildfire.”*





# Design According to Your Property's Natural Potential

## GUIDING PRINCIPLE #1

### Consider the Characteristics of Your Site

No matter where you live at Lake Tahoe, you are in a unique environment. At elevations above 6,000 feet, the growing season is short, soils are usually very shallow over rock, and most areas are heavily wooded. To get the most enjoyment from your land and minimize impact on the environment, consider the following factors:

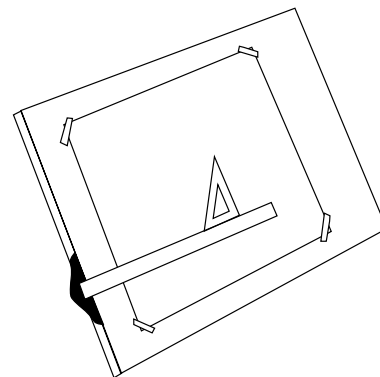
What do you have to work with? Are you renovating an older, established or overgrown landscape, or are you landscaping around a newly constructed house? What are the site's growing characteristics? Is the site sunny or shaded? Is the lot hilly or flat? How good is the existing soil? What is the wild-fire potential? How is the lot drained? Does runoff go into a roadside ditch or a nearby stream or wetland? Your landscape plan will be more successful if you design according to your property's natural potential.

project. The first is to measure or step off the various elements of your property and note the dimensions on a sketch you have made in rough form. This will form the basis of your planning. On the other hand, if you want everything precisely located, you'll want to make a more accurate map. To do this, start with a 100-foot tape measure, ruler, yardstick, string, string level, pencils and graph paper 2 feet wide and 3 feet long. Graph paper imprinted with 8 squares to the inch works well. You'll need a drawing board (a 1/8 inch piece of hardboard, 30 inches wide and 40 inches long with straight sides), T-square and tape. You can buy these from an art or office supply store. If you prefer, you can engage a landscape designer or engineer to create your plot plan.

## Start with a site inventory

Begin by making a sketch of your lot, called a **plot plan** or **site plan**. If your house is new, the plans will already include a site plan. Consider these factors in your plot plan: soils, topography, existing plants, footprint of the house, paved areas and other structures, access, views, areas subject to erosion, rights-of-way and sun exposure (see note).

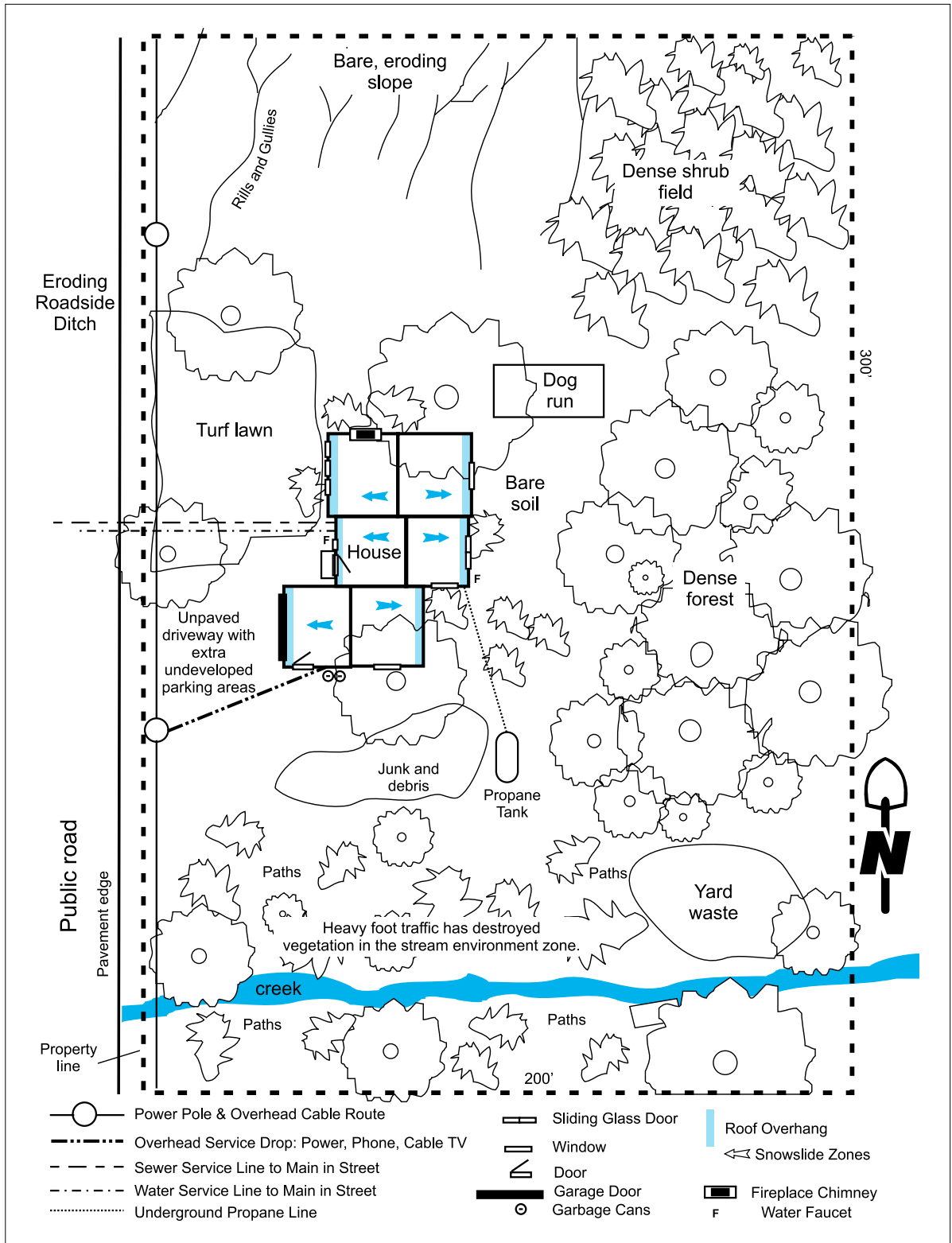
Your map must be accurate and to scale, and show the location of the house on the lot. A scale of 1 inch equals 8 feet works well for all but the largest sites. There are two ways to address this



*Mount the graph paper on the smooth side of the drawing board before drawing the site plan.*

Note: If Land Capability Verification (LCV) has been done through the Tahoe Regional Planning Agency (TRPA), the file will contain a plot plan showing any stream environment zone (SEZ) and required setback.

The north arrow helps you determine where the sun and shade are and how they change during the day.



The plot plan is a scale drawing that shows all characteristics of your property – structures, pavement, drainage features, vegetation and microclimates.

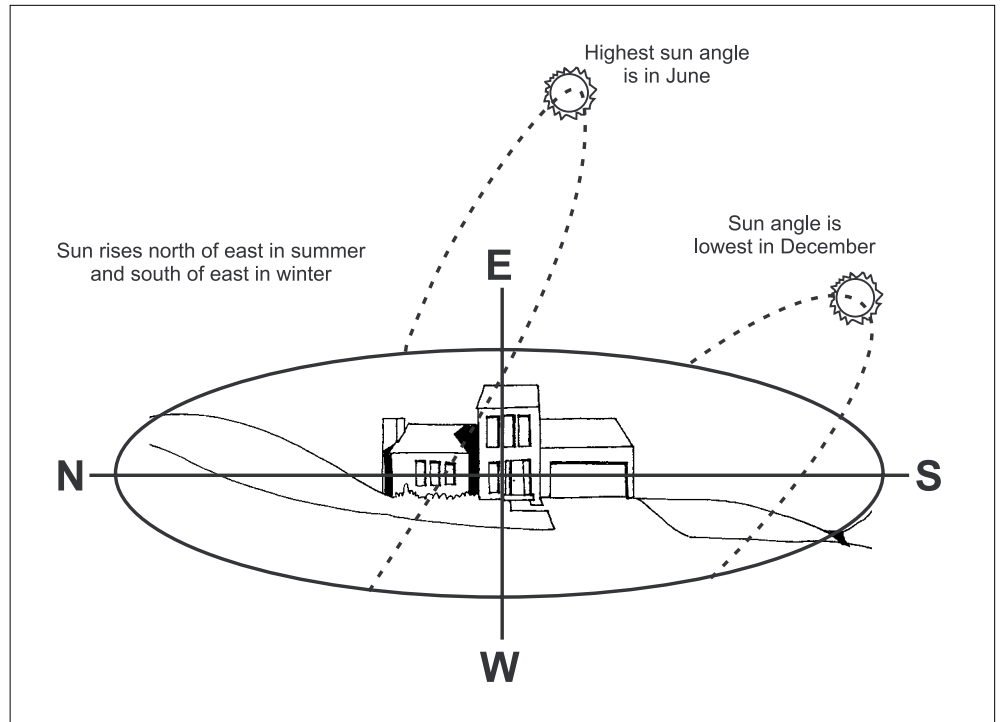
Note: A larger-than-average lot is shown in order to illustrate as many landscape features as possible.

Start with the boundary lines of the site and draw the footprint or outline of the house and any other structures. Include doors and windows, and note the height of the windows. This helps you select plants that will not cover the window when fully grown.

Draw the features of the site including walks, driveways, storage areas, decks, the street and public right-of-way. Show where surface runoff, such as a creek or roadside ditch, will enter your site, how it will cross or pass next to your site, and where it will exit. Note whether this drainage way shows signs of erosion.

Include the existing vegetation, as well as trees on neighboring lots that could affect your sun and shade. Draw the plants on your map using a symbol for each type of plant or tree. If there are boulders or rock outcrops, draw those in as well.

Note the location of hose faucets attached to the house or installed elsewhere, and the utilities coming into the house or crossing beneath the property. Draw the overhang of the roof to indicate where plants will be buried by snow sliding off the roof. Include the site exposure with a “north” arrow. This determines where the sun and shade are and how they’ll change during the day. You may have **microclimates** on your property such as warm, sunny spots and cool, shady areas. Note these.



*The south and west sides of your house generally create warm microclimates because of greater sun exposure.*

### Include key factors on your plot plan

**Stream environment zones (SEZs)** may be part of your property. These are streamside areas, wetlands or areas adjacent to the beach. Include them on your map, as they’ll influence how you construct and maintain your landscape. In fact, the TRPA prohibits new construction or landscaping within SEZs. (See Chapter 3.)

What is the elevation of your site? Elevation and proximity to the lake affect your growing season. The closer to the lake, the milder the climate and the longer the growing season. Conversely, the farther from the lake, and the higher in elevation above the lake, the more severe the weather/climate and the shorter the growing season. Glenbrook, located at lake level (6,229 feet), has a growing season of 188 days. However, at 7,000 feet, plants grow more slowly, the

season is shorter, and freezing may occur any time during the summer.

Include offsite factors such as neighbors' yards and the location of their homes. Do dog runs, storage sheds or boat storage areas need to be screened? Do trees on neighboring lots shade your site or enhance your landscape? Do you have a view you want to preserve?

Take photos of your property to match your inventory plan. It's a great way to document your landscaping progress.

### Evaluate your topography (slopes)

Show elevation contour lines in 2-foot intervals on your site plan (LCV maps may have these). Topography affects the construction of patios, decks, walkways and drainage and the need for retaining walls. It also affects defensible space—your plan to minimize flammable vegetation next to your home. If possible, install driveways parallel to contour lines.

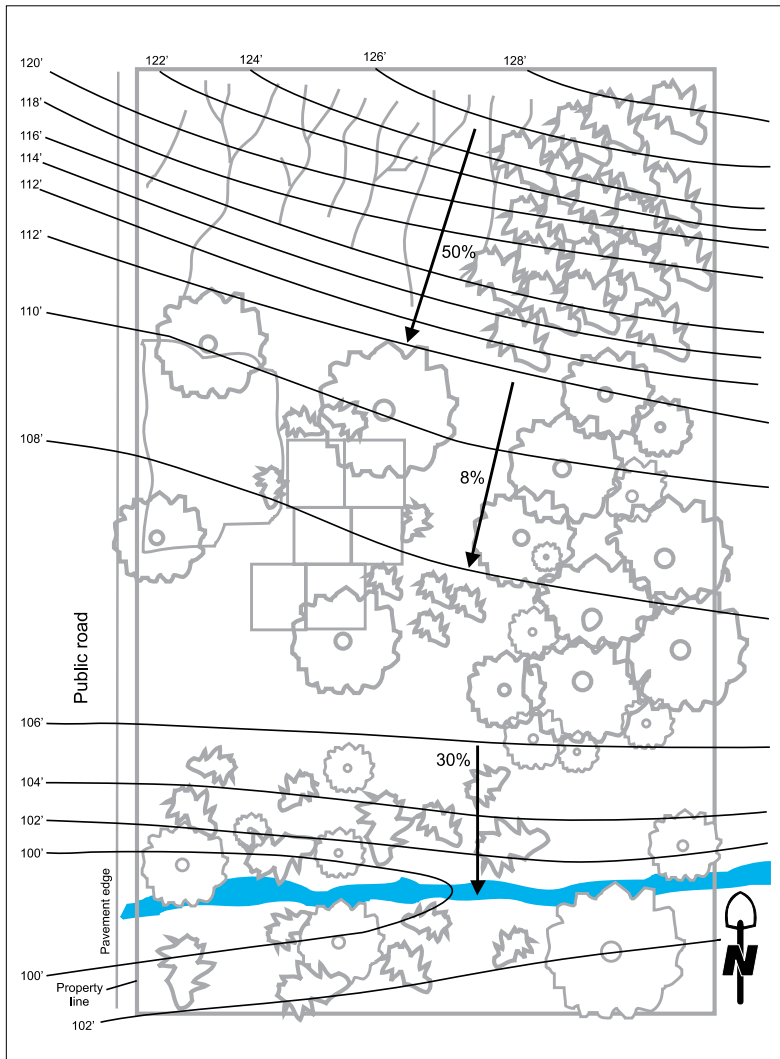
Show the downward direction of slopes with arrows indicating the steepness of the slope as a percent. Measure the grade using a string level and yardstick. A 20-percent grade indicates the ground falls or rises 2 feet for every 10 feet of travel. Note: Slope percent is different from slope angle in degrees, e.g., a 100-percent slope has an angle of 45 degrees from horizontal.

### Check your soils

The overall health of your plants depends on the soil. Knowing your soil type and its current condition helps you prevent erosion and determine the drainage for the site.

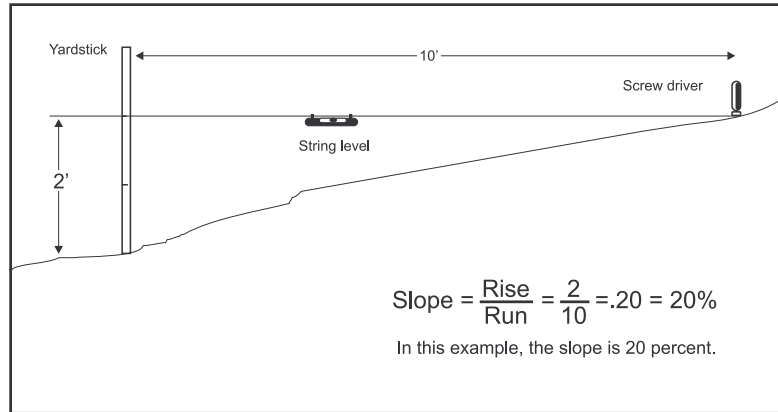
Check your site for soil compaction. Vehicles driven on the property, especially during the wet season, cause the soil to compress, eliminating beneficial soil pores. The soil near new houses was most likely compacted during construction. A simple test for soil compaction is to dig a hole. If it's difficult to drive the shovel more than an inch or two, you may have compacted soil.

Have your soil analyzed at a University of Nevada Cooperative Extension office for pH and salts. This helps you determine what soil "amendments" may be needed, and what plants will adapt to your soil type. A test of the mineral content can determine if some plants need fertilizer. Because the loss of Lake Tahoe's famed clar-



Show the steepness of each slope on your plot plan by drawing contour lines and arrows labeled with the percent slope.

ity is linked to the growth of algae, it's important for property owners to avoid excessive use of fertilizers. For more detailed analysis of soil properties, check out firms in the yellow pages for the Central Valley of California (in area codes 209 or 559) under "laboratories, soil." (See Chapter 9 for more discussion of soils and fertilization.)



*Measure the slope at various points on your property by using a 10-foot string and a yardstick*

### Map your vegetation

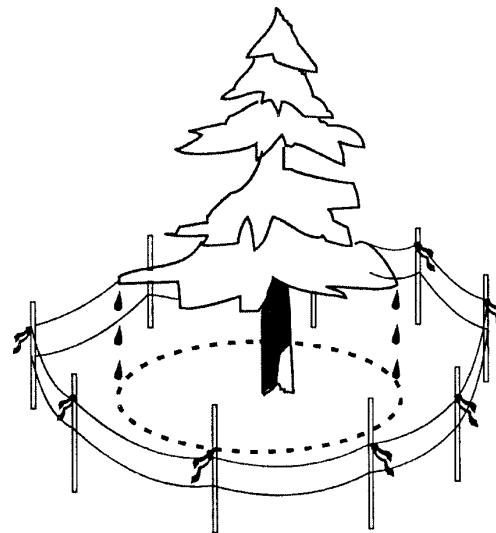
When you analyze the site, be sure to correctly identify your plant species. Preexisting plants indicate those that are best adapted to the site. If the site vegetation includes aspen, alders, willows, rushes and sedges, it's most likely a wetland or SEZ. If the vegetation is predominately Jeffrey pine and manzanita, the site is dry. You'll need irrigation to establish new plants and maintain ornamentals.

Engage an expert/professional (a certified arborist) to help you evaluate your existing plants. Are they located in a spot where they're an asset, or could they pose a problem? If trees, shrubs and other plants aren't healthy, mark them on the site plan for removal. Indicate plants that are potential fire hazards. (See Chapter 5 for a discussion of how to reduce hazards from wildfire.) Healthy trees are permanent features of the site unless they're on the house footprint or are a fire hazard. If you need to remove trees larger than 6 inches in diameter, you must obtain a Tahoe Basin Tree Removal Form from the Nevada Division of Forestry (NDF) or California Division of Forestry (CDF). (See Chapter 6 for tips on identifying and maintaining native vegetation.)

When you map the trees, show the area

needed for the root system, which extends far beyond the canopy of the tree. Run construction equipment no closer to the trunk than one and one-fourth times the radius of the tree's drip line. If the drip line extends out 20 feet, don't go any closer than 25 feet from the trunk of the tree. (See illustration.)

The tree footprint also shows where soil cuts can be made and fill placed without damage to existing trees, and where you could cover the site with topsoil. Most trees die if topsoil is put on top of existing soil covering the roots.



*Use boundary flagging and fencing to protect your tree's root system before construction starts. Put the fence 25 percent beyond the length of the tree's longest limbs.*

### Is a site assessment necessary?

Addition of impervious surfaces such as steps, walkways, decks, pavement and some retaining structures generally requires TRPA approval. (See box at right for specifics on determining “total allowable **land coverage**.”) If your landscape renovation involves addition of land coverage, call TRPA for a site assessment.

A site assessment may also be necessary if you have a SEZ on or adjacent to your lot. This includes channels that only carry water during winter or spring.

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### IMPORTANT!

#### Schedule Your Free BMP Site Evaluation

All owners of developed property in the Tahoe Basin are required to install best management practices (BMPs) on their properties to protect the lake’s water quality. Research shows that one of the main contributors to the pollution of Lake Tahoe is stormwater runoff from developed properties. If you own a single family residence, you can determine what priority watershed you live in and schedule a free “BMP Site Evaluation” by calling the Nevada Tahoe Conservation District or (for California) the Tahoe Resource Conservation District. If you own commercial or multi-family residential property, call TRPA’s Erosion Control Team for a free site evaluation. The phone numbers for these agencies are listed on the back inside cover of this book.

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### Additional Assistance

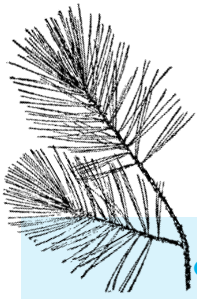
You can call the Nevada Tahoe Conservation District for Nevada and the Tahoe Resource Conservation District for California to create a conservation plan for your property. This plan can include recommendations for BMPs, invasive weeds, native vegetation, water and fertilizer management, and other natural resource issues.



### Tahoe Regional Planning Agency (TRPA) Regulations on Land Coverage

- ◆ Additions of decks, patios, driveways, walkways and other hardscapes to your landscaping result in what the Tahoe Regional Planning Agency calls “impervious land coverage” (coverage). It’s defined as structures and other coverings that compact the soil, prohibit water infiltration and prevent the growth of native vegetation.
- ◆ Additional coverage on residential property is regulated based on the environmental sensitivity of each parcel. Some lots in the Lake Tahoe region already have the maximum amount of coverage allowed under TRPA rules. In that case, the homeowner may be able to move existing coverage from one place to another in a landscape design, but cannot add new coverage.
- ◆ Some developed parcels may not be at the maximum allowable level of land coverage. In that case, homeowners can incorporate additional hardscape into their landscape design.
- ◆ To determine whether your parcel is at maximum allowable coverage, contact a TRPA planning technician at (775) 588-4547, or call your local city or county building department for a site assessment.
- ◆ Large landscaping projects that involve movement of more than 7 cubic yards of dirt also require a TRPA permit.
- ◆ Movement of between 3 and 7 cubic yards requires notification to TRPA that a “Qualified Exempt” activity is underway.
- ◆ Most residential landscaping projects will involve movement of less than 3 cubic yards of dirt, which is exempt from any permit or notification requirements (provided no new hardscape is added).





# Design for Function and Ease of Maintenance

## GUIDING PRINCIPLE #2

### Design the Landscape to Meet Your Needs

Consider the guiding principles of an integrated landscape (Page *v* in the Preface) in making a landscape plan. Be sure to incorporate all the functions and features you and your family desire. Design the landscape for ease of maintenance to minimize the time required for yard work. Draw all your design plans on paper.

Use what you've learned in Chapter 1 to incorporate the characteristics of your property to your advantage. Leave well-established native vegetation and natural sites undisturbed to reduce environmental contamination and preserve wildlife habitat. Protect these areas and individual trees during construction.

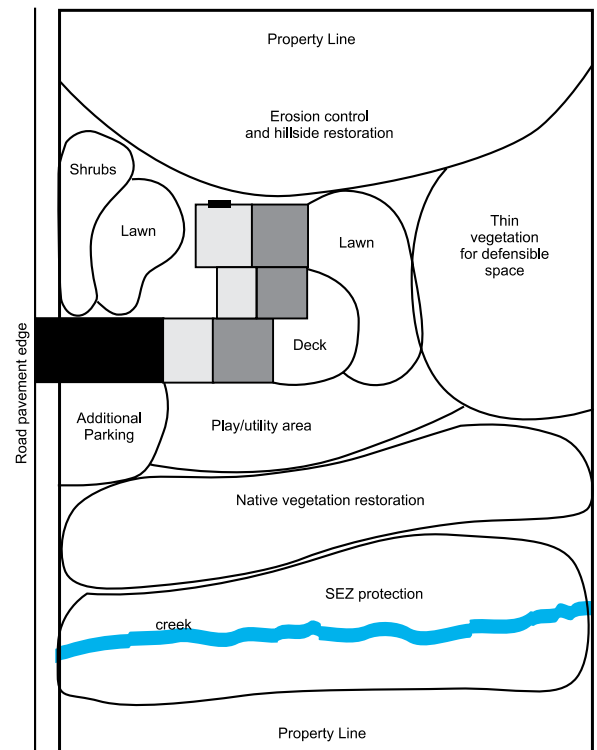
## Use appropriate landscaping

A landscape design that works in other parts of the country may not be suitable at Lake Tahoe. The climate, elevation and ecosystem differ from those of other areas, and regional objectives call for "environmentally friendly landscaping."

### Start with a list of ideas

Start by determining what you want the landscape to do for you. Consider room for entertaining or recreation, space for pets, gardening or

privacy. Your children may need a yard for play. Most likely, it'll be a combination of these. To get the process started, have each member of the household make a list of the things they want in the yard. Then as a group, narrow it down to those ideas that are most important. Next, take the short list and determine whether it's practical to incorporate the ideas into the landscape design. A bubble diagram, shown below, is helpful for this analysis.



*Draw bubble diagrams to determine how to use areas for different functions.*

“One of the goals of this guide is help your landscape design protect Lake Tahoe”

**Put your landscape plan on paper**

Begin your landscape plan by taping tracing paper over the plot plan you drew in Chapter 1. Since your plot plan already shows the physical features and structures on the site, experiment with what you want to change and what you want to keep. With Tahoe’s cold climate and soil erosion potential, keep healthy vegetation wherever it’s established unless it’s creating a hazard. One of the goals of this guide is to help your landscape design protect Lake Tahoe. We therefore urge you to incorporate **best management practices (BMPs)** into your plan. BMPs are practices that help reduce adverse impacts to water quality from human activities. The TRPA lists the landscape plan, or “development site plan,” as BMP #1 (see box) in its *Handbook of Best Management Practices*.

The TRPA’s regulations specify the maximum coverage on any lot as a function of the soil type, slope and other factors. On some sites only 20 or 25 percent coverage is allowed. Thirty percent is the maximum allowed on any site in the Tahoe Basin. (See Page 6.)

If you’re renovating an existing home landscape, healthy vegetation should generally be retained unless it poses a fire hazard next to your home. Place a piece of tracing paper over your plot plan and trace in the healthy, attractive, stable areas you want to keep. Plan your renovations in the spaces between these “constants.” Use several sheets of tracing paper, and keep trying new designs until you refine your plan.

Residents of Incline Village and Crystal Bay are required to submit a landscape plan to the county whenever they are renovating a landscape or irrigation system (see Page 40).

**Visit a demonstration garden**

There are currently two demonstration gardens at Lake Tahoe where you can obtain ideas for design and plant selection: 1) The North Lake Tahoe Demonstration Garden, at the Lake Campus of Sierra Nevada College on Country Club Boulevard, just below Highway 28 in Incline Village. Call the Nevada Tahoe Conservation District for details; and 2) The Lake Tahoe Demonstration Garden, at the Lake Tahoe Community College, at One College Drive off Al Tahoe Boulevard, in South Lake Tahoe. Call the Tahoe Resource Conservation District for details.

**A Basic Rule at Lake Tahoe**

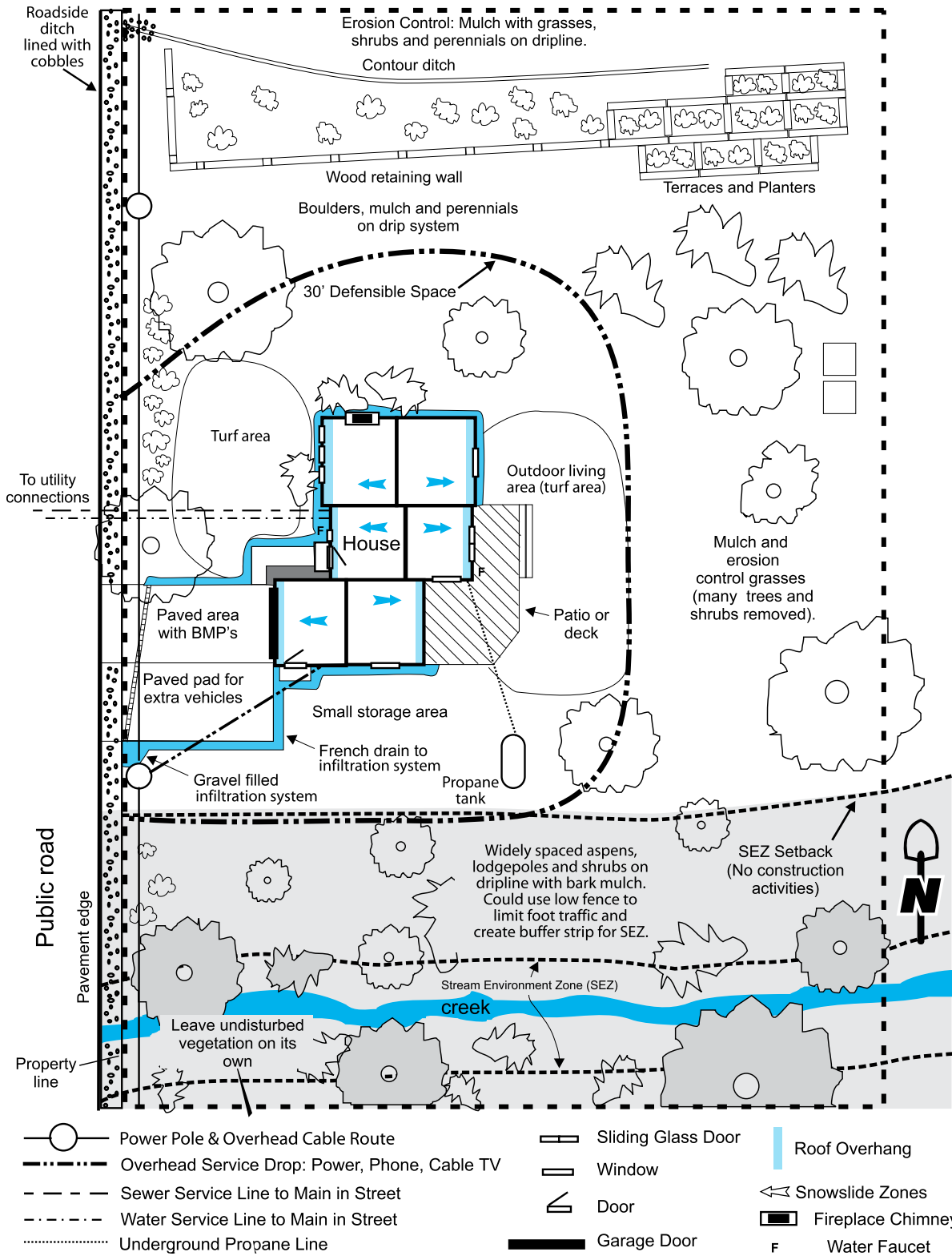
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**Development Site Plan**  
**TRPA’s Best Management Practice #1**

When developing or altering a site, TRPA requires that you minimize land disturbances.

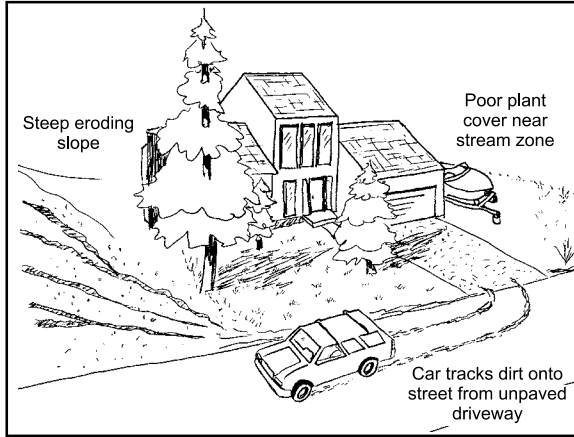
1. Minimize earth movement.
2. Minimize impervious coverage. Paved areas and structures may cover no more of the land than the percentage allowed by TRPA (never more than 30 percent).
3. Minimize vegetation removal.
4. Avoid disturbing steep slopes.
5. Align roads and driveways parallel to slope contours.

Retain the natural drainage system. Do not disturb stream environment zones.

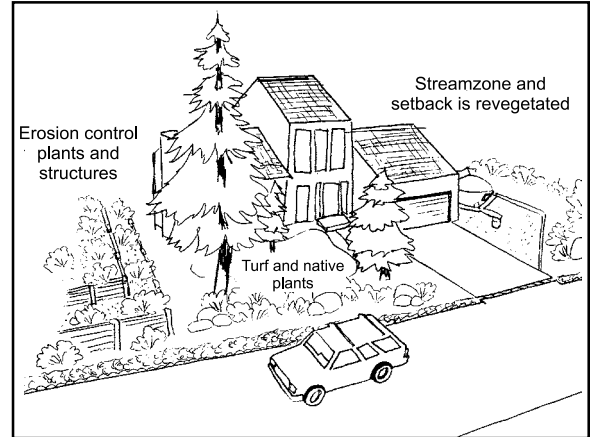


*This landscape plan illustrates how many of the problems shown in Chapter 1's Site Plan (see Page 2) are solved by incorporating best management practices (BMPs).*

*Implementing BMPs makes property more beautiful, increases its value and helps keep Lake Tahoe blue and clear.*



Before BMPs



Benefits of BMPs after a landscape renovation

## Design tips for creating a successful landscape plan

### 1. Pay careful attention to drainage to protect and conserve water resources

Incorporate BMPs to reduce the flow of polluted runoff from your property. Follow these rules for steep slopes and anywhere poor drainage occurs:

- ◆ The slope must be stable. Manage water draining from the slope by using vegeta-

tion or structural means. Construct infiltration systems to allow runoff water to soak into the soil. (See Chapter 3 for ways to keep slopes from eroding.)

- ◆ Plants should have strong rooting characteristics to help stabilize the slope. (See Chapter 7.)
- ◆ Use drip or micro-spray irrigation systems to prevent runoff and water pollution. Apply more water at the top of a slope than at the bottom, and use multiple watering cycles with short on times and one- to two-hour off times. This allows the water to soak into the soil without runoff. (See Chapter 4.)



Photo of the Peer residence

*This attractive rock staircase eliminates a sloping pathway that could become an eroding gully. Native plants and inorganic mulch (rocks) stabilize the slope.*

### 2. Never alter or disturb stream environment zones (SEZs)

The TRPA protects these zones. They include land adjacent to streams (whether wet or dry), wet meadows, wetlands and lake shore. They're important because plants that live in SEZs consume natural and man-made fertilizers in runoff. If excess nutrients like phosphorus and nitrogen are not filtered by SEZs, they flow into the lake and promote the growth of unsightly algae, clouding the lake's world-famous clarity. (See Chapter 3.)

**3. Limit hard surfaces in the landscape**

Hard surfaces (walks, decks, patios) and compacted areas (paths, parking, play areas) should be limited in size. Rooftops and paved areas create impervious surfaces that prevent precipitation from soaking into the ground. Since roof areas generally can't be reduced, limit other impervious areas by using porous pavements, nonsolid decking without a plastic or impermeable liner underneath and organic and inorganic mulches, such as shredded bark or gravel. Regardless of the treatment, the TRPA considers any deck, pathway or vehicle parking area that does not sustain vegetative cover as "land coverage" (see Page 6).

If you're building on a new site, design the access before construction starts, so equipment use is confined to the areas that will be covered by the driveway and the house. This minimizes

the effects of compaction on the roots of existing trees. Design the footprint of the structure and all hard surfaces to minimize disturbance of soil and native vegetation. Fence off and flag the undisturbed areas prior to construction.

**4. Examine your soil**

See Chapters 1 and 9 for tips on soil health.

**5. Select your plants.**

Choose plants that are adapted to each unique site on the property, keeping in mind the soil type, topography, potential flammability and climatic factors such as low temperatures, shading, snow loading, wind and exposure. (See the plant list in Chapter 7 for suggestions.)

**6. Shape appropriate turf areas.**

The lawn could be a small oasis near the home's entrance or a larger area for play. Turfgrass planted close to structures helps create defen-

*Create patios, decks and walkways that allow water to infiltrate into the ground. Cover the ground under decks with gravel mulch.*

Photos by John Cobourn



sible space, as discussed in Chapter 5. Avoid planting turfgrass on steep slopes. Instead, use ground covers or erosion control grasses that don't require mowing. (Chapter 3 covers other tips for landscaping steep slopes.)

**7. Irrigate efficiently**

To achieve a water-efficient landscape, design the irrigation system to suit the soil and plants in each hydrozone. Hydrozones are areas where the plants have similar water needs. If you have turf, irrigate it as a separate zone. Irrigate other landscape areas with drip emitters or micro-sprays. Run separate drip irrigation circuits to zones requiring water every two or three days or only weekly. Established native vegetation will not require an irrigation system.

(See Chapter 4 for more details on irrigation.)

**8. Use mulches**

Organic mulches such as bark chips, shredded bark, sawdust, pine needles, leaves and grass clippings reduce water evaporation from the soil, allow water to infiltrate and help control weeds. (See Chapter 9 for more information about mulches.)

Inorganic mulches are materials such as gravel, coarse sand and river rock. Use them in places where plants are not desired, such as storage and work areas. Planting beds or sculpted mounds covered with river rock, mulch or bark chips are attractive sites for flowers or shrubs individually watered by drip emitters.

*Choose a level of maintenance appropriate to the landscape setting and your resources, commitment and time available for gardening.*

Landscape Maintenance Chart		
Category	Description	Hours per month
High Maintenance Landscape <b>(Not Recommended at Lake Tahoe)</b>	Annuals, large lawns, hybrid tea roses, use of poorly adapted plants that don't like dry summers, non-hardy ornamental specialty plants. High maintenance plants needing meticulous trimming, hand watering or special fertilizers. A perfectly manicured landscape.	15 and up
Medium Maintenance Landscape	Some lawn, a few annuals. Some hand watering. Wide variety of native and exotic ornamentals. Neat, but not perfect.	6 - 15
Low Maintenance Landscape	No lawn or annuals other than drought-tolerant self-seeding wildflowers, hardy, pest-resistant native and adapted plants, water-efficient ornamental plants. Lots of mulches, automated drip irrigation, no hand watering. Annual addition of organic matter to feed the soil. A casual appearance. Much of lot left undisturbed, with only native vegetation.	2 - 6
Ultra-Low Maintenance Landscape	Once slopes are stabilized and native plants are established, the landscape needs no irrigation, fertilization or other maintenance except for annual defensible space work.	0 - 2

**9. Create defensible space**

To help make your home defensible from fires, flammable materials should be kept to a minimum for at least 30 feet from structures. (See Chapter 5.)

**10. Minimize maintenance**

Use pest-free plants. Gardening guides indicate whether a plant is “pest-free” or not. Limit flower beds and turf to areas near patios or decks where they’re easily seen and maintained. Add organic matter to soils before planting in order to reduce fertilizer needs later. (See Chapter 9.)

Heavily trafficked areas are almost impossible to maintain if they’re in grass or ground covers. Try placing paving stones among ground covers.

If your Tahoe property is a vacation home, you may want an ultra-low maintenance landscape. Once slopes are stabilized and all soil is vegetated with native plants, you will not need to irrigate, fertilize or mow a lawn. Your only maintenance will be annual defensible space practices, such as mowing grasses and forbs (small flowering plants) in September when they turn brown, and pruning and thinning vegetation as described in Chapter 5. Check the chart on Page 12 for maintenance needs. See Chapter 12 for landscape care tips and a calendar for monthly and yearly maintenance chores.

**Summary**

The integrated landscape begins with a plan that allows for future plant growth. It incorporates various uses of the yard, selects appropriate plants for each property zone, applies defensible space principles for fire safety, provides well-designed irrigation, drainage and water infiltration systems, allows access for ease of maintenance, and includes both hard and soft surfaces in the design.



Photo of the Horney residence



*Property owners who establish only native grasses, forbs, shrubs and trees have no maintenance chores except routine defensible space practices.*



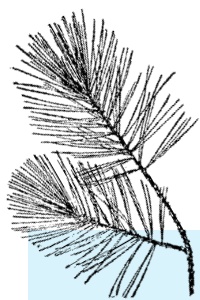
Photo of the Yori residence

*An integrated landscape combines limited turf areas with mulched beds where plants are irrigated using a drip system. The area near the house is defensible space.*

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PLACE HOLDER ONLY





# Protect Lake Tahoe with “Best Management Practices”

## GUIDING PRINCIPLE #3

### Use Erosion Control Techniques to Protect Water Quality

What we do in our landscapes has a huge impact on the future of Lake Tahoe. If we allow sediment, fertilizers, pet waste or other pollutants to run off properties into the lake, its beauty could be destroyed in our lifetime.

To keep Lake Tahoe clear and blue, everyone must prevent water pollution. Since household sewage is treated at plants and pumped outside the basin, the real concern is **nonpoint-source pollution** caused by activities at home, work and in our communities. This pollution comes from streets and properties rather than a single point, such as the discharge pipe of a factory or wastewater treatment plant. It all adds up, whether it's litter out of a car window, soil erosion or fertilizer that washes off a landscaped area.

The first line of defense against nonpoint-source water pollution, or polluted runoff, is to follow guidelines known as **best management practices**, or **BMPs**. The most challenging BMP at Lake Tahoe is erosion control. Erosion control BMPs should be used during landscape design and construction, and also for existing landscapes. This book explains how to implement BMPs as functional and aesthetic improvements to your landscape.

## How erosion hurts water quality

Soil erosion occurs when soil particles are detached and moved from their original location, usually by water, wind or gravity. Though soil erosion is a natural process, accelerated erosion caused by poor drainage, construction or other

human activity, causes serious environmental problems. Soil loss from your property makes it less attractive and less fertile. It also degrades water quality and fish habitat if the eroded soil finds its way into streams and to the lake.

During rainstorms, snowmelt or irrigation, flowing water moves eroded soil, called **sediment**. Moving water transports sediment to Lake Tahoe via ditches, creeks and storm drains.

Once in a creek or river, sediment buries aquatic organisms, smothers fish eggs, clogs fish gills and spawning gravels and muddies clean waters. Sediment also carries fertilizers, pesticides and other chemicals, any of which cause additional pollution concerns for the lake. Sediment, especially fine particles and dust, carries phosphorus, the key nutrient stimulating the growth of algae that clouds the lake's waters.

## Spot and correct erosion problems

Observe what happens during irrigation, a rainstorm or strong winds. Do you see muddy water flowing off your property or dust clouds carrying your soil away? If so, you have an erosion problem.

**Your soil, mulch and vegetation should be able to absorb rainwater, snowmelt and irrigation to prevent soil erosion. Ideally, you want your landscape to absorb all the water it receives, like a sponge. When water can't soak or infiltrate into your soil, it accumulates on the surface, then runs off, flowing downslope as a sheet, or thin film, taking soil with it.**

Small streams of water that cut separate channels, called rills, are greater threats. When rills merge, erosion potential increases. (See photo this page.) Rills or gullies that appear after rainstorms are clear evidence of soil erosion. So is the accumulation of soil at the bottom of slopes or in other low-lying areas.

**Use these BMPs to control erosion**

- 1 Vegetate and mulch bare soil.
- 2 Stabilize steep slopes with vegetation and structures.
- 3 Pave and properly drain unpaved driveways.
- 4 Collect and direct runoff from rooftops and pavement to shallow infiltration systems where the water can soak into the ground.

**1 Vegetate and mulch bare soil**

Completed BMP site evaluations recommend that property owners “vegetate and mulch all bare soil areas.” Research indicates that the most cost-effective way to protect Lake Tahoe is to keep soil in place on the landscape. It is the microscopic soil particles from erosion that do the most to reduce the lake’s clarity. Once they leave your property, it is practically impossible to prevent them from clouding the lake’s water.

Without a protective cover of vegetation, duff (decaying leaves and needles) or mulch, bare soil is vulnerable to raindrop impact and soil loss by wind and water. (See illustration below.) Cover all bare soil. Among the many options to prevent erosion are living ground covers (dense, low-growing plants) or physical covers, such as organic or inorganic mulches.

One easy way to protect the soil is to leave the bottom inch or two of decomposing pine needles in place instead of raking them each

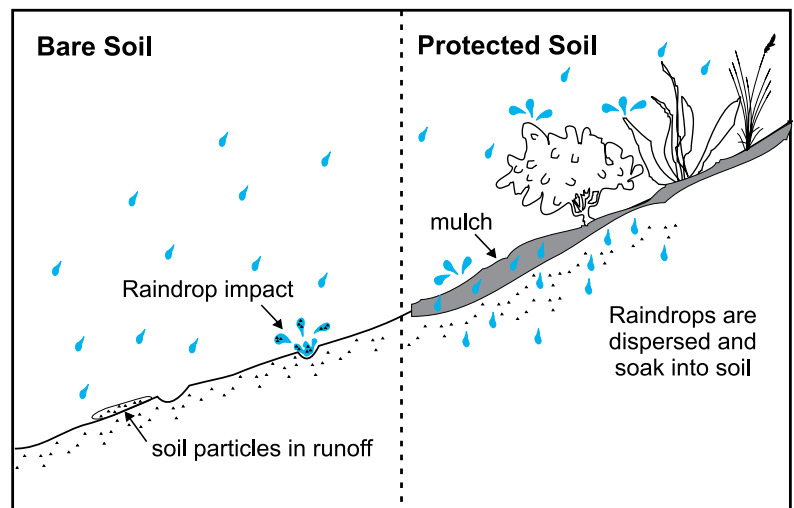


*Small channels that run down slopes after a rainstorm are an indication of “rill erosion.”*

year. Needles that are raked from rooftops and near structures can be composted briefly and then spread to a depth of 1 to 2 inches over bare soil on your property, providing a mulch that can develop into duff.

While soil loss can occur on level ground during high winds or floods, soil erosion is much more prevalent on unvegetated, sloping ground. Pay special attention to bare ground on slopes. As the diagram on Page 16 shows, the steeper the slope, the greater the challenge.

(Note: Vegetation and mulch are encouraged for bare soils except for the sandy beaches and dunes along the lake’s edge. These sandy “backshore” soils are naturally void of vegetation and should be left unaltered.)



*Prevent “raindrop impact” from washing away your topsoil. Cover the ground with pine needles, mulch, grasses or shrubs.*

## 2 Stabilize steep slopes with vegetation and structures

**Guidelines for stabilizing slopes of various steepness: (See illustration Page 19.)**

### On moderate slopes (less than 33 percent)

◆ Mulches, such as bark chips, wood chips, pine needles, river rock or stones, provide a good protective cover and can be an attractive component of your landscape. They're also useful as temporary ground cover until supplemental vegetation becomes established. Erosion control blankets and mats, such as coconut fiber blankets or jute netting, can provide short-term protection.

### On steep slopes of 33 to 50 percent

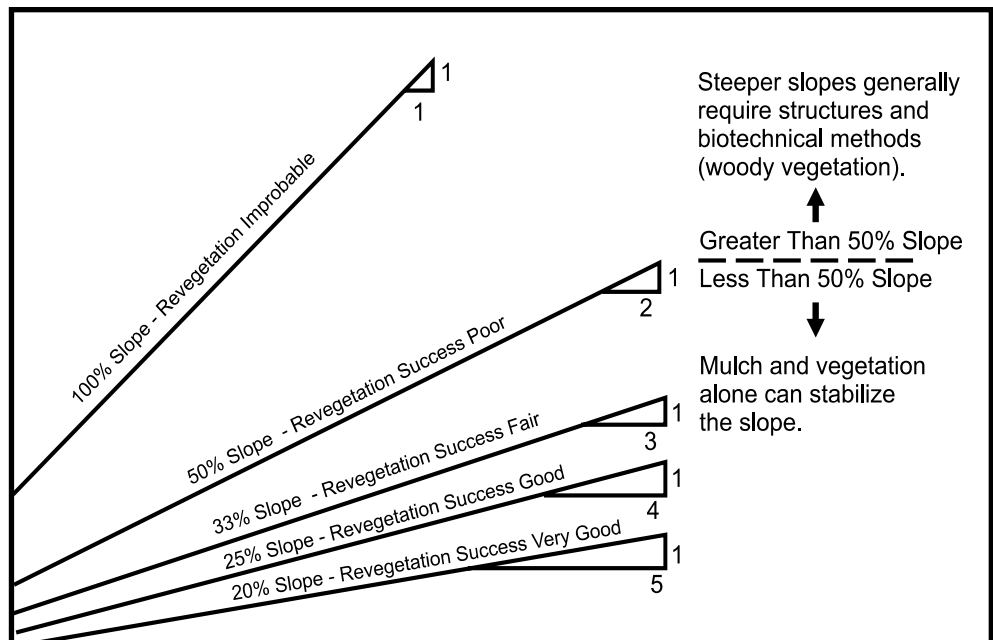
◆ Many plant species cover and protect the soil. Erosion control blankets and mats can be used while getting plants established. Once established, plants provide excellent long-term erosion control. Their roots knit together to hold

the soil in place. Their leaves, needles and twigs reduce the impact of rain and wind, and the organic matter they add to the soil improves water infiltration. A drip irrigation system provides slow delivery of water to plants, so water infiltrates with little or no runoff.

### On extremely steep slopes (greater than 50 percent)

◆ Terraces and retaining walls are used to reduce the gradient and provide level or gently sloping areas for establishing vegetation. Retaining walls and terrace walls are constructed with boulders, treated timber, bricks or interlocking concrete blocks. (Walls over 3 feet high must be designed by an engineer.) Biotechnical methods, such as willow wattling, incorporate fresh willow cuttings singly or in mats or bundles. Where these take root, soil erosion is greatly reduced.

*The steeper the slope, the more difficult it is to stabilize the soil and revegetate the area. (See slope measurement diagram on Page 5.)*



**Incorporate slope stabilization and other erosion control practices**

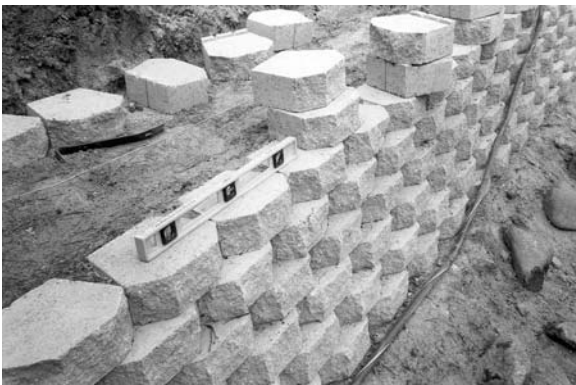
Combining erosion control practices is more effective on extremely steep slopes than applying a single practice. A retaining structure is a wall or other structure placed at the bottom of an extremely steep slope to prevent erosion. The use of native vegetation along the top and around retaining structures increases their effectiveness. (See biotechnical methods previous page.) Establishing vegetation (both grass seed and willow cuttings) along with riprap (a layer of rocks placed on an erodible surface) is another effective slope-stabilization technique.

Implementation of BMPs like those below may require a permit from the TRPA or your local building department, depending on the structure height and the amount of soil to be moved.



*Sven Krevold and Dan Sutton won TRPA's Landscape Design Award for this slope stabilization, revegetation and driveway paving project. (See close-up, Page 24.)*

Photos by John Cobourn



*Other common methods of slope stabilization include wood retaining walls, interlocking concrete blocks and riprap.*

**Methods to stabilize extremely steep slopes (greater than 50 percent or 30 degrees)****(Illustrated on Page 19.)****Terraces**

Many materials are available for building terraces. Treated wood is easy to work with, blends well with plants and is often less expensive than other materials. However, avoid railroad ties. They're not recommended in the basin due to their pollution potential from creosote. Interlocking concrete blocks are made specifically for walls and terraces and are more easily installed by a homeowner than other materials, such as fieldstone and brick.

The steepness of the slope dictates wall height. Make the terraces in your yard high enough so the land between them is close to level. This soil surface should be carefully revegetated. Be sure the terrace material is strong and anchored well to stay in place through cycles of freezing, thawing and heavy rainstorms. Large terraces should be tied back into the slope and properly drained. This takes expertise and equipment, so you may want to restrict the terraces you build to a foot or two in height. Get help from a professional to make sure higher walls stand up to the forces of gravity and water pressure in the soil.

**Wood retaining walls**

Wood retaining walls are used on slopes steeper than 50 percent slope or 30 degrees (two to one) and are often located between the base of a slope and an adjacent road, driveway or drainage way. Lumber and posts should be treated with an approved wood preservative (not creosote). Six-by-six-inch posts should be set in concrete at least 2 feet into the ground. The 2x12- or 3x12-inch planks should be placed on the uphill side of the posts, allowing space between planks to permit

drainage. As always, vegetation should be established on the slope above the wall.

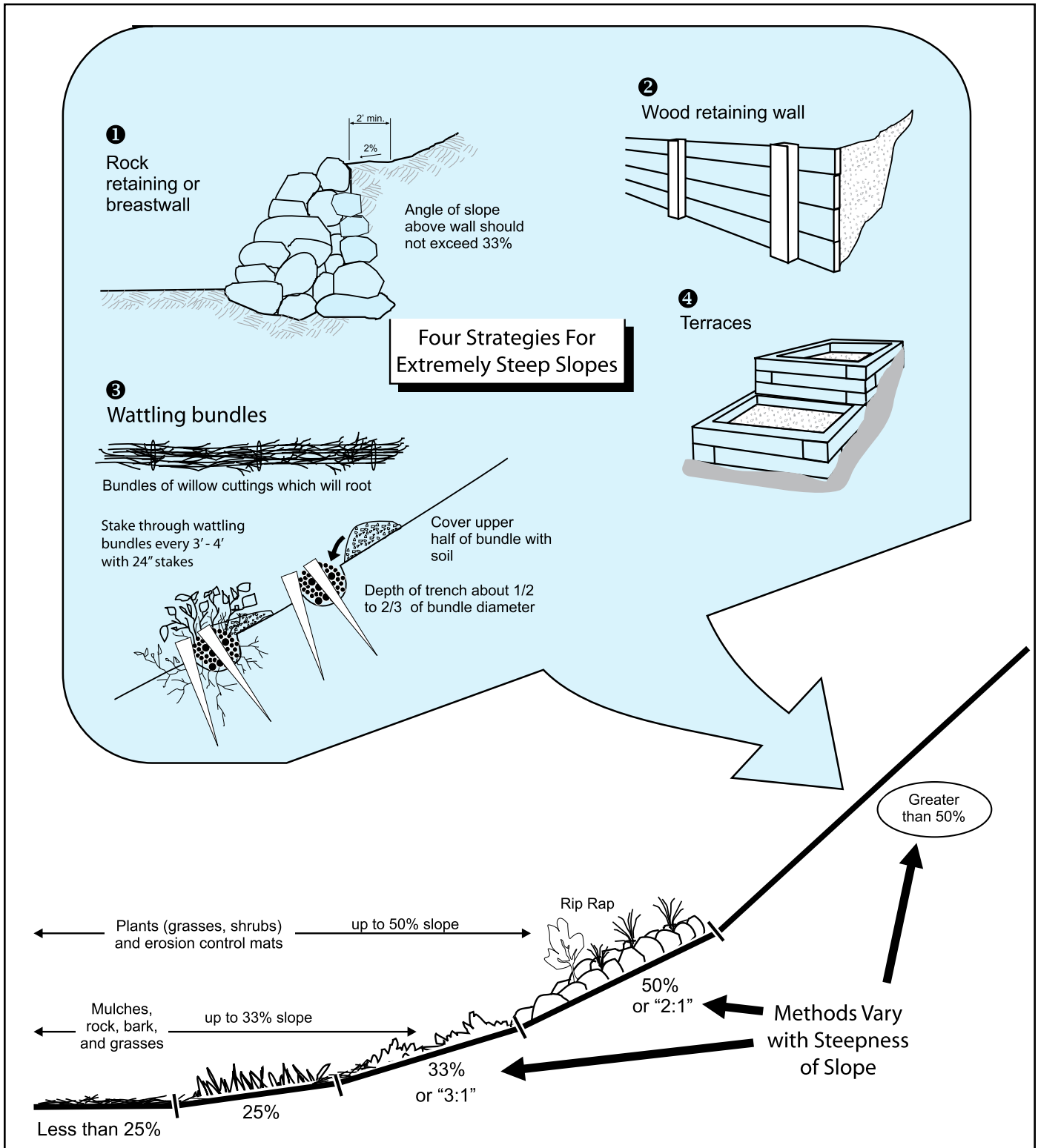
**Rock retaining walls or breast walls**

Breast walls are an alternative to wood retaining walls and are often used next to a roadway or drainage way. They are free-standing walls built from rock 10 inches to 2 feet in diameter. A footing trench is dug along the toe of the slope, and the largest boulders are placed in the trench. Subsequent rocks are laid with at least three bearing points on previously laid rocks. The external face of the wall should incline slightly uphill, though the wall itself is free-standing and does not lean. (See illustration.) As the wall is built, fill material is placed around and behind the rocks and packed in. Since the finished slope behind the wall will be flatter than before treatment, possibly a level terrace, it should be easier to establish all-important perennial plants on and above the wall.

**Willow wattling**

Wattling is the practice of placing long bundles of fresh willow cuttings into shallow trenches that have been dug along the contour lines of cut or fill slopes. Suitable shrub willows for cutting are common on public lands in wet areas, and sometimes in roadside ditches. Be sure to obtain permission from the landowner and TRPA before taking cuttings. Once these overlapping bundles, or "wattles," are staked into the slope and covered with topsoil, they intercept runoff and help infiltrate it into the soil. If the site is irrigated for the first few growing seasons, the willow branches will sprout and root, providing excellent vegetation cover.

### Stabilize Slopes to Prevent Erosion



*This diagram illustrates how methods used to control erosion vary with the steepness of the slope. While plants and mulch work well on moderate slopes, steeper sites generally require structural strategies as well.*

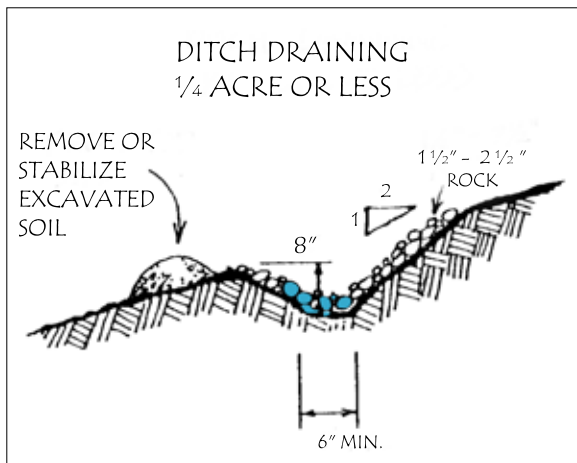
Wattling is an excellent example of integrated, biotechnical slope protection. It can be less costly than other structural techniques, but requires more care and maintenance. For a homeowner who enjoys a gardening challenge, wattling will yield rewards in appearance, wildlife habitat and erosion control.

An alternative to willow wattling is to purchase **fiber rolls** or fiber logs, composed of biodegradable fibers, which are installed in a similar manner. Since these don't sprout, they're more suitable for temporary use, stabilizing a slope while other vegetation becomes established. (See Page 25.)

**Contour ditches or waterbars**

Contour ditches (shallow channels running across the slope or along the contour line) help control erosion on slopes. They collect water running down the slope, slow its flow and discharge it to a lawn or a natural vegetated area. The slope of a contour ditch should be about 2 percent, and the outlet must discharge without causing erosion.

*A contour ditch collects water running down a slope and conveys it at a low velocity to a place where it percolates into the ground.*



Drawing by Steve Goldman and Ross Turner

**Beautify roadside ditches**

Roadside ditches are sometimes poorly vegetated, eroding gullies that can collect pollutants and carry them to the nearest stream. If your roadside ditch is unsightly and erodes during wet periods, consider installing erosion-control vegetation (such as grass or shrubs) or riprap to stabilize it and improve its appearance. Since the roadside ditch is usually in the road right-of-way, contact the local public works department if you want to improve and maintain the ditch. Application for an encroachment permit may be necessary.

*Below, eroding roadside ditches are unsightly and pollute Lake Tahoe; a rock-lined ditch controls erosion.*

Photos by John Cobourn



### 3 **Pave and properly drain unpaved driveways**

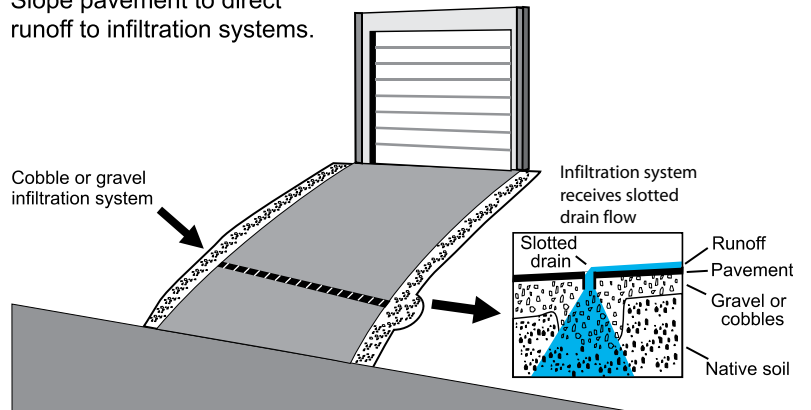
For driveways that are used year-round, paving is required. Here’s why:

- ◆ **Snow removal** – Every time you plow an unpaved driveway, soil is removed. When the pile of snow melts, the runoff takes soil with it to the nearest culvert or storm drain. Storm drain water from streets flows into the lake. Snow should never be plowed into a Stream Environment Zone (SEZ).
- ◆ **Tracking** – Every time you pull out of your unpaved driveway, your vehicle tires track dirt and mud into the street. (See illustration on Page 10.) The sediment eventually washes into storm drains and into the lake.
- ◆ **Erosion** – Unpaved driveways compact over time from the weight of vehicles parked on them, preventing infiltration of water. Water flows over the compacted parking surface instead of soaking into the ground, and erodes soil away, causing sedimentation downstream. One good storm can wash away much of your driveway, creating a constant maintenance headache and contributing to pollution.

A well-designed driveway is gently sloped and paved, and bordered by a shallow infiltration trench or infiltration swale. An out-sloped drive should have a slotted channel drain or swale installed across the width of it to collect and infiltrate runoff before it reaches the county or city right-of-way. (See diagram to see how a slotted drain works.) Paving is commonly asphalt or concrete. In sunny locations, asphalt absorbs heat and helps melt snow.

Paved driveways should be designed and installed by professionals. It is during the paving

Slope pavement to direct runoff to infiltration systems.



*Above, driveway runoff is directed to a slotted channel drain, which conveys water to an appropriately sized system for storage and infiltration. Note the rock borders along the driveway, which can infiltrate water and prevent soil and nutrients from moving onto the paved surface.*

planning process that the flow path of the runoff is determined. By grading the surface prior to paving it, the flow can be directed toward flat, well-vegetated areas, off one or both sides of the driveway, or to the location of an infiltration system. It should not be directed off the property or out toward the public right-of-way.

In the city of South Lake Tahoe and El Dorado County, contact the building department for a driveway paving permit. If your property is in Placer, Washoe or Douglas County, contact the TRPA.



**4 Direct runoff from roofs and pavement to shallow infiltration systems**

A shallow infiltration system is one of the most effective methods of controlling relatively clean runoff from residential rooftops and driveways. These systems collect runoff and store it until it's absorbed by the soil. Several types of shallow infiltration systems are shown on Pages 22-24.

**Shallow infiltration trenches** are useful as borders along paved areas (driveways and patios) and beneath the drip line of roof eaves. (See illustration.) They capture relatively clean runoff from roof gutters, downspouts and driveway runoff conveyance structures and allow the water to slowly infiltrate into the ground. Based on the characteristics of your property, such as slopes, rocks or tree roots, these trenches can be designed as linear or rectangular excavations.

Infiltration trenches can be filled with ¾- to 1 ½-inch diameter gravel or prefabricated infiltration units. The volume (and amount of excavation) can be greatly reduced by using prefabricated infiltration units instead of gravel

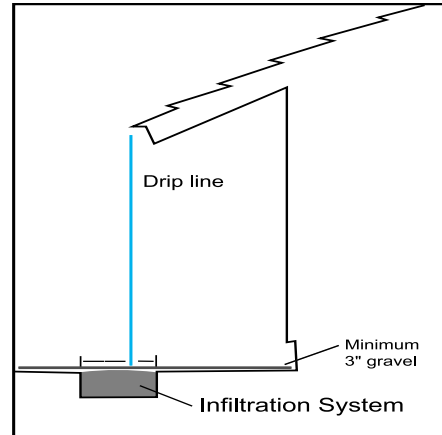
inside the trench. These units are essentially hard plastic honeycombs or porous boxes with filter fabric wrapped around their sides and top and covered with gravel or rocks.

Infiltration systems require periodic maintenance to remove sediment and debris. A sediment trap or clean-out device should be installed to prevent clogging of infiltration systems and to simplify maintenance.

It is best to make infiltration systems wider than they are deep. This allows more horizontal surface area for infiltration and more soil below to filter potential contaminants, protecting groundwater. The bottom of these systems must be level to ensure even spreading of water through the storage area and infiltration rather than the possibility of overflow.

Ground water is used as a source of drinking water in some parts of the Tahoe Basin. A BMP site evaluation is necessary to determine appropriate design and placement of infiltration systems to prevent contamination of ground water. A properly trained site evaluator will determine design parameters based on site characteristics

Photos by John Cobourn



*Roof drip line infiltration systems can vary from a thin layer of gravel mulch to a shallow trench filled with gravel or prefabricated infiltration units, depending on slope, soil type and roof dimensions.*

including slope, soil type and depth to ground water. Once an infiltration system is constructed, it is important to keep all pollutants out of and away from the system, so that ground water pollution does not occur. For more information on how you can prevent pollution of ground water, please refer to Pages 134-136 in Chapter 11.

► Design standards for shallow infiltration systems and other BMPs can change from year to year. Be sure to obtain a BMP site evaluation for recommendations on how to meet TRPA’s water quality protection requirements. (See Page 6.) You can view TRPA’s BMP requirements at: <http://www.trpa.org/documents/docdwnlds/ordinances/COCh25.pdf>

### Above ground infiltration systems

**Gravel mulch:** Also called inorganic mulch or gravel armor, gravel can be used to protect soil from erosion and promote infiltration into soils with rapid permeability. On such soils, install gravel mulch under the drip line to a minimum depth of 3 inches. This treatment must extend 6 inches inside the eave and a minimum of 12 inches beyond the eave of a single story roof, 18 inches beyond the eave of a two-story roof, and 24 inches beyond the eave of a three-story roof. This treatment prevents splash erosion and allows runoff to infiltrate without the requirement of additional infiltration systems. Gravel armor should also be placed under all decks.

**Vegetated drip line:** Homeowners can maintain mature, established vegetation in their roof drip lines (where water drips from the roof onto the ground). An example of this is a drip



*The overflow spillway of this infiltration basin is at the low point under the mature shrub.*

line covered with a thick mat of grass or low fire-hazard perennial plants.

**Water spreading:** Sheet flow over large flat vegetated or mulched areas is called water spreading. If runoff flows to a flat or gently sloping, well-vegetated or mulched area with little runoff potential, it will infiltrate naturally. This type of infiltration system should be used when soils are not compacted and have good infiltration capacity. A major advantage to using natural infiltration is that there is no excavation or soil disturbance. A flat lawn can be an ideal location for this practice. Conveyance structures are often necessary to redirect water as sheet flow away from foundations to well-vegetated areas with very little slope. Borders may be necessary to prevent water from running off the property (e.g., wood borders or vegetated berms).

**Infiltration basin:** An infiltration basin, also called a sediment basin, a detention basin or dry pond, is a shallow depression in the ground or an area with vegetated or rock berms, up to 2 feet deep, to store runoff water from rooftops and pavement. This practice allows the water to infiltrate, recharging the ground water and often restoring low flows to streams. Like all infiltration systems, basins and dry ponds need to be sized for the storage of the site’s runoff from a storm of one inch of rain in an hour, based on

the permeability of the soil on the site. Since it is a common practice to store snow in these basins, they should be designed with additional capacity so that rain-on-snow events are treated. Basins and dry ponds must have armored or well-vegetated spillways to allow safe overflow of water during extremely large runoff events. To minimize opportunities for breeding of mosquitoes, basins and swales should be designed to infiltrate water into the soil within 72 hours after a summer rainfall event.

**Vegetated or rock lined swale:** An open channel or linear dry pond designed to treat storm water runoff is called a swale. As storm water runoff flows into a channel or series of channels separated by low check dams, it is filtered by the vegetation in the channel, the sub-soil matrix, and infiltration into the underlying soils. Variations of swales include the grassed swale and the rock-lined swale, which can be designed to resemble a dry creekbed with check

dams to slow and pool the water. Ponds, basins and swales can all be shaped to meet the aesthetic desires of the owners. They should be inspected at least once a year, and sediment should be removed and stabilized on site. Enclosed swales must have armored or well-vegetated spillways to allow safe overflow of water during extremely large runoff events. A swale or basin that is installed below grade in a nearly level lawn does not need to have an armored spillway. When planted, these flat-bottomed basins are called “rain gardens.” To minimize opportunities for breeding of mosquitoes, basins and swales should be designed to infiltrate water into the soil within 72 hours after a summer rain.

**For more information about this topic:**

Call the Natural Resources Conservation Service Backyard Conservation Program, your Conservation District or the TRPA Erosion Control Team.



*This large grassed swale can infiltrate and filter runoff. It is easier to clean sediment out of basins and swales than from underground infiltration systems.*



Photos of the Kreveld residence

*A close-up of the retaining wall on Page 17 (top). The wall mechanically stabilizes the eroding cut slope. The roots of native daisies, columbines, lupines and delphiniums hold soil in place. A layer of organic mulch over the soil improves infiltration.*

### Minimize erosion on construction and grading sites with temporary BMPs

Most soil loss occurs when the terrain is disturbed. Construction activities, such as bulldozing, grading, contouring, vehicle parking and materials storage, disturb soil by removing vegetation and digging up stable soil layers. Disturbed soil is vulnerable to wind and water erosion. To guard against erosion during construction, follow these steps:

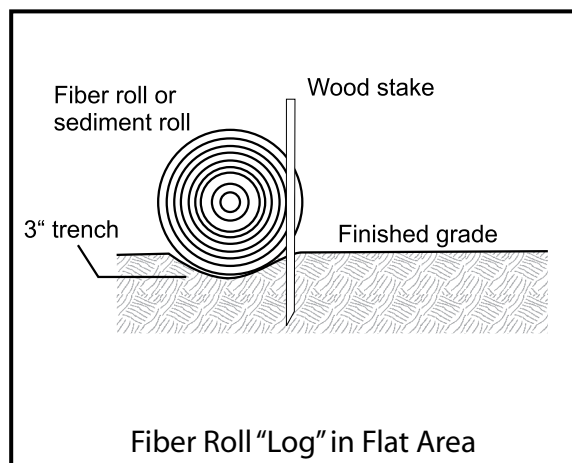
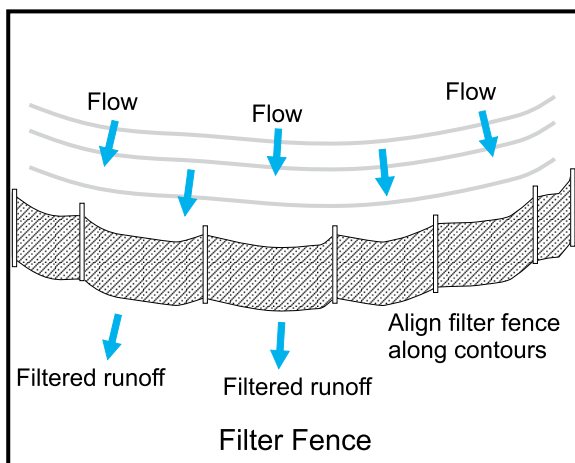
- ◆ Disturb as little ground as possible. Use colored flagging or boundary fencing to mark areas to be left undisturbed. Meet with the contractor before work begins to make sure subcontractors and workers understand why and where flagging is used. The areas beneath and near the drip lines of trees should be fenced off.
- ◆ Control blowing dust from disturbed areas by spraying water on exposed soil surfaces whenever they dry out.
- ◆ Stockpile topsoil from disturbed areas for future use in revegetation efforts. Cover the pile with a tarp to protect the topsoil from wind and rain.
- ◆ Perform grading only during building season, between May 1<sup>st</sup> and October 15<sup>th</sup>.



Before work begins, install temporary sediment-control measures such as contoured ditches, fiber roll sediment barriers, filter fences, sod and catch basins downslope. They'll catch water, sediment and pollutants and keep them from leaving the property and polluting water downstream. Following construction, redistribute sediment accumulated behind the barriers, cover the ground with mulch and revegetate with native species so that the soil will stabilize over time. Make sure to spread the sediment in places where it will not wash away in a storm. Place it far from downspouts, gutters and storm-drain inlets. Since the sediment may be fine silts and clays, add sand and organic material to create good loamy topsoil.

*Boundary fencing around construction sites prevents vehicles and equipment from damaging adjacent soil, vegetation and habitat.*

**Note:** The use of straw or hay bales is now discouraged, because they may contain the seeds of noxious weeds, which can create serious new problems for the environment. Noxious weeds such as tall whitetop must be eradicated as soon as they're discovered to prevent their spread.



*Filter fences and fiber roll (or fiber logs) sediment barriers help guard against soil erosion during construction activities.*

## The importance of Stream Environment Zones (SEZ)

SEZs are riparian or streamside areas, wetlands, marshes, normally dry stream channels and lakeshore areas. (See illustration.) Natural, undisturbed SEZs are ecological communities that filter and cleanse water flowing to Lake Tahoe. The plants that grow there, including aspens, alders, willows, black cottonwoods, birch, lodgepole pines, sedges and rushes, have vigorous root systems that compete for water and the nutrients it contains. When maintained in their natural state, these areas provide many benefits, including wildlife habitat, flood management, nutrient uptake and erosion control.

SEZ plants absorb natural and man-made fertilizers in runoff. Naturally functioning SEZs are even more important in developed areas. Runoff from developed areas carries more sediment and nutrients, which need to be removed before reaching the lake.

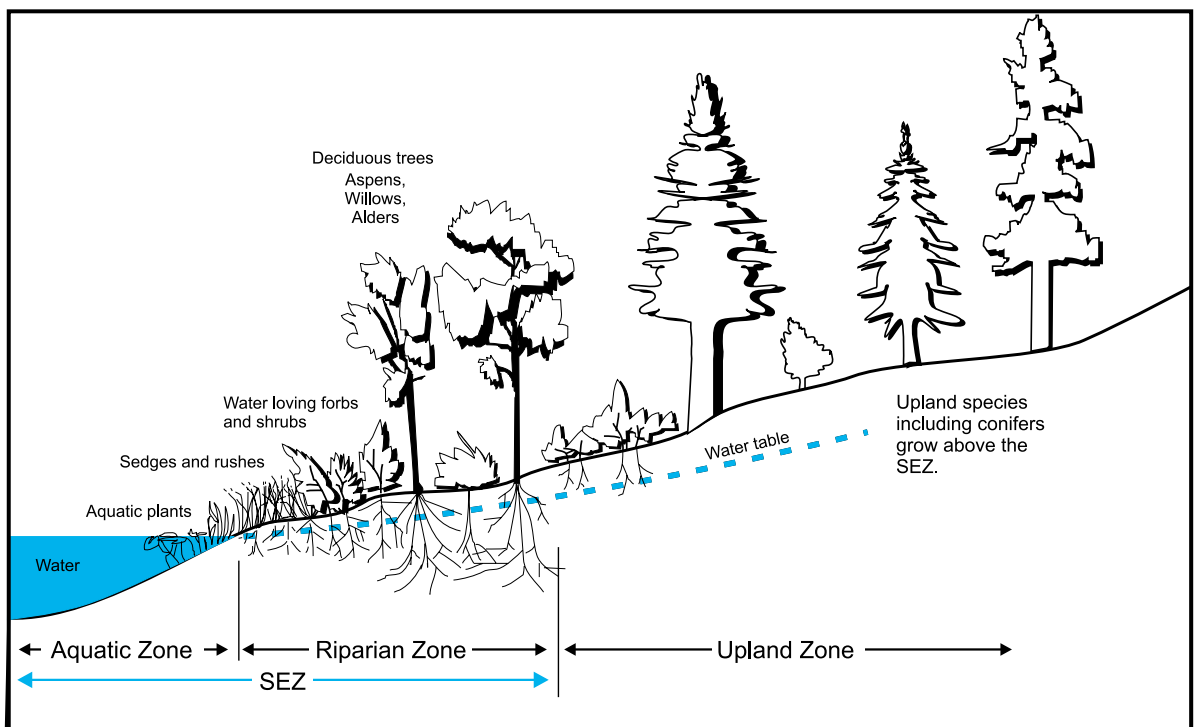
The TRPA wants to keep these areas as natural and capable of removing contaminants as possible by protecting them from disturbance, construction and excessive pollution. **For this reason, the TRPA prohibits encroachment for landscaping activities, such as planting turf or ornamental plants or constructing hardscapes in SEZs.** Planting and landscaping activities are also prohibited in backshore areas, which are lands immediately adjacent to the lakeshore, whether sandy or rocky.

### Protect the beauty of Stream Environment Zones

Think of stream environments as natural gardens or oases in your neighborhood. As such, they have scenic and recreational values all their own. Many of our most beautiful rushes, sedges and flowers are found in the wet meadows and lowlands near streambeds.

A SEZ is also a great place to observe wildlife. Marshes are terrific for bird watching,

*Stream environment zones contain vegetation requiring large amounts of water.*



while ponds and streams attract deer, coyotes, foxes, beaver, nonpoisonous garter snakes, trout and salmon.

### Care for your Stream Environment Zone

Approximately 25 percent of SEZ acreage in the Tahoe Basin (75 percent in urban areas) has been disturbed or developed. This has contributed to the degradation of the lake’s water quality, so a long-term effort is underway to restore and rehabilitate the damaged or destroyed SEZs.

Help protect the richness and beauty of your local SEZ by picking up trash and litter and encouraging the growth of natural vegetation such as willows. (Leave naturally occurring logs and branches in place.) Keep vehicles away from fragile wet areas. Even small creeks or meadows that dry up in late summer and fall should be spared from vehicle traffic or construction activities.

Construction activities are prohibited in SEZs and the setback areas adjacent to every SEZ. These setbacks vary from 10 to 60 feet in width depending on the site. Think of your SEZ as a local mini-wilderness, where you “take only pictures and don’t even leave footprints.”

The TRPA prohibits any work in a SEZ or backshore that would negatively impact the vegetation. Activities that could alter vegetation may be undertaken only if the TRPA has approved a Remedial Vegetation Management Plan to restore the area’s function in the ecosystem.

## Guidelines for Stream Environment Zone management

### How to protect wet areas

Whether your local SEZ is a creek or wetland, the following practices are universally beneficial in safeguarding water quality:

#### **Guideline 1: Maintain existing vegetation along stream banks and water bodies.**

Trees, shrubs and other herbaceous perennial plants along stream banks provide shade to keep water cool. Warm water is often detrimental to fish and promotes rapid growth of pond weeds and algae. Plants provide cover and food for fish and other aquatic life. Wildlife also needs trees and brush for cover and food. Native vegetation protects stream banks from erosion and filters pollutants from stormwater before they reach the stream.



*Protect vegetation along water bodies from trampling or other disturbances to prevent soil erosion.*

**Guideline 2: If natural vegetation is lacking, create and protect a buffer strip or filter strip of adapted vegetation next to the water body.**

A buffer or filter strip is a swath of undisturbed vegetation adjacent to a water body. Properly designed and vegetated buffer zones are highly effective in intercepting and filtering pollution in runoff. Use buffer zones to protect creeks (especially those with steep banks), drainage swales, storm sewer outlets and other wet areas.

Dedicate the adjacent SEZ “setback” area as a buffer strip to gain an extra measure of protection for a SEZ that is well-vegetated. A mixture of trees, shrubs and ground covers is more effective than a single species. With the help of your Conservation District representative, determine the degree of slope, soil types and the quantity and types of vegetation in order to calculate the buffer width necessary to filter runoff and preserve habitat.

Install mulch or erosion-control mats, or

plant grasses and legumes to hold the soil until trees and shrubs are established. Fencing prevents pedestrians or animals from destroying young plants and disturbing erosion control fabrics. As noted on Page 27, before beginning work in a SEZ, you’ll need to obtain TRPA approval for a Remedial Vegetation Management Plan.

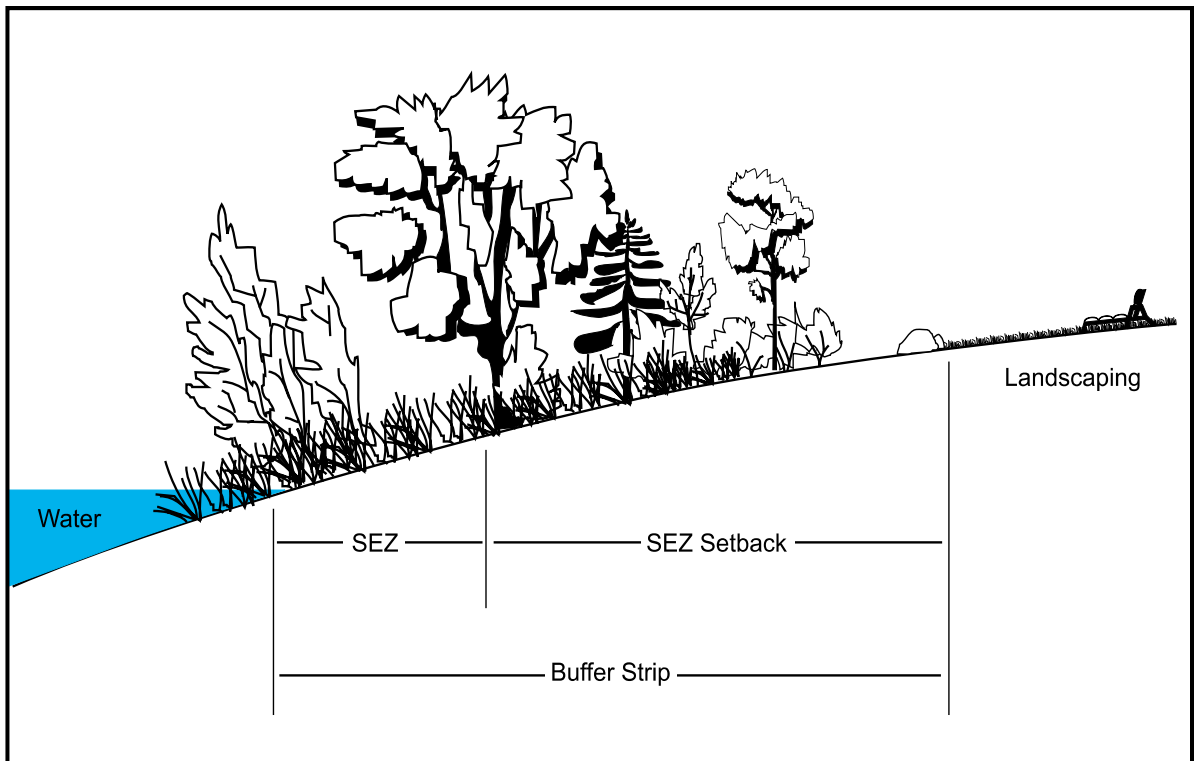
**Guideline 3: Don’t pave over or fill wet areas with dirt or rocks.**

Wet areas filter pollutants only when they’re clean, well-vegetated and undisturbed. It’s illegal to fill any wetland unless you have a Clean Water Act Section 404 permit from the Army Corps of Engineers.

**Guideline 4: Keep plant nutrients out of ponds, creeks and wetlands.**

Plant nutrients such as nitrogen and phosphorus can be beneficial when added in proper amounts to gardens and lawns. However, in surface or ground water, they’re pollutants. Do not store or apply commercial fertilizers within 25 feet of a

*A vegetated buffer strip and wildlife area protects the Stream Environment Zone.*



water body. These nutrients stimulate growth of algae both locally and downstream. (See Chapter 9.)

**Guideline 5: Keep home, yard and garden chemicals out of the waterway.**

Use and store pesticides or any of the hazardous chemicals listed at right with great care. The chemicals must never be dumped on the ground, in a hole, down a drain, or anywhere except authorized hazardous waste collection centers. These centers also accept used motor oil and antifreeze, which are extremely hazardous. Check your local newspaper or call the county environmental health department for information on household waste collection, and call auto parts stores for the location of collection centers. (See Chapter 11 for a list of disposal sites.) Ask the question, “Could the next heavy rainstorm wash this substance downstream to pollute a stream or the lake?”

**Guideline 6: Design your landscape to limit human access and activity in a SEZ.**

Public access and activity should be limited in and around a SEZ. Trails and high-use sites should be planned outside a SEZ. Strategically placed screens, barrier plants, parking bollards or fences can be used to protect a SEZ. In winter, ensure that snow removal operators do not store snow in or adjacent to a SEZ. Where access and traffic are necessary, walks, platforms and bridges that are least intrusive and most protective of the environment should be designed with TRPA approval. When this guideline is followed, it’ll help you succeed in your effort to implement guidelines 1 and 2.

**Examples of Hazardous Household Chemicals**

- ◆ **Automotive products:** oil, battery acid, brake fluid, antifreeze, gasoline.
- ◆ **Fertilizers and pesticides** (weed-killer, fungicides, insecticides): no-pest strips, flea collars, some pet shampoos.
- ◆ **Household cleaners:** spot removers, furniture polishes, deodorizers, drain cleaners, oven cleaners, disinfectants, moth repellents, ammonia.
- ◆ **Maintenance supplies:** paint, varnish, lacquer, turpentine, wood stains, wood preservatives, asphalt, asbestos, roofing tar, swimming pool and hot tub chemicals.

Photo by Sherm Swanson



*A healthy wetland (or SEZ) provides habitat for birds and wildlife and improves water quality through its natural filtration system.*



## Do-It-Yourself BMP Site Evaluation

Use this work sheet to evaluate your property. Start where the driveway meets the street and work your way into the yard. You may want to prioritize installation of BMPs in this order. For each question answered “yes,” take the corrective action indicated.

“The first line of defense is to follow guidelines known as Best Management Practices, or BMPs.”

**Is the access road, driveway or area for two on-site parking spaces unpaved?** Yes No

*The No. 1 BMP is paving legally established roads, driveways and parking areas. Paving adds value to your property and is appreciated in every season.*

**Does rain and snowmelt runoff flow from the driveway into the street or roadside ditch?** Yes No

*Driveways should slope toward an infiltration trench installed on the downslope side, have a swale which conveys runoff to an infiltration system or be constructed with a slotted drain, which drains to an infiltration system.*

**Are there any channels or gullies from man-made drainages after heavy rains?** Yes No

*Small waterways should be shaped and lined with rocks or grass to convey water at non-erosive velocities. A qualified professional should determine the appropriate shape, size and material.*

**Are there unvegetated, eroding slopes?** Yes No

*Use retaining walls, rock-slope protection and vegetation separately or together to stabilize eroding slopes.*

**Are there any sizable areas of bare soil which need landscaping or a duff layer to control dust and soil erosion?** Yes No

*Native or adapted plants hold soil in place, help infiltrate runoff and enhance the beauty of your property. Once established, they require less water and fertilizer than nonnative plants. Pine and fir needles form a duff layer and protect soil.*

**Are channels or gullies forming from drip lines beneath the eaves of the house or garage?** Yes No

*If drip line areas are already well-vegetated or have a good duff cover, additional BMPs may not be needed. If not, infiltration trenches beneath eaves or infiltration systems at rain gutter downspouts increase drainage capacity in these areas. They look and perform better if they’re wood framed. Drain rock, sized from ¾ inch to 1 ½ inches, is recommended.*

**Do you have a deck with bare dirt below?** Yes No

*A 1 inch to 3 inch layer of gravel spread evenly over the bare area dissipates drip-impact erosion and improves infiltration. Use wood borders to keep the gravel in place on sloping ground. Vegetation is also used to control erosion and runoff.*

Photos by John Cobourn



*Undisturbed SEZ vegetation such as sedges and willows are important for water quality and wildlife habitat.*

## Where to go for help

**For assistance with erosion control, storm water runoff, restoration or SEZ identification on your property, contact:**

- ▶ TRPA’s Erosion Control Team — for all commercial, multi-family and lakefront properties.
- ▶ Nevada Tahoe Conservation District — for single-family residential properties in Nevada.
- ▶ Tahoe Resource Conservation District — for single-family residential properties in California.

**For assistance with conservation practices on your property or to create your own conservation plan, contact:**

- ▶ Nevada Tahoe Conservation District - for properties in Nevada.
- ▶ Tahoe Resource Conservation District - for properties in California.
- ▶ Natural Resources Conservation Service - for soil specific issues.

**For information about getting involved in the community effort to save Lake Tahoe, contact:**

- ▶ The Lake Tahoe Environmental Education Coalition or visit their website at

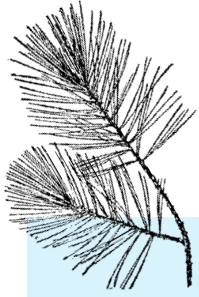
[www.lteec.org](http://www.lteec.org)

**Note: Please see the list of phone numbers for these agencies on the inside back cover.**



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This page is a place holder only. Actual  
page 31 contained in Chapter 3



# Plan Your Irrigation System to use Water Efficiently

## GUIDING PRINCIPLE #4

### Plan for Efficient Water Use

Inefficient watering of landscapes leads to runoff and erosion that result in the degradation of Lake Tahoe's water quality and clarity. Wasting and polluting water limits the amount available to you and to future generations of people and wildlife. Therefore, it's important to use landscaping and irrigation methods that protect and preserve our water resources.

A well-planned irrigation system is an integral part of your property whether you're building a new home or renovating an existing landscape. Divide the property into zones according to the irrigation requirements of existing and proposed plants. (See Chapter 7.) Native forest vegetation doesn't need a formal irrigation system. There may be areas with young plants that need to be irrigated regularly until they become established. Finally, areas of lawn, wildflowers or ornamental gardens require specific irrigation installations. Match the irrigation components to the needs of the plants involved.

Proper irrigation ensures that plants receive the water they need to thrive. Equally important, well-planned and maintained irrigation systems avoid creating runoff containing fine soil particles, fertilizers or pesticides that could eventually enter the lake.

The water needs of plants depend on several factors: type of plant, soil type, weather, light intensity, temperature, humidity and wind. West and south-facing slopes are hotter and drier than

north or east-facing slopes. Plants need more water in direct sun and windy areas than they do in shaded or protected areas.

### Design for water efficiency

There are ways to use water wisely. Watering routines must be adjusted seasonally, since water demands vary by season. Watering early in the day results in less water lost through evaporation due to wind or higher temperatures, and hydrates the plant in preparation for the hottest part of the day. Watering deeply and thoroughly (but not excessively) allows a plant to develop a healthier, deeper root system that is less prone to drying out. Caution: Some decomposed granite (DG) and sandy soils should be watered in shorter cycles to avoid washing nitrates through them and polluting the water table. Plants in these soils may require more frequent irrigation with less water applied each time.

Runoff occurs on sloping sites due to gravity and on heavy clay soils because of slow water penetration. Decrease the rate at which water is applied in such areas to eliminate runoff.

Leaving water on too long when irrigating is a primary contributor to runoff. To reduce runoff, use repeated, short watering cycles (10–15 minutes on, 2–3 hours off). This allows water to soak in between applications. An automatic controller/timer can be purchased for irrigation systems, including hose-end, drip and rigid-pipe systems. Choose a timer that has the ability to water several times throughout the day. For ex-

ample, choose a timer that has three start times or six start times or more, or choose a controller that has A, B, and C programs. These allow the homeowner to use “on-off” watering for greater efficiency and less runoff. Another choice is the new “smart controller.” Smart controllers or timers use current or historical evapotranspiration (ET) rates, (the amount of water lost from the plant and the soil). Studies indicate they can save up to 25 percent or more on outdoor water use and reduce runoff and pollution.

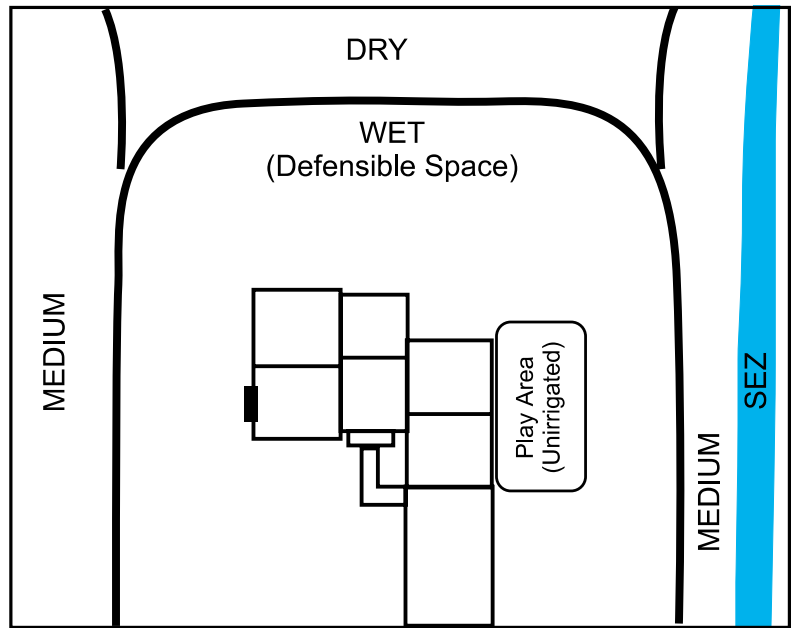
Plant species that are well-adapted to Tahoe’s climate are more effective water users than plants struggling to survive outside their optimum growing conditions. (See Chapter 7.)

Mulch is an excellent tool to reduce water loss from the soil surface. It reduces runoff and improves soils. Organic mulch acts as an insulating blanket, preventing extremes in soil temperature and reducing moisture evaporation from soil.

### Group similar plants into moisture zones or hydrozones

Grouping plants with similar water needs is important for water-use efficiency. Run separate lines to groups of plants with high, medium or low-water requirements. These separate areas of your landscape are called moisture zones, or hydrozones. Low water-use plants must be irrigated on a different schedule from high-water use plants to avoid unhealthy situations where some plants dry up and others drown.

If you created a landscape design using Chapters 1 and 2, or have evaluated your existing landscape, you know where your hydrozones are located. For defensible-space purposes, you’ve made the area within 30 feet of your home a moderate-to-high water use zone. In addition to hardscape (patios, walkways and



*Group plants with similar water requirements into moisture zones, or hydrozones, where they are irrigated more efficiently.*

parking areas), the lawn should be in this zone. Choose a grass variety that is hardy for Lake Tahoe. (See Chapter 7.) Plant the lawn on level ground or on slopes of less than 20 percent for maximum water penetration without runoff.

Outside your 30-foot “lean, clean and green zone,” in areas where you plan to establish native or ornamental plants, consider valves dedicated to drip systems. Well-established native vegetation does not require irrigation, except in drought periods, when it is watered by hand.

### Design an efficient water delivery system

There are two main methods of irrigation: stationary systems that use rigid pipe with fixed sprinklers or sprays, and drip systems using flexible tubing and various size emitters. Of course, the traditional portable hose with a sprinkler head is also available.

*“Never  
landscape  
or irrigate  
within a  
Stream  
Environment  
Zone”*

The choice between systems depends on the time you want to devote to watering, the type of areas to be watered, the costs involved, and the water requirements of your plants. Hoses are the least expensive and the most time-consuming, and they waste water if they're not monitored carefully. The rate of application is difficult to control and contributes to runoff if the water is delivered faster than the soil can take it up. Directing the spray is also difficult. However, many homeowners find hoses useful to supplement an installed irrigation system.

## Use a rigid pipe/high-pressure sprinkler system

High-pressure irrigation systems with underground pipe and sprinkler heads on risers are best used for lawns and low-growing ground covers. These systems are very efficient when

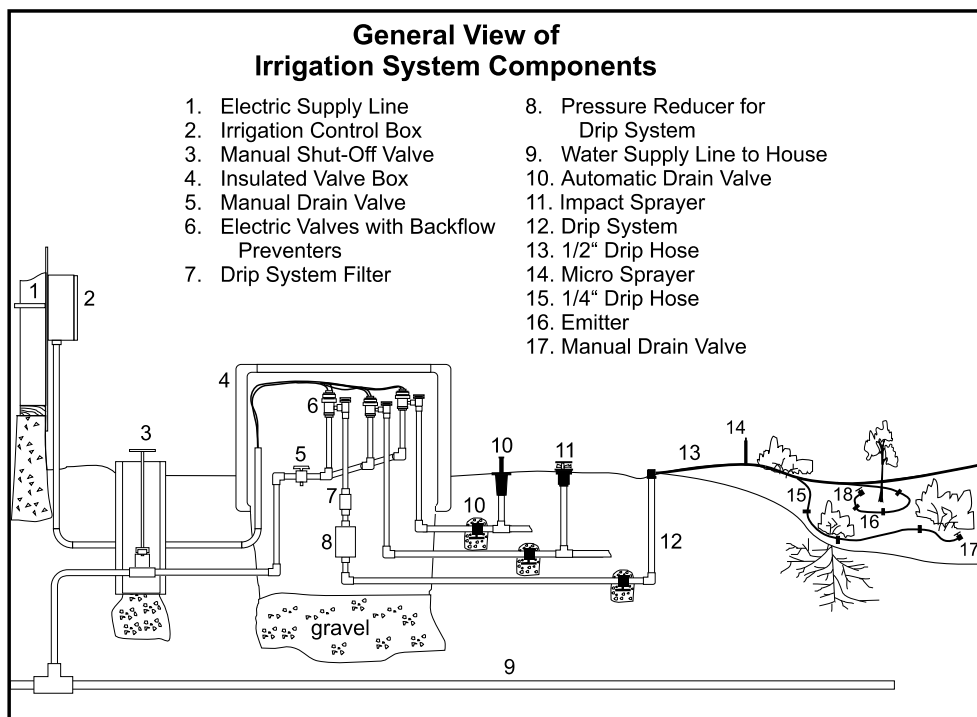
coupled with automatic timers, matching precipitation-rate sprinkler heads and rain-sensing shutoffs.

Control valves with backflow preventers (pressure vacuum breakers or anti-siphon devices) are installed with this system. Backflow occurs when the incoming community water pressure is lowered. This causes a reverse flow of water or suction (back pressure) to occur in the service line. The device prevents water, possibly contaminated with fertilizers, pesticides and sediments, from flowing back into the main water line that provides the drinking water supply.

Lawn sprinklers are generally most efficient at high pressure: 30-80 pounds per square inch (PSI). However, few homes have enough water pressure to service the house and the landscape at the same time. Therefore, irrigation systems are divided into zones or circuits. Each part

of the landscape is irrigated separately, operated by its own electric control valve, to avoid exceeding the maximum flow rate of the water supply. You should not mix high and low pressure fittings on a single irrigation line.

Polyvinyl chloride (PVC) pipe is a standard irrigation pipe that comes in many diameters, lengths and strengths. PVC fittings come in various shapes to allow for angles, corners, etc.



*An irrigation system divides the property into different zones and serves each with an appropriate delivery system on its own electric valve.*

## Choosing a sprinkler

There are several types of lawn sprinklers, such as spray pop-ups, impact heads, multi-stream or stream spray and single-stream spray gear-driven rotors. High-pressure bubblers are used for shrubs and trees.

Pop-ups, ideal for small lawns, come in 3- to 6-inch heights. They produce a tight pattern and emit a constant flow of water in a short period of time. Advantages of using this sprinkler are: the radius is adjustable from 5 to 15 feet; nozzles are adjustable from 90 to 360 degree sprays; and they're recessed when not in use.

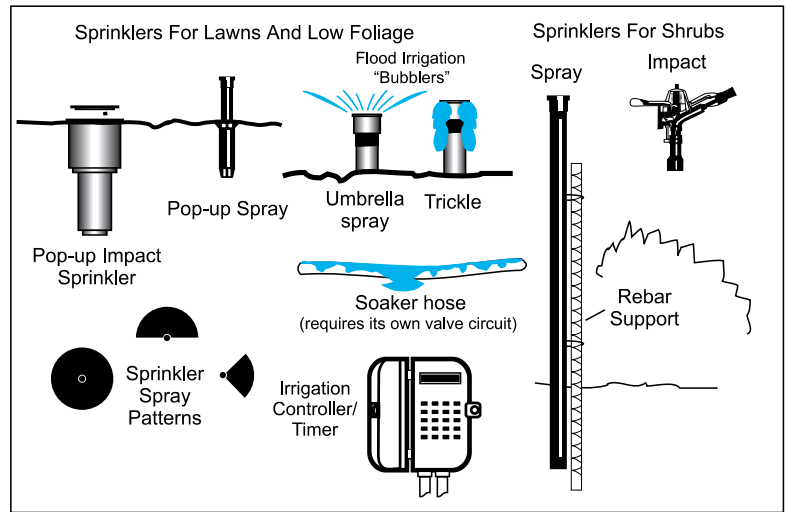
Flood bubblers are different from pop-ups or any other fixed sprinklers. Bubblers provide a high flow of water that covers and soaks the soil. They're used around trees and shrubs and in planters. Their function is similar to flood irrigation used in agriculture; however, the bubbler is designed specifically for the landscape. They should never be linked to the same irrigation line as a pop-up, since bubblers apply a higher volume of water at reduced water pressure.

Multi-stream sprinklers are gear driven and emit fingers of water slowly over a long period of time. They're used for medium-size lawns, shrub areas, areas of ground cover and steep slopes. Their radius can be adjusted from 18 to 27 feet.

## Use the correct sprinkler spacing for lawns and ground cover

Correct sprinkler-head spacing is essential for maximum efficiency. Designers commonly use "50 percent" or "head-to-head" spacing. The 50 percent refers to one-half the diameter (the radius) of the sprinkler throw. A 30-foot diameter sprinkler has a 15-foot radius; thus the spacing for this sprinkler is 15 feet, or one "head" every

## High-Pressure, Rigid Underground Sprinklers



*There are many types of high-pressure sprinkler heads suitable for lawns. Full circle and half circle spray patterns are pictured here. A controller/timer is highly recommended even for small residential lots.*

Note: Sprinklers made by different manufacturers vary somewhat in design and appearance.

15 feet. This provides the proper overlap to prevent dry spots without overwatering the lawn. Some manufacturers or sales representatives explain this overlap as "100 percent" coverage, but they're actually referring to a 50-percent overlap. Ask your designer or contractor whether sprinkler heads should be spaced in a square or

triangular (alternating) pattern. (See illustration below.)

**Advantages of an automatic sprinkler irrigation system**

- ◆ Provides a defense against wildfires by keeping vegetation green and moist near the home.
- ◆ Keeps your plants healthy, reducing disease and insect problems.
- ◆ Prevents dry spots in lawns.
- ◆ If managed well, eliminates runoff that would carry sediments, fertilizer and pesticides to lakes and streams, jeopardizing humans, wildlife, water quality and clarity.
- ◆ Saves time by eliminating the need for hand watering. If an electric timer is used, your landscape will be irrigated whether you're there or not.
- ◆ Enables the irrigation of separate zones such as lawns, trees, shrubs, flowers or native areas, each with unique watering needs.

**Designing the sprinkler irrigation system**

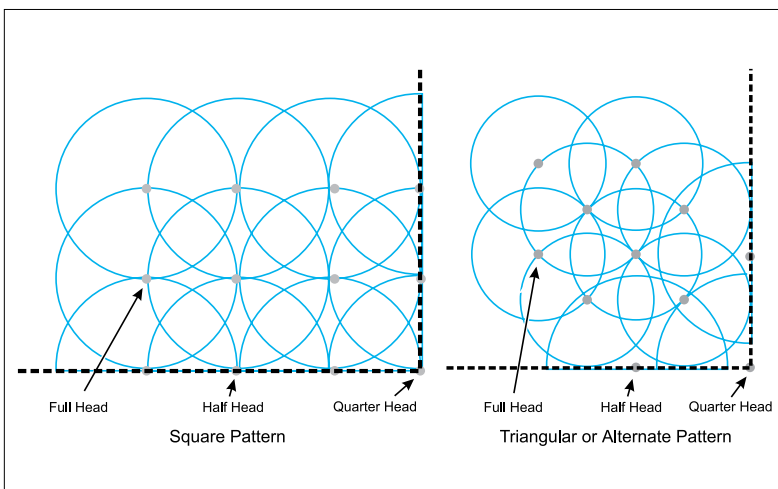
Indicate on the landscape plan where you tap into the main water supply. Locate the water meter and shutoff valve for the house. Indicate the power source for the timer and valves. Determine the gallons-per-minute of delivery the main water line can supply. This indicates whether you can handle the proposed irrigation system. An irrigation retailer or contractor can help you.

You should also determine your incoming water pressure. Sprinkler systems are designed to operate with an optimum pounds-per-square-inch (PSI) of pressure. Pressure is needed to move water up hills, through valves, pipes and sprinkler heads. Steady water pressure is needed to ensure successful operation of the system and to prevent surges in pressure that strain and damage your home's plumbing.

**Installing the rigid pipe system**

**What's involved?**

- ◆ Install temporary erosion control BMPs.
- ◆ Rough grade the landscape and remove debris.
- ◆ Connect to the service line through the main water line.
- ◆ Attach the backflow preventer, shut off valve and filter, if necessary.
- ◆ Stake out sprinkler head and line locations, and dig trenches.
- ◆ Cut and lay pipe.
- ◆ Assemble and attach the manifold (the grouping of control valves) underground or in an insulated box.
- ◆ Connect the pipes to the manifold.
- ◆ Connect the control valves to the electrical supply for the time clock.



*Match the lawn sprinkler's spray pattern and spacing layout with the area to be watered. Your goal: an even distribution of water over the entire area.*



- ◆ Test manifold for leaks.
- ◆ Install risers.
- ◆ Flush the system.
- ◆ Attach sprinkler heads.
- ◆ Align sprinkler heads and adjust spray direction.
- ◆ Backfill and settle the trenches.
- ◆ Final grade the landscape.

More information on sprinkler irrigation is available from irrigation supply manufacturers or contractors. You can also call the Natural Resources Conservation Service Backyard Conservation Program and ask for their “Turf Watering Management” tip sheet.

## Drip irrigation systems save water

Whereas rigid pipe systems use high water pressure to deliver a large volume of water over large areas, **drip systems** work at low pressure (10-30 PSI). They deliver less water to specific locations, usually to the roots of individual plants. Water application to the soil is slow and seldom exceeds the infiltration rate. Thus, runoff does not occur. How deep the water penetrates into the soil depends on the duration of each watering. **Emitters** deliver gallons per hour, not gallons per minute.

A drip system waters individual plants thoroughly, using less water than sprinklers. Drip systems are excellent choices for plants on hillsides, because there is rarely any runoff. This system applies water directly to the soil through a tube, with the volume of water determined by the size of an emitter. Emitters range in size from 1/2 gallon per hour to 5 gallons per hour of delivery. There are also spray-mist emitters and other specialty emitters.

### Advantages of a drip irrigation system

- ◆ Requires no excavation.
- ◆ Operates on low water pressure.
- ◆ Reduces runoff and pollution to streams and lakes.
- ◆ Reduces weed growth.
- ◆ Provides slow application of water directly to soil and roots, rather than to foliage, preventing many leaf diseases.
- ◆ Permits easy configuration, expansion and modification.
- ◆ Allows for fertilizer application through the system.

### Disadvantages

- ◆ Requires regular checking for clogged emitters.
- ◆ Is prone to rodent damage or snowload damage if on slopes.
- ◆ Reduces humidity around plants because foliage is not watered.
- ◆ May restrict root development if enough emitters are not installed or added each year.
- ◆ Requires at least annual modification and maintenance.

### How to install a drip system

A drip system is easy to install, compared to a rigid pipe system. It is connected to one or two valves of the irrigation manifold, or to a hose bibb or hose end. The main tubing is usually a 3/8- to 1/2-inch diameter flexible pipe that delivers water to the emitter, which then delivers water to the individual plant. Emitters can also be connected to the main tubing through 1/4-inch diameter hose or “spaghetti tubing.” The hoses are laid out to service each hydrozone. Ideally, separate drip systems controlled by separate valves should be run to low and moderate wa-

ter-use hydrozones. A drip system is installed by slipping the tube into fittings, such as 90-degree elbows and “tees.” PVC glue is not needed. Emitters come in different sizes and shapes and are color-coded according to their gallon-per-hour rating. They’re barbed at one end and installed by punching a pilot hole in the tube, into which the emitter is pushed.

It’s best not to bury the main line or smaller tubing because it interferes with repairs. The tubing lies on the ground and may be covered with mulch to hide it from view.

Drip systems require monthly inspections of the emitters to determine if any are clogged and if the plant has the appropriate emitter to provide adequate moisture. For maximum compatibility of parts and ease of replacement, it’s recommended that all drip components be of the same brand.

### Various kinds of drip system installations

- 1 Emitters with tubing
- 2 In-line emitters and in-line pressure-compensating emitters
- 3 Sweat tubing or porous hose
- 4 Misters or low-volume sprinklers

### Consider the following factors when selecting drip irrigation components for your property:

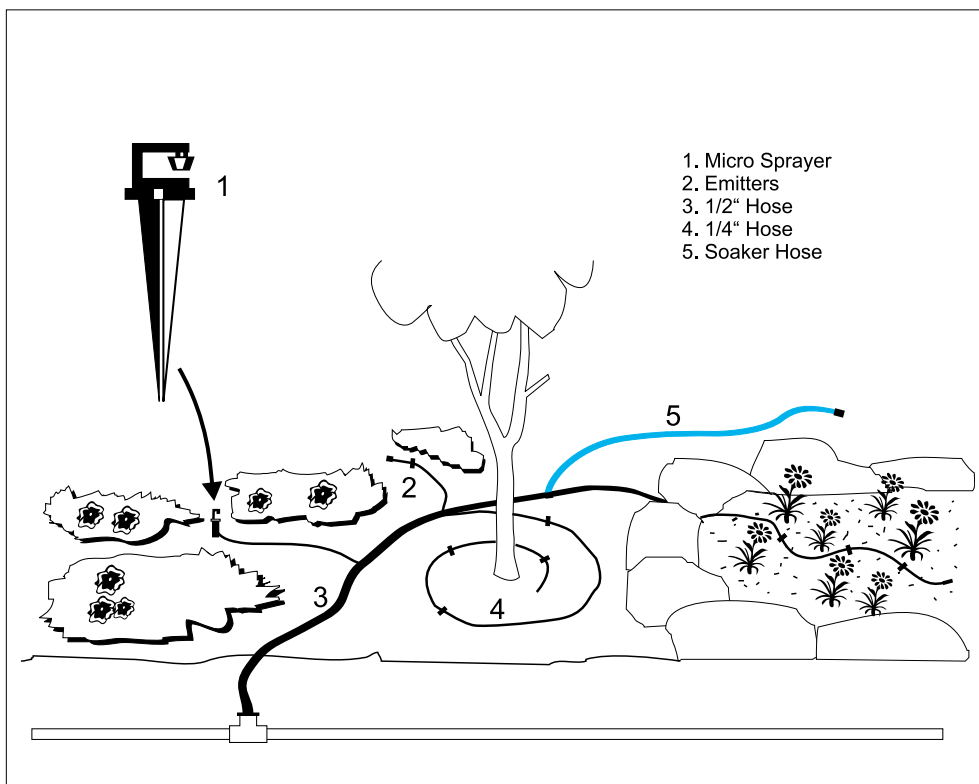
#### Emitters with tubing

Tube systems are laid out so that emitters can be evenly spaced around and on top of the root ball of newly planted trees and shrubs. Sufficient emitters need to be placed in order to wet the entire root ball and surrounding soil. Wetting the surrounding area allows roots to grow into adjoining soil, providing an extensive root system and producing a healthy plant.

#### In-line emitters are useful for rows of plants

In-line emitters are preinstalled in drip tubing. The emitters are spaced at regular intervals (e.g., one every 12, 18, 24 or 36 inches) to accommodate various plant spacings. These internal emitters are designed to reduce clogging. They’re often used in vegetable gardens where spacing is measured, or placed in rings around perennials such as trees and shrubs. They cost more than a conventional tube and emitter system.

Pressure compensating in-line emitters (PCE) differ from noncompensating emitters.



PCEs compensate for variations in pressure due to elevation changes up to 20 feet and provide a consistent rate of water to the plants while operating under low water pressures fluctuating from 7 to 25 PSI.

Contact a local irrigation supply company or hardware store before purchasing one of these systems. Ask about longevity of the system under local conditions, methods of proper care and availability of spare parts. This will help determine if the system is right for you.

### **Sweat tubing or porous hose soaks the soil**

Sweat tubing or porous hose, also called soaker hose, is made from used tires or new tire trimmings mixed with polyethylene. The hose applies water slowly. The soil becomes moist beneath the entire length of the hose, due to the thousands of holes in the tubing.

The benefits of using a porous hose are its durability, availability and ease of installation. It can also be buried and is self-draining to protect it from freezing.

A disadvantage of sweat tubing is that fittings may leak or come apart if water pressure is too high. High water pressure can be eliminated by installing a pressure regulator and adjusting it to 10 PSI. A 200-mesh filter, or “Y” filter, can be installed to prevent the small pores in the hose from clogging.

More drawbacks: if left uncovered, a 5/8-inch hose is rather unsightly, as are the metal hose clamps used for fittings. Gophers have been known to chew through these hoses. Flow rates vary considerably from the beginning to the end of the line, causing dry spots and unevenly watered soil.

### **Low-volume sprinklers are versatile**

Low-volume sprinklers or micro-sprayers are installed above ground and operate in the same

Photos by John Cobourn



*Drip emitters, micro-sprayers, mini-sprinklers, misters and porous hose provide a variety of methods for efficient water application to zones other than lawns.*

Note: Fittings made by different manufacturers vary somewhat in design and appearance

way as punch-in emitters. They’re often used to water low-growing groundcovers, bedding plants and potted annuals, or are used in conjunction with an in-line system to germinate seeds.

Their spray patterns range from a 45-degree angle to a full circle. The spray pattern (radius) is much smaller than a lawn sprinkler’s, but covers a greater distance than an emitter.

A low-volume sprinkler covers a larger area than an emitter, thereby, producing a larger and healthier plant. They’re easily adjustable, whereas, in-line and tube emitters are not.

However, this system requires more fittings than conventional drip systems, including various “holders” to keep the mini-spray heads in place as well as couplers, tees, 90-degree barb elbows and ¼-inch “spaghetti tubing.” Also, more weeds germinate because larger areas receive water. The system is also easily broken and more costly than other systems, and it requires more gallons of water per minute to operate.

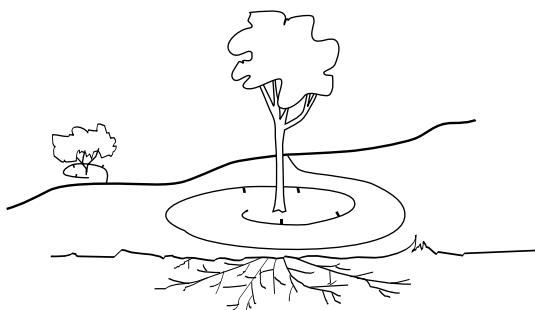
**How many emitters can I put on a line?**

You can use up to 225 one-gallon-per-hour emitters for each 300 feet of ½-inch tubing. However, since emitters are available in ½- to 5-gallon-per-hour rates, any combination can be used up to a 225-gallon maximum limit. If the limit is exceeded, the flow rate varies.

*With a drip system, you must add emitters from year to year. As new trees and shrubs grow, place emitters farther from the trunk until established.*

**Add emitters as trees mature**

Contractors or landscape designers sometimes run a line of drip tubing along a newly planted row of trees while punching-in emitters near the root ball of each plant. The mature height and spread of the tree may not be considered. For any newly planted trees, loop ¼-inch or ½-inch drip tubing around the trunk, leaving enough slack to accommodate the growth of tree roots for up to five years on dry sites. Start with two or three emitters per tree, and add emitters around each tree every year until it’s well established. Mistlers, or micro-sprayers, can also be used.



Face them to spray out from the trunk and not on the trunk. Continuously wetted bark is subject to disease.

**Please don’t waste water**

To irrigate your lawn efficiently and avoid overwatering, you should perform an “irrigation audit” (can test) on your sprinkler system. If you are applying more than 1½ inches of water per week in spring or fall, or more than 2 inches per week in July and August, you are overwatering and perhaps leaching nutrients down into the groundwater. For more information, call Cooperative Extension (775) 784-4848, or Waste Not, at IVGID, (775) 831-8603.

**The Incline Village General Improvement District** has developed landscaping and irrigation standards to support community water conservation efforts.

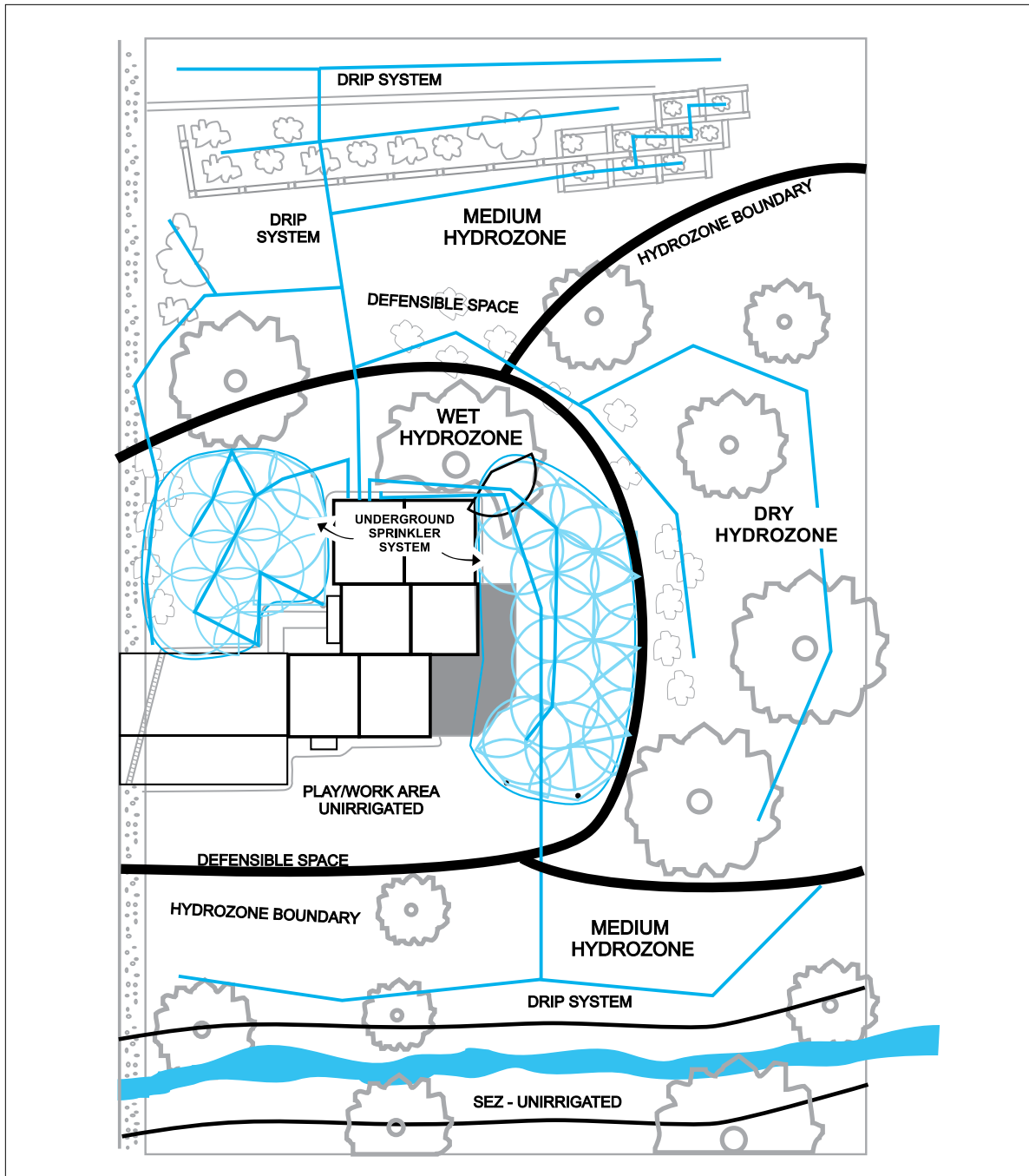
The standard applies to Incline Village and Crystal Bay residents who are: building a new structure, remodeling with the expansion exceeding 15 percent of the original structure footprint, increasing a water line size, installing new irrigation or updating an existing irrigation system.

During the county permit process, residents submit a landscaping plan and a completed Landscaping Standards Checklist-Plan Review form.

**Landscaping standards and quick tips:**

- ◆ Turf area should be limited to 33 percent of pervious coverage (33 percent of the portion of the property not already covered by structures, pavement, walkways or patios).
- ◆ Use plants from the recommended plant list found in Chapter 7 of this book.
- ◆ Plants must be arranged by hydrozone.

For additional information, please contact the WASTE NOT HOTLINE at (775) 831-8603, or check the website at [ivgid.org](http://ivgid.org).



*An irrigation plan for the landscape illustrated in Chapter 2 might include both drip lines and underground (rigid pipe) sprinkler systems.*

## Summary

There are many factors to consider in the design and installation of an irrigation system. You may want to consult a landscape or irrigation professional, or read manuals on the subject available through irrigation suppliers and garden centers.

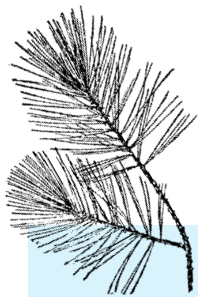
Proper watering is critical to the health of your plants and the lake. You, as a gardener, make a significant impact on water quality through careful planning and implementation of an efficient irrigation system. Such a system not only benefits your plants but also the aesthetics of your landscape and the value of your home.



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**placeholder**

## CHAPTER 5



# Defensible Space: Landscape to Reduce the Wildfire Threat

## GUIDING PRINCIPLE #5

### Plan Defensible Space for Fire Safety

Much of the Tahoe Basin is considered an extreme fire hazard environment, possessing all the ingredients necessary to support large, intense and uncontrollable wildfires. The term “defensible space” is used to describe techniques for reducing the wildfire threat to homes. This chapter discusses the integration of defensible space concepts into the residential landscape.

Evaluate the risk of wildfire in your area and take steps to reduce that risk. If a major wildfire were burning within a mile of your house and strong winds were blowing the flames and burning embers in your direction, would firefighters have enough open space around all sides of your house to defend it? How much fuel (vegetation) exists immediately adjacent to your house? How easily would this fuel ignite your home?

Most houses in the Sierra and at Lake Tahoe are at risk from wildfire. To reduce this risk, work on your property and with your neighbors to accomplish these tasks:

- 1) Remove dead vegetation.
- 2) Remove ladder fuels.
- 3) Break up dense shrub fields and thick tree cover.
- 4) Reduce the amount of highly flammable native vegetation, and plant less flammable, low-growing species for a distance of at least 30 feet from your house.

Improve fire safety without creating bare ground, which leads to erosion and water quality degradation.

### What is defensible space?

The term “defensible space” refers to the area between a house and an oncoming wildfire where the vegetation has been managed to reduce the wildfire threat and allow firefighters to safely defend the house. In the event that firefighters are not available, defensible space also improves the likelihood of a home surviving without assistance. It’s a key area that can make the difference in a structure surviving a wildfire or being destroyed. Often, defensible space is simply a homeowner’s backyard.

The amount of time, effort and money involved in creating an effective defensible space varies considerably and is dependent upon the size of the property involved, types of vegetation, accessibility, steepness and slope aspect. In some instances, a homeowner may already have an effective defensible space in place that doesn’t require any additional work other than routine maintenance. On the other hand, homes located on steep slopes, especially south and west-facing slopes, or in dense brush fields may require substantial work. If the vegetation is properly modified and maintained, a wildfire can be slowed down, the length of flames shortened and the amount of heat reduced. All these factors contribute to a house surviving a wildfire.

The purpose of defensible space is to reduce the wildfire threat to a home by changing the characteristics of the adjacent vegetation. Specifically, defensible space practices alter vegetation by increasing the moisture content,

decreasing the amount, shortening the height and altering the arrangement of potential fuels. This is accomplished through the removal, reduction and replacement of vegetation. (Table 1.)

**Who should worry about wildfire?**

Most people realize that homes located in or adjacent to wildland vegetation (naturally occurring plants such as greenleaf manzanita, huckleberry oak and Jeffrey pine) should be concerned about the wildfire threat. However, few people recognize that even homes located in urbanized areas are at risk.

During intense wildfires, burning pine cones, branches and other materials can be lofted high into the air and carried ½ mile or more beyond the fire front. As a result, showers of embers are produced. If these embers land in spots with easily ignited fuels (such as wood shingle roofs, trash piles and dried grass), new fires can start.

Table 1 The Three R's of Defensible Space	
<b>REMOVAL</b>	Eliminate stems and branches of selected plants, particularly trees and shrubs and other fuels from the defensible space area. Cut down dead trees, remove flammable shrubs and move firewood piles away from the house. Leave plant roots, which hold soil in place.
<b>REDUCTION</b>	Remove plant parts, such as branches or leaves. Prune dead wood from shrubs, remove low tree branches and mow dried grass.
<b>REPLACEMENT</b>	Substitute less flammable plants for more hazardous vegetation, e.g., cut down a dense stand of flammable shrubs, and plant and irrigate "low fire hazard" plants. (See Chapter 7.)

Consequently, homes located in the urbanized portions of the Tahoe Basin, blocks away from wildland vegetation, are also at risk.



*Defensible space is that area between a house and an oncoming wildfire.*



## Creating an effective defensible space

**A strong recommendation: maintain a lean, clean and green area near your house.**

All residents would be wise to reduce, remove or replace most flammable vegetation within 30 feet of their house. This area should be kept:

- ◆ Lean – only small amounts of flammable vegetation are present;
- ◆ Clean – there is no accumulation of dead vegetation or other flammable debris; and
- ◆ Green – plants are healthy, well-watered and green during the fire season.

In designing or redesigning your landscape,

you should make the areas closest to your house lean, clean and green. Many people find this fits their other landscape objectives as well. The area closest to the house is where you entertain guests, eat outside in good weather or enjoy a lawn or flower garden. A paved driveway and deck or patio are usually in this area. If they're constructed of nonflammable materials, they'll meet the criteria for defensible space.

Since the area within 30 feet of your house needs to be less flammable, it should be the area of highest water use.

As you consider your landscaping goals for the area closest to your home, incorporate the principles from the checklist in Table 2.

**Table 2: The Lean, Clean and Green Checklist**

**(For the area within 30 feet of your house.)**

✓	Emphasize the use of low-growing, herbaceous (non-woody) plants kept green during the fire season through irrigation. Herbaceous plants include lawn, clover and a variety of ground covers, bedding plants, bulbs, perennial flowers and conservation grasses.
✓	Emphasize use of inorganic mulches (see Chapter 9), rock and noncombustible hard surfaces such as concrete or asphalt sidewalks, patios or driveways near structures. Note: At Lake Tahoe, land coverage standards apply, and TRPA permits may be required. (See Chapter 1.)
✓	Carefully manage pine needles as described in the table "Types of Dead Vegetation and Recommended Action" on Page 47. Avoid using combustible mulch within 5 feet of the house or under decks.
✓	Deciduous ornamental trees and shrubs are acceptable, if they're kept green and free of dead plant material, and ladder fuels are removed. Plants or groups of plants should be arranged so adjacent wildland vegetation can't convey a fire to the house. Shorter deciduous shrubs are preferred.
✓	Minimize the use of ornamental coniferous shrubs and trees (e.g., juniper, arborvitae and mugo pine) and tall exotic grasses (e.g., pampas grass).
✓	Where permitted, the stems and branches of most wildland shrubs and trees should be removed from this zone and replaced with more desirable alternatives (see first box). Individual specimens or small groups of wildland shrubs and trees can stay if they're healthy, free of dead wood, pruned to reduce the amount of fuel and their height, and if ladder fuels are removed. Do not dig up plant roots, which hold the soil in place.
✓	In some areas, substantial removal of wildland vegetation may not be allowed. In these instances, wildland vegetation should conform to the recommended separation distances, be free of dead plant material, pruned to remove ladder fuels and reduce fuel load, and arranged so it cannot readily convey a fire to the house. Be aware of local requirements before you remove wildland vegetation.
✓	Tree limbs within 10 feet of a chimney, encroaching on power lines or touching the house, should be removed.



*A lean, clean and green zone, beautifully done, using noncombustible mulch, turf and perennial beds.*

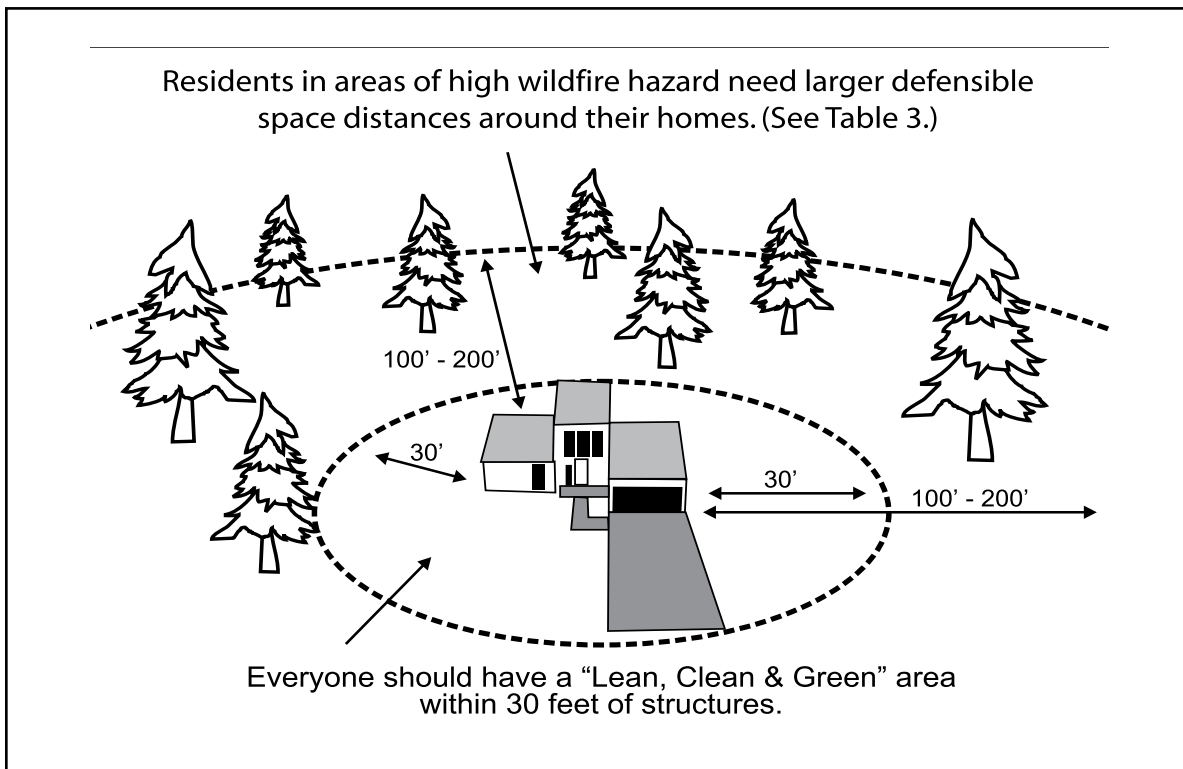
### Create an effective defensible space in high wildfire hazard areas

Many homes are located adjacent to forests or brush fields or on steep vegetated slopes that are areas of high wildfire hazard. They need both

the lean, clean and green zone (the first 30 feet) and outer defenses as well. The remainder of this chapter gives detailed instructions on how to create effective defensible space in these high hazard areas.

To determine your appropriate defensible space distance, you'll need to know the type of wildland vegetation (grass, shrubs or trees) growing on or adjacent to your property, and the steepness of slope (flat to gently sloping, moderately steep or steep). Refer to Table 3

for the recommended defensible space distance. If you live in an urban setting where wildland vegetation is absent, use the distance values for the "grass" vegetation type.

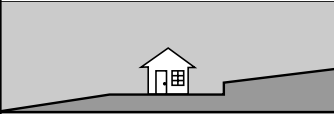
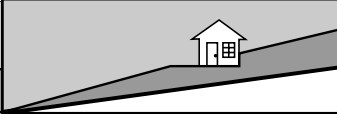






*Recommended defensible space distances are measured from the base of the house and extend outward. The recommended distance for an effective defensible space is not the same for everyone.*

For example, a house located on flat terrain in a Jeffrey pine forest with sparse understory should have a defensible space distance of 100 feet. However, a house situated on a moderately

steep slope in a huckleberry oak and greenleaf manzanita brush field should have a defensible space distance of 200 feet.

If the recommended distance goes beyond

Table 3 Recommended Defensible Space Distances			
STEEPNESS OF SLOPE ➔			
	Flat to Gently Sloping 0 to 20%*	Moderately Steep 21% to 40%*	Very Steep 41+%*
VEGETATION TYPE ⚡	⚡ DISTANCE REQUIREMENTS ⚡		
 Grass Wildland grasses, weeds and widely scattered shrubs with grass understory. Use these values for urban settings.	<b>30 feet</b>	<b>100 feet</b>	<b>100 feet</b>
 Shrubs Includes shrub-dominant areas such as bitterbrush, huckleberry oak and manzanita.	<b>100 feet</b>	<b>200 feet</b>	<b>200 feet</b>
 Trees Includes forested areas with a mostly pine needle understory. If substantial grass or shrub understory is present, use those values shown above.	<b>100 feet</b>	<b>100 feet</b>	<b>200 feet</b>

Note: Measurement of slope percent is explained on Page 5.

the property boundaries, contact the adjacent property owner and work cooperatively on creating a defensible space. The effectiveness of defensible space increases when multiple property owners work together. Do not implement defensible space practices on neighboring properties without first securing permission. The county assessor’s office can provide assistance, if the owners of adjacent parcels are unknown.

Once your recommended distance is determined, temporarily mark the outer boundary with strips of cloth tied to trees or shrubs. The land located within this designated boundary is

the “defensible space area.” The next questions apply to the vegetation located within this area.

**Within your defensible space area, is there any dead vegetation present?**

Dead vegetation includes dead trees and shrubs, dead branches lying on the ground or still attached to plants, dried grass and flowers, dropped leaves and needles and firewood. Dead vegetation should be removed from the defensible space area. Two important exceptions are pine needles covering bare soil and downed trees embedded in the ground. (See Table 4 for details.)

*Dead vegetation should be removed from the defensible space area.*

Table 4 Types of Dead Vegetation and Recommended Action	
Dead Vegetation Type:	Recommended Action:
<b>Standing Dead Tree</b>	Remove all standing dead trees within the defensible space area.
<b>Downed Dead Tree</b>	Remove all downed dead trees within the defensible space area, if they’ve recently fallen and are not yet embedded into the ground. Downed trees that are embedded into soil, and which cannot be removed without soil disturbance, should be left in place. Remove all exposed branches from embedded downed dead trees.
<b>Dead Shrubs</b>	Remove all dead shrubs from within the defensible space area. Leave roots in place to hold the soil in place.
<b>Dried Grass and Wildflowers</b>	Once grass and wildflowers have dried out, cut them down and remove from the defensible space area.
<b>Fallen Pine Needles and Leaves Covering Bare Soil</b>	Reduce thick layers of pine needles and leaves to a depth of 1-2 inches. Greater accumulations create an unacceptable fire risk. However, do not rake pine needles down to bare soil. Reducing pine needles and leaves to less than a 1-inch layer may make the underlying bare soil vulnerable to erosion. Take care to avoid disturbing the “duff layer” (the dark area at the ground surface where needles and leaves are decomposing) if present. For detailed information on managing pine needle mulch, contact your Conservation District office. Note: Do not allow any pine needles or leaves to accumulate within 5 feet of the house or under decks. Consider using rock mulches or planting low-fire-hazard vegetation to cover bare ground in these areas.
<b>Fallen Pine Needles and Leaves Covering Other Than Bare Soil</b>	Remove pine needles and leaves from roofs, rain gutters, decks, driveways, lawns, flower beds and other areas where doing so does not expose bare soil. Also, remove dead needles and leaves that are still attached to living trees and shrubs to a height of 15 feet.
<b>Firewood and Other Combustible Debris</b>	Place firewood and other combustible debris (wood scraps, grass clippings, leaf piles, etc.) at least 30 feet uphill from the house.

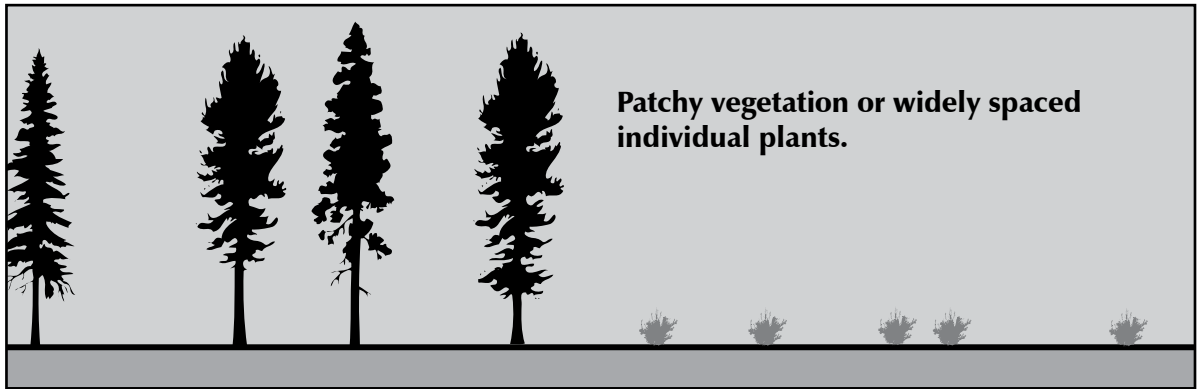
**Within your defensible space area, is there a dense, continuous cover of shrubs or tree canopies?**

Sometimes wildland plants grow as an uninterrupted layer of vegetation as opposed to patchy or widely spaced plants. The more continuous and dense the vegetation, the greater the threat

of wildfire. If tree or shrub branches touch without large openings within the defensible space area, break them up. There are two types of dense, continuous vegetation that homeowners are likely to encounter in the Tahoe Basin: brush fields and crowded stands of coniferous trees.

**A comparison: Patchy vegetation versus continuous, dense vegetation**

*Patchy vegetation or widely-spaced individual plants are less likely to carry a wildfire.*



*Continuous, dense, uninterrupted vegetation increases the threat from wildfire.*



**Brush fields**

Create a separation between shrubs based on shrub height and steepness of slope. The separation distance between individual or small groups of shrubs on flat to gently sloping terrain should be twice the height of remaining shrubs.

For example, if the shrub height is 4 feet, then the recommended separation distance

should be 8 feet (2 x 4-foot shrub height = 8-foot separation distance). Separation distances are measured between the shrub canopies (edges of the outermost branches), not from the trunks of shrubs. The separation distance between shrub canopies should increase as the steepness of slope increases.

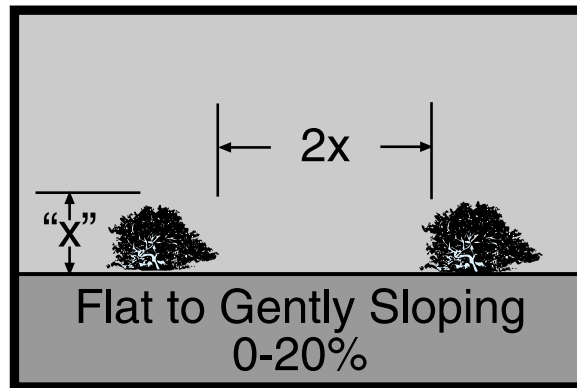
Creating the necessary separation distance in brush fields dominated by nonsprouting shrubs, such as big sagebrush and mountain whitethorn, is a relatively simple removal of plants by cutting. Providing adequate distances in fields dominated by resprouting shrubs is a more difficult proposition.

The most prominent resprouting shrubs in the Tahoe Basin include greenleaf manzanita, huckleberry oak and snowbrush. These shrubs often grow in dense stands, with interwoven branches, and have little space between individual plants. Creating separation between these shrubs is further complicated by their hard wood and dense branches.

Actual removal (killing) of the resprouting shrubs to provide separation is possible through grubbing-out (digging up and severing the root system), using heavy equipment and implements, or by applying herbicides. These techniques, however, are discouraged in the Tahoe Basin, because they're impractical for the homeowner, promote soil erosion and/or cause other undesirable environmental effects.

As an alternative, the trunks of resprouting shrubs can be cut off near ground level with a chain saw. The detached top growth can be chipped and broadcast over the site, piled and burned after a burn permit is obtained from the local fire department, or hauled away. In subsequent years, maintain the regrowth generated from the cut shrub base in a shorter (less than 2 feet in height) and more compact form with pruning shears or a weed whacker.

The best approach is to treat resprouting brush fields over a several-year period. During the first treatment, cut the resprouting shrubs as described above. Several years later, treat the remaining mature shrubs. Eventually, the



*Recommended separation distance between shrubs situated on flat to gently sloping terrain.*

Photo by John Cobourn



*Break up dense patches of native shrubs near the house.*

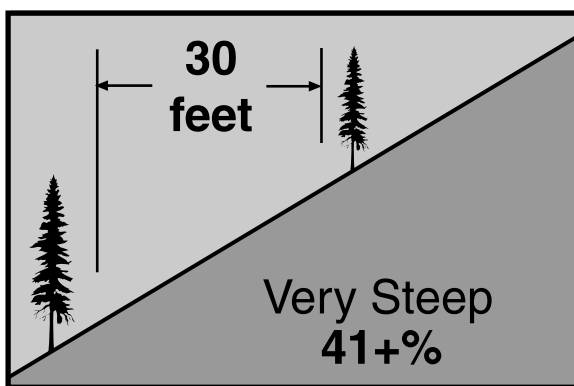
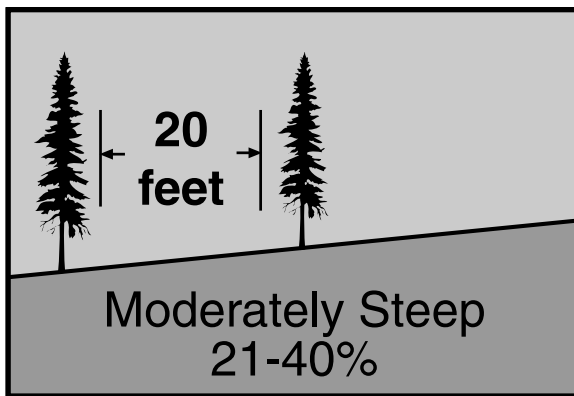
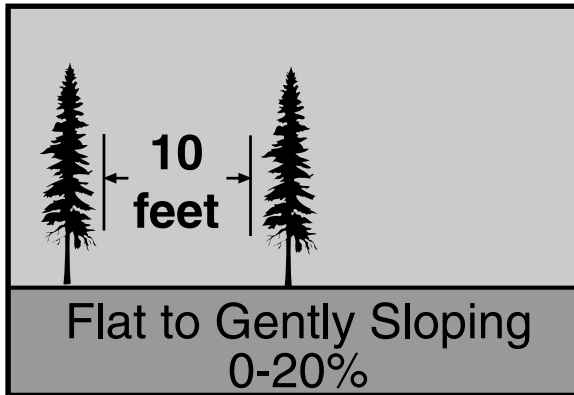
resprouting shrubs within the defensible space area will consist of shorter plants, requiring less separation distance.

When creating separation between shrubs, remove more hazardous shrubs and retain less hazardous shrubs. Less hazardous shrubs include pinemat manzanita, squawcarpet, snowberry, mountain whitethorn, serviceberry, willow, currant and bittercherry.

Shrubs associated with moist areas, such as willow, mountain alder and bittercherry, are much less of a wildfire threat. They typically would not need the recommended separation distances between plant canopies as long as dead stems are removed.

### Crowded stands of trees

In many areas of the Tahoe Basin, coniferous trees occur in dense, overcrowded stands where their branches are touching or interwoven. These conditions contribute to the risk of uncontrol-



*The recommended separation distance between tree canopies within the defensible space area varies from 10 to 30 feet depending on slope.*

Note: Separation distances are measured between canopies (outermost branches) and not between trunks.

lable and sometimes catastrophic crown fire (wildfire burning through the tree canopies, independent of the understory vegetation).

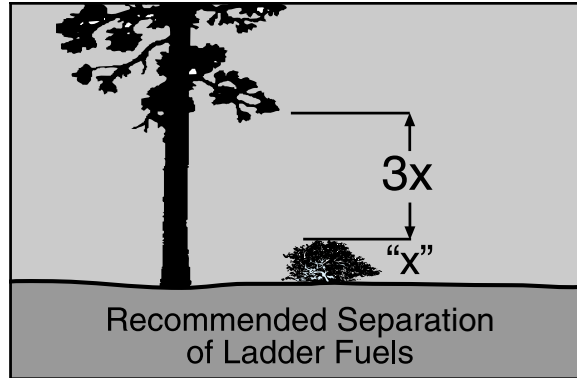
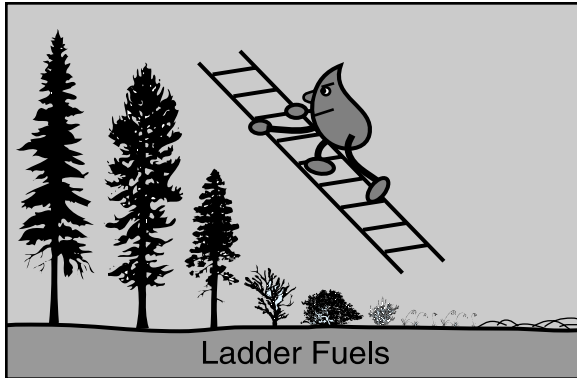
To address this problem, create a separation between tree canopies within the defensible space area. This is typically accomplished through tree removal or thinning of the stand. The diagrams at left present the recommended separation distances between tree canopies based on steepness of slope. For example, if a house is situated on a 30 percent slope, the separation between tree canopies within the defensible space area should be 20 feet. **Please note that in the Tahoe Basin, removal of live trees with trunks greater than 6 inches in diameter requires a TRPA permit available through the TRPA or the Fire Protection Districts (FPDs) on the Nevada Shore or some FPDs on the California shore.** (See Page 63 for details.) If possible, keep less common trees such as sugar pine and incense cedar, and remove more abundant trees such as white fir and lodgepole pine.

### Are ladder fuels present within your defensible space area?

Sometimes plants can provide uniform vegetation (fuel) from ground level to the treetops. Serving like rungs of a ladder, they can carry flames from fuels burning at ground level, such as excess pine needles, to taller fuels, such as shrubs, which ignite still taller fuels, such as tree branches.

The ladder fuel problem can be remedied by raising the height of the upper fuel layer (such as removing lower tree branches) or reducing the height of lower fuel layers (such as pruning or removing tall shrubs or small trees).

Within the defensible space area, a vertical separation between fuel layers of at least three times the height of the lower fuel layer is recom-



*Ladder fuels are vegetation that carry a fire from ground level to taller fuels, like trees. Removal of ladder fuels should provide a separation of three times the height of the lower fuel layer.*

mended. If a shrub growing adjacent to a white fir tree is 3 feet high, the right separation would be 9 feet (3 feet  $\times$  3 = 9 feet). You could remove the lower tree branches or reduce the height of the shrub or both. Exceptions to this practice are: removal of lower tree branches should not exceed a third of the tree's total height; lower tree branches should be removed at least 5 feet in height when no understory vegetation is present; and lower branches from large shrubs (greater than 3 feet in height) should be removed to provide at least 12 inches of separation from the ground.

### Maintenance and review

Maintaining a defensible space is an ongoing activity. Plants grow back, and flammable vegetation needs to be routinely removed and disposed of properly. Before each fire season, reevaluate your property using this chapter as a guide and implement the necessary defensible space recommendations.

## Choose plants for defensible space areas

Fundamental to creating an effective defensible space is the proper selection of plants. In ad-

dition to other needs (providing shade, adding color, controlling erosion, etc.) and adaptation to local growing conditions, landscape plants used in high wildfire hazard areas should possess desirable fuel characteristics.

Unfortunately, there are no "fireproof" plants. Any plant can burn during extreme fire conditions. There are, however, considerable differences between plants in their contribution to the wildfire hazard. Some plants are more difficult to ignite, burn more slowly, produce less heat and have shorter flame lengths.

### Selecting plants for use in a high fire-hazard environment

Choose plants that possess the following characteristics:

- ◆ **High-moisture content:** These are more difficult to ignite and burn more slowly. Green, healthy and actively growing herbaceous plants (grasses and flowers) have a much greater moisture content than woody plants (shrubs and trees). When dried out, however, herbaceous plants possess a much lower moisture content than woody plants. **If kept green** throughout the fire season by irrigation, grasses and flowers are usually more desirable than woody plants in the de-



fensible space area. Mow them down when they dry out.

- ◆ **Low-growing habit:** Plants that grow close to the ground usually produce shorter flames and have less fuel than taller plants. Select plants that grow to a height of less than 18 inches at maturity, or can be readily maintained at this height by pruning.
- ◆ **Low-fuel volume:** There is considerable variability between plant species regarding the amount of fuel produced. Select plants that produce relatively small amounts of vegetation and have plant parts (stems and branches) that are less than ½ inch in diameter.
- ◆ **Desirable chemical content:** Avoid selecting plants with resinous, oily or waxy plant parts such as juniper, sagebrush and arbovitae. These evergreen plants possess an undesirable chemical content that increases their flammability.

*“The manner in which plants are maintained is just as important as the species of plant selected”*

The manner in which plants are maintained is just as important as the species of plant selected. For example, plants considered low fire hazard can become high-hazard plants without proper irrigation, pruning, removal of dead leaves and branches, etc. Likewise, the risk associated with high-hazard plants can be reduced through appropriate cultural practices.

**Selecting and maintaining plants in a residential landscape located in a high wildfire hazard area**

- ◆ **Well-maintained lawns that are kept green** during the fire season can be effective in reducing the wildfire hazard when planted within 30 feet of the house. Lawns have their drawbacks, such as higher water use and maintenance requirements.

- ◆ **Clover, such as the ‘White Dutch’ variety,** is a good defensible space plant and lawn substitute. It has lower maintenance and water requirements than lawn but does not withstand foot traffic, and it does attract bees.
- ◆ On disturbed slopes, use erosion-control grasses such as **‘Durar’ hard fescue, ‘Covar’ sheep fescue, ‘Tegmar’ intermediate wheatgrass and ‘Luna’ pubescent wheatgrass.** If the grasses can’t be irrigated and kept green during the fire season, they should be cut down once they start drying out.
- ◆ Flower beds, if kept green and free of dead leaves, pose a much lower fire hazard than most native shrubs. Some examples of flowers that are adapted to local conditions include **columbine, lupine, Shasta daisy, yarrow and California poppy.**
- ◆ Ground covers, due to their low height and low fuel volume, are desirable plants for use in the defensible space. Some examples include **pinemat manzanita, kinnikinnick (bearberry manzanita), squawcarpet, moss pink (accent plant), periwinkle and stonecrop.**
- ◆ If trees or tall shrubs (greater than 3 feet) are desired, select deciduous types. **Aspen, birch, redstem/creek (red osier) dogwood, mountain alder, willow, bittercherry and currant** are a few good choices.
- ◆ Avoid planting coniferous or evergreen shrubs and trees (juniper, pines, spruces, etc.) within 30 feet of the house.
- ◆ A few native shrubs can be kept in the landscape, if well maintained. They should be free of dead wood and pruned regularly to reduce height and fuel volume. Low-hazard vegetation such as lawn, ground covers

and flower beds or mulches should be used around native shrubs. Keep less flammable native shrubs such as currant, snowberry, wildrose, serviceberry, mountain whitethorn and bittercherry, and remove more flammable shrubs such as huckleberry oak and greenleaf manzanita.

Please note that the TRPA's Code of Ordinances places some restrictions on the species, amount and placement of plants that can be used in residential landscapes. Plants from Table 1 in Chapter 7 can be used without restriction. Accent plants from Table 2 in Chapter 7 must be used sparingly as specimens that add color and diversity to your landscape.

Photo by CA Dept. of Forestry and Fire Protection



*Don't count on this! During a major wildfire it's unlikely that a fire engine will be parked in the driveway.*

### Some Defensible Space Misconceptions

#### **Misconception #1: Defensible space isn't necessary because the fire department will protect my house**

During a major wildfire, it's unlikely that there will be enough fire fighting resources available to defend every home. Even with adequate resources, some wildfires are so intense that there is little firefighters can do to prevent houses from burning. The key is to reduce fire intensity as a wildfire nears the house. This can be accomplished by reducing the amount of flammable vegetation surrounding a home.

#### **Misconception #2: Defensible space means a lot of bare ground around my house**

While bare ground would certainly be effective in reducing the wildfire threat, it is both unnecessary and environmentally damaging. Many homes have attractive, well-vegetated properties that are also effective as defensible space. Bare ground would be unacceptable because of aesthetic and soil erosion concerns. (See Chapter 3.)

#### **Misconception #3: Creating defensible space requires special skills and equipment**

For the most part, creating a defensible space employs routine gardening and landscape maintenance practices such as pruning, mowing, weeding, plant removal, appropriate plant selections and irrigation. Necessary equipment consists of common pruning shears, loppers, a weed eater, saw, shovel and rake.

## Integrate defensible space and water quality protection

When creating a defensible space, be aware of Lake Tahoe water quality concerns. If misapplied, defensible space practices could encourage accelerated erosion, a major contributor to the lake's declining water clarity. Erosion control concepts that should be incorporated into the defensible space are:

- ◆ Do not remove all vegetation from the defensible space area.
- ◆ If plant removal results in patches of exposed soil, revegetate the site as described in Chapters 7 and 8.
- ◆ When breaking up dense, continuous brush fields on steep slopes, create groups or "islands" of shrubs staggered horizontally across the slope.
- ◆ If present, leave a 2-inch ground cover (or mulch) of decomposing pine needles.

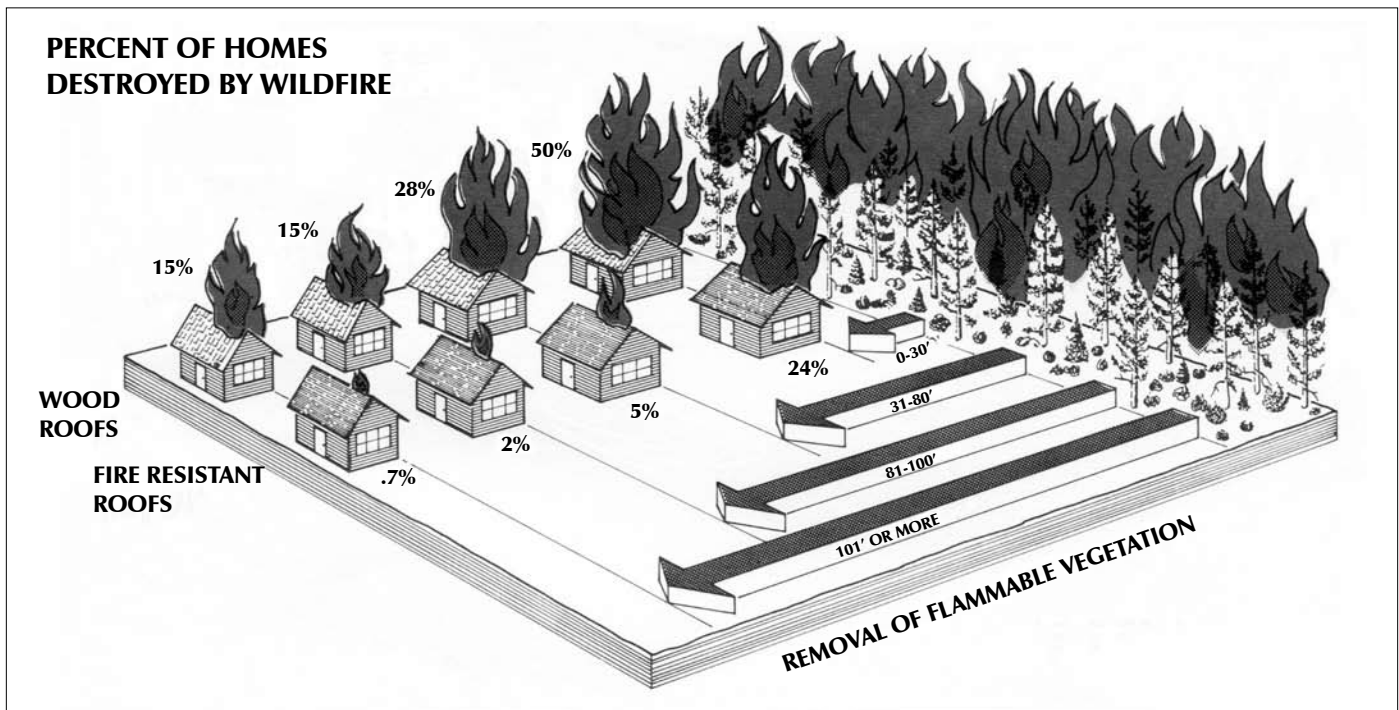
*The percent of homes destroyed by wildfire is correlated with roof type and extent of removal of flammable vegetation.*

- ◆ Remove vegetation in a manner that creates a minimum of soil disturbance. Do not dig out the plant's roots. This is particularly important on slopes.

## Defensible space works

Does defensible space make a difference? Research results say, "Yes." Based on investigation of houses exposed to wildfire, the evidence demonstrates that modifying vegetation and having a fire resistant roof greatly improves a home's survival probability.

The illustration below demonstrates one such investigation. Note that homes with little or no defensible space (removal of flammable vegetation) were more likely to be destroyed by wildfire. The fewest homes destroyed were those with the greatest amount of defensible space and fire-resistant roofs. Does creating a defensible space and having a fire-resistant roof guarantee that a home will survive a wildfire? No. They will, however, improve the homeowner's odds considerably.



## Protect Your Home and Structures From Wildfire

Having an effective defensible space may not be enough to protect your home from wildfire. **Other measures that will improve the survivability of your home include:**

- ✓ Have a fire-resistant roof. **Avoid wood roofs.**
- ✓ Make sure your address can be readily seen from the street.
- ✓ Cover all exterior house vents with wire screen having a mesh size of 1/8 inch or less.
- ✓ Make sure your chimney has an approved spark arrestor consisting of 1/2-inch or smaller wire mesh.
- ✓ Use heavy, fire-resistant drapes on windows.
- ✓ Clear all vegetation for 10 feet around and above propane and fuel tanks.
- ✓ Screen the open portion beneath decks with 1/4-inch or smaller wire mesh or enclose it with fire-resistant materials.
- ✓ Have these tools available: shovel, rake, ladder tall enough to access the roof, hoses connected to all exterior faucets, a five-pound, multipurpose fire extinguisher and a bucket.

## Additional sources of information:

- ◆ The local fire marshal.
- ◆ *Living With Fire – A Guide for the Homeowner* publication available at the fire department or University of Nevada Cooperative Extension offices.
- ◆ Go to the new website, [www.livingwithfire.info](http://www.livingwithfire.info). This site was developed in conjunction with Nevada and Lake Tahoe area fire-fighting experts to provide comprehensive information on how to live more safely with the threat of wildfire. This includes what to do before a wildfire threatens your home, evacuation tips during a wildfire, many informative publications and links to other useful fire-related websites.
- ◆ Sierra Front Wildfire Cooperators publication, “Wildfire Protection for Homeowner and Developers.”

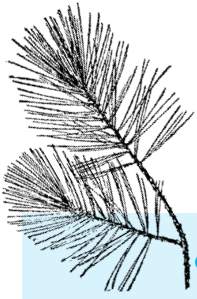
## Disposal or recycling of excess plant materials

- ◆ Groups have been working to help residents recycle the limbs and other plant parts that are removed while implementing defensible space.
- ◆ You can chip or shred your excess vegetation and use it at home for mulch or compost.
- ◆ Inquire about a local or regional biomass-recycling program. Contact South Tahoe Refuse, (530) 541-0366.
- ◆ For recycling of pine needles and excess plant materials in Incline Village, call Waste Not, (775) 831-8603.



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PLACE HOLDER



# Maintain Natural Areas Through Backyard Forestry

## GUIDING PRINCIPLE #6

### Maintain Your Native Vegetation

How much native vegetation do you have on your property? Are there plants in areas that weren't disturbed by vehicles or equipment during construction? Are there trees, shrubs or other plants that appear to be in their natural state? This is your native vegetation.

How healthy is your native vegetation? Has it been damaged by human activities or pests? If so, care for it so it remains a viable part of your landscape. Native vegetation has ecological and financial value. It helps water to infiltrate into the soil, controls erosion, provides wildlife habitat and is generally inexpensive and easy to maintain.

You can call on state and federal agencies to help manage your native vegetation. They may advise irrigation, planting, pruning or thinning a dense patch of vegetation. These and other techniques are used to integrate your natural areas with other facets of your landscape, such as your defensible space and erosion-control features.

**Note:** Before removing any trees from your property, check with the Tahoe Regional Planning Agency (TRPA) or state forestry agency. Removal of live trees larger than 6 inches in diameter requires a TRPA permit or tree removal form.

### Native vegetation has great value

One of the reasons people live at Lake Tahoe is the scenic beauty of the area. The lake, mountains, seasonal changes and ecosystem make Tahoe one of the most beautiful places in the world. The native plants, including trees, shrubs, wildflowers and grasses, are a big part of the region's inherent beauty.

This native vegetation has many values, from economic to ecologic. A forested landscape with a diverse complement of plants makes property attractive and desirable. These conditions often raise property values.

Native vegetation also lessens the impact of human activities. Buildings, roads, traffic and other human influences affect the forest ecosystem in negative ways. The more native vegetation we maintain on the property, the lower the impact on the ecosystem. An exception is the need for a less vegetated defensible space zone within 30 feet of your house. In this zone, removal of flammable shrubs and other dense vegetation reduces the hazards of wildfire. (See Chapter 5.)

### Identifying your native shrubs and trees

What kinds of native trees and shrubs are on your lot? Are the trees evergreens or deciduous? If deciduous (losing their leaves each fall), chances are they're aspens, willows, cottonwoods or alders (all of which like lots of water). If their leaves are long and thin, they are **wil-lows**. **Aspens** have round leaves. **Cottonwood** leaves are triangular-shaped with a sharp point, while leaves with saw-toothed edges and small cone-like seed heads are **alders**.

If the trees are evergreens, there are a few more choices. Are the leaves lacy, rather than needlelike, and forming "fans?" If so, it's likely an **incense cedar**. The other evergreen trees in the Basin have needlelike leaves and are either

pinus or firs. Firs have needles attached singly to the twigs rather than in bundles and may be either white or red fir. **White fir** generally grows at lower elevations than red fir. Its needles are 1 ½ to 3 inches long and flat. **Red fir**, though it's sometimes found with white fir, grows most often at higher elevations, generally above 7,000 feet. It's quite similar to white fir, but its needles are slightly shorter, can be rolled between thumb and middle finger, and tend to curve upwards.



*White Fir*



*Black Cottonwood*



*Incense Cedar*



*Mountain Alder*



*Scouler's Willow*



*Aspen*



*Jeffrey Pines have large cones, 5 to 9 inches long and three long needles per bundle.*

If the needles are attached to twigs in bundles, they're pines. The pines are divided into three groups, based on the number of needles in each bundle: two, three or five. There is only one native pine in the Tahoe Basin with two needles per bundle, **lodgepole pine**. The three-needle pines are Jeffrey and ponderosa. Both have straight needles that are 4 inches or longer in length. **Jeffrey pines** have large cones, 5 to 9 inches long. The spine on the tip of each cone scale is turned inward giving the nickname "gentle Jeffrey." The **ponderosa pine** cones are smaller, 3 to 5 inches long, and the prickles are turned outward resulting in the nickname "prickly ponderosa." **Sugar pines** have five, 2 to 3 ½ inch needles per bundle. The tree's cones are the largest of any pine tree, 12 to 18 inches long, and hang conspicuously from the ends of the tree's upper branches.

Other evergreen trees are high-elevation species and are unlikely to be found on privately held properties that ring the lake's lower elevations. These trees are western white pine, whitebark pine, mountain hemlock and western juniper.



*Sugar pines (above, top) have five needles per bundle. Lodgepole pines have two needles per bundle.*



### Is special care necessary?

Typically the native plant communities at Tahoe need very little, if any, care, because they're adapted to the area's growing conditions. They've been here much longer than we have. However, human activities often harm the native vegetation, making special care necessary to promote plants' long-term health.

There are some native inhabitants, such as bark beetles, dwarf mistletoe (a parasitic plant) and root-decay fungi, who make their living at the expense of Tahoe's trees. In the general forest areas, these organisms serve important ecological functions. However, when they do their work in home landscapes where individual plants have high value, they become pests, often requiring control to protect the plants. Our activities often weaken plants, predisposing them to harm by pests. Contact your local State Forestry office for control recommendations if you suspect your trees are affected by a forest pest.

### Check the health of native vegetation

The basic growth requirements for plants are sunlight, water, nutrients and space. When all these are available, the plant is usually healthy (growing well). But determining that all these requirements are present in sufficient amounts is difficult. Therefore, look for an indirect indicator – namely, the plant's appearance. Leaf color, leaf size and the amount of foliage are good indicators of plant health.

Normal foliage color of Tahoe natives varies among species, from pale yellow-green to deep forest-green to blue-green. Compare the plants on your property with the same species on similar sites. Lighter, yellowish color often means a root problem, drought, soil compaction, poor nutrition or disease.

Browning or reddening of plant foliage in patches is often a sign of insects, foliage disease or a broken branch. Widespread or complete color change of a tree is often a sign of damage to the growing layer just under the bark, the result of insects feeding in this layer or heat, drought or fungi.

Healthy plants have fuller, or thicker, foliage than stressed plants. A plant with thinning foliage is under stress. Unless the stress is identified and eliminated, the plant continues to decline, or it succumbs to secondary problems like insects or disease.

Photos by John Cobourn



*Healthy plants like the Jeffrey Pine above left, have good color and fuller or thicker foliage than stressed plants (right).*

## Recommendations for healthy vegetation

Maintenance practices like watering, fertilizing and staking are typically not necessary for Tahoe's native plants. In fact, they can harm plants that aren't used to them. What's important is to prevent damaging native plants, directly by physical contact or indirectly by altering their growing site.

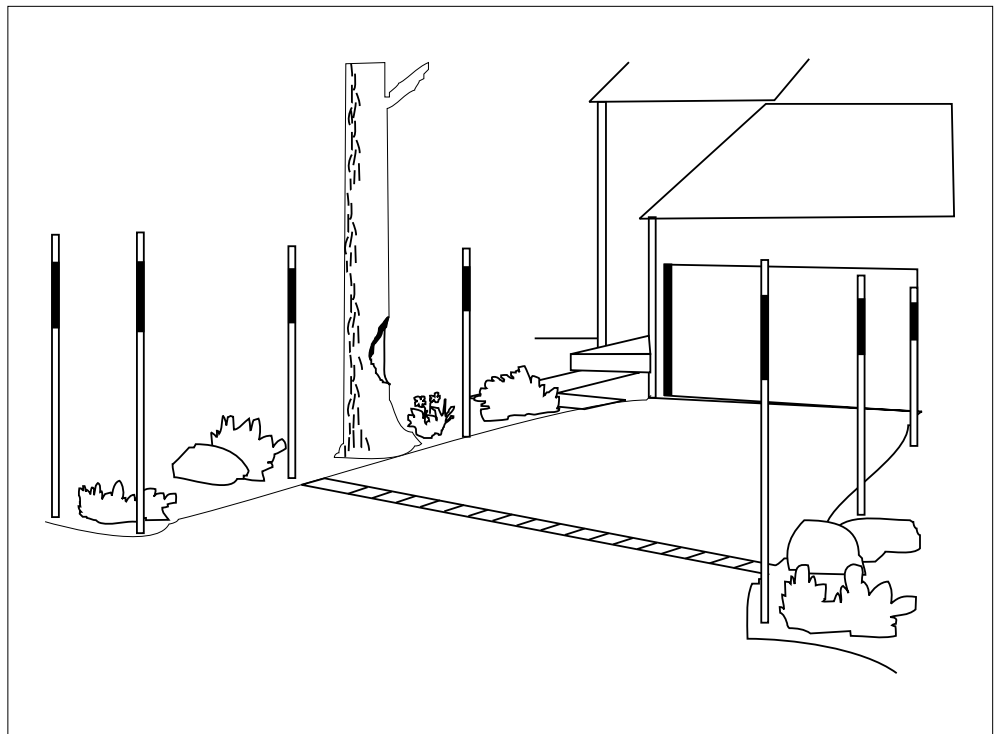
### Avoid physical damage

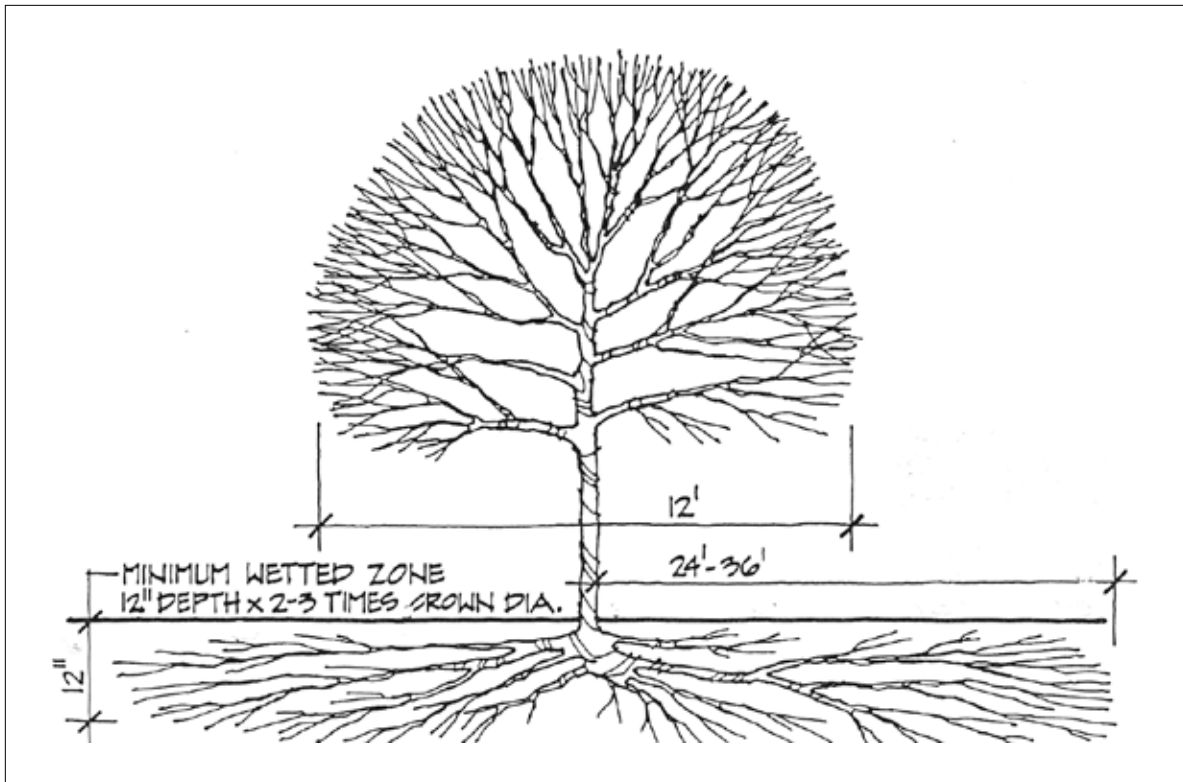
Physical damage is the most obvious and easiest to avoid. Avoid striking plants with vehicles (snow removal equipment is a prime culprit). Plan ahead and locate driveways away from vegetation. (See Chapter 2.) You can also damage trees by using them as utility poles or fence or sign posts.

Although not visible, most of a plant lies 12 to 18 inches below the ground. A plant's root system is often more extensive than its stems, branches and foliage. Established trees may have roots that extend out one and one half to three times the height of the tree. Keep this in mind when digging or excavating. Trenches and slope cuts should be located well outside a plant's drip line to avoid damage to the root system.

Roots are susceptible to damage indirectly from soil erosion, soil compaction or addition of new soil on top of the old. These activities make it difficult for roots to grow; they're deprived of necessary air and water. For more information on protecting plants from construction activities, pick up University of Nevada Cooperative Extension's Fact Sheet 93-85, "Protection of Trees and Other Vegetation During Construction."

*Protect your plants and their roots during the winter by using snow stakes to mark where machines should plow. Create snow storage areas so that snowmelt from plowed snow will infiltrate into the soil rather than draining to a SEZ or roadside ditch.*





*Tree roots extend beyond the drip line. Excavation cuts, construction activities and addition of fill dirt should occur well outside the tree's drip*

### Soak trees periodically

To maintain the health of native Tahoe trees, irrigate during the driest part of the summer. During mid- and late-summer months the moisture reserves in the soil become depleted. Trees experience drought stress, weakening them and increasing their susceptibility to attack by the pests mentioned earlier. To effectively irrigate the trees, snake a soaker hose around the trees, extending well beyond the drip line. Water trees once a month during summer and early fall by soaking the soil to a depth of 12 to 18 inches. Don't keep the soil saturated. Let it dry out between waterings.

### Fertilize with caution

A general rule at Lake Tahoe for all landscaping is "fertilize with caution." Fertilize plants only when they need it and with great care to ensure that no fertilizers escape in runoff or infiltrate

down to the groundwater. Native vegetation rarely requires fertilization. There is usually no need to fertilize native plants unless the soil has been disturbed or you're trying to get a young plant established. (See Page 117.)

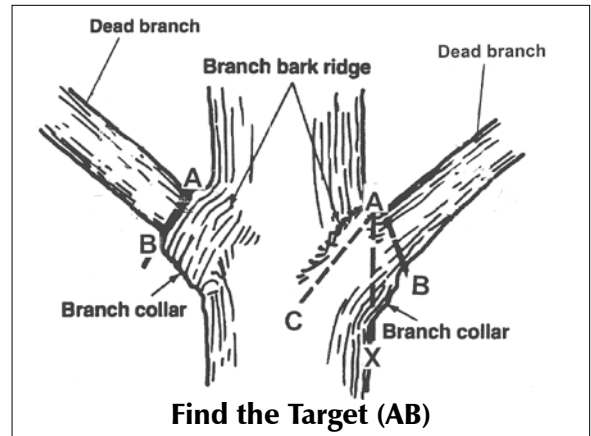
### Prune for health and safety

Prune only to repair damaged or diseased branches, to eliminate limbs in walkways or to provide for fire safety. The best time to prune conifers is in the spring, prior to resumption of growth. If a young conifer has a forked top, prune out one of the two tops or "leaders." Deciduous trees are pruned in the fall after a few hard frosts or early spring BEFORE buds show evidence of swelling. Prune broken limbs whenever they are found. Do not leave branch stubs; they won't heal and will leave trees open to infectious disease. The following page illustrates proper pruning techniques.

## Guide to proper pruning—Target pruning

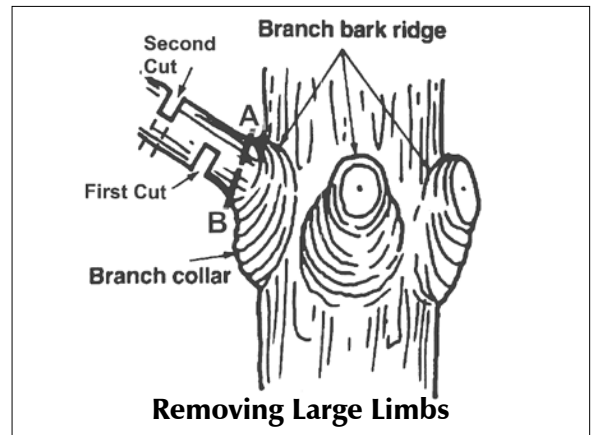
### Pruning steps – Find the target

1. Locate C just below the branch bark ridge.
2. Find TARGET A – just outside of the branch bark ridge.
3. Find TARGET B – swelling where branch meets branch collar.
4. If B is hard to find, drop a line AX to form the angle CAX. Make a mirror image of the angle CAX to determine the angle XAB. Cut the branch at AB.



### Removing large limbs

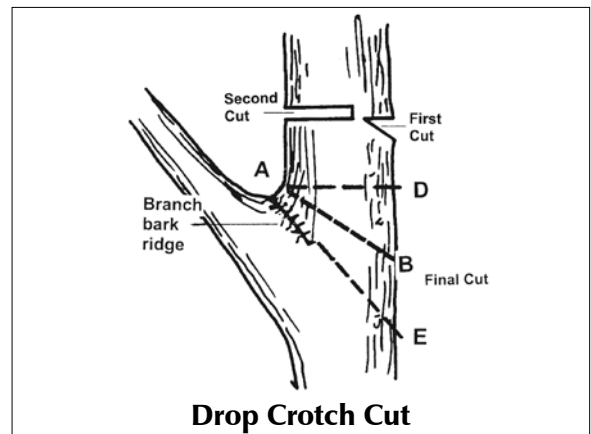
Use the 'three-cut' method for 2-inch and larger limbs. Make a first cut on the underside of the branch, 8 to 10 inches from where the branch connects to the trunk. Cut a third to halfway through the limb. Make the second cut from 1 to 3 inches outside the first cut, starting on the top, and cutting through the branch. Make the final cut at line AB, just outside the branch collar.



### Drop crotch cut

Use to reduce the height of a deciduous tree (not conifers) by removing a main branch back to a smaller branch that is at least one-third to half (*preferred*) the diameter of the branch being removed.

1. Use the 'three-cut' method described in "Removing large limbs."
2. To determine where to make the final cut, first draw an imaginary line perpendicular to the branch being removed, DA.
3. Make cut at AB, the line that divides or bisects the angle between the perpendicular line DA, and the branch bark ridge AE.



**Please note:** For any tree larger than 6 inches in diameter at breast height (dbh), a permit is required to remove live limbs from the upper two thirds of the tree.

### General pruning tips

- ◆ Do not top trees or leave flat tops.
- ◆ Do not cut into the branch collar. The branch collar determines the angle of the cut.
- ◆ Do not leave stubs.
- ◆ Do not paint or seal wounds or cuts.

### Thin trees as necessary

When a tree’s supply of light, water, nutrients and growing space is limited, or there are too many trees sharing the resources, the trees suffer. Overcrowding weakens trees and makes them susceptible to attacks from insects and diseases. That’s why thinning—removal of trees that are growing too closely together—is sometimes needed. Using the guidelines described below, select trees for removal that are deformed or have a thin crown or a dead top or that show evidence of disease, insect damage or mechanical damage.

First, in order to remove or damage any tree 6” dbh<sup>1</sup> or greater in the Lake Tahoe region, you must obtain a tree removal permit. These TRPA permits are available through the TRPA, and can also be issued by fire protection districts in Nevada and some California fire protection districts as part of a scheduled defensible space inspection. Trees smaller than 6” dbh generally may be removed at the homeowner’s discretion unless located in a SEZ or lakeshore area. When thinning these smaller trees, consider the following: 1) Young, vigorous trees grow fastest and with best form if they have 10-15 feet of growing space around them; 2) Trees are best located at least 10 feet from buildings and at least 5 feet from pavement; 3) Trees growing beneath other trees (“overtopped”) often cannot develop well, so removal should be considered; 4) Trees under power lines are likely to be topped or removed in the future; 5) Mature trees thrive with 20 feet or more of growing space around them.

Permits Required for Tree Removal <sup>1</sup> from Private Residential Property	
Proposed Activity or Project	TRPA Requirements
Removal of trees less than 6” dbh <sup>2</sup>	No permit required unless tree is in a Stream Environment Zone (SEZ).
Removal of dead <sup>3</sup> trees <sup>4</sup>	No permit required.
Removal of live trees 6” dbh <sup>2</sup> or greater	Obtain a tree removal permit from most fire protection districts or TRPA. If heavy equipment is to be used off roads or drive-ways, a Qualified Exempt form must be completed.
Cutting, trimming or removal of live lakeshore or SEZ vegetation <sup>5</sup> of any size	Requires a TRPA permit.

- <sup>1</sup> Tree removal is defined as cutting, killing or materially damaging a tree. “Material damage includes topping, removal of live limbs in the upper 2/3 of the total tree height, damage to trunk or roots, chemical damage or any other damage that weakens or disfigures the tree.
- <sup>2</sup> dbh: Diameter at breast height, measured 4 ½ feet above the ground on the uphill side of the tree.
- <sup>3</sup> A dead tree is defined as a conifer totally lacking green limbs and needles throughout the crown, or a deciduous tree determined to be dead by a qualified forester.
- <sup>4</sup> Removal of dead trees greater than 30 inches dbh outside urban areas or in SEZ’s requires TRPA approval. In eastside forests (in Nevada and east of Highway 267) the upper limit is 24 inches dbh.
- <sup>5</sup> SEZ vegetation: willows, cottonwoods, aspen, alder and other vegetation associated with areas of wet soil conditions in early summer. Also lakeshore vegetation and land capability “1b”.

For additional information on thinning forest trees, refer to University of Nevada Cooperative Extension Fact Sheet “Thinning and Defensible Space” (FS-92-55).

Keeping a mix of plant species with varying ages on your property lessens the chance of severe insect or disease problems. Species diversity also provides better habitat for Tahoe’s wildlife. Removal of trees is needed when they constitute a hazard (they may fall on your house)

or when they create excessive fuel. For more up-to-date details, please see the “Tree Removal Permit Application” by visiting [www.trpa.org](http://www.trpa.org), and clicking on “Permits and Documents.”

**Conserving Tahoe’s most imperiled plant: Tahoe yellow cress**

**What is Tahoe yellow cress?**

Tahoe yellow cress or “TYC” (*Rorippa subumbellata*) is a small, low-growing plant found along the shores of Lake Tahoe and nowhere else in the world. Tahoe yellow cress has tiny yellow round



or cup-shaped flowers, about ¼ inch in size, with four petals. Whole plants are often only an inch or two wide, but some may grow 12 inches or more in



diameter. The photos show a typical plant growing on sand among natural needle and bark litter.

Tahoe yellow cress is a perennial, the rootstock

surviving from year to year, with the stems lasting just one growing season. Generally, Tahoe yellow cress begins to grow in April and will flower from late spring through early fall.

Based on recent shorewide surveys, Tahoe yellow cress occupies less than 30 percent of its known historic sites around the Lake. Evidence suggests the current decline is due to a variety of causes, including increased human use of the lakeshore habitat.

**Where Does It Grow?**

Tahoe yellow cress typically grows on open, sandy beaches or dunes, especially near the edge of the Lake, stream mouths and back lagoons.

**Giving Tahoe yellow cress a little breathing room**

Protecting Tahoe yellow cress can be as easy as giving the plant a little room on your beach. Tahoe yellow cress usually occupies only a small portion of any one beach, and simply knowing how to identify it is the first step to protection. Also, let your visitors and others know about the plant and how to avoid trampling it.

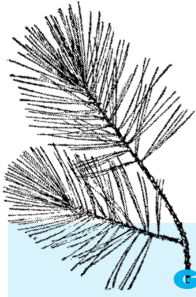
**What you can do to protect Tahoe yellow cress**

- ◆ Learn to identify the plant.
- ◆ Survey your property for Tahoe yellow cress. Pay close attention to sandy beach areas close to water sources.
- ◆ Become an active Tahoe Yellow Cress Steward; for more information, contact TRPA, (775) 588-4547, ext. 229.
- ◆ Redirect traffic away from Tahoe yellow cress.
- ◆ Launch and store watercraft away from the plant.
- ◆ Eliminate or reduce beach disturbance such as beach raking. Whenever possible, remove beach litter by hand. Use soft leaf rakes if raking is necessary.

**Summary**

This chapter provides insights on the value of maintaining native vegetation and gives recommendations on how to maintain it in a long-term healthy condition. For additional information, refer to the “Who to Call” section on the back cover.





# Use Plants for an Integrated Landscape

## GUIDING PRINCIPLE #7:

### Choose Plants for Aesthetics, Water Requirements and Other Objectives

Plants are the heart and soul of the landscape. They provide practical, economic, aesthetic and environmental value to the property. Exercise care and foresight when selecting plants for specific locations. Reduce the wildfire threat by creating defensible space, and control erosion by providing plant cover that protects and holds soil in place.

Different plants work on dry, moist or wet sites (Stream Environment Zones or SEZs) as well as in shady or sunny exposures. Plants on the Recommended Plant List (Table 1) are approved by the Tahoe Regional Planning Agency (TRPA) for use in any suitable landscape or revegetation application. The Accent Plants (Table 2) are ornamental plants that add color and variety to a landscape, but they aren't approved for widespread use or revegetation projects. See the section "Beware of Invasive Plants" for some safe alternatives to aggressive species.

### Plan before you buy

If you design your new landscape or refurbish an existing landscape according to the principles outlined in this book, you'll have a carefully worked out plan before you select plants. You will have identified special features such as SEZs, which can't have new landscaping, and patches of native vegetation that you'll leave in their natural state with no new plantings or irrigation systems. Don't begin buying plants until you have created a landscape plan. (See Chapter 2.)

Select plants to prevent erosion in areas where the soil has been disturbed or vegetation has been removed. (See Chapters 3 and 8.) Your landscape plan should identify where erosion-control grasses, shrubs or trees should be located. Determine the characteristics you want in each plant. For example, to revegetate steep, dry or rocky areas (a "harsh" site), find erosion-control species well-suited to such a site. Always till organic soil amendments, such as compost, into the soil before planting grasses or perennials. (See Chapter 9.)

## Use the TRPA Recommended Plant List

The TRPA requires that nearly all plants in your landscape be selected from their **Recommended Plant List (Table 1)**. These are "proven" plants that grow successfully in the Tahoe Basin. Many are natives, and the rest are introduced species that are well-adapted to the soil and climate. Most require little fertilizer, protecting the lake's water quality. Many are drought-tolerant and, once established, need little supplemental irrigation. The use of "resource-efficient plants" also reduces the likelihood of problems when a homeowner isn't present to care for them regularly.

Many of the plants on this list fit the natural landscape appearance of the basin and contribute to its scenic beauty even in developed regions, without completely replacing natural habitats.

**Use accent plants sparingly**

Other plants can be used as accents or specimens in the landscape. According to the TRPA’s Code of Ordinances, they may be planted in “borders, entryways, flower beds and other similar locations to provide color, diversity or ornamental qualities to the landscape dominated by native or adapted landscape selections.” **A list of suggested accent plants is presented in Table 2.**

*“Matching plant moisture needs with the hydrozone reduces plant stress, disease, insect problems and maintenance.”*

Many of the plants on the lists are difficult to grow from seed or transplant from the wild. Digging up a plant and transplanting it to your site almost always results in its death. Obtain written permission from the landowner before removing plants. For best results, buy plants from a nursery.

**Group plants into moisture zones**

Placing plants that require moist soil conditions in a wet area avoids the constant battle of keeping the site in an altered condition so plants can live. Areas that have dry soils do best when planted with species that thrive in dry conditions. Matching plant moisture needs with the hydrozone reduces plant stress, disease, insect problems and maintenance.

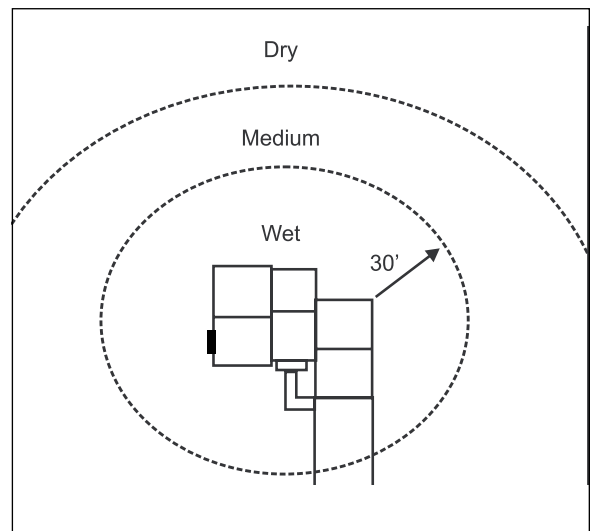
The plant lists give moisture requirements to assist you in selecting plants for specific sites on your property. (See column labeled “Moisture Zones.”) Plants labeled “wet” will require water every two to four days during the growing season. Plants labeled “medium” should do well on gently sloping or flat areas with deep soils that are not excessively wet or dry. Plants marked “dry” will survive on steeper or rockier slopes that face south or west, once established.

Group plants with similar moisture requirements. Specific valves of your irrigation system will serve each of these moisture zones, or

“hydrozones,” as described in Chapter 4. For example, the “Lean, Clean and Green Zone” (30 feet from structures) should have lawn, deciduous trees, perennials and shrubs requiring water every two to four days in summer, and once a week in spring and fall. Select “wet” plants for this zone.

Further away from structures, you may have dry soils with established native vegetation such as Jeffrey pine, western juniper, manzanita or mountain whitethorn. Select from “dry” plants when adding to these areas. A separate drip line can run through this zone, programmed to irrigate once a week or less, after new plants are established. A third zone needing its own drip line is the transition area between wet and dry zones, suitable for plants listed as having “medium” water requirements.

The irrigation system must be designed to match the planting zones in your landscape. A system that waters all areas equally wastes the resource and is detrimental to your plants’ health.



*Group plants with similar water requirements into hydrozones that can be irrigated efficiently.*



## Other tips on plant selection

### Mature height and spread

Select plants that mature to the height and spread desired. If this is not done, the plant may overgrow its intended space, cause damage to structures, maintenance problems and competition with other plants for space, nutrients and water.

### Practical use

Is the plant suitable for the site? Will it block views? Will it grow into adjacent yards? Will it serve its intended use? Will trees provide shade where needed? Deciduous shade trees are a good choice along the southeast, south and southwest walls of a house. They provide shade in summer and allow sunlight to warm the house during winter.

### Growth characteristics

Does it flower? Does it fruit? Does it produce fall color? How fast will it grow? What is its shape? Does it have an informal or formal shape? Is it upright or spreading? Does it drop seeds, pods or other debris?

### Texture

Plants produce a wide variety of leaf shapes. A narrow leaf is considered fine-textured, whereas, a wide leaf is coarse. Variety in texture adds interest to the landscape.

## Limit the size of lawns at Lake Tahoe

Lawns are used as an accent area, with the remaining land planted with more resource-efficient plants. A 30-foot band of turfgrass surrounding the house adds an important component for defensible space. (See Chapter 5.) These turf zones are irrigated most efficiently with

carefully timed applications of sprinkler irrigation.

All turfgrass species recommended for the Tahoe Basin can survive on twice-a-week watering, once established. (See Table 1 in Chapter 7.) Maximum water conservation is achieved when lawns are irrigated separately from trees and shrubs. When severe water restrictions are in place, lawns go dormant and turn brown. This doesn't mean the grasses are dying. They regain their normal color as soon as they receive an adequate amount of water.

Refer to *"The All Seeing, All Knowing Lawn Care Manual,"* produced by the University of Nevada Cooperative Extension, for lawn watering tips. You can also call the Natural Resources Conservation Service Backyard Conservation Program for their "Turf Watering Management" tip sheet.

## About the revised TRPA Recommended Plant List

### Native vs. introduced plants

The current Recommended Plant List differs from the 1988 version in that it lists more adapted introduced plants. Native plants are plants that were here prior to the arrival of European-American settlers. Adapted introduced plants originated elsewhere, but are well-suited to conditions in the Lake Tahoe Basin. Local horticulturists and botanists have recommended the adapted introduced plants because they're attractive and successful in this area. They are available commercially, and contribute to an important goal for vegetation— preventing soil erosion. If we vegetate bare soil, we will reduce the amount of sediment entering the lake. When using native plants, the plant stock should originate from as close as possible to the Tahoe Basin. Local specimens are recommended when available.

*"A band of turfgrass surrounding the house adds an important component for defensible space"*

### Species, cultivars and varieties

Plants on the Recommended Plant List are listed alphabetically by common name, as well as by genus and species. In some cases, only the genus is listed, with the notation that various species will work (“spp.”). On the other hand, the notation, “ssp.” stands for subspecies, and the following italicized word on the list is the recommended subspecies. Since scientific names occasionally change, former names are noted in brackets, for example [formerly *ovina*]. Suitable cultivars or varieties are also listed in the “remarks” column. When in doubt, consult a nursery in Truckee or Lake Tahoe to select the specific plants that best suit your needs.

### Lake Tahoe’s climate and growing conditions

The climate pattern of the Tahoe Basin reflects its high-altitude location, with dry, warm summers and cold, wet winters. Precipitation comes from winter snow, with smaller amounts from summer rainstorms. The lower elevations of the basin receive an annual average precipitation of 25 to 40 inches (liquid water).

Inhabited areas of the basin enjoy a relatively moderate climate. The darkest days of winter have a daytime average high of 35 to 40 degrees, with nights in the low teens to below zero. The last killing frost usually occurs in early June. Summer temperatures hover around 70 to 80 degrees during the day and 35 to 45 degrees at night.

Lake Tahoe enjoys an average of 274 days of sunshine a year. The lake’s water, warmer than the winter air and cooler than the summer air, pulls air temperatures toward the middle of the thermometer, away from the extremes. Because the Pacific Ocean is not far away, most winter storms have relatively mild temperatures and ample moisture. *Sunset* magazine has classified Lake Tahoe’s climate as “Climate Zone 2” due to these factors.

### Vegetables, fruits and berries

Fruits, vegetables and berries also grow at Lake Tahoe. However, you’re encouraged to use organic gardening methods to reduce pollution to the lake. The cold night temperatures and chance of frost during the summer make some plants, like tomatoes, more difficult to grow and care for. Check with local nurseries or contact [www.projectmana.org](http://www.projectmana.org) to select varieties that thrive with minimal fertilizer and pesticides.

### Fire hazard column

Each plant on the list is rated as low, high or unknown. This notation gives a *rough indication* of the potential for the plant to ignite and burn in a wildfire and is *not based on scientific trials*. The values of “low” and “high” were derived from a variety of sources. Their listing here does not imply an endorsement by the University of Nevada Cooperative Extension, only that this is what others have reported. “Unknown” indicates there is no data about a plant’s potential flammability. **THERE ARE NO FIRE-RESISTANT PLANTS.** Since many other factors affect how a plant burns in a wildfire (wind, steepness of slope, moisture content of soil and plants) these estimates simply give *an indication of relative fire hazard*. Factors such as the amount, arrangement, height and condition of plants around a house may be more important than inherent fire resistant properties of plant species. Plants that have dried out or turned brown (e.g., grasses) will burn more quickly than when they’re green. Many evergreen plants such as manzanita, juniper and pine, burn intensely even when green due to chemical content. Apply the principles of defensible space and see “Choose Plants for Defensible Space Areas” in Chapter 5.

## Native Perennials from TRPA's Recommended Plant List



*This homeowner planted delphinium surrounded by lupine, daisy, and columbine to win a TRPA Erosion Control Award in a beautiful way.*



*Native plants, such as this columbine, attract beautiful butterflies. Plant some areas of your landscape with species that provide food and cover for wildlife.*

Photos and landscaping by Sven Krevald

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>NON-TURF GRASSES</b>				
<b>Bluegrass, big</b> (see photo p. 71) 📷 <i>Poa ampla</i> [Ecotype of <i>P. secunda</i> ssp. <i>juncifolia</i> ]	med-dry	low	Suitable cultivars include 'Sherman's' & 'Canby's'; sun, revegetation, stabilization.	A
<b>Brome, Mountain/California</b> 📷 (photo p. 71) <i>Bromus carinatus</i>	med-dry	low	Suitable nonnative cultivar is 'Bromar'; sun, revegetation, stabilization.	N
<b>Fescue, blue</b> (see photo p. 71) 📷 <i>Festuca glauca</i>	med	low	Sun, edging, ornamental bunch grass.	A
<b>Fescue, hard</b> (see photo p. 71) 📷 <i>Festuca ovina</i> var. <i>duriuscula</i> [formerly <i>F. longifolia</i> and <i>F. ovina</i> ]	med-dry	low	Suitable cultivars include 'Durar,' 'Sierra,' & 'Scaldis'; sun, revegetation, stabilization; formerly called longifolia.	A
<b>Fescue, sheep</b> (see photo p. 71) 📷 <i>Festuca trachyphylla</i> [formerly <i>F. ovina</i> ]	dry	low	Suitable cultivar is 'Covar'; sun, revegetation, stabilization.	A
<b>Squirreltail</b> (see photo p. 71) 📷 <i>Elymus elymoides</i> ssp. <i>californicus</i>	dry	low	Stabilization, sun, revegetation.	N
<b>Tufted hairgrass</b> <i>Deschampsia cespitosa</i>	med-wet	low	Good for revegetation and erosion control. Is attractive when unmowed.	N
<b>Wheatgrass, bluebunch</b> <i>Pseudoroegneria spicata</i>	dry	low	Sun, revegetation, landscape interest.	A
<b>Wheatgrass, intermediate and pubescent</b> <i>Elytrigia intermedia</i>	dry	low	Drought-tolerant, tall, produces abundant roots, good seedling vigor. Green to bluegreen. 'Tegmar,' a dwarf cultivar, is superior for erosion control on harsh areas. Ideal for low-fertility sites. Another suitable cultivar is 'Luna.' Very competitive.	A
<b>Wheatgrass, slender</b> <i>Elymus trachycaulus</i>	dry	low	Quick cover, suitable for most soil textures. Short-lived plants, should be planted in a mix with other species. Very competitive.	N
<b>Wildrye, blue</b> <i>Elymus glaucus</i>	med-wet	low	Sun to shade, revegetation, stabilization, SEZ restoration.	N
<b>Wildrye, creeping</b> <i>Elymus triticoides</i>	med	low	Sun and part shade, revegetation, very competitive.	N
<b>Note: New cultivars are introduced periodically. Check to see if superior plants are available for your location.</b>				

Photo by Ed Kleiner, Jr.



*Bluegrass, big*

Photo by Michael Hogan



*Squirreltail*

Photo by Ed Kleiner, Jr.



*Fescue, hard*

Photo by Michael Hogan



*Brome, Mountain/California*

*See the table  
on Page 70  
for more  
information  
about these  
nonturf  
grasses*

Photo by Ed Kleiner, Jr.



*Fescue, sheep*

*Fescue, blue (right)*

Photo by Christy Malone



TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST

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<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>TURF GRASSES</b>				
<b>Bentgrass, creeping</b> <i>Agrostis stolonifera</i>	wet-med	low	Suitable cultivar is 'Penncross;' part shade to shade, lawn.	A
<b>Bluegrass, Kentucky</b> <i>Poa pratensis</i>	wet-med	low	Sun and part shade, lawn use only, many nonnative cultivars available.	N
<b>Fescue, chewings</b> <i>Festuca rubra</i> ssp. <i>commutata</i>	med	low	Part shade, lawn.	A
<b>Fescue, red</b> <i>Festuca rubra</i>	wet-med	low	Suitable cultivars include 'Ensilva' and 'Molate;' shade, lawns, many cultivars available.	N
<b>Fescue, tall</b> <i>Festuca arundinacea</i> [Formerly <i>Festuca elatior</i> ]	med	low	Part shade, lawns, ask for turf-type tall fescues or dwarf types. Do not use in SEZ.	A
<b>Ryegrass, perennial</b> <i>Lolium perenne</i>	med-dry	low	Sun, common in lawn seed mix and sod, many cultivars available.	A
<b>Note: Use turfgrass primarily within 30' of a deck and structures for defensible space. Grasses are low fire hazard plants when consistently irrigated and mowed.</b>				
<b>FLOWERS</b>				
<b>Alumroot or Coral Bells</b> <i>Heuchera micrantha</i> var. <i>erubescens</i>	wet-med	low	Part shade, groundcover, flowers, SEZ revegetation.	N,P
<b>Alumroot or Coral Bells</b> <i>Heuchera sanguinea</i>	wet-med	low	Part shade, groundcover, flowers, SEZ revegetation, many cultivars available.	A,P
<b>Arnica</b> <i>Arnica chamissonis</i> ssp. <i>foliosa</i>	med	low	Sun, part shade, flower, SEZ revegetation (seed is rare).	N,P
<b>Aster</b> <i>Aster</i> spp., many cultivars	med	low	N and A species available, sun to part shade, flower.	N,A,P
<b>Bee balm</b> <i>Monarda didyma</i>	med	low	Suitable cultivars include 'Cambridge Scarlet;' sun to part shade, flowers.	A,P
<b>Blanket flower</b> <i>Gaillardia aristata</i>	med-dry	low	Sun to part shade, flower, revegetation mix, many species and cultivars available.	A,P
<b>Bleeding heart, western</b> (see photo p. 73) ☒ <i>Dicentra formosa</i>	med	low	Part shade, flower, many species and cultivars available.	A,P
<b>Blue flag iris, western</b> (see photo p. 73) ☒ <i>Iris missouriensis</i>	med	low	Sun, part shade, may be invasive, many species and cultivars available.	N,P

Photo by Ed Smith



*Bleeding heart, western*

Photo by Laird Blackwell



*Blue flag iris, western*

Photo by Laird Blackwell



*Columbine, western or crimson*

Photo by Ed Smith



*Columbine*

Photo by Laird Blackwell



*Flax, blue*

*See the table on Page 74 for  
more information about these  
recommended flowers*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST










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<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
FLOWERS				
<b>Cinquefoil, Sticky</b> <i>Potentilla glandulosa</i>	med-wet	mod	Ornamental meadow flower.	N,P
<b>Columbine</b> (see photo p. 73)  <i>Aquilegia</i> spp.	med	low	Flowers, borders, many cultivars available. <i>A. formosa</i> and <i>A. pubescens</i> are native.	A,P
<b>Columbine, western or crimson</b> (see photo p. 73)  <i>Aquilegia formosa</i>	wet-med	low	Part to full shade, SEZ revegetation seed mix.	N,P
<b>Flax, blue or Flax, Lewis</b> (see photo p. 73)  <i>Linum lewisii</i>	med-dry	low	Sun, flowers, revegetation mix, many species and cultivars available.	N,P
<b>Fuchsia, California</b> (see photo p. 75)  <i>Epilobium canum</i> spp. <i>latifolium</i>	med-dry	low	Sun, flower, revegetation mix, many species and cultivars available.	A,P
<b>Iris, Hartweg's</b> <i>Iris hartwegii</i>	med	low	Sun to part shade, flower, difficult to grow.	A,P
<b>Jacob's ladder</b> (see photo p. 75)  <i>Polemonium occidentale</i>	wet-med	low	SEZ, part to full shade, flower borders or under trees.	N,P
<b>Larkspur, mountain</b> (see photo p. 75)  <i>Delphinium glaucum</i>	wet	low	SEZ, sun to part shade, flower borders, many species and cultivars available.	N,A,P
<b>Lupine</b> <i>Lupinus</i> spp.	med-dry	low	N and A varieties available, sun, flowers, revegetation, cover, many species and cultivars available.	N,A,P
<b>Lupine, large-leaved</b> (see photo p. 75)  <i>Lupinus polyphyllus</i>	wet-med	low	SEZ, sun to part shade, flower, SEZ revegetation mix	N,P
<b>Monkey flower</b> (see photo p. 75)  <i>Mimulus</i> spp.	wet	low	SEZ, suitable sub-species include ' <i>lewisii</i> ' (N), ' <i>cardinalis</i> ' (A), ' <i>guttatus</i> ' (N), part to full shade, flowers, possible SEZ mix.	A,N,P
<b>Monkshood, Columbian or Venus' chariot</b> <i>Aconitum columbianum</i> or <i>nepellus</i>	med-wet	low	Shade to partial sun. <i>A. nepellus</i> (A) and <i>A. columbianum</i> (N) are both suitable.	N,P
<b>Pennyroyal</b> (see photo p. 75)  <i>Monardella odoratissima</i>	dry	low	Sun, foliage herb, seed, may be difficult to grow.	N,P



Photo by Laird Blackwell



*Pennyroyal*

Photo by Laird Blackwell



*Jacob's ladder*

Photo by Laird Blackwell



*Larkspur, mountain*

Photo by Laird Blackwell



*Fuchsia, California*

*See the table on Page 74  
for more information  
about these recommended  
flowers*

Photo by Laird Blackwell



*Monkey flower*

Photo by Laird Blackwell



*Lupine, Large-leaved*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST





Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>FLOWERS</b>				
<b>Penstemon, Azure</b> <i>Penstemon azureus</i>	med	low	Good rock garden plant.	N,P
<b>Penstemon, hot-rock</b> <i>Penstemon deustus</i>	dry	low	Sun, flower, revegetation mix.	N,P
<b>Penstemon, gray</b> <i>Penstemon humilis</i>	med-dry	low	Sun, small flowers, revegetation mix, wide range of adaptation.	N,P
<b>Penstemon, Whorled or Sierra</b> <i>Penstemon heterodoxus</i>	med-dry	low	Sun to part shade, groundcover, revegetation mix.	N,P
<b>Penstemon, meadow</b> <i>Penstemon rydbergii</i> var. <i>oreocharis</i>	wet-med	low	SEZ, sun to part shade, flower, SEZ mix, difficult.	N,P
<b>Penstemon, Rocky Mountain</b> (see photo p. 77)  <i>Penstemon strictus</i>	med-dry	low	Many cultivars, sun, flowers, revegetation mix.	A,P
<b>Phlox, wild or sweet williams</b> <i>Phlox divaricata</i>	med-dry	low	Sun, rock garden or border flower, many species and cultivars available.	A,P
<b>Saxifrage</b> <i>Saxifraga bryophora</i>	wet-med	low	Sun to part shade, rock garden flower, many species and cultivars available.	N,P
<b>Sibbaldia</b> (see photo p. 77)  <i>Sibbaldia procumbens</i>	med	low	Sun to part shade, try as rock garden flower.	N,P
<b>Yarrow</b> (see photo p. 77)  <i>Achillea millefolium</i>	med	low	Many horticultural species, revegetation mix, aggressive, invasive if watered or in a SEZ.	A,P
<b>GROUNDCOVERS</b>				
<b>Daisy or Fleabane cultivars</b> <i>Erigeron</i> spp.	med	low	Sun to part shade, shrubby flowers, many species and cultivars available. <i>E. barbellulatus</i> is native.	A,P
<b>Daisy, Wandering</b> <i>Erigeron peregrinus</i>	med	low	SEZ, sun to part shade, shrubby flowers.	N,P
<b>Daisy, Coulter's</b> <i>Erigeron coulteri</i>	wet-med	low	SEZ, sun, part shade, shrubby flowers.	N,P
<b>Lupine, Brewer's</b> (see photo p. 77)  <i>Lupinus breweri</i>	dry	low	Sun, low traffic groundcover, spring flowers, difficult seed collection, many cultivars available.	N,P

Photo by Laird Blackwell



*Sibbaldia*

Photo by Christy Malone



*Yarrow*

Photo by John Cobourn



*Thimbleberry*

Photo by Laird Blackwell



*Lupine, Brewer's*

Photo by John Cobourn



*Strawberry, mountain*

Photo by Laird Blackwell



*Buckwheat, sulfur-flower*

*See the tables on Pages  
76 and 78 for more  
information about these  
flowers*

Photo by Christy Malone



*Penstemon, Rocky Mountain*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST









Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>GROUNDCOVERS</b>				
<b>Strawberry, mountain</b> (see photo p. 77)  <i>Fragaria virginiana</i>	wet-med	low	Sun to part shade, rock garden, groundcover with some flower.	N,P
<b>Strawberry, wood</b> <i>Fragaria vesca</i>	wet-med	low	Part shade, low traffic groundcover with some flower.	A,P
<b>Thimbleberry</b> (see photo p. 77)  <i>Rubus parviflorus</i>	wet-med	low	Part shade, low traffic groundcover and berries, stabilization.	N,P
<b>LOW SHRUBS, GROUNDCOVERS AND VINES</b>				
<b>Buckwheat, sulfur-flower</b> (see photo p. 77)  <i>Eriogonum umbellatum</i> ssp. <i>polyanthum</i>	dry	unknown	Sun, low-mounded shrub, stabilization.	N,P
<b>Kinnikinnick or bearberry</b> (see photo p. 79)  <i>Arctostaphylos uva-ursi</i>	med	unknown	Part shade, groundcover, low shrubby, flower.	A,E
<b>Manzanita, pinemat</b> (see photo p. 79)  <i>Arctostaphylos nevadensis</i>	dry	unknown	Sun, revegetation groundcover, difficult.	N,E
<b>Penstemon</b> <i>Penstemon heterophyllus</i>	med-dry	low	Sun to part shade, low shrubby flower.	A,P
<b>Penstemon, mountain pride</b> (see photo p. 79)  <i>Penstemon newberryi</i>	med-dry	low	Sun to part shade, low shrubby flowers, stabilization.	N,E,P
<b>Snowberry, creeping</b> (see photo p. 79)  <i>Symphoricarpos mollis</i>	med	unknown	Sun to part shade, groundcover flowerberry, stabilization.	N,P
<b>Squaw Carpet or mahala mat</b> (see photo p. 79)  <i>Ceanothus prostratus</i>	med-dry	unknown	Dappled shade under pines, sun, groundcover, spring flowers, difficult establishment.	N,E
<b>SHRUBS</b>				
<b>Alder, white</b> <i>Alnus rhombifolia</i>	wet-med	low	SEZ, sun to part shade, medium tree, stabilization.	N,D

Photo by John Cobourn



*Kinnikinnick or bearberry*

Photo by Christy Malone



*Penstemon, mountain pride*

Photo by Ed Smith



*Manzanita, pinemat*

Photo by Ed Smith



*Squaw Carpet or mahala mat*

Photo by Ed Smith



*Snowberry, creeping*

*See the table on Page 78 for more information about these recommended low shrubs, ground covers and vines*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST







Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>SHRUBS</b>				
<b>Alder, mountain</b> (see photo p. 81)  <i>Alnus tenuifolia</i>	wet	unknown	SEZ, sun to part shade, small tree, stabilization.	N,D
<b>Bitterbrush</b> (see photo p. 81)  <i>Purshia tridentata</i>	dry	high	Sun to part shade, for natural areas, revegetation and stabilization, plant away from structures.	N,E
<b>Buckthorn, alder</b> <i>Rhamnus alnifolia</i>	wet-med	unknown	Sun to part shade, edge of wet meadows and streams, revegetation.	N,D
<b>Chinquapin, bush</b> (see photo p. 81)  <i>Chrysolepis sempervirens</i>	med-dry	high	Sun to part shade, plant away from structures.	N,E
<b>Cinquefoil, shrubby</b> (see photo p. 81)  <i>Potentilla fruticosa</i>	wet-med	unknown	N and A cultivars available, sun to part shade, flowering.	N,A,D
<b>Coffeeberry, Sierra</b> <i>Rhamnus rubra</i>	med-dry	unknown	Sun to part shade, foliage, berries, revegetation.	N,D
<b>Creambush, oceanspray</b> <i>Holodiscus discolor</i>	med-dry	unknown	Sun to part shade, flowering, accent, revegetation.	N,D
<b>Currant</b> <i>Ribes odoratum</i>	med	unknown	Sun to part shade, fragrant flowers, attractive berries, stabilization.	A,D
<b>Currant, alpine</b> <i>Ribes alpinum</i>	med	unknown	Sun to part shade, attractive berries, stabilization.	N,D
<b>Currant, golden</b> (see photo p. 81)  <i>Ribes aureum</i>	med-dry	unknown	Sun to part shade, attractive berries, stabilization.	A,D
<b>Currant, mountain pink</b> (see photo p. 81)  <i>Ribes nevadense</i>	med	unknown	Part shade, ornamental, revegetation.	N,D
<b>Currant, red flowering</b> <i>Ribes sanguineum</i>	med	unknown	Part shade, woody flowers and berries.	A,D
<b>Currant, sticky</b> <i>Ribes viscosissimum</i>	med-dry	unknown	Sun to part shade, berries, stabilization.	N,D
<b>Currant, wax</b> <i>Ribes cereum</i>	med-dry	unknown	Sun to part shade, berries, revegetation, stabilization.	N,D

Photo by Laird Blackwell



*Cinquefoil, shrubby*

Photo by Wayne Johnson



*Currant, mountain pink*

Photo by Ed Smith



*Chinquapin, bush*

Photo by Christy Malone



*Currant, golden*

Photo by John Cobourn



*Alder, mountain*

Photo by Ed Smith



*Bitterbrush*

*See the table  
on Page 80  
for more  
information  
about these  
recommended  
shrubs*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST







Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
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<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>SHRUBS</b>				
<b>Dogwood, redstem/creek</b> (see photo p. 83)  <i>Cornus sericea</i>	wet	low	SEZ, shade, flowers, showy red stems in winter, SEZ revegetation.	N,D
<b>Elderberry, blue</b> <i>Sambucus cerulea</i>	wet-med	unknown	Part to full shade, berries, revegetation.	N,D
<b>Elderberry, common red</b> (see photo p. 83)  <i>Sambucus racemosa</i>	wet-med	unknown	Part to full shade, berries, revegetation.	N,D
<b>Elderberry, red</b> <i>Sambucus racemosa</i> var. <i>microbotrys</i>	wet-med	unknown	Part to full shade, fruit, revegetation, difficult to manage.	N,D
<b>Manzanita, greenleaf</b> (see photo p. 83)  <i>Arctostaphylos patula</i>	dry	<b>high</b>	Sun, neutral areas away from structures, revegetation, difficult germination.	N,E
<b>Maple, Rocky Mountain</b> <i>Acer glabrum</i>	wet-med	unknown	SEZ, part to full shade, fall color, SEZ revegetation, many varieties named.	N,D
<b>Mountain ash, California</b> (see photo p. 83)  <i>Sorbus californica</i>	wet-med	unknown	SEZ, part to full shade, red berries, shrub to small tree.	N,D
<b>Ninebark</b> <i>Physocarpus capitatus</i>	wet-med	unknown	SEZ, part shade, cultivars, SEZ revegetation.	A,D
<b>Oak, huckleberry</b> <i>Quercus vaccinifolia</i>	med-dry	<b>high</b>	Sun to part shade, revegetation, stabilization, away from structures, very competitive.	N,E
<b>Rabbitbrush</b> (see photo p. 83)  <i>Chrysothamnus nauseosus</i>	dry	<b>high</b>	Sun, revegetation and stabilization.	N,D
<b>Sagebrush, low</b> <i>Artemisia arbuscula</i>	med-dry	<b>high</b>	Sun, dappled shade, gray color, slope stabilization and revegetation.	N,D
<b>Sagebrush, mountain</b> (see photo p. 83)  <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	dry	<b>high</b>	Sun to part shade, away from buildings, revegetation.	N,E
<b>Sagebrush, Rothrock</b> <i>Artemisia rothrockii</i>	med-dry	<b>high</b>	Sun, high Sierra meadow revegetation.	N,D



Photo by Laird Blackwell



*Elderberry, common red*

Photo by Ed Smith



*Dogwood, redstem/creek*

Photo by Ed Smith



*Manzanita, greenleaf*

Photo by John Cobourn



*Sagebrush, mountain*

*See the table  
on Page 82  
for more  
information*

Photo by Christy Malone



*Rabbitbrush*

Photo by Wayne Johnson



*Mountain ash, California*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST









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<b>SHRUBS</b>				
<b>Sagebrush, silver</b> <i>Artemisia cana</i> ssp. <i>bolanderi</i>	med-dry	<b>high</b>	Stream margins, sun to part shade, small shrub, color, revegetation.	A,D
<b>Serviceberry, western</b> (see photo p. 85)  <i>Amelanchier alnifolia</i> var. <i>pumila</i>	med-dry	unknown	Sun to part shade, flowers, stabilization, revegetation, many species and cultivars available.	N,D
<b>Skunkbush sumac</b> (see photo p. 85)  <i>Rhus trilobata</i>	med-dry	unknown	Sun to part shade, revegetation, stabilization, orange-red berries.	A,D
<b>Snowberry, mountain</b> <i>Symphoricarpos rotundifolius</i>	med	unknown	Sun to part shade, white berries, revegetation.	A,D
<b>Spiraea, mountain</b> (see photo p. 85)  <i>Spiraea densiflora</i>	wet-med	unknown	Part to full shade, flowering, low hedge, SEZ revegetation.	N,D
<b>Tobacco brush or Snowbrush</b> (see photo p. 85)  <i>Ceanothus velutinus</i>	dry	<b>high</b>	Sun, revegetation away from structures.	N,E
<b>Twinberry</b> <i>Lonicera involucrata</i>	wet-med	unknown	SEZ, part to full shade, SEZ revegetation.	N,D
<b>Whitethorn, mountain</b> (see photo p. 85)  <i>Ceanothus cordulatus</i>	dry	unknown	Sun to part shade, revegetation, stabilization.	N,E
<b>Woods rose</b> (see photo p. 87)  <i>Rosa woodsii</i> var. <i>ultramontana</i>	med	unknown	Sun to part shade, flowers, revegetation, stabilization.	N,D
<b>SHRUBS TO SMALL TREES</b>				
<b>Bittercherry</b> (see photo p. 87)  <i>Prunus emarginata</i>	med	unknown	Sun to part shade, spring flowers, revegetation.	N,D
<b>Chokecherry, western</b> (see photo p. 85)  <i>Prunus virginiana</i> var. <i>demissa</i>	med	unknown	Sun to part shade, flowers, fruit, revegetation stabilization.	N,D
<b>Mountain mahogany, curlleaf</b> <i>Cercocarpus ledifolius</i>	dry	<b>high</b>	Sun, revegetation, stabilization, away from structures. Also <i>C. intricatus</i> , <i>C. montanus</i> (A)	N,E
<b>Willow, Pacific</b> <i>Salix lasiandra</i>	wet	unknown	SEZ, sun to part shade, stabilization, revegetation.	N,D

Photo by Ed Smith



*Serviceberry, western*

Photo by Wayne Johnson



*Chokecherry, western*

Photo by Ed Smith



*Whitethorn, mountain*

Photo by Ed Smith



*Tobacco brush or Snowbrush*

Photo by Laird Blackwell



*Spiraea, mountain*

Photo by Wayne Johnson



*Skunkbush sumac*

*See the table on Page 84 for more information about these recommended shrubs*

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST





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<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>SHRUBS TO SMALL TREES</b>				
<b>Willow, arctic</b> <i>Salix arctica</i>	wet-med	unknown	SEZ, sun to part shade, stabilization, revegetation.	A,D
<b>Willow, Geyer's</b> <i>Salix geyariana</i>	wet	unknown	SEZ, sun to part shade, stabilization, revegetation.	N,D
<b>Willow, Lemmon's</b> <i>Salix lemmonii</i>	wet	unknown	SEZ, sun to part shade, meadow and stream margins, stabilization, revegetation.	N,D
<b>Willow, narrow-leaved</b> <i>Salix exigua</i>	wet	unknown	SEZ, sun to part shade, meadow and stream margins, stabilization, revegetation.	N,D
<b>Willow, purple osier/Alaska blue</b> <i>Salix purpurea</i>	wet	unknown	SEZ, sun to part shade, showy purple stems in winter, ornamental, stabilization, revegetation.	A,D
<b>Willow Scouler's</b> (see photo p. 87)  <i>Salix scouleriana</i>	wet	unknown	SEZ, sun to part shade, meadow and stream margins, stabilization, revegetation.	N,D
<b>Willow, shining</b> <i>Salix lucida</i>	wet	unknown	SEZ, sun to part shade, meadow and stream margins, stabilization, revegetation, tall shrub or prune as tree, check subspecies.	A,D
<b>Willow, Sierra or strap leaved</b> <i>Salix eastwoodiae</i> or <i>ligulifolia</i>	wet	unknown	SEZ, sun to part shade, meadow and stream margins, stabilization, revegetation, shrub or small tree with pruning. Can be difficult to find.	N,D
<b>TREES</b>				
<b>Aspen, quaking</b> (see photo p. 87)  <i>Populus tremuloides</i>	wet-med	low	SEZ, sun to part shade, best grown in clumps, invasive in lawns; streambank revegetation, fall color, needs protection.	N,D
<b>Cottonwood, black</b> (see photo p. 87)  <i>Populus trichocarpa</i>	wet	unknown	SEZ, sun to part shade, shade, SEZ revegetation. Plant away from structures and pavement. Invasive roots.	N,D
<b>Fir, red</b> <i>Abies magnifica</i>	med	high	Part to full shade, accent, appropriate site revegetation.	N,E
<b>Fir, white</b> (see photo p. 87)  <i>Abies concolor</i>	med	high	Sun to part shade, accent, appropriate site revegetation.	N,E

Photo by Laird Blackwell



*Woods rose*

Photo by John Cobourn



*Cottonwood, black*

Photo by Ed Smith



*Bittercherry*

Photo by John Cobourn



*Fir, white*

Photo by John Cobourn



*Aspen, quaking*





Photo by John Cobourn



*Willow, Scouler's*

See the tables on Pages 84 and 86 for more information about these recommended shrubs and small trees

TABLE 1: TAHOE REGIONAL PLANNING AGENCY RECOMMENDED PLANT LIST

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>TREES</b>				
<b>Hemlock, mountain</b> <i>Tsuga mertensiana</i>	med	<b>high</b>	Part to full shade, grows above 8,000' well.	N,E
<b>Incense cedar</b> (see photo p. 89)  <i>Calocedrus decurrens</i>	med-dry	<b>high</b>	Sun to part shade, specimen, revegetation.	N,E
<b>Juniper, western/Sierra</b> (see photo p. 89)  <i>Juniperus occidentalis</i> var. <i>occidentalis</i>	dry	<b>high</b>	Sun, specimen, revegetation, slow growing.	N,E
<b>Oak, canyon live</b> <i>Quercus chrysolepis</i> ssp. <i>australis</i>	med-dry	unknown	Sun to part shade, revegetation.	N,E
<b>Pine, foxtail</b> <i>Pinus balfouriana</i>	med	<b>high</b>	Sun, best at sub-alpine elevation, specimen, revegetation.	N,E
<b>Pine, Jeffrey</b> (see photo p. 89)  <i>Pinus jeffreyi</i>	med-dry	<b>high</b>	Sun, specimen, revegetation.	N,E
<b>Pine, limber</b> <i>Pinus flexilis</i>	wet-med	<b>high</b>	Sun to part shade, best above 7,000' elevation, revegetation.	N,E
<b>Pine, lodgepole</b> <i>Pinus contorta</i> var. <i>murrayana</i>	wet-med	<b>high</b>	Sun to part shade, specimen, revegetation.	N,E
<b>Pine, ponderosa</b> <i>Pinus ponderosa</i>	med-dry	<b>high</b>	Sun, specimen, revegetation.	N,E
<b>Pine, sugar</b> (see photo p. 89)  <i>Pinus lambertiana</i>	med	<b>high</b>	Sun, when young survives partial shade, specimen, revegetation.	N,E
<b>Pine, whitebark</b> <i>Pinus albicaulis</i>	med-dry	<b>high</b>	Sun to part shade, tolerates difficult conditions at high elevations.	N,E
<b>Pine, western white</b> <i>Pinus monticola</i>	med-dry	<b>high</b>	Sun to part shade, tolerates difficult conditions at high elevations.	N,E

*The authors wish to thank the Tahoe Regional Planning Agency's botanist, Larry Benoit, for his assistance in creating the Recommended Plant List and the Accent Plant List.*

Photo by John Cobourn



*Pine, Jeffrey*

Photo by Christy Malone



*Juniper, western/Sierra*

*See the table on Page 88  
for more information  
about these trees*

Photo by John Cobourn



*Incense cedar*

Photo by John Cobourn



*Pine, sugar*

TABLE 2: ACCENT PLANT GUIDE FOR LAKE TAHOE

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>NON-TURF GRASSES</b>				
<b>Miscanthus grass</b> <i>Miscanthus sinensis</i>	wet	high	Suitable cultivar is 'Gracillimus;' shade, landscape interest, aggressive.	A,P
<b>Note: With grasses as with other plants, new cultivars are introduced over time. Check to see if superior varieties are available for your location.</b>				
<b>FLOWERS</b>				
<b>Astilbe</b> <i>Astilbe</i> spp.	med	low	Part to full shade, flowering.	A,P
<b>Candy Tuft</b> <i>Iberis sempervirens</i>	med-dry	low	Sun to part shade, rock garden groundcover.	A,P
<b>Common thrift</b> <i>Armeria maritima</i> ssp. <i>californica</i>	wet-med	low	Cultivars are available, part to full shade, rock garden foliage and flowers.	A,P
<b>Coneflower, purple</b> <i>Echinacea purpurea</i>	med-wet	low-mod	Similar to Black-eyed Susan with purple flowers.	A,P
<b>Coreopsis cultivars</b> <i>Coreopsis lanceolata</i>	med	low	Many cultivars including 'Baby Sun' and 'Moon Beam;' sun, small flowers.	A,P
<b>Daylily</b> (see photo p. 91) 📷 <i>Hemerocallis</i> spp.	med	low	Full sun to part shade, harsh site, many cultivars are available.	A,P
<b>Delphinium, Tower</b> <i>Delphinium belladonna</i>	wet-med	low	Sun, flowers, other species available.	A,P
<b>Foxglove</b> (see photo p. 91) 📷 <i>Digitalis</i> spp.	med	low	Suitable cultivars include 'Yellow Foxglove;' suitable species include <i>Grandiflora</i> , sun to part shade, flower.	A,B
<b>Gilia, star or scarlet</b> <i>Ipomopsis aggregata</i>	med-dry	low	Sun to part shade, flower, difficult to grow.	N,B
<b>Iris, Siberian</b> <i>Iris sibirica</i>	med	low	Suitable cultivars include 'Caesars Brother;' sun to part shade, flower.	A,P
<b>Lamb's ear</b> (see photo p. 91) 📷 <i>Stachys byzantina</i>	med-dry	unknown	Cultivars, sun to part shade, flowers, very competitive.	A,P
<b>Lily</b> <i>Lilium</i> spp.	wet-med	low	Many horticultural varieties are available.	A,P



Photo by Laird Blackwell



*California poppy*

Photo by Wayne Johnson



*Daylily*

Photo by John Cobourn



*Foxglove*

Photo by Wayne Johnson



*Lamb's ear*

*See the tables on Pages 90 and 92  
for more information about these  
recommended flowers*

TABLE 2: ACCENT PLANT GUIDE FOR LAKE TAHOE

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
FLOWERS				
<b>Lupine, ornamental</b> <i>Lupinus</i> spp.	med	low	Most popular cultivars include 'Russell's Hybrids;' sun to part shade.	A,P
<b>Peony</b> <i>Paeonia</i> spp.	wet-med	low	Require well-drained, moist soils, sunny sites, spring flowering, <i>Paeonia brownii</i> = N.	A,P
<b>Pink, Moss</b> (see photo below) 📷 <i>Phlox subulata</i>	med-dry	low	Sun, rock garden or border flower.	A,P
<b>Phlox, Annual</b> <i>Phlox drummondii</i>	med-wet	low	A tall, showy annual. Needs full sun, irrigation.	A,A
<b>Poppy, California</b> (see photo p. 91) 📷 <i>Eschscholzia californica</i>	med	low	Sun to part shade, flowers.	A,C
<b>Poppy, Oriental</b> <i>Papaver orientale</i>	med	low	Sun to part shade, flower.	A,P
<b>Red hot poker</b> (see photo below) 📷 <i>Kniphofia uvaria</i>	med-dry	low	Sun, flower, attracts birds, hardy.	A,P
<b>Sweet William</b> <i>Dianthus barbatus</i>	med	low	Small carnation-like biennial, 12 inches tall.	A, B
<b>Wallflower, Siberian</b> <i>Erysimum hieraciifolium</i>	med	low	Sun, flowers, <i>Erysimum capitatum</i> , ssp. <i>perenne</i> is native.	A,P

See the table above for more information about these recommended flowers



Red hot poker



Pink, moss

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
<sup>1</sup> The fire hazard rating is a rough estimate of the potential flammability of the plant and is not based on scientific trials. Plants that turn brown often become "high" fire hazards. Mow grasses and forbs when they begin to turn brown each year.				
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GROUNDCOVERS				
<b>Baby's breath, creeping</b> <i>Gypsophila repens</i>	med-dry	low	Cultivars, sun to part shade, rock garden, ground cover.	A,P
<b>Buttercup, creeping</b> <i>Ranunculus repens</i>	wet-med	low	Suitable cultivars include 'Pleniflorus;' sun to part shade, groundcover flowers, live-stock toxic, very competitive.	A,P
<b>Cinquefoil, spring</b> (see photo below) 📷 <i>Potentilla tabernaemontanii</i>	wet-med	low	Suitable cultivars include 'Nana;' sun to part shade, groundcover, flower.	A,P
<b>Dusty miller</b> <i>Artemisia stellerana</i>	med-dry	low	Suitable cultivars include 'Silver Brocade;' sun to part shade, flower, border ground-cover.	A,P
<b>Speedwell, pink wooly</b> <i>Veronica incana</i>	med-dry	low	Sun to part shade, groundcover, flower.	A,P
<b>Stonecrop</b> (see photo below) 📷 <i>Sedum spp.</i>	dry	low	Suitable cultivars include 'Forsterianum;' sun to part shade, low traffic groundcover.	N,P
<b>Sweet Woodruff, bedstraw</b> (see photo below) 📷 <i>Asperula odorata (Galium odoratum)</i>	med	low	Shaded, groundcover.	N,P



Sweet Woodruff, bedstraw



Stonecrop



Cinquefoil, spring

See the table above for more information about these recommended ground covers

TABLE 2: ACCENT PLANT GUIDE FOR LAKE TAHOE





Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
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<b>LOW SHRUBS, GROUNDCOVERS AND VINES</b>				
<b>Cotoneaster</b> (see photo p. 95)  <i>Cotoneaster</i> spp.	med-dry	low	Suitable cultivars include 'Coral Berry,' 'Eicholz,' 'Bearberry;' sun to part shade, flowers, shrubs and groundcovers.	A,D
<b>Mahonia longleaf</b> <i>Mahonia, nervosa</i>	med	unknown	Sun to part shade, groundcover, berry, stabilization.	A,E
<b>Mahonia or Oregon grape holly</b> <i>Mahonia aquifolium</i>	med-dry	low	Suitable cultivars available; sun to part shade, groundcover, produce waxy purple berries, stabilization.	A,E
<b>Virgin's Bower or Clematis</b> <i>Clematis montana</i>	wet-med	unknown	Suitable species and cultivars include 'Alpiva,' 'Vitticello;' sun to part shade, woody vine, flower - screen.	A,D
<b>SHRUBS</b>				
<b>Butterfly bush</b> (see photo p. 95)  <i>Buddleia davidii</i>	med	unknown	Many cultivars, sun to part shade, flowering, cut back after flowering.	A,D
<b>Cherry, western sand</b> (see photo p. 95)  <i>Prunus besseyi</i>	med-dry	low	Sun to part shade, accent and fruit stabilization.	A,D
<b>Chokeberry</b> <i>Aronia melanocarpa</i>	wet-med	unknown	Part to full shade, fall color and berries.	A,D
<b>Cotoneaster, Peking</b> <i>Cotoneaster acutifolius</i>	dry	unknown	Sun, flowering hedge.	A,D
<b>Honeysuckle, gold flame</b> <i>Lonicera heckrottii</i>	wet	unknown	Cultivar, part to full shade, flowers; 'Pink Gold Flame' also available.	A,D
<b>Honeysuckle, tatarian</b> (see photo p. 97)  <i>Lonicera tatarica</i>	wet-med	unknown	Part to full shade, berries are poisonous.	A,D
<b>Hypericum, Dart's gold</b> <i>Hypericum</i> spp.	med	<b>high</b>	Hybrid, suitable cultivars include 'Dart's Gold;' sun to part shade, flowers; many species available. (Illegal to plant <i>Hypericum perforatum</i> .)	A,D
<b>Lilac</b> <i>Syringa vulgaris</i>	med	unknown	Sun to part shade, flowers, hardy.	A,D
<b>Maple, vine</b> <i>Acer circinatum</i>	wet-med	low	Part to full shade, specimen, screen.	A,D

Photo by Christy Malone



*Rose*

Photo by Wayne Johnson



*Cherry, western sand*

Photo by Christy Malone



*Butterfly bush*

Photo by Christy Malone



*Cotoneaster*

Photo by Wayne Johnson



*Snowberry*

*See the tables on  
Pages 94 and 96 for  
more information  
about these  
recommended plants*

TABLE 2: ACCENT PLANT GUIDE FOR LAKE TAHOE







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<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>SHRUBS</b>				
<b>Pussywillow</b> <i>Salix discolor</i>	wet-med	unknown	Part to full shade, flowers.	A,D
<b>Rose, hedge or tomato</b> <i>Rosa rugosa</i>	med	unknown	Cultivars, sun to part shade, flowering hedges.	A,D
<b>Rose, redleaf</b> <i>Rosa rubrifolia</i>	med	unknown	Sun to part shade, foliage color and flowers.	A,D
<b>Rose</b> (see photo p. 95)  <i>Rosa spp.</i>	med	unknown	Cultivar, flowers (photo: Harrison's).	A,D
<b>Snowberry</b> (see photo p. 95)  <i>Symphoricarpos albus</i> var. <i>laevigatus</i>	wet-med	unknown	Sun to part shade, revegetation, berries may be toxic.	A,D
<b>Spiraea cultivars</b> (see photo p. 97)  <i>Spiraea spp.</i>	med	unknown	Cultivars, part shade, flowers, <i>Spiraea densiflora</i> = N.	A,D
<b>St. Johnswort, creeping or Aaron's beard</b> <i>Hypericum calycinum</i>	med	unknown	Suitable cultivars include 'Sunshine;' sun to part shade, E-D flowers. (Illegal to plant <i>Hypericum perforatum</i> .)	A,E,D
<b>Viburnum</b> (see photo p. 97)  <i>Viburnum spp.</i>	med	unknown	Sun to part shade, flowers, many species and cultivars available.	A,D
<b>Willow, dwarf arctic</b> <i>Salix purpurea</i>	wet-med	unknown	Suitable varieties include 'Nana;' part to full shade, border or specimen.	A,D
<b>SHRUBS TO SMALL TREES</b>				
<b>Birch, paper</b> (see photo p. 97)  <i>Betula papyrifera</i>	wet	unknown	Sun to part shade, specimen, sensitive to snow load.	A,D
<b>Birch, western water</b> <i>Betula occidentalis</i> var. <i>pontinalis</i>	wet	unknown	Sun to part shade, specimen, stabilization.	A,D
<b>Maple, amur</b> <i>Acer ginnala</i>	med	unknown	Sun to part shade, red fruit and fall color, hardy.	A,D
<b>Pine, mugo</b> (see photo p. 97)  <i>Pinus mugo</i>	med-dry	<b>high</b>	Sun to part shade, screen, plant away from structures.	A,E

Photo by Christy Malone



*Viburnum*

Photo by Wayne Johnson



*Honeysuckle, tatarian*

Photo by John Cobourn



*Pine, mugo*

Photo by John Cobourn



*Birch, paper*

Photo by John Cobourn



*Spiraea cultivars*

*See the tables on Pages 94 and 96  
for more information about these  
recommended shrubs and small trees*

TABLE 2: ACCENT PLANT GUIDE FOR LAKE TAHOE

Common Name/ Scientific Name	Moisture Zone	Fire Hazard <sup>1</sup>	Remarks	Origin/ Habit <sup>2</sup>
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<sup>2</sup> A=Adapted/introduced species, N=Native species, D=Deciduous, E=Evergreen, P=Perennial, B=Biennial				
<b>TREES</b>				
<b>Cherry, flowering</b> <i>Prunus</i> spp.	med	low	Sun to part shade, spring flowering tree - specimen.	A,D
<b>Crabapple, flowering</b> (see photo p. 99) <i>Malus</i> spp. & cultivars	med	unknown	Cultivars, sun to part shade, spring flowering tree, fall color.	A,D
<b>Giant sequoia or Sierra redwood</b> <i>Sequoiadendron giganteum</i>	med	unknown	Good for scenic mitigation, plant away from structures and pavement.	A
<b>Ginko, Maidenhair tree</b> (see photo p. 99) <i>Ginkgo biloba</i>	med	unknown	Sun to part shade, shade or street tree, fruits undesirable, male trees preferred, slow-growing	A,D
<b>Golden Chain Tree</b> <i>Laburnum anagyroides</i>	med	unknown	Sun to part shade, yellow chains of flowers, all parts poisonous.	A,P
<b>Hawthorn, Washington</b> <i>Crataegus phaenopyrum</i>	med-dry	unknown	Many cultivars, sun to part shade, flowering street tree-shade/specimen, fall color.	A,D
<b>Maple, red</b> <i>Acer rubrum</i>	med	unknown	Sun to part shade, foliage color tree, specimen.	A,D
<b>Mountain ash, European</b> <i>Sorbus aucuparia</i>	med	unknown	Sun to part shade, spring flowering tree, attractive fall fruit, many cultivars available, <i>sorbus californica</i> =N.	A,D
<b>Pear, flowering</b> (see photo p. 99) <i>Pyrus calleryana</i>	med	unknown	Suitable cultivars include 'Aristocrat,' sun, flowers, specimen.	A,D
<b>Pine, bristlecone</b> <i>Pinus aristata</i>	med-dry	unknown	Sun, specimen, site conditions, slow-growing.	A,E
<b>Plum, purple leaf, flowering</b> <i>Prunus cerasifera</i> 'Atropurpurea'	med	unknown	Sun to part shade, street tree, foliage color, specimen.	A,D
<b>Sweetgum, American</b> <i>Liquidambar styraciflua</i>	med-dry	low	Sun to part shade, street tree, specimen, fall color.	A,D

*The authors wish to thank the Tahoe Regional Planning Agency's botanist, Larry Benoit, for his assistance in creating the Recommended Plant List and the Accent Plant List.*



Photo by Wayne Johnson



*Crabapple, flowering*

Photo by Christy Malone



*Ginko, Maidenhair tree*

Photo by Christy Malone



*Pear, flowering*

*See the table on Page 98 for  
more information about these  
recommended trees*



## Beware of invasive plants

Most people are unaware that they could unleash a new weed infestation and disrupt native vegetation by bringing in a single invasive plant or seed packet containing an invasive species. Many of the invasive weeds currently damaging wildlands throughout the West were originally introduced for landscaping or erosion control purposes, only to escape cultivation and invade wild areas.

### What is an invasive weed?

Invasive weeds are plants that grow aggressively, spread rapidly and choke out native and other desirable plants from your neighborhood. They produce enormous amounts of seed, have spreading root systems and lack natural predators.

Noxious weeds are invasive weeds that are particularly destructive, competitive and difficult to control. California and Nevada state laws require control of specific noxious weeds and list many plant species as illegal to cultivate or sell

for use in ornamental plantings. The responsibility for noxious weed control is placed on the property owner or occupier. This means we are all responsible for controlling the spread of these damaging weeds, from homeowners to city, state or federal agencies that own and/or manage land.

### How do weeds spread?

Seeds can attach to people and animals during work or play, and may travel many miles before being dislodged into an area where they were not originally found. The transport of contaminated hay, seed, ornamental flowers and other apparently harmless products has introduced noxious and invasive weeds to California and Nevada. Weeds can also be spread during construction and landscaping activities, when contaminated fill, gravel, topsoil or other materials are moved from an infested site to your neighborhood. Always specify weed-free products for use in your landscape.

Instead of this invasive plant:	Plant these safe alternatives:
Scotch broom* ( <i>Cytisus scoparius</i> ) *CA noxious weed, C-rated	<ul style="list-style-type: none"> <li>• Clematis species, p. 94</li> <li>• Cinquefoil (<i>Potentilla fruticosa</i>), p. 80</li> <li>• Harrison’s yellow rose (<i>Rosa harisonii</i>), p. 96</li> </ul>
Dalmatian* and yellow** toadflaxes ( <i>Linaria genistifolia</i> spp. <i>dalmatica</i> ; <i>Linaria vulgaris</i> ) *NV noxious weed. *CA noxious weed, A-rated. **NV noxious weed.	<ul style="list-style-type: none"> <li>• Torch lily or red-hot poker (<i>Kniphofia uvaria</i>), p. 92</li> <li>• Snapdragon (<i>Antirrhinum majus</i>)</li> <li>• Hot-rock penstemon (<i>Penstemon deustus</i>), p. 76</li> </ul>
Oxeye daisy ( <i>Leucanthemum vulgare</i> )	<ul style="list-style-type: none"> <li>• Shasta daisy (<i>Leucanthemum x superbum</i>)</li> <li>• Coulter’s daisy (<i>Erigeron coulteri</i>), p. 76</li> <li>• Sweet William (<i>Dianthus barbatus</i> L. ssp. <i>barbatus</i>), p.92</li> </ul>
Klamathweed* ( <i>Hypericum perforatum</i> , or St. Johnswort) *CA noxious weed, C-rated. *NV noxious weed.	<ul style="list-style-type: none"> <li>• Lamb’s ears (<i>Stachy byzantinas</i>), p. 90</li> <li>• Sulfur buckwheat (<i>Eriogonum umbellatum</i>), p. 78</li> <li>• Monkey flower (<i>Mimulus</i> spp.), p. 74</li> </ul>

**Report invasive weed sightings to the county entity responsible for weed management:**

El Dorado County, CA  
Agriculture Commissioner  
(530) 621-5520

Nevada County, CA  
Agriculture Commissioner  
(530) 273-2648

Placer County, CA  
Agriculture Commissioner  
(530) 889-7372

Douglas County, NV  
Weed District  
(775) 782-9835

Washoe County, NV  
University of Nevada Cooperative Extension  
(775) 784-4848

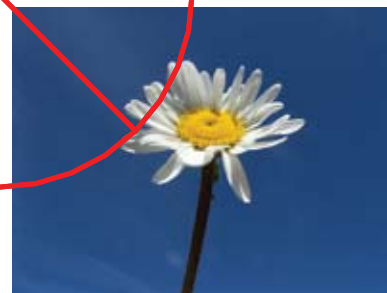
**DO NOT PLANT**  
*these invasive pests in your yard or garden!*



◀ *Scotch broom, flowering* ▼



▲ *Oxeye daisy, flowering* ▲



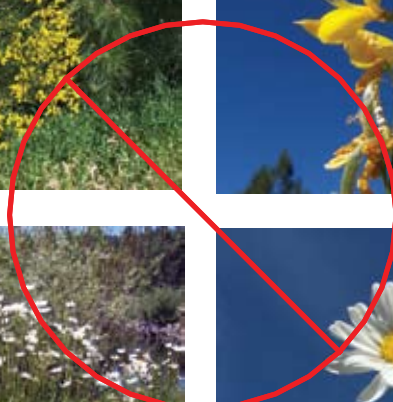
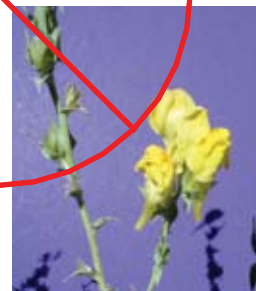
▼ *Yellow toadflax, flowering* ▼



▲ *Klamathweed, flowering*

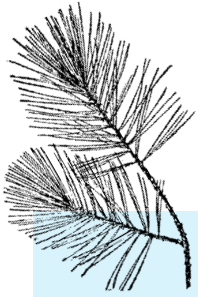


*Dalmatian toadflax, flowering* ►



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**NOTE: placeholder**



# Use Proven Planting Techniques to Ensure Success

## GUIDING PRINCIPLE # 8

### Learn How to Plant and Nurture New Plants

Each plant needs proper planting and nurturing for the first year or two until established. Otherwise, it may do poorly for years or even die outright.

Plants are purchased in a variety of sizes and forms, including seeds. Knowledge of planting techniques is essential. Spots with poor soils, steep slopes, dry or wet areas, shady sites or other complicating factors, require appropriate plant selection and post-planting maintenance to ensure good plant performance and survival.

### Buy the right plant!

Follow the tips in this book before purchasing any plants. Match each plant to its site. All species have slightly different requirements for their growing environment. The plant lists in Chapter 7 indicate some of these requirements, such as the moisture zone suitable for each species. Plants should be:

- ◆ Appropriate for Lake Tahoe's climate and the microclimate of the planting site;
- ◆ Healthy, properly developed and pest-free when purchased; and
- ◆ Able to fulfill your expectations for beauty, size, color and use.

This chapter assumes that: an integrated landscape design is under development (Chapter 2); plantings to control erosion are planned (Chapter 3); an efficient irrigation system is de-

signed (Chapter 4); defensible space is addressed (Chapter 5); plant selections by site are itemized (Chapter 7); and soil improvements are made (Chapter 9). These elements contribute significantly to the ultimate success of the integrated landscape.

## Use the proper planting techniques

Whether you're planting a small lawn, flowers, shrubs or trees, select the correct planting technique. Remember the saying, "Don't plant a fifty dollar tree in a five dollar hole."

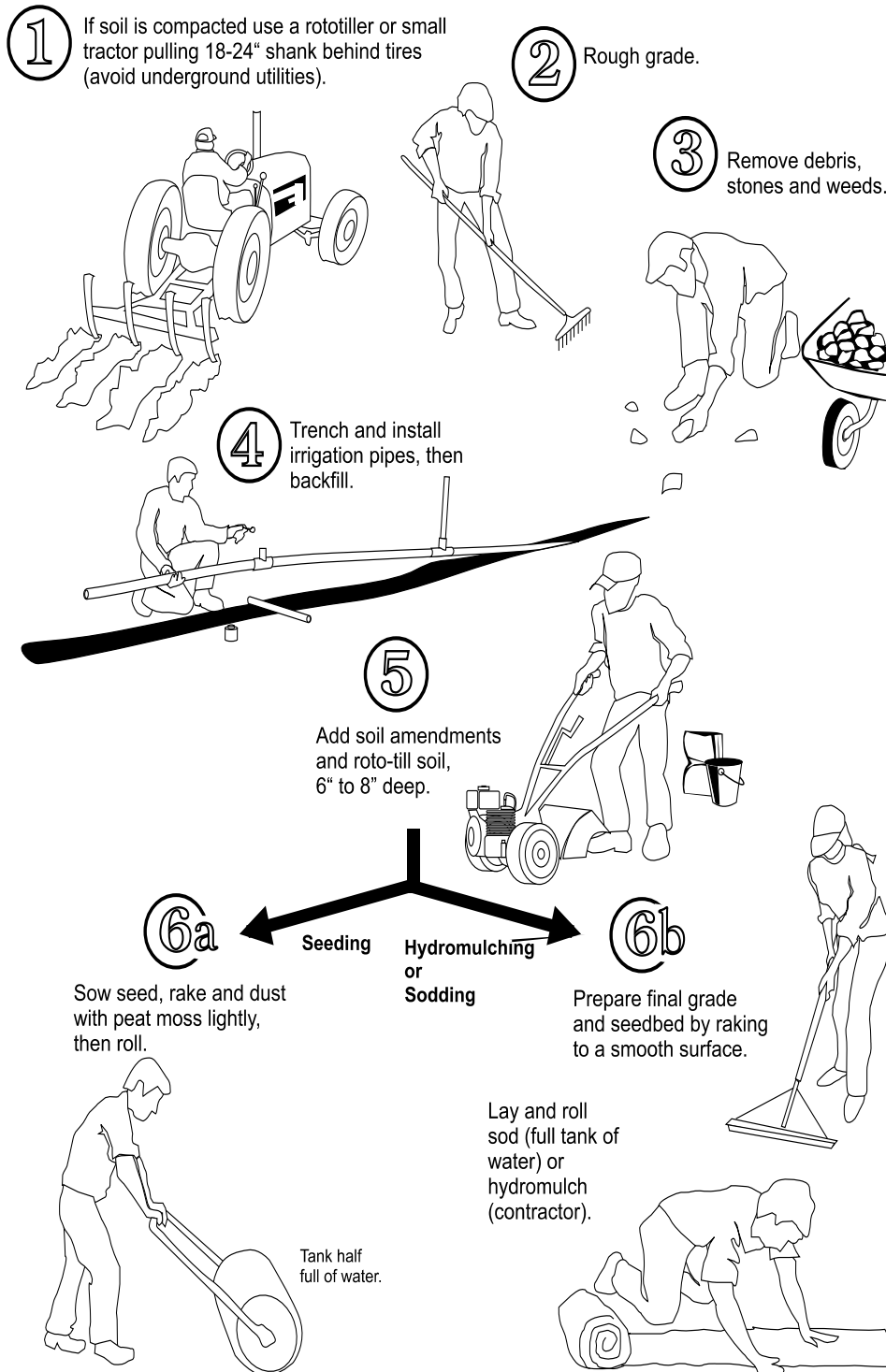
### Plant lawns that benefit the environment

Lawn is one of the most versatile and functional plants in the landscape, reducing runoff and erosion. Lawns also reduce heat buildup around a home and clean the air of dirt and dust. They require regular irrigation and maintenance.

An appropriate turf area is one that uses lawn for a specific function. It can be a small oasis near the entrance of the home or a larger area for play. Make certain it's serving a purpose and is no larger than necessary, in order to conserve water and protect water quality from fertilizers or pesticides. Plan your turf areas in shapes that are easily irrigated and maintained. Don't design them with sharp, narrow angles or in long narrow strips, which are difficult to mow and irrigate.

## Planting Lawns

*The steps for preparing the ground for lawns are the same whether planting by seed, hydro-mulch or laying sod.*



*“Overwatering suffocates the new roots and encourages disease”*

Once the site is prepared, (see illustration, Page 101)—soil loosened to a depth of 4 to 8 inches, organic matter tilled in, surface leveled, irrigation installed, debris removed and the area given the final grading—seeding or sodding can begin.

**Plant seeded grasses in spring or late fall**

Seeded grasses do best when planted after the soil has warmed up in the spring. Late fall plantings, four to six weeks before the first snow, also do well. Rake the area and broadcast (throw) the seed uniformly over the area, either by hand or with a seeder. Ensure a uniform coverage of the area by broadcasting half the seed walking in one direction and the other half walking at 90 degrees to the first. Follow seed package recommendations for the amount of seed to be applied over each 1,000 square feet.

Cover the seed with soil or light mulch, according to seed packet planting instructions. A light dusting of peat moss helps retain moisture for the seed and seedlings. Bluegrass seed requires light to germinate. Make sure the covering is applied lightly enough (usually less than 1/8-inch thick) to allow some light to strike the seed. Other grasses may be covered more

deeply. Roll the seeding with a roller half-full of water to press the seed into the soil. Wet the area immediately to hold the seed in place and start germination.

Water the site lightly by hand to prevent washing the seed away. Keep the soil moist for three to four weeks, or until grass has grown 3 or 4 inches high. If the seed or seedlings dry out, they die. Do not overwater. Overwatering suffocates the new roots and encourages disease, either of which kills the seedlings. Continue to water as soil conditions dictate for the remainder of the growing season. Gradually wean the grass to less frequent watering to prepare for winter as temperatures cool in late summer.

**Use hydromulching in windy areas**

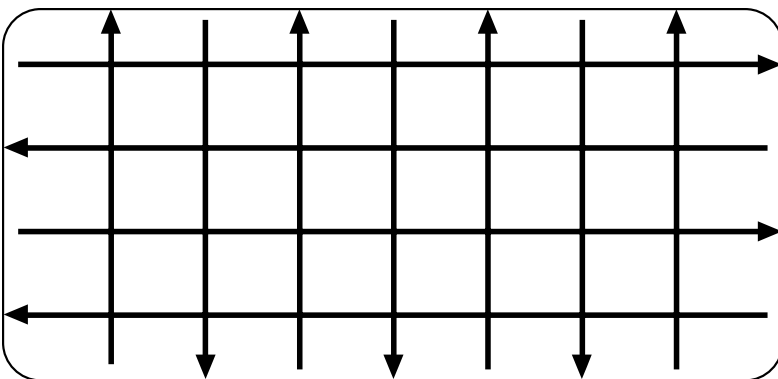
Hydromulching is also available for sowing lawns. Seed is mixed with organic matter and blown in with a hydromulcher. The organic matter helps retain moisture while the grass becomes established. This method is recommended in windy areas and on slopes. It costs slightly more than seeding but less than laying sod.

**Sod installation provides an instant lawn**

Sod offers the advantage of quick rooting and establishment compared to seeding. Some seeding projects, especially those with native seeds, take two years to become established.

To lay sod, place a string line through the center of the area parallel to topographic contour lines. Lay the first course of sod along this line. Place each section of sod snugly against the last section. Then, lay the next rows of sod in an alternating pattern as in a brick wall. Cut sections of the sod to make up the ends.

To lay a curve in the lawn, trim sod to fit rather than bending it to fit. Set the sod in place with a lawn roller full of water to ensure firm contact with the soil. Water the sod once a day



*Ensure a uniform coverage of grass seed by broadcasting half the seed in one direction and the other half at 90 degrees to the first.*

until it knits (roots) with the soil. With the tops of exposed slopes, south and west-facing areas, windy sites and soils that drain rapidly and dry out easily, it may be necessary to water twice daily. Do not over water. Progress toward rooting is determined by gently tugging on the sod. If the sod does not pull up, it has rooted and will take moderate traffic. Sod may be planted anytime during the growing season.

### Set the correct mowing height for your lawn

Cutting cool-season grasses too short causes roots to die. Roots should grow as deep as possible to take advantage of available moisture. Cut bluegrass and ryegrasses at 2 to 2 ½ inches high and fescues at 2 ½ to 3 inches. Mow when the grass has grown a third higher. Removing more than a third of the blade injures the root system.

## Use a variety of plants to control erosion

Areas of bare, disturbed soil that need vegetation to prevent erosion or weed infestation are called revegetation sites. These sites abound after construction activities and should be planted with a mixture of nonturf grasses, perennial flowers and shrubs. Select plants from the TRPA Recommended Plant List. (See Chapter 7.)

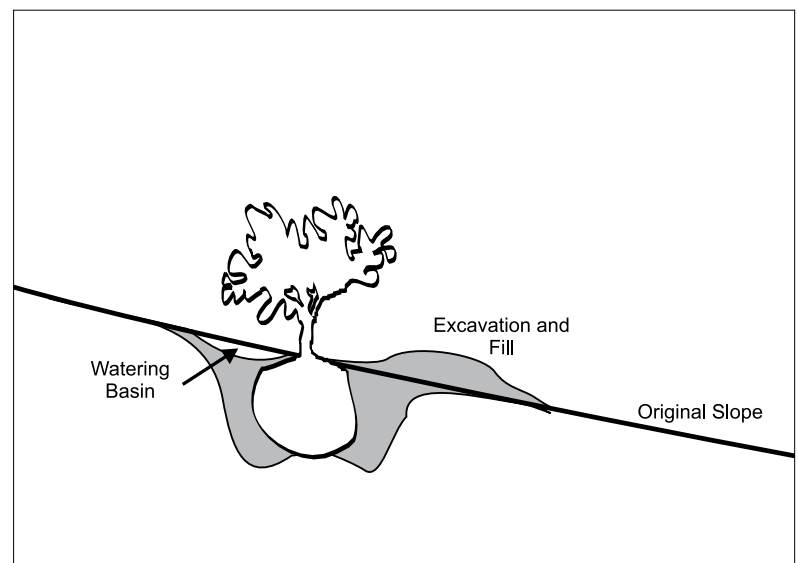
If sites are steep, or have existing rills, gullies or dead plants, install temporary erosion-control measures (see Chapter 3), and shape the surface to a more gradual, uniform slope. If the slope is greater than 33 percent (3:1), incorporate slope stabilization, such as riprap, prior to planting. If the slope is steeper than 50 percent (2:1), structural methods should be built prior to planting vegetation. (See Chapter 3.)

Uniformly spread the topsoil, if removed and stockpiled, on the planting site. Other soil amendments, such as organic matter or compost may also be added to the soil. (See Chapter 9.) Use slow-release fertilizer sparingly for planting, particularly in hot, windy or dry conditions.

Perennial flowers and shrubs are easily established by transplanting from containers. (See next section.) Erosion control planting requires asymmetric spacing of perennials and shrubs, placed 4 to 7 feet apart, with nonturf grasses between the plants. This creates a blend of plants resembling a natural, undisturbed environment and requires very little maintenance once plants are established. Nonturf grasses are best planted by broadcast seeding. (See previous page.)

After planting, lightly mulch the site using wood fiber, pine needles or compost. Pine needles are not applied in depths over 2 inches.

*“Erosion control planting requires asymmetric spacing of perennials and shrubs”*



*When planting on gentle slopes, create the planting hole in its own watering basin by digging a small terrace in the slope.*



**Buy bare root plants in early spring**

This type of plant is sold without soil around the roots. The plants are grown to a modest size, then dug up when they have gone dormant. Stored until late winter, they're shipped to catalog consumers or retail nurseries for early spring sales. Bare root stock is sold by mail order to reduce weight and shipping costs. Many fruit trees come this way.

Bare root stock should be planted in early spring while dormant. This allows the root system to develop sufficiently before leaves begin to grow. Otherwise, the top demands more water than the newly developed roots are able to supply. This causes the plant to dehydrate and die.

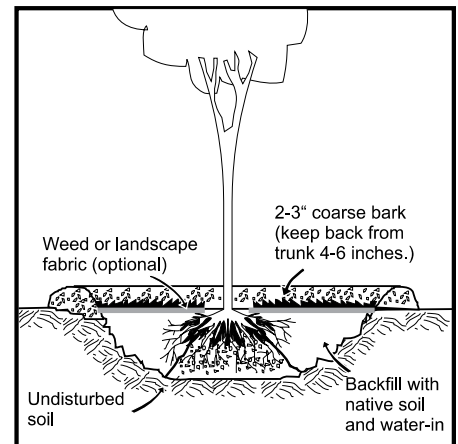
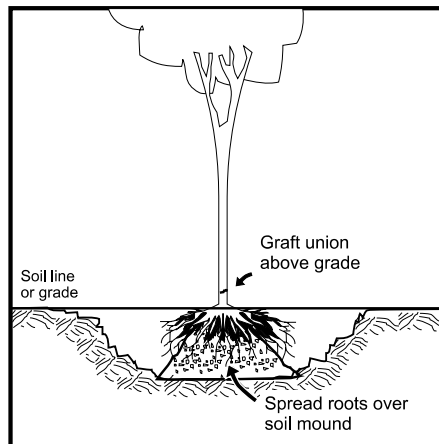
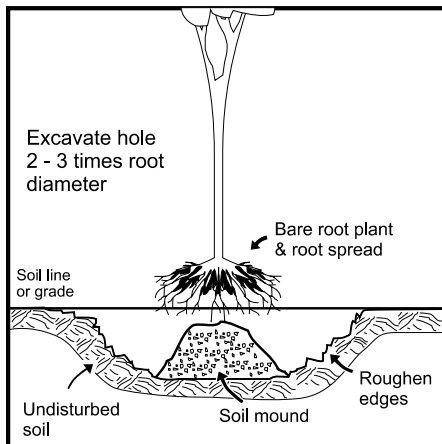
**Look for bare root stock with:**

- ◆ Moist and supple shoots and roots;
- ◆ Disease and insect-free shoots and roots;
- ◆ Large, plump and viable buds on the shoots.

Avoid bare root plants that have leafed out. (They needed planting weeks earlier and won't survive freezing or warm windy weather without protection.)

The best time to plant bare root stock is just after the snow melts. Bare root stock starts out small and takes time to establish and achieve mature growth. However, within three to five years, a bare root plant grows as big or bigger than the same, larger plant established from a container. It's also less expensive.

**Planting Bare Root Plants**



*1. Make a cone of soil in the hole. Remove broken roots and untangle twisted roots. Trim 1/2 to 1 inch off the ends of the roots. This stimulates new root growth.*

*2. Spread roots over soil cone and backfill with native soil. The soil line on the plant should be even with ground level or the grade of the slope. Do not allow the plant to settle below the surrounding soil.*

*3. Lightly tamp or pack in the soil, and add water. Work soil around roots, keeping them spread out. During the growing season, add soil or mulch around the plant to make a watering basin or install two or three drip emitters.*

## Container-grown plants come in many sizes

Containers bring us all kinds of plants, from flowers to big trees. They come in plastic, metal, paper-maché and other containers. The roots develop as a fibrous root system in the container, which allows rapid establishment.

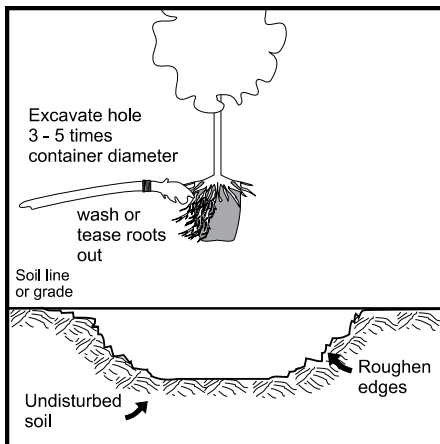
Dig a hole three to five times the width of the plant's container, using a spade or shovel. A wider hole allows for better root development. Fill the hole with water and allow it to drain. If it doesn't drain after 24 to 36 hours, do not plant a tree in the hole; put in a drain first, then plant. A tree in a hole that doesn't drain will die prematurely.

Gently remove the plant from the container, taking care not to break or damage the plant or the roots. If the root ball is "rootbound" with circling roots around the perimeter, gently pull these roots out from the ball or cut them off to prevent plant failure by girdling.

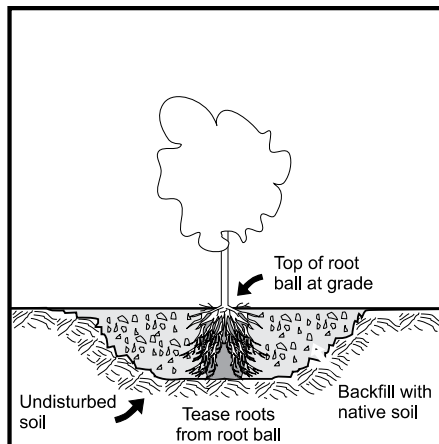
Place the plant into the hole and adjust it so the top of the root ball is at grade and roots are spread out. Refill the hole, using the same dirt. This is preferable to adding a soil amendment. Fill with soil only halfway before filling the hole with water. This settles the plant and removes air pockets around the roots.

Finish filling the hole with soil to the top of the root crown, gently tamping or packing the soil with your hands.

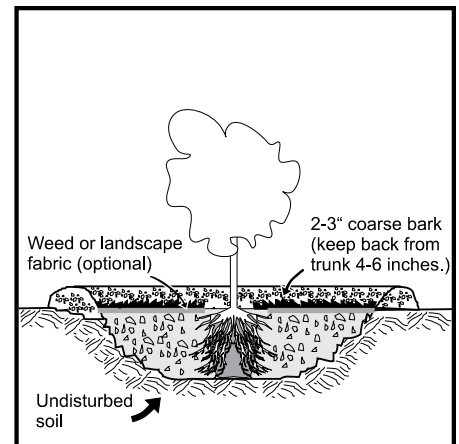
## Planting Container-Grown Plants



*1. As you remove the plant from the container, spray the root ball. Cut or pull away any circled or matted roots so they radiate out from the root ball.*



*2. Place the plant in the hole so the soil line of the plant is at grade (level with the surrounding soil). Backfill the hole with unamended native soil. Don't allow the plant to settle below grade.*



*3. Mound soil around the plant to form a watering basin. Water to keep the root ball and surrounding soil moist, but not wet, or install two or three drip emitters to water the tree.*

**Balled and burlapped plants can be quite large**

Balled and burlapped (B&B) plants, often evergreens, are field-grown and dug up for spring and early summer sales. Nursery workers wrap the root ball with burlap and secure it with twine or wire for handling and shipping. Large root balls are often placed in cardboard wrappings in wire baskets or wooden boxes. The wrappings should be removed once the plant is in the hole. Make sure the twine around the trunk is removed.

**Construct a watering basin for healthy roots**

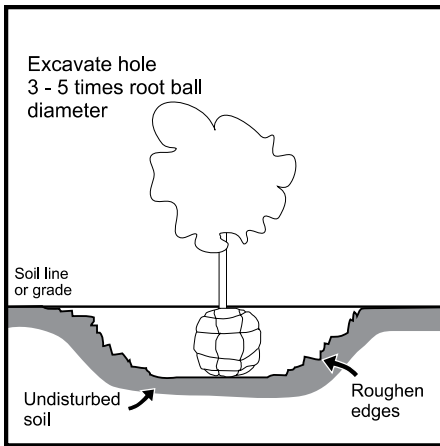
A plant should be watered on a regular basis

until established and then as needed, as soil conditions dictate. Construction of a watering basin ensures that water penetrates deeply around the roots.

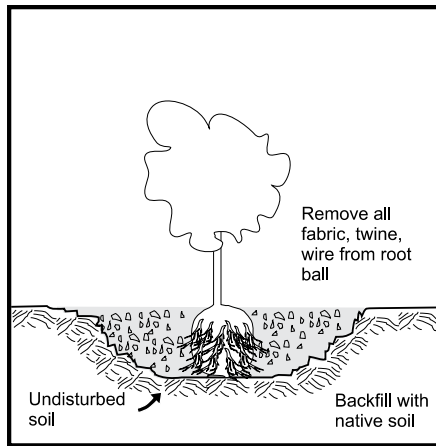
A basin is established by building a four to 6-inch berm of soil around the area, twice the diameter of the planting hole. Fill the basin with water; let it drain, then repeat.

After the second draining, put a couple inches of mulch in the basin to keep the soil cool, reduce evaporation and keep weeds down. If using shredded wood or bark mulch, keep it 4 to 6 inches from the tree trunks to prevent crown disease. Break the berm down in winter to avoid water sitting in the well and “drowning” the plant.

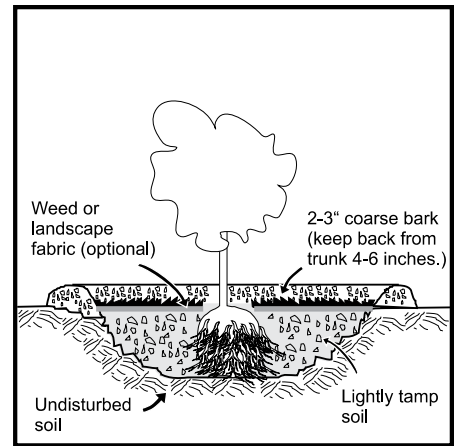
**Planting Balled and Burlapped Plants**



1. Set the plant into the hole on undisturbed soil, so the top of the root ball is at grade (level with the surrounding soil).



2. Remove the burlap and twine from the root ball. Fill and water in the unamended backfill soil. Firm the soil around the lower roots.



3. Add more soil and lightly tamp in until firm but not compressed. Build a basin and water the plant well or install two or three drip emitters.

## Special tips for new trees

Of all the things that comprise a landscape, none is more massive or dramatic than a tree. Trees are purchased as bare root stock (small), container-grown (medium to tall in height), and ball and burlap or boxed (the largest of the nursery plants). Give special attention to the location and methods of planting because of their future size.

Trees are planted any time of the year as long as the ground is not frozen. Late summer or early fall are ideal, allowing the tree to establish new roots before soils freeze. The second choice is late winter or early spring. Planting in hot summer weather should be avoided or accompanied with greater attention to irrigation.

### How to prepare the hole

The hole should be three to five times wider in diameter than the root ball, and no deeper than the height of the container or root ball. In heavy clay soil with a hardpan layer or poor drainage, dig down through the hardpan layer and loosen the soil at the bottom of the hole to improve drainage. Rocks or gravel placed in the bottom of the hole only inhibit drainage.

To check for drainage, fill the hole with water. After it has drained, fill again. If the water from the second filling doesn't drain at a rate of  $\frac{1}{2}$  inch per hour, break through the hardpan layer of soil at the bottom of the hole, or find another planting site. Roughen the sides of the planting hole, using a pick or shovel so roots penetrate the surrounding soil. Glazed or slick walls interfere with root growth.

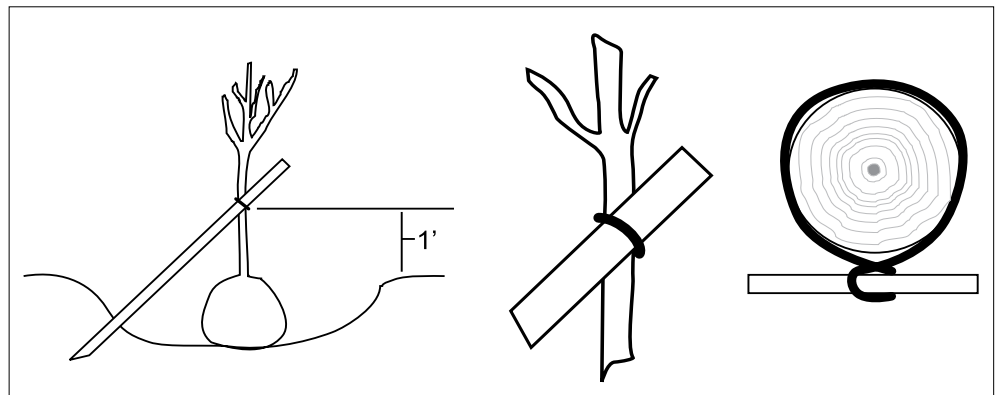
Lay a container-grown

tree on its side with the container end near the planting hole. Hit the bottom and sides of the container until the root ball is loosened, then remove the container. Slice through circling roots, and then tease them out from the root ball. If balled and burlapped, remove the string. Once the tree is in the hole, it's not necessary to remove all the burlap and wire from beneath the ball, only from the sides of the root ball and trunk.

Gently separate the circling roots and guide them downward and outward. Complete this task promptly, as root tips die quickly when exposed to light, heat and dry air. Place the root ball in the hole with its top at grade with the surrounding soil. Hold the tree in a straight vertical position. Backfill the hole using the original soil.

### Stake trees to stabilize the root ball

Trees are staked to secure the root ball until the plant is established, which usually takes less than one growing season. Staking is not necessary unless trees are planted in windy areas or a tree is top heavy with an underdeveloped root system. Trees may also be staked to protect them from mower injury. If staking is required, there are a variety of methods using one, two or three stakes, or guy wire with very large trees.



*The single stake method stabilizes the root ball, while allowing some stem movement for the development of proper "stem taper."*

*“Wires girdle the tree if not removed, cutting into the trunk and eventually killing it”*

### Using the single or two-stake method

The single-stake method involves driving a stake into the ground at a 45-degree angle in the direction of the prevailing wind with the top of the stake resting alongside the main trunk, 1 foot above the ground. Alternatively, put two stakes in line with the trunk at a right angle to the prevailing wind. In both cases, place the stakes outside the root ball and drive them into undisturbed soil.

Tree supports are placed as low as possible for deciduous trees, but high enough to keep the tree in an upright position. To find the proper height for two stakes, grasp the tree 4 feet above the root ball and, using your other hand, gently bend the top of the tree away from you. Tie the stake at the point where the trunk resists bending, usually 1 to 3 feet above the root ball. When tied at this point, the tree will stand upright.

Tie with green plastic tree ties (available from a nursery) a 2-inch band of cloth or webbing, or a used nylon stocking. These allow the tree to move without disturbing the root ball or causing damage to the bark. It's acceptable if the tree sways above this point.

If using the single-stake method, use a

figure-eight loop of commercial tree tie or elastic webbing to secure the tree at the stake. Leave a couple inches between the trunk and the stake to allow for minor movement. The top of the tree should sway, but not enough to uproot the root ball. Cut off the top of the stake about 2 inches above the support tie but below the lowest limbs.

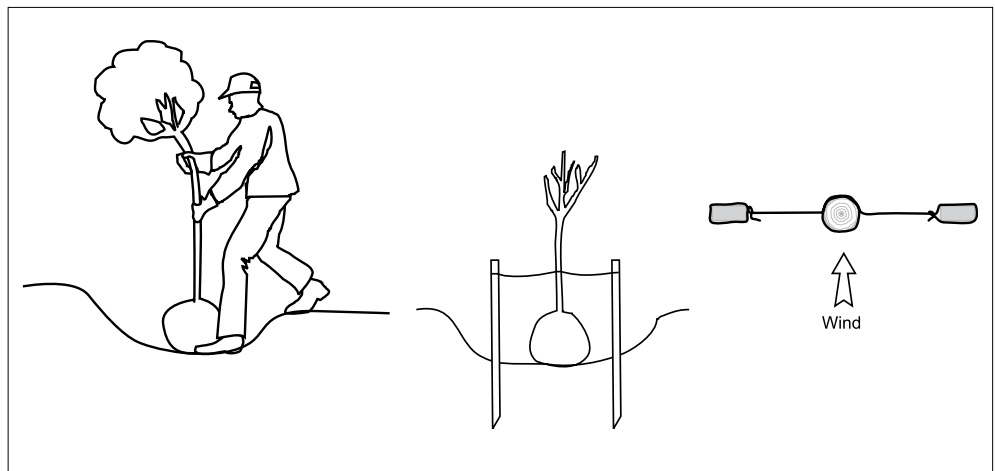
### Anchor very large trees with guy wires

Use three to four guy wires to anchor very large trees. The wires should slope from halfway up the trunk to the ground at an angle of 45 degrees. Attach the upper ends of the wires by encircling the trunk with a loop encased in a protective cover. Anchor the lower ends of the wires to stakes driven deeply into the soil.

Low-branched evergreens do not need staking. Guy top-heavy evergreens if they have recently been transplanted.

Remove all stakes and support wires after trees are established, usually after one growing season. If the tree needs support during the second year, recheck the proper tying height, retie and shorten stakes if necessary. Wires girdle the tree if not removed, cutting into the trunk and eventually killing it.

*Determine the proper height of the tie attachment when using the two-stake method. The multiple stake method stabilizes the root ball and protects the trunk from injury.*



## Nurture your new trees

### Water frequently

New plants require more frequent watering the first one to three years. Once established, nature provides sufficient moisture for native and adapted plants, except during prolonged dry spells. Water new plants regularly, allowing them to dry out between waterings. The soil should not be kept saturated. Once plants are well-rooted, water less frequently, soaking them thoroughly once a month during dry periods. However, water wider and deeper to encourage roots to grow out into the surrounding soil. Many nonnative plants need watering throughout their existence.

### Fertilize lightly

Recently planted trees benefit from an occasional light application of slow-release fertilizer. The best time to apply is in the spring after the snow melts, two to four weeks before the plant breaks

dormancy. Plants benefit greatly from a yearly application of 2 to 4 inches of compost gently worked into the soil. Keep bark and compost 3 or 4 inches away from trunks of trees. This allows the bark to dry and helps prevent invasion of crown-rot disease.

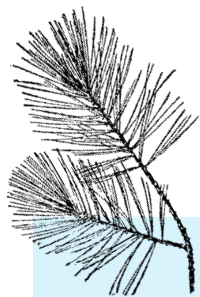
### Prune with care

New trees, especially evergreens, need little to no pruning. In windy areas, “thinning cuts” (removing an entire limb back to the trunk or branch) open up the canopy and reduce resistance to wind. (See Chapter 6.) Do not head back (prune) the entire canopy. This removes the terminal buds, a source of hormones that stimulate rooting. It also causes limbs to break bud and produce excessive numbers of limbs, creating increased wind resistance, a problem in windy areas. Refer to Chapter 12 for various maintenance tasks needed throughout the year.



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PLACE HOLDER



# Improve Your Soils and Use Fertilizer Sparingly

## GUIDING PRINCIPLE # 9

### Determine How to Improve Your Soils

How good are the soils on your landscape site? Are they suitable for your plants? Do they have abundant organic matter? Has the topsoil been removed during construction activities? Are soils loose and workable, or have they been compacted so that water doesn't infiltrate (soak in) easily?

Often a landscape has some good soils and some poor soils. Improve your soil by working in organic matter like compost or aged manure, or place mulch such as bark, grass clippings or leaves on top of your soil. Compacted areas are improved by aerating the soil or loosening it with equipment. Whether you're starting a new landscape or renovating an older one, your new and existing plants will do better if you take time to improve your soils.

It's important to reduce the use of fertilizers in the Tahoe Basin. In general, lawns should be fertilized lightly, and only in the spring and late summer. Phosphorus should be added sparingly, if at all, as it is plentiful in Tahoe's soils, and overuse is harmful to the lake.

### Your topsoil may have problems

Topsoil may be deficient in nutrients or organic matter, or so compacted that it doesn't allow sufficient water infiltration. (See illustration, Page 111.) It may be excessively dusty, sandy or gravelly. Your topsoil may be a heavy clay or overly acidic.

The basic strategy for improving your soils is to add organic matter such as compost, humus, aged bark, shredded leaves, etc. As organic matter decomposes in the soil, microorganisms improve soil structure and help make water and nutrients available to plant roots.

There are a number of other soil-conditioning practices to improve your soil and keep it in good shape. They include tilling or aerating compacted soil, adding amendments such as compost or lime (after testing for pH) or mulching the soil in areas that are not densely vegetated. To help prevent soil compaction, make sure vehicles are never driven over unpaved areas, particularly when soils are damp.

### Tahoe's fragile soils

Most soils around the Tahoe Basin contain a thin layer of organic matter and are susceptible to soil erosion when disturbed and left without mulch or plant cover. They're characteristically low in nutrients for plant growth and retain little moisture for plant use. Hence, plants that are not well-adapted to these soils require frequent watering and fertilizing. The bad news is that once these soils are disturbed by man's activities, it's tough to reestablish vegetation to prevent soil from eroding. This is particularly true where subsoils are exposed through cuts and grading.

Contact the Natural Resources Conservation Service to obtain information about the soil in your neighborhood. This information is also available at [www.soils.usda.gov/survey](http://www.soils.usda.gov/survey).



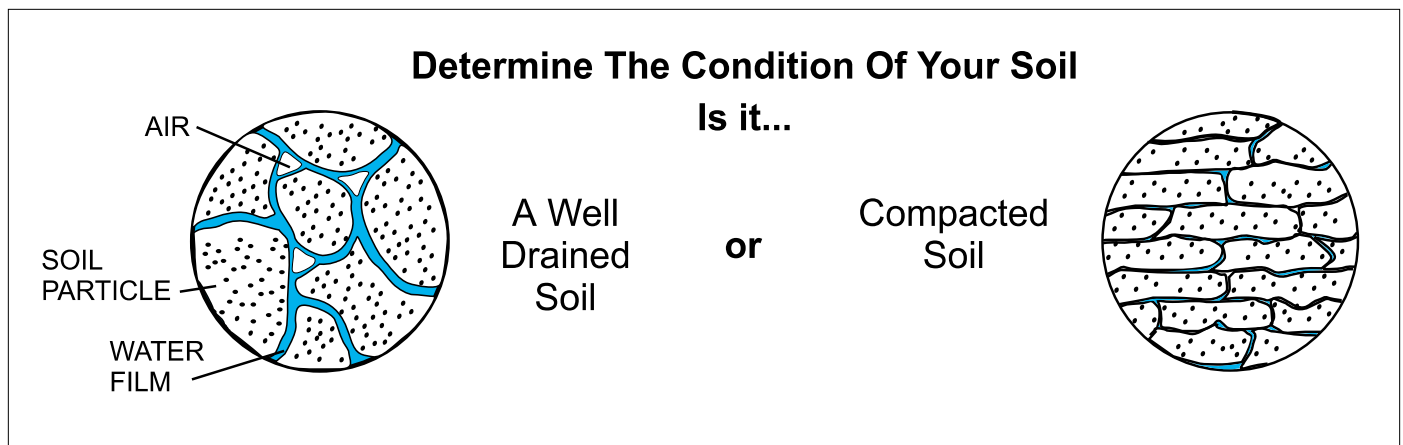
### Add soil amendments to improve your soil

Adding soil amendments improves soil fertility and moisture-holding capacity, reducing the potential for soil erosion. Included among organic soil amendments are aged ground bark, decaying pine needles, leaf mold, aged manure, compost or other plant remains. Organic matter improves soil structure, increasing aeration, water infiltration and moisture retention. This encourages microbial activity and root growth, increasing the availability of nutrients for plant growth. Soils high in organic matter tend to have a greater supply of plant nutrients compared to soils low in organic matter. In addition, increasing organic matter can reduce the leaching of these nutrients from the soil.

Aged manure is an excellent source of plant nutrients and organic matter. Fresh manure may contain too many salts that will injure plants. For best results, work composted manure into the soil. If preparing a bed before planting, compost and manure are worked into the soil to a depth of 8 to 12 inches. If adding to existing plants, mix it carefully into the soil around them.

Applying compost is one of the best methods of supplying additional soil nutrients. While compost is relatively low in available nutrients compared to commercial fertilizers, it's especially beneficial to the soil. By keeping the soil loose, compost allows plant roots to grow well throughout the soil, allowing them to extract nutrients from a larger area. A loose soil enriched with compost is also an excellent habitat for earthworms and beneficial soil microorganisms that are essential for releasing nutrients for plant use. The nutrients from compost are released slowly, so there is no chance of "burning" the plant with overapplication. Note: Even though compost increases water infiltration and adds plant nutrients to the soil, it's still important to irrigate amended soils cautiously to prevent runoff.

Properly aged compost is produced locally in both California and Nevada, and is superior to raw wood shavings, fresh manure, ground bark or bark compost as a soil amendment. Shop around before deciding on the best soil amendment for your site.



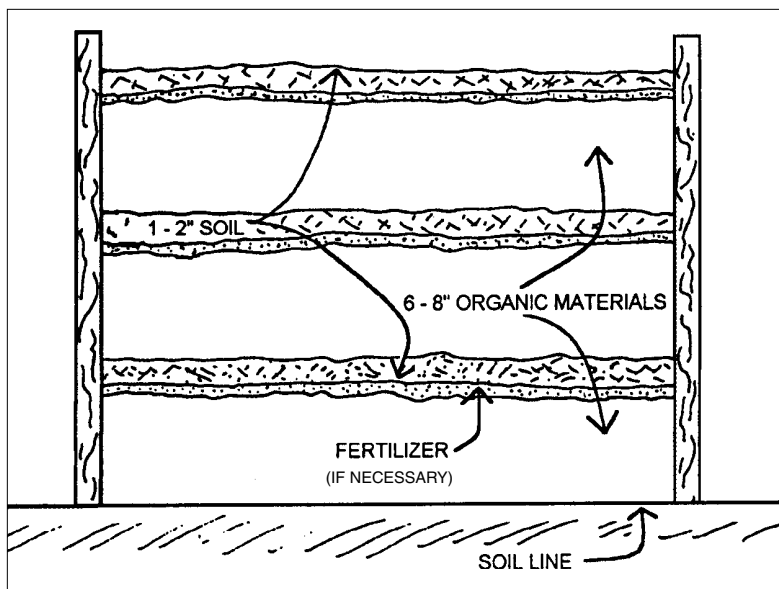
*When there is a film of water between soil particles and air in all but the smallest pores, water can infiltrate into the soil.*

*When soil particles are squashed together, water and air cannot move through the soil. Water runs off the surface.*

When adding organic amendments to the soil, mix them deeply and uniformly. The volume added should equal 25 to 50 percent of the total soil volume being amended. Mix the amendment into the soil thoroughly by spading or rototilling. Since the amendments are broken down gradually over time, add additional quantities in succeeding years as needed. Inspect your soils each spring by digging 6 to 12 inches at various locations. If organic matter is not visible to your eye, it's probably time for another application. A good rule of thumb is to apply half as much as you did the previous application.

## Make your own compost

Making your own compost is a practical and convenient way to transform yard and household plant waste into a valuable resource. Compost can be used as either a soil amendment or as mulch.



*In a layered compost heap, dried leaves and pine needles are sandwiched between layers of manure, grass clippings or other nitrogen-rich material.*

## How composting works

All organic matter eventually decomposes under normal conditions. Composting speeds the process by providing an ideal environment for bacteria and other decomposing microorganisms. The final product, humus or compost, looks and feels like fertile garden soil. This dark, crumbly, earthy-smelling stuff works wonders for all kinds of soils and provides vital nutrients to help plants grow and look better.

Decomposing organisms consist of bacteria, fungi or larger organisms such as worms, sow bugs, nematodes and numerous others. Decomposing organisms need four key elements to thrive: nitrogen, carbon, moisture and oxygen. Space and normal temperatures are also required. For best results, mix materials high in nitrogen (such as clover, fresh grass clippings or livestock manure) with those high in carbon (such as dried leaves or chipped twigs). If there isn't a good supply of nitrogen-rich materials, a handful of slow-release organic fertilizer helps supply the nitrogen. You'll need to water the pile to keep it damp during dry periods. Be careful not to saturate the pile. Turning or mixing the pile provides oxygen. Frequent turning yields faster decomposition.

## Get started

Many materials may be added to a compost pile, including leaves, grass clippings, chipped woody brush, vegetable and fruit scraps, coffee grounds, livestock manure, sawdust and shredded paper. Add some topsoil to the mix to help it along. Don't use diseased plants, noxious weeds, dead animals, meat scraps that attract animals, or dog or cat manure, which carry disease.

Composting is as simple or involved as you like. It depends on how much yard waste you have,

how fast you want results and the effort you're willing to invest.

### Cold or slow composting is easy

This method requires little maintenance, but takes several months to a year or more for the pile to decompose. Cold composting works well if you don't have the time to tend the compost pile periodically, have little yard waste or are not in a hurry to use the compost. Cold composting also leaves more undecomposed bits of material, which can be screened out.

First, mix grass clippings and dry leaves on the ground or in a bin. Keep weeds and diseased plants out of the mix, since the temperatures reached with cold composting are not high enough to kill the weed seeds or disease-causing organisms. Add yard waste as it accumulates. Watering, shredding, chopping and occasionally turning the pile over speeds up the process. To shred material, run your lawn mower over small piles of leaves and trimmings before adding them to the pile.

### Hot composting is faster

Hot composting requires more attention, but with a few minutes every week or so and the right ingredients, you'll have finished compost in six to eight weeks, depending on weather conditions. Hot piles do best when the carbon to nitrogen ratio is 25–30 to one. A pile with the minimum dimensions of 3 feet by 3 feet by 3 feet is needed for efficient heating. For best

heating, make a heap that is 4 or 5 feet wide and at least 3 feet high. As decomposition occurs, the pile shrinks. If you don't have this amount at one time, stockpile your materials until a sufficient quantity is available. Many containers, elaborate bins and other structures are touted as necessary for speeding up the process. A pile works fine and doesn't cost anything. A bin keeps the process neat.

### Common composting problems

Composting is not an exact science. Experience dictates what works best. If you notice that nothing is happening, you may need to add more nitrogen, water or air. If the core of the pile is too hot, you probably have too much nitrogen and need to add more carbon materials to reduce the heat. A bad smell also indicates the need for oxygen. Mix the pile and turn it over.

Photo by John Cobourn



*Compost can be made in a pile, a homemade bin or commercially available compost bins like the ones shown above.*

Photos by John Cobourn



*Three types of mulches are shown above. From top: chipped bark, pine needle mulch and river rock.*

Adding kitchen wastes to compost attracts flies and insects. To prevent this problem, make a hole in the center of your pile and bury the waste.

Check on local or state regulations for composting in urban areas – some communities require rodent-proof bins.

### **Trouble shooting for soil acidity**

The acidity of your soil can increase over the years due to the liberal application of organic matter. Most plants grow well in soils that are slightly acidic, such as those in the Tahoe Basin. The growing environment may become inhospitable, however, if soils are allowed to become too acidic. Correct this problem with the addition of lime or fireplace ashes. Your local nursery or University of Nevada Cooperative Extension office can determine if soil acidity is a problem, as well as recommend application rates of lime or other products to fix the problem.

### **The magic of mulching**

Mulching is one of the simplest and most beneficial practices you can use in the garden or landscape. **Mulch is a protective layer of material that is spread on top of the soil. Mulches are either organic – such as pine needles, grass clippings, bark chips, or similar materials – or inorganic – such as stones, brick chips or plastic.** Both organic and inorganic mulches have numerous benefits.

Use mulch on top of soil wherever there is no turf or other ground cover. Bare soil promotes erosion that is detrimental to lake clarity. The water infiltration rate in mulched areas is often more than double that of unmulched areas because the mulch intercepts the impact of

raindrops and prevents the soil from developing a less permeable crust. (See Page 15.) Because organic mulch can move with water or wind, it is recommended for erosion control only on flat areas and slopes up to 33 percent. (See Page 19.) Mulch also controls weeds, reducing the need for herbicides or labor to pull the weeds. It provides a favorable environment for earthworms and insects that increase water infiltration and build soil. A healthy soil is the first step to a healthy plant, and also prevents disease or pests from attacking the plant.

### When to apply mulch

The best time for application depends on what you hope to achieve. Mulches moderate the soil temperature by providing an insulating barrier between soil and the air. This means that mulched soil in the summer is cooler than adjacent unmulched soil; while in the winter, the mulched soil does not freeze as deeply as unmulched soil. However, since mulch acts as an insulating layer, mulched soils tend to warm up more slowly in the spring and cool down more slowly in the fall.

If you're using mulches in your vegetable or flower garden, apply them after the soil has warmed up in the spring. Cool, wet soils tend to slow seed germination and increase the decay of seeds and seedlings. If adding additional layers of mulch to existing perennial beds, wait until the soil has completely warmed.

Apply mulches to help moderate winter temperatures late in the fall after the ground has frozen, but before the coldest temperatures arrive. Applying mulches before the ground has frozen may attract rodents looking for a warm overwintering site. Delayed applications of mulch should prevent this problem as, hope-

fully, the creatures would already have found another place to nest!

Mulches to protect plants over winter should be loose material, such as pine needles or pine boughs that help insulate the plants without compacting under the weight of snow and ice. One of the benefits from winter applications of mulch is the reduction in the freezing and thawing of the soil in the late winter and early spring. These repeated cycles of freezing at night and then thawing in the warmth of the sun cause small or shallow-rooted plants to be heaved out

Mulch Choices for Erosion Control		
Material	Amount to Apply	Notes
<b>Bark Mulch or Wood Chips</b>	2 - 3 inches	Smaller chips are easier to spread, especially around trees, shrubs and perennial gardens. When spreading mulch around trees, keep the mulch 4 inches away from the trunk. Not recommended for use on slopes over 33 percent or within 5 feet of structures.
<b>Pine Needles</b>	1 - 2 inches	Where there is no vegetation on the ground, decaying pine needles are good mulch if they don't get too thick. Not recommended for use on slopes over 33 percent or within 5 feet of structures.
<b>River Rock or Gravel</b>	2 - 3 inches	Known as inorganic mulch, 1- to 3-inch diameter river rock or gravel makes a tough, attractive surface and helps provide defensible space when used near structures.

of heavy soils. This leaves their root systems exposed, resulting in injury or death.

Mulch, such as bark mulch and wood chips, is sometimes used with landscape fabric. The fabric is laid on top of the soil and covered with a layer of bark chips. While initially the fabric provides protection against weeds, as the mulch breaks down, weeds grow in the mulch itself. These are easier to hand pull, since the roots generally do not penetrate the fabric. The barrier between soil and mulch prevents any improvement in the soil condition and makes growing additional plants more difficult. Irrigation lines also become more difficult to access. Never use sheet plastic under mulch in the landscape.

Check the yellow pages under mulches, garden centers or nurseries for sources of mulch.

## Use fertilizers sparingly

It's vitally important to prevent plant fertilizers from washing off the property or infiltrating to groundwater. Slow-release and organic fertilizers are recommended for use in beds and gardens and to establish ornamental and erosion control plants, but use them sparingly to reduce pollution. A good way to increase plant nutrients in soil is adding organic matter such as compost before planting takes place.

Residents and businesses are urged to apply fertilizers to turf only in the spring and late summer. Property owners who hire lawn-maintenance firms, should direct the foreman to fertilize using the recommendations outlined on the following pages.

### Understanding a Fertilizer Bag Label

**Product brand name** → **Super-Grow Lawn Food**

**Formula percentages of nitrogen, phosphorus and potassium (always in that order). Since all three nutrients are present, this would be a "complete fertilizer."** ← **20-2-7**

**Manufacturer's warranty on the contents of the** → **Guaranteed Analysis**

Total Nitrogen (N).....	20%
10.4% Ammoniacal Nitrogen	
6.4% Urea Nitrogen	
3.2% Water Insoluble Nitrogen (W.I.N.)	
Available Phosphoric Acid (P <sub>2</sub> O <sub>5</sub> ).....	2%
Soluble Potash (K <sub>2</sub> O).....	7%

**Fast release forms of nitrogen. Nitrate nitrogen is also a fast-release form.** ← 10.4% Ammoniacal Nitrogen, 6.4% Urea Nitrogen

**There are various forms of slow-release nitrogen, including sulf-coated Urea, IBDU Ureaform, resin-coated and plastic-coated nitrogen. W.I.N. shows the percentage of Water Insoluble Nitrogen. This does not move readily with water unless pellets are washed downslope.** ← 3.2% Water Insoluble Nitrogen (W.I.N.)

**Basic source of fertilizer nutrients used in this product** → Primary nutrients from Ammonium Phosphate, Ammonium Sulfate, Mariate of Potash, Sulfur-coated Urea, Urea

**Net Weight 20 lbs.**

### Apply fertilizer to lawns only in the late spring and late summer

Fertilize turf twice a year, applying only the correct amount, so excess fertilizer does not leach through the soil or run off and contaminate water in the Tahoe Basin.

Pay attention to the timing of your fertilizer application. In the spring, apply lawn fertilizer after the snowpack has melted. On shady, high elevation or north-facing sites, aim for a June application in most years. On warmer, south-facing sites or after a warm spring, you could fertilize in late April or May. Apply fertilizer again in late August in higher, cooler locations or the first half of September in warmer sites near lake level. This late summer application should be done when the “average daily temperature” for three or more consecutive days is below 50 degrees. This promotes a vigorous, healthy root system and a hardy crown without encouraging shoot growth. Add the day’s high and low temperatures and divide by two to determine the average daily temperature.

### Use the correct amount of fertilizer

To determine the correct amount of fertilizer for each application, calculate the area of lawn (square feet) by multiplying the length by the width. Divide the turf area up into sections that approximate a square, rectangle or triangle; then calculate the individual areas and add them up.

Most soils in the Tahoe Basin, especially volcanic soils, are rich in phosphorus. Homeowners can therefore use fertilizers with little or no phosphorus in order to reduce the potential for phosphorus pollution in the lake. If you suspect a deficiency in phosphorus after a few years, you can get a soil test to determine if it is needed.

When fertilizing lawns in spring and fall, apply only  $\frac{1}{2}$  to  $\frac{3}{4}$  pound of actual nitrogen for every 1,000 square feet of lawn. On the bag label illustrated on Page 118, the net weight is 20 pounds, but only 20 percent of that (4 pounds) is actual nitrogen. This means that it takes 5 pounds of the product to get 1 pound of actual nitrogen. Be careful of generic bag recommendations, such as “This bag will cover 3,000 square feet.” Use the recommended rates and calculations for best results.

A lawn that’s 40 feet by 25 feet has an area of 1,000 square feet. Each application requires  $\frac{1}{2}$  to  $\frac{3}{4}$  pound of actual nitrogen. Since 5 pounds of the product contain a pound of nitrogen, you should apply 2  $\frac{1}{2}$  to 3 pounds of this fertilizer only twice a year for each 1,000 square feet of lawn.

For more information on this topic, you can call the NRCS Backyard Conservation Program to request their tip sheet on “Yard Fertility Management.”

### A word about slow- vs. fast-release fertilizers

The goal of lawn fertilization is to stimulate root growth, which is essential for controlling erosion. Using the fertilizer application rates recommended above, turf roots will take up the nutrients rapidly in late spring and again in late summer or early fall and put the nutrients to work strengthening and deepening root systems.

Because of this, conventional fast-release fertilizers are acceptable. In fact, they may be preferable to slow-release fertilizers for the late summer or early fall application. If applied in the fall, slow-release fertilizer pellets may remain on the turf for months, making them

vulnerable to washing off slopes and into waterways during rain showers. If used for the spring application, slow-release fertilizers will release nutrients to the lawn throughout the summer. Since rapid spring “green-up” may not occur, homeowners should be patient, and **refrain** from applying extra fertilizer in the hopes of faster “results.”

As noted earlier in this chapter, the best time to add organic material to soil, including organic slow-release fertilizer, is before lawns, shrubs, trees or other erosion control vegetation is planted. (See the section on improving your soils on Pages 112 to 114.)

### **Follow up with good irrigation**

Follow up immediately with good irrigation. Apply enough water to soak the ground 6 to 8 inches deep. This washes the fertilizer off the leaves and into the root zone of the grass where it’s quickly taken up into the plant. Do not over-irrigate. This will leach (flush) the fertilizer down past the root zone and contaminate groundwater.

On-off watering two or three times following a fertilizer application avoids carrying the fertilizer away in surface runoff. Ten minutes to 15

minutes on and one hour to two hours off works well in many soils. Regulate the time on by watching for ponding or runoff. When it begins, shut the water off, note how long the water was on and then begin the “off” pattern of the cycle. Repeat the same time “on” again later.

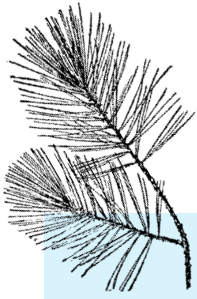
Compacted soils may require less time “on” and longer time “off.” Test the depth of wetness by inserting an 8 to 10-inch screwdriver into the soil. When it penetrates easily 6 to 8 inches, enough water has been applied. Inexpensive moisture probes are also available at many nurseries.

### **Protect Tahoe’s water quality**

Follow these suggestions to protect Tahoe’s water quality. Avoid applying any fertilizers in or near stream channels or shore-zone areas; never apply fertilizers over snow; be extra careful when using fast-release fertilizers, and be careful not to overfertilize. You’ll enjoy a healthy green lawn without affecting Tahoe’s clear water by doing the appropriate calculations and following these recommendations.







# Control Pests Without Harming The Environment

## GUIDING PRINCIPLE # 10

### Plan Ahead to Minimize Pesticide Use by Using Integrated Pest Management (IPM)

Integrated Pest Management eliminates serious pest problems while causing minimal environmental damage. It involves learning which pests are likely to be a problem and which control measures are likely to be effective, and then planning how to prevent pests from becoming a problem. Basic steps of IPM include:

1. Learn what plant species (grasses, trees, flowers, etc.) are best adapted to this area, and plant them. Adapted plants require less maintenance. They'll be less prone to pest problems and require less pest control.
2. Determine the time of year to control each pest. Develop a seasonal checklist and be proactive in preventing recurring problems.
3. Inspect your property often—weekly during the spring—to catch pests early. Carefully monitor their populations. Some pests, like weeds and rodents, may require immediate control. Others, like some insects, may diminish with the help of natural predators.

**NOTE:** *IPM does not advocate preventive chemical treatment for insect or disease pests. Use chemicals only as a last resort.*

4. Discover a variety of methods (cultural, mechanical, biological or chemical) to reduce pest problems.
5. Keep plants healthy and vigorous. Pests attack stressed plants.
6. Don't overfertilize with nitrogen fertilizer. Soft, rapid plant growth is susceptible to insects.

No one likes to see their residential landscapes decimated by pests, whether they're weeds, rodents, disease or insects. If you've planted a tree and then discovered thousands of aphids devouring a new crop of leaves, you may have reached for an insecticide. While insecticides can be safe and effective, if used with care according to label instructions, horticulturists now recommend them only as part of a comprehensive IPM strategy.

IPM is a process for determining if, when, where and what type of control measures should be used for a particular pest. As the term "integrated" implies, IPM involves the use of a combination of control tactics—cultural, mechanical, biological and chemical—in an overall pest management plan.

### The origins of Integrated Pest Management (IPM)

Scientists in the late 1950s studied an alarming situation in California. Spotted Alfalfa Aphid damage continued to increase, even though the entire crop was sprayed regularly. Scientists discovered: 1) the aphids developed resistance to the pesticide; and 2) the beneficial insects normally found in the area were destroyed. The predators of aphids didn't develop resistance to the synthetic insecticides.

The scientists then developed a new pest-management approach to reduce the use of synthetic pesticides and encourage the buildup of biological control mechanisms in the environ-

ment. They used pesticides sparingly and only when the pest damage threatened to diminish the economic value of the crop. This approach replaced the routine application of pesticides at the same time every season with no regard to the presence, buildup or absence of pests on the crop.

### Inspect and monitor plants

Effective IPM requires you to look at your plants. When examining a plant, look for pests, leaf damage, disease, animal damage, stress or stunted growth, poor color or wilt. This should be done on a weekly basis during the growing season. See the pest monitoring form at the end of this chapter.



Carefully examine each type of plant in the garden. By keeping monitoring records, you'll know in future years when to start inspecting for a particular pest on individual or groups of plants.

IPM strategies vary in the home garden. Success is dependent upon the pest, the plant, its vigor, soil, climatic conditions, timing, etc. Include the temperature and weather conditions for each day you monitor the garden. Some problems may be weather-related.

### Determine thresholds realistically

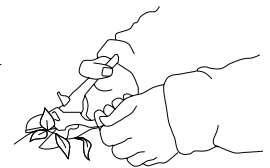
The threshold is the point at which the pest population unacceptably affects the ornamental or food value of the plant. IPM recommends that you tolerate some insects and other pests as long as they're not a serious threat to your landscape or the use of your plant or its products.

### Apply control strategies

Develop strategies for control and protection before a threshold is reached. Include cultural, mechanical (physical), biological and chemical controls. (See box at left.) Use cultural practices and mechanical techniques to reduce an initial pest problem. Your monitoring records determine the point at which a control is selected and used.

#### CONTROL STRATEGY A: Cultural Practices

Know the life histories and habits of the pests you're likely to encounter, and select pest resistant plants.



- ◆ Native and adapted plants are not as susceptible to pests, and natural controls are usually sufficient to keep pests under control.

## The Four Pest Control Strategies of IPM

### (Integrated Pest Management)

#### A. Cultural practices

Plant pest-resistant species and create healthy environments for plants by planting, watering, fertilizing and pruning appropriately.

#### B. Physical or mechanical methods

Mow or burn weeds, spray aphids or spider mites off plants with a strong jet of water from a hose, trap rodents, etc.

#### C. Biological controls

Introduce and encourage pest predators such as ladybird beetles (ladybugs) and Trichogramma wasps.

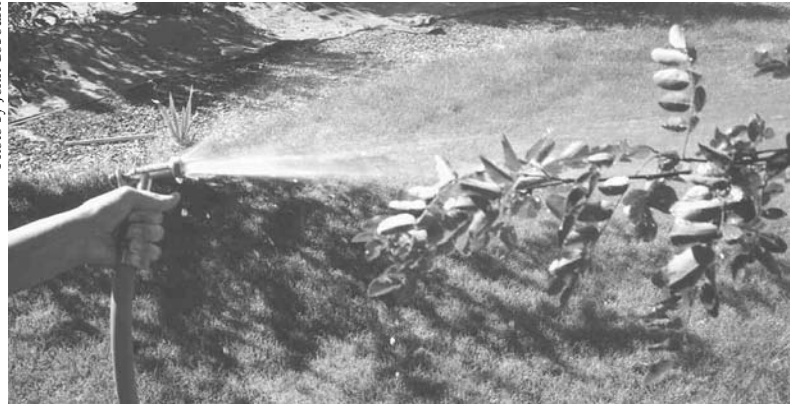
#### D. Chemical methods (pesticides)

Though these can be safe and effective, if used with great care according to label instructions, they are a last resort. If you plan ahead and follow the tips in this chapter, you'll rarely need to use pesticides. Apply the least toxic pesticide first.

Most plants on the TRPA Recommended Plant List (see Chapter 7) are resistant to pests.

- ◆ If you grow vegetables, rotating crops to a new location reduces the buildup of pests, particularly soil diseases. If potatoes are grown in the same spot each year, the chance of losing the crop to disease increases dramatically. The problem with crop rotation is the space needed to relocate the planting to the other side of the yard. One solution is to grow potatoes one year, lettuce or broccoli the next, squash the third and potatoes again the fourth year, all in the same space.
- ◆ Sanitation keeps the landscape free of weeds, pest-ridden plants and debris. Don't let plant residue, diseased plants or weeds lie around all winter. They harbor diseases and insects and should be removed from the yard.
- ◆ Cultivation, turning or loosening the soil, is critical in tilled beds. Many weeds in the garden harbor diseases and insects that attack plants. Cultivation exposes soil insects to the elements and natural predators. Cultivation isn't recommended for natural areas because it could induce erosion.
- ◆ Mulches conserve water and help control weeds. Make sure the mulch is free of disease, harmful insects and weed seed. Organic matter such as compost, tilled deeply into garden soil in the fall, improves the soil-plant relationship and soil nutrition for healthier plant growth. (See Chapter 9.)
- ◆ Reduce stress to plants. Provide adequate water (neither too much nor too little) and soil amendments. Waterlogged or drought-stressed plants are weaker and more susceptible to pests.

Photo by John Cobourn



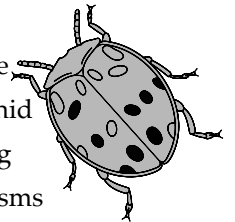
*Use a garden hose with a spray nozzle to wash insects off plants and trees for an effective mechanical pest-control method.*

### **CONTROL STRATEGY B: Physical or Mechanical Methods**

Mechanical methods include hoeing or mowing weeds, hand removal of insects or using a stiff spray of water to wash pests off the plant. Pruning out diseased, damaged and dead plant parts is a mechanical method. Barriers are also effective. Sticky tape or bands of sticky materials painted around the base of trees can trap insects as they crawl onto plants. Floating row covers of thin porous plastic film over the top of vegetables or flowers keep pests from the garden. Various traps are available such as pheromone traps for insects and gopher, vole and mole traps.

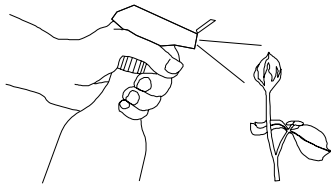
### **CONTROL STRATEGY C: Biological Controls**

There are many beneficial insects and mites in your garden. They can be supplemented by purchasing more predators. These include ladybird beetles (ladybugs), lacewings, syrphid flies, wasps and praying mantis. Insect-eating birds are also useful. Disease-causing organisms such as bacteria, fungi and parasitic nematodes are effective controls for many garden pests as well. *Bacillus thuringiensis*, Bt., is one of the most popular microbial-based insecticides used to control caterpillars.



**CONTROL STRATEGY D:****Chemical Methods**

These are used as a last resort, but they're often the only practical method of reducing insects that have reached threshold levels. Chemicals include attractants, growth regulators, sterilants, repellents, insecticides, fungicides and antibiotics. The less toxic insecticidal soaps, horticultural



oils and other biorational materials should be used first. (See box on next page.) Use traditional pesticides only when these and other techniques are not successful.

Take great care when using chemicals. Use the appropriate chemical at the proper time to control the pest without damaging the plant or

crop. This reduces the risks to you, your family and the environment. Always follow label instructions and measure accurately when mixing. Most chemicals don't stop the pest dead in its tracks—it may take hours or days. **Identify the pest and use a chemical that lists that pest on its label. Never exceed the recommended rate—it's dangerous and against the law.**

Always wear the personal, protective equipment stated on the label. Most general use pesticides require a long shirt, pants, boots, rubber gloves and goggles worn when spraying. A hat or respirator may also be required. Do not apply pesticides in shorts, sandals or barefooted, without a shirt or gloves. It's not safe and may be against the law. Pesticides enter our bodies through our skins, mouth, nose and eyes, so cover up.

Store pesticides only in their original containers, and dispose of excess quantities as directed on the label. Never dump them on the ground or down a drain or toilet. Purchase only the amount you need, and use it all or share it with a neighbor. Dispose of the container properly, according to the package directions. (See Chapter 11 for disposal site locations.)

**More information available to help control garden pests**

Contact University of Nevada Cooperative Extension, (775) 784-4848, for help with landscape pest questions. For more information on controlling garden and landscape pests, see the tables on Pages 126, 128, 132 and 134.

## Reasons to Minimize Use of Pesticides

- ◆ Each time you use a spray or powder, you're exposed to the danger of inhalation or absorption of the toxin.
- ◆ Pesticides can contaminate surface and groundwater supplies. If they percolate down to the water table, your personal water supply – and your neighbor's – may be jeopardized. (In California, the Lahontan Water Quality Control Board allows no detectable pesticides in surface waters or ground waters.)
- ◆ Some pesticides break down slowly and remain in the environment for years.
- ◆ Pesticides may kill or harm beneficial insects, such as ladybird beetles (ladybugs), which feed on other small, harmful insects, larvae or eggs.

## Interpreting pesticide labels

All pesticides, whether man-made or plant-derived, should be regarded as poisons and used cautiously in strict accordance with label directions and precautions. In this way, pesticides control pests without harming people or the environment.

### Know how to read the product label:

- √ The registration number shows the EPA has approved it.
- √ “Danger” and “poison,” along with the skull and crossbones, mean it’s highly toxic.
- √ “Warning” = moderately toxic.
- √ “Caution” = slightly toxic.
- √ Emergency first aid measures are listed - take the pesticide label to the doctor if poisoning occurs.
- √ Physical and chemical hazards are listed.
- √ Environmental considerations are included.
- √ Directions for use are often complicated and should be carefully studied.
- √ “Application to harvest” specifies the time that must elapse between pesticide application and using a food crop or allowing animals to graze treated forage.
- √ Follow storage and disposal directions.

## A Word About Mosquitoes

Because some species of mosquitoes at Lake Tahoe can carry West Nile Virus, property owners are urged to eliminate all sources of stagnant water on their property that could support mosquito breeding. If infiltration basins are used to hold storm runoff, they should be designed to allow infiltration, or “drain-down,” within 72 hours after summer rainfall events. Some basins can be lined with rocks to eliminate the prob-

## Least Toxic Pesticides and Biorational Materials

Try these biorational materials (often referred to as “soft chemicals”) before reaching for traditional chemical control methods.

- ◆ **Insecticidal soap:** Potassium, salt-based, effectively controls aphids, red spider mites and mealy bugs. It must hit the insect directly.
- ◆ **Herbicidal soap:** Potassium, salt-based, effectively controls very young weed seedlings.
- ◆ **Botanical-derived insecticides:** These include pyrethrins, derived from the chrysanthemum plant, neem oil, and seeds of the neem tree. While they’re safer to the user and the environment than conventional pesticides, they may kill beneficial insects and may not be as effective in control of pests.
- ◆ **Sulfur sprays:** Good all-purpose fungicides, which also help control mites.
- ◆ **Bt:** *Bacillus thuringiensis*, a bacterial biological control, is effective against leaf-eating caterpillars. For best control, use when caterpillars are young.
- ◆ **Horticultural oils:** Most effective when applied as a dormant spray during fall and winter. Controls many types of insects and insect eggs, including aphids, scale and mealybugs.

lem of standing water. For more details about protecting your family from the risk of infection, please go to the Web link at: <http://www.trpa.org/documents/WNV.pdf>.

**For more information on controlling landscape pests, see the following table and the tables at the end of this chapter. ➡**

TABLE 1: CONTROL THE EIGHT MOST UNWANTED PESTS IN THE LAKE TAHOE LANDSCAPE

PEST	Cultural Control	Physical Control	Biological Control	Least Toxic Pesticide	Traditional Pesticide
<b>APHIDS</b> (ornamental trees, shrubs, annuals, and perennials)	Avoid applying excessive nitrogen fertilizers; use slow-release fertilizers; water to avoid plant stress.	Jet water from garden hose over foliage; prune out and destroy isolated heavy infestation.	Green lacewing, ladybird beetle (ladybug), parasitic wasps.	Azadirachtin, horticultural oil, insecticidal soap, pyrethrins.	Acephate, carbaryl, malathion, spinosad, and others.
<b>BARK BEETLES</b> <i>Ips</i> , <i>Dendroctonus</i> , <i>Scolytus</i> (fir and pine trees). The threat of bark beetles is greater during droughts, when their populations increase.	Avoid stressing trees. Water beyond the drip line during droughts. Avoid compacting soil over roots. Maintain appropriate spacing between trees.	Remove infested trees after inspection by a forester, e.g., the California Department of Forestry or Nevada Division of Forestry. Dispose of infested material by debarking logs, chipping and drying small material or removing from the site. Do not store firewood or cover properly with plastic.	Encourage predation of larvae by woodpeckers, etc. This probably will not save the infested tree but will decrease the number of beetles.	None.	Contact the local forestry office in California or Nevada prior to applying any pesticides. They'll provide you with names of protective sprays registered for bark beetle treatment. The spray should be applied completely to the trunk and lowest branches in accordance with the label recommendations for timing.
<b>MITES</b> (ornamental trees, shrubs, perennials and lawn)	Use mulches under mite-susceptible plants to increase humidity and keep dust down; keep plants well irrigated to reduce stress.	Direct a forceful jet of water to lower leaf surfaces; keep dust off plants, especially near unpaved roads.	Predaceous mites, ladybird beetle, predaceous thrips.	Avoid insecticides that kill a wide variety of insects (broad spectrum) which also kill natural predators. Insecticidal soaps and horticultural oils offer some control.	Bifenthrin, fenbutatin-oxide (in home-garden mixes), lime sulfur.
<b>BLACK VINE WEEVIL</b> (rhododendron [some resistant], lilac, privet, euonymous)	Select rhododendrons that are not as susceptible (P.J.M.); keep susceptible plants well watered throughout summer.	Install sticky barriers to prevent flightless adults from climbing into canopy.	Parasitic nematodes.	None recommended.	Acephate, azadirachtin, imidacloprid (apply to leaves and soil surface when leaf notching occurs).

PEST	Cultural Control	Physical Control	Biological Control	Least Toxic Pesticide	Traditional Pesticide
<b>CODLING MOTH</b> (apple, pear)	Remove fallen fruit immediately; keep weeds and rubbish away from the tree base to avoid overwintering sites.	Band trunk with corrugated cardboard or tanglefoot to trap larvae as they move down the tree to pupate; tie a paper bag around fruit after thinning; mass trap with pheromone traps if far from other infested trees.	Bacillus thuringiensis (Bt) for limited control. Must be timed with larval hatching.	Some control with the botanical insecticides, pyrethrin and ryania. Time sprays to coincide with egg hatching.	Carbaryl, malathion, spinosad (protect bees, apply these after petal fall).
<b>POWDERY MILDEW</b> (common to many landscape plants and vegetables)	Avoid excess fertilizer; plant mildew-resistant varieties; remove and dispose of fallen leaves; prune plant to open canopy and improve air circulation.	If infestation is limited, prune out and destroy affected leaves, move plant to an area with less shade and more air circulation.	None.	Horticultural oils, neem oil, jojoba oil, sulfur, potassium bicarbonate, bicarbonate of soda (baking soda), and biological fungicides.	Triforine, Myclobutanil and others.
<b>CYTOSPORA CANKER</b> (cottonwood, aspen, willow, poplar, many ornamental trees)	Avoid planting susceptible species; keep trees watered well. Fertilize with moderate amounts of slow-release fertilizer.	Prune out infested twigs and branches when disease is first observed. Disinfect tools with 20% bleach solution between cuts. Once disease is in main trunk, nothing can be done.	None.	None.	None.
<b>FIREBLIGHT</b> (members of the rose family including apple, pear, pyracantha, Mountain ash)	Plant resistant varieties or avoid members of the rose family where fireblight has been a problem.	Prune out infested twigs and branches well below symptoms. Disinfect tools with 20% bleach solution between cuts.	None.	Limited control with bordeaux (copper sulfate) or copper fungicides applied several times during bloom.	None recommended.

**Note:** Pesticides may become unavailable over time. Contact your State Agricultural Department or Cooperative Extension for up-to-date pesticide information.

TABLE 2: CONTROL WEEDS IN YOUR GARDEN AND LANDSCAPE

PEST	Key Identifying Characteristics	Mechanical Controls	Commonly Available Pesticides❖
<b>Broadleaf Lawn Weeds</b>	<ul style="list-style-type: none"> <li>◆ Leaves have net-like venation</li> <li>◆ Primarily tap-rooted</li> <li>◆ Include dandelions, clover, plantain, spotted spurge, etc.</li> </ul>	Hand-pull annual weeds. Dig and remove entire root system of perennial weeds. Prevent weeds from producing seed.	Spot-treat with herbicides containing 2,4-D (avoid broadcast application of “weed-and-feed” products).
<b>NOXIOUS AND INVASIVE WEEDS</b>			
<b>Weeds reproducing from seed only. Control by preventing formation of seed.</b>			
<b>Bull thistle</b> <i>(Cirsium vulgare)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 6 feet tall</li> <li>◆ Stems are spiny</li> <li>◆ Leaves have sandpaper texture with prominent veins</li> <li>◆ Pink to purple flower head is vase-shaped</li> </ul>	Cut taproot two inches below the soil line prior to bloom. Clip flowers, bag securely, and discard in trash.	Apply glyphosate (Roundup®, Rodeo®, etc.) to rosettes or early growth.
<b>Diffuse knapweed</b> <i>(Centaurea diffusa)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 2.5 feet tall</li> <li>◆ Stems are rough but lack spines</li> <li>◆ White to pale pink flowers are spiny</li> <li>◆ After frost, may break off and tumble</li> </ul>	Mow after bolting and before full flower. Or, hand pull before flowers appear, removing entire root base.	Apply glyphosate to actively growing plants before flowers appear.
<b>Spotted knapweed</b> <i>(Centaurea maculosa)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 5 feet tall</li> <li>◆ Stems are erect and rough</li> <li>◆ Pink to purple flowers have distinctive dark spots on bracts</li> <li>◆ Can regrow from root buds</li> </ul>	Mow before full flowering. Or, hand pull, removing the entire root base to minimize spread. Repeat as needed.	Apply glyphosate to actively growing plants with buds but before flowers appear.
<b>Yellow starthistle</b> <i>(Centaurea solstitialis)</i>	<ul style="list-style-type: none"> <li>◆ Grows 0.5 – 5 feet tall</li> <li>◆ Leaves are grayish and hairy</li> <li>◆ Yellow flower has up to 1-inch-long spines at tips of bracts</li> </ul>	Hand pull before flowers appear. Remove as much root as possible.	Apply glyphosate to actively growing plants before flowers appear.
<b>Weeds reproducing from both roots and seeds (perennials). These weeds are difficult to control mechanically, and will require many years of effort to eliminate.</b>			
<b>Canada thistle</b> <i>(Cirsium arvense)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1.5 – 4 feet tall</li> <li>◆ Stems are smooth and ridged with no spines</li> <li>◆ Light purple to white flowers produced in clusters on each stem</li> </ul>	Hand pull or mow repeatedly prior to bloom. Difficult to control.	Apply glyphosate to actively growing plants and/or prior to the first killing frost.
<b>Dalmatian toadflax</b> <i>(Linaria genistifolia</i> spp. <i>dalmatica)</i>	<ul style="list-style-type: none"> <li>◆ Grows to 3 feet tall</li> <li>◆ Stems are erect and branched</li> <li>◆ Leaves are heart-shaped and waxy</li> <li>◆ Flowers are yellow with throat</li> </ul>	Hand pull before flowers appear and repeat regularly as needed.	In spring, clip plants to 3 inches tall. Wait 60-90 days, then apply glyphosate to regrowth.



PEST	Key Identifying Characteristics	Mechanical Controls	Commonly Available Pesticides❖
<b>Klamathweed</b> <i>(Hypericum perforatum)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 3+ feet tall</li> <li>◆ Numerous stems with rust-colored branches</li> <li>◆ Leaves have transparent dots</li> <li>◆ Yellow flowers have five petals</li> </ul>	Mow or clip frequently throughout growing season to prevent seed set.	Apply glyphosate to actively growing plants before flowers appear.
<b>Oxeye daisy</b> <i>(Leucanthemum vulgare)</i>	<ul style="list-style-type: none"> <li>◆ Grows 0.8 – 2 feet tall</li> <li>◆ Stems are smooth to slightly hairy</li> <li>◆ Single flowerheads grow at ends of branches</li> <li>◆ Flowers are white with yellow centers</li> </ul>	Hand pull or dig in spring before flowering occurs. Remove the entire root mass. Repeat as needed.	Apply glyphosate to actively growing plants before flowers appear.
<b>Perennial pepperweed</b> <i>(Lepidium latifolium, tall whitetop)</i>	<ul style="list-style-type: none"> <li>◆ Grows to 6 feet tall</li> <li>◆ Upper leaves are much smaller than lower leaves</li> <li>◆ Tiny 4-petaled flowers occur in dense clusters near ends of branches</li> </ul>	Hand pull or dig, removing as much root as possible. Repeat as soon as regrowth appears. Requires repeated action for many years.	Apply 2,4-D at bud stage and repeat as needed. Apply glyphosate to actively growing plants before flowers appear (less effective).
<b>Russian knapweed</b> <i>(Acroptilon repens)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 3 feet tall</li> <li>◆ Stems are cobwebby</li> <li>◆ Upper part of root is black</li> <li>◆ Bracts are papery</li> <li>◆ Pink to purple flowers are produced from summer into fall</li> </ul>	Mowing will reduce the current year's growth, but will not effectively control this weed.	Apply glyphosate to actively growing plants. Repeated applications will be needed.
<b>Scotch broom</b> <i>(Cytisus scoparius)</i>	<ul style="list-style-type: none"> <li>◆ Grows up to 10 feet tall</li> <li>◆ Woody shrub</li> <li>◆ Stems are ridged</li> <li>◆ Leaves are small and inconspicuous</li> <li>◆ Pale to deep yellow pea-like flowers</li> </ul>	Pull seedlings each spring, removing as much root as possible. Lop off mature plants at ground level during the dry season (late August to September).	Apply glyphosate in spring to actively growing plants.
<b>Yellow toadflax</b> <i>(Linaria vulgaris)</i>	<ul style="list-style-type: none"> <li>◆ Grows 1 – 2 feet tall (shorter than Dalmatian toadflax)</li> <li>◆ Leaves are linear and pointed at both ends</li> <li>◆ Flowers are yellow with orange throat</li> </ul>	Mow or hand pull before flowers appear and repeat regularly as needed	In spring, clip plants to 3 inches tall. Wait 60-90 days, then apply glyphosate to regrowth.

❖ These pesticides are registered for use in both Nevada and California. Note that glyphosate will provide varying levels of control. Contact your local county department for additional herbicide recommendations. (See Page 100.) Always read and follow label directions. The label is the law.

TABLE 2: CONTROL WEEDS IN YOUR GARDEN AND LANDSCAPE



*Spotted knapweed*



*Diffuse knapweed*



*Bull thistle*



*Yellow starthistle*



*Canada thistle*



*Dalmatian toadflax*



*Klamathweed*



*Oxeye daisy*



*Perennial pepperweed  
(Tall whitetop)*



*Russian knapweed*



*Scotch broom*



*Yellow toadflax*

## A word about bark beetles

Bark beetles can kill trees that are stressed. During droughts, weakened trees are more likely to be attacked. To protect your trees, keep them healthy, and water them during droughts. If you think a tree may be infested, call an expert at your State Department of Forestry. You can also call University of Nevada Cooperative Extension, (775) 832-4150 and ask for Fact Sheet-98-40, "Bark Beetles in the Lake Tahoe Basin," and Fact Sheet-98-42, "Thinning and Sanitation."

## Control rodents and other animal pests

The first part of any pest control program is to identify the pest you wish to control. Some rodents are identified visually; others by their behavior. A mole mound is conical and seldom more than 1 foot in diameter. A gopher's mound, on the other hand, has fine soil pushed up around the edges, and is one to 3 feet in diameter and often resembles a horseshoe or kidney.

Once the pest is identified, choose from the four methods of control: physical, cultural, biological or chemical. Cultural controls include techniques that disturb the animal's habitat such as mowing, burning, dethatching or tilling. Voles, or meadow mice, prefer areas with a heavy ground cover of grasses, grasslike plants or litter. Mowing makes voles more susceptible to predators. Voles are particularly troublesome because they're voracious feeders and cause tree death due to girdling (removing bark around the tree). They're also carriers of plague.

Because deer mice carry the deadly Hantavirus and other rodents can carry plague, don't tolerate mice or other rodents in your house, garage, sheds or outbuildings. If you find mouse

droppings, be sure to follow correct cleanup procedures to **avoid stirring up dust**. Spray first with Lysol, or a mixture of one gallon of water and three tablespoons of household bleach. Wait at least a half an hour and then use a wet mop or cloth to remove the droppings and litter. Wear a dust mask and gloves while performing these procedures.

Burning infested areas in the fall or spring encourages natural predators, such as hawks, owls and coyotes, to feed upon exposed varmints, thus reducing populations. At Lake Tahoe, residents should check with their county government to find out when open burning is permitted and if a permit is needed from the local fire marshal. Encourage the presence of raptors by installing raptor poles. (See "biological controls.") Tilling or furrowing affected areas is also effective, but is not appropriate for slopes. Physical controls of rodents include live trapping or snap trapping.

### Commonly used traps

The two most commonly used traps are the live-catch trap and the snap trap. Live-catch traps are rectangular boxes of wire mesh with a trap door that closes when the animal touches a trigger. Once caught, they're taken in the trap to the local animal control or released in an acceptable area. Snap traps are designed to close on the leg or body of the animal when it touches the trigger. Some are designed to kill the animal, while others hold it until the trapper releases it. Snap traps are staked or attached to a tree or pole so the animal can't drag it away. Be sure the snap trap is located in an area where you can't accidentally trap a child or pet. Check the trap daily.

To trap moles or gophers, locate the main burrow area. Use a rod or shovel to probe

*"Once the pest is identified, choose a method of control: physical, cultural, biological or chemical"*



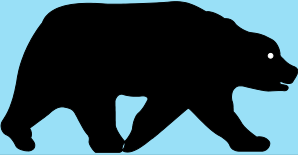
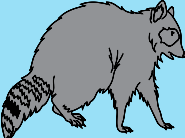

through the tunnels, searching for the main burrow. Once found, expose the burrow using a shovel, and place two snap or live traps in the burrow. Each trap should have jaws or doors open toward the access tunnel. Stake the trap for moles because they're strong enough to drag traps a long distance, and coyotes can also remove the traps.

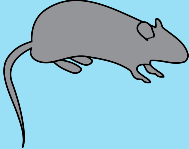

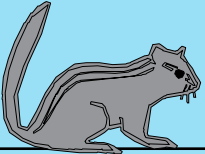




Biological controls include vertebrate predators, such as dogs, cats and wild animals, such as bobcats, raptors and others. If you have a large open area with rodent problems, install a raptor pole. These poles work best if they're 15 to

20-feet high, with a sturdy cross bar at the top (a perch) that allows hawks to prey on rodents.

Chemical controls include poison baits. For certain types of rodents, such as voles, chemical controls are very effective. The chemical of choice is zinc phosphide. This is a restricted-use pesticide administered only by a certified applicator. These chemicals must be applied with extreme care to ensure only the target species feed upon the poison bait. Before using any poison baits, check to make sure there is no chance of a secondary kill of raptors or pets. Keep poisons out of reach of children.

TABLE 3: RODENTS AND OTHER ANIMAL PESTS AT LAKE TAHOE

PEST	Cultural Control	Physical Control	Biological Control	Chemical (Pesticide)
<b>DEER</b> 	Deer resistant plants, "lure" crops.	Wire/electrical deer fencing; fence off garden.	None.	Repellents; sulfurous-best; hot-spicy—okay.
<b>DEER MICE</b> <b>HOUSE MICE</b> (in buildings) 	Sanitary counters, etc.; mouse-proof food storage; reduce cover around buildings.	Close openings over 1/4 inch, mouse traps, glue boards.	Cats – limited effectiveness.	Anticoagulant or other toxic bait.
<b>BEARS</b> 	Don't feed bears. Never leave food or garbage where a bear can access it. Keep food in stout containers.	Bear-proof trash containers; fencing. Notify Nevada Division of Wildlife biologists to trap and relocate.	None.	None.
<b>RACCOONS</b> 	Don't feed raccoons. Never leave food or garbage where they can access it.	Raccoon-proof trash containers; electric fencing; exclude from chimneys, crawl spaces, etc.; traps.	USDA Wildlife Service trappers available.	None
<b>MOLES</b> 	Reduce soil moisture to deter digging.	Mole traps; flooding.	Dogs or cats – limited effectiveness.	Use of soil insecticides reduces food supply.

PEST	Cultural Control	Physical Control	Biological Control	Chemical (Pesticide)
<b>POCKET GOPHERS</b> 	Flood irrigation.	Gopher traps; wire cylinders around plants.	Dogs or cats — limited effectiveness.	Toxic baits; strychnine; zinc phosphide; anticoagulants; gas cartridges; fumigants.
<b>VOLES</b> 	Tillage destroys burrows; reduce cover to expose to predators.	Wire mesh cylinders around plants; snap traps.	Dogs or cats, raptors.	Zinc phosphide; anticoagulant baits.
<b>GROUND SQUIRRELS (in buildings)</b> 	Remove cover, trash, etc. around buildings; repeated burrow destruction.	Exclude from buildings using 1/4-inch mesh screen; caulking; tree bands, live trap and relocate or euthanize.	Dogs or cats, raptors.	Zinc phosphide; anticoagulant baits; fumigants; gas cartridge.
<b>CHIPMUNKS (in buildings)</b> 	None.	Same as ground squirrels and voles.	Dogs or cats, raptors.	None.
<b>DOUGLAS/WESTERN GREY SQUIRRELS (in buildings)</b> 	Plant trees away from buildings; cut branches near buildings.	Same as ground squirrels and voles.	Dogs or cats, raptors.	None.
<b>WOOD RATS (PACK RATS) (in buildings)</b> 	None.	Same as ground squirrels and voles.	None.	Zinc phosphide.
<b>SKUNKS</b> 	Keep food away; skunk-proof trash containers.	Exclude from buildings; live trap and relocate or euthanize.	None.	None.

**Table 4: HOME LANDSCAPE INSECT CONTROL METHODS<sup>1</sup>**

Pest	PHYSICAL					OTHERS					BIOLOGICALS					BOTANICALS		TRADITIONAL INSECTICIDES																
	Wash or Syringe Off	Trapping	Pruning	Hand Pick	Barriers (Tanglefoot, edging, etc.)	Sulfur	Lime Sulfur (Calcium Polysulfide)	Iron Phosphate	Insecticidal Soaps	Horticultural Oils	Diatomaceous Earth (kaolin)	Nematodes	Syrphid, Flower or Hover Flies	Predatory Mites	Predatory Bugs	Parasitic Wasps	Ladybird Beetles	Lace Wings	<i>Bacillus thuringiensis</i> (BT)	<i>Beauveria bassiana</i>	Spinosad	Rotenone	Pyrethrins/Pyrethrum/Pyrethroids	Azadirachtin (neem extract)	Metaldehyde	Malathion	Dicofof	Imidachloprid	Halofenozide	Dimethoate	Carbaryl	Acephate		
Adelgids		X						X	X					X									X				X							
Armyworm & Cutworms				X	X			X	X							X		X		X	X	X	X		X			X			X	X	X	
Aphids	X	X						X	X			X				X	X	X	X	X	X	X	X				X			X	X	X	X	
Beetle, Elm Leaf				X				X	X								X	X	X	X	X	X	X		X									
Beetles, Bark		X													X								X				X			X	X	X	X	
Borers Bark & Twig		X													X						X	X	X				X							
Boxelder Bug								X													X	X	X									X	X	
Clearwing Moths		X									X				X						X	X	X							X	X	X	X	
Earwig		X						X							X							X	X											
Foliar-feeding Caterpillars			X									X		X			X	X	X	X	X	X	X		X					X	X	X	X	
Lace Bug								X	X														X			X								
Leaf Beetles								X	X									X	X	X	X	X	X											
Leafhoppers								X	X												X	X	X				X							
Leafminers		X						X	X						X			X	X	X	X	X	X				X							
Leafrollers & Leaffolders		X	X					X	X			X			X			X	X	X	X	X	X											
Lygus Bug								X	X					X							X	X	X											
Mealybugs	X					X		X	X		X			X		X	X	X	X	X	X	X	X				X							
Moths: Bud, Shoot, Tip, etc.											X						X	X	X	X	X	X	X											

**Table 4: HOME LANDSCAPE INSECT CONTROL METHODS<sup>1</sup>**

Pest	PHYSICAL					OTHERS					BIOLOGICALS					BOTANICALS		TRADITIONAL INSECTICIDES																
	Wash or Syringe Off	Trapping	Pruning	Hand Pick	Barriers (Tanglefoot, edging, etc.)	Sulfur	Lime Sulfur (Calcium Polysulfide)	Iron Phosphate	Insecticidal Soaps	Horticultural Oils	Diatomaceous Earth (kaolin)	Nematodes	Syrphid, Flower or Hover Flies	Predatory Mites	Predatory Bugs	Parasitic Wasps	Ladybird Beetles	Lace Wings	Bacillus thuringiensis (BT)	Beauveria bassiana	Spinosad	Rotenone	Pyrethrins/Pyrethrum/Pyrethroids	Azadirachtin (neem extract)	Metaldelhyde	Malathion	Dicofol	Imidachloprid	Halofenozide	Dimethoate	Carbaryl	Acephate		
Mites	X					X	X	X	X	X			X	X	X					X	X	X	X			X	X			X	X	X	X	
Pod Gall Midge																X				X	X	X	X											
Psyllids								X	X					X							X	X	X	X				X						
Root Weevils											X												X	X		X							X	
Sawfly: Rose, Pear & Pine	X	X		X				X	X								X		X	X	X	X	X	X			X							
Scale Armored (Hard)			X			X	X	X	X						X	X					X	X	X	X										
Scale Soft			X			X	X	X	X						X	X					X	X	X	X										
Slugs/Snails		X		X	X		X			X															X									
Sod Webworm																			X			X	X					X						
Sow bug & Pill bug		X			X					X																								
Spittlebug								X														X	X			X								
Tent Caterpillars			X					X											X	X	X	X	X	X			X							
Thrips <sup>2</sup>	X	X						X	X	X		X	X	X		X						X	X	X										
Webworms			X					X	X										X	X	X	X	X	X			X							
Whiteflies <sup>2</sup>		X						X	X			X		X					X	X	X	X	X	X			X							
White Grubs								X	X	X	X		X		X							X	X			X								

<sup>1</sup> Follow all label insecticide directions exactly. To do otherwise is dangerous to the user, others and the environment and is unlawful. The label is the law. Mentioning an insecticide does not constitute an endorsement of insecticidal effectiveness by UNCE or its personnel.

<sup>2</sup> Thrips – For trapping, use blue sticky cards; Whiteflies – For trapping, use yellow sticky cards.

# Pest Monitoring Form for Home Landscapes

Monitor: \_\_\_\_\_

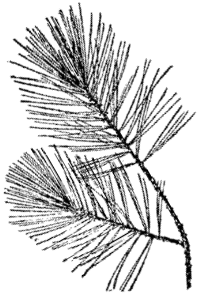
DATE	LOCATION	PLANT SPECIES	PLANT PART SAMPLED	PLANT STATUS	PEST	WEATHER	TEMPERATURE

**Comments/Notes**  
Plant stage of development, last pesticide application, observations.

**Map**  
Sketch pest landscape location, indicate sampling pattern and sites, note problem areas.







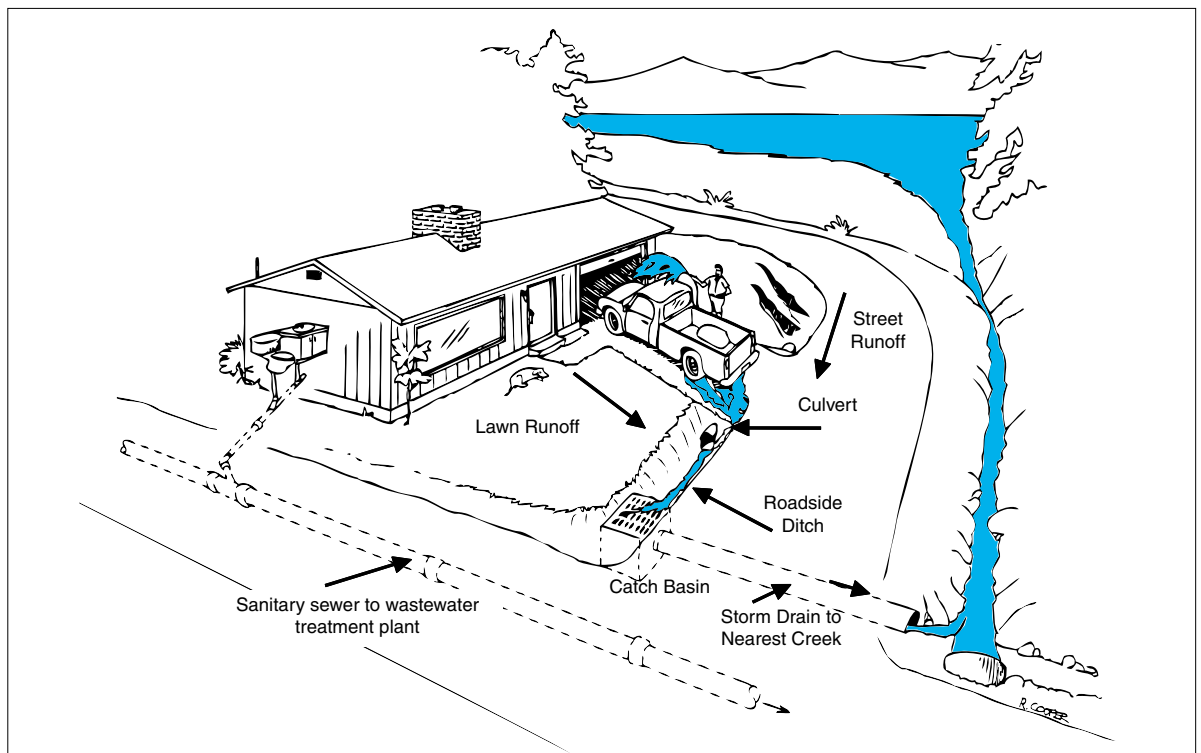
# Other Ways You Can Prevent Lake Pollution

## Storm runoff and the lake

### Did you know there are two water drainage systems in the Tahoe Basin?

At Lake Tahoe, we drink water taken from wells and from the lake. This water is treated for drinking, piped to our homes and businesses, then carried away by sanitary sewers and treated as “wastewater” before being pumped out of the basin.

An entirely separate system carries rainwater and snowmelt off our rooftops, parking areas and streets. This “urban runoff” is not treated in any treatment plant, but is conveyed to the nearest creek and into the lake by storm drains, culverts, manholes, catch basins and roadside ditches. Designed to control flooding, this urban “storm water” system is often hidden under our streets.



*Unlike household wastewater, which flows through sanitary sewers to a wastewater treatment plant, urban runoff at Lake Tahoe is piped through a separate storm drain system directly into the nearest stream or the lake.*

## The Stormwater Problem

Because many Lake Tahoe residents are not aware of how our storm drain system works, a great deal of water pollution occurs that could easily be prevented. All impervious (hard) surfaces such as pavement and rooftops are collectors for future water pollutants. These surfaces create runoff when we get a rainstorm or when winter snow melts. Once the rain has rinsed off

the streets, parking lots and storage areas, the muddy runoff water is carried to the nearest creek, where it fouls fish and wildlife habitat all the way to the lake. Most pollutants that wash into our street drains are carried through pipes or roadside ditches directly to our beautiful lake. It is rare when street drains pass through sediment detention basins on the way to Lake Tahoe.

## MAJOR TYPES OF POLLUTANTS IN AMERICA'S WATERWAYS AND AQUIFERS

Class	Examples	Major Source	Major Effects
<b>NUTRIENTS</b>	Nitrogen, Phosphorus	Wastewater treatment plants, fertilizers, leaking septic tank systems, animal wastes, soil erosion and storm runoff (storm drains).	Produces excess algae. Slow, steady increase of single-cell algae reduces the lake's famed clarity.
<b>SEDIMENTS</b>	Soil, sand, silt, dust, gravel	Erosion of soil from roads and residential areas by water or wind, road de-icing, storm drains.	Harms habitat and carries attached phosphorus into the lake. Suspended sediment reduces water clarity.
<b>PATHOGENS</b>	Bacteria, viruses, parasites	Human and pet waste, leaking septic tank systems, storm drains.	Makes water unsafe for human consumption.
<b>TOXINS</b>	Hydrocarbons, heavy metals	Chemical spills, automobile products and emissions, motorboats and watercraft, street runoff, improper use of storm drains, leaking underground petroleum storage tanks, improper use of pesticides.	Harms wildlife and fish, and contaminates human drinking water.
<b>SALINITY</b>	Total dissolved solids (TDS), salts (minor problem at Lake Tahoe)	Agricultural return flows, wastewater treatment plants, geothermal springs, road de-icers.	Accumulates in agricultural fields and lakes.
<b>THERMAL POLLUTION</b>	Increased water temperature (minor problem at Lake Tahoe)	Agricultural return flows, geothermal springs, loss of streamside tree canopy.	Water holds less dissolved oxygen; harms fish and other aquatic life.

## Things you can do

You can transform our urban watersheds and streams into community treasures. Small actions can improve the health of our water. Here's what you can do:

- ◆ Keep trash, litter and grass clippings out of drainage ways, roadside ditches, street gutters and creeks.
- ◆ Sweep drives and parking areas periodically and throw the dirt into the trash. Do not hose down or blow dirt and debris into streets or ditches.
- ◆ Prevent the disturbance of stream bottoms and banks. These are critical environments and should be protected from equipment or vehicle use, even during dry periods.
- ◆ Join the effort to educate people about storm drains. The old maxim "Every litter bit hurts," is true today. (See section "Storm Drain Stenciling Program" at the end of this chapter.)
- ◆ Water carefully and avoid runoff. Yard chemicals and fertilizers can wash into ditches and storm drains. Use lawn and garden chemicals carefully, according to their labels, to avoid excess or unneeded application.
- ◆ Place a drip pan under your car. Small quantities of oil or other leaking fluids can then be soaked up with kitty litter and put in the trash.
- ◆ Recycle used automotive oil. Never dump oil, paint, antifreeze or other chemical into a street drain or ditch. Oil dumped on the ground or in the street can pollute groundwater, streams and the lake.
- ◆ Wash cars at a commercial car wash that filters and recycles wash and rinse water.
- ◆ Clean up after pets. Don't place animal waste in the street or waterway.
- ◆ Organize a group of family and friends to "adopt" a creek, to help restore it to a healthier state and maintain it that way. This involves careful removal (by hand) of man-made trash and litter, while leaving natural vegetation, logs or branches in place.
- ◆ Properly service engines and motors in vehicles and watercraft.

*"Small actions can improve the health of our water"*



### Help is a phone call away...

#### **For construction, grading or filling on land near a stream or wetland:**

Call the TRPA, (775) 588-4547.

#### **For help with landscape care:**

Call University of Nevada Cooperative Extension, (775) 832-4150.

#### **For a soil or stream bank erosion problem:**

Call your local Conservation District. (See inside back cover.)

#### **To report problems such as oil or chemicals spills in California:**

Call the Lahontan Regional Water Quality Control Board, (530) 542-5400.

## Where to dispose of household hazardous wastes

### El Dorado County Residents

- 1. Lake Valley Fire District**  
2211 Keetak St., South Lake Tahoe, CA  
(530) 577-3737  
**Materials accepted:** Motor oil and antifreeze  
**When:** Monday through Sunday, 8AM to 5PM

- 2. Kragen Auto Parts**  
2317 Lake Tahoe Blvd.  
South Lake Tahoe, CA  
(530) 544-1974  
**Materials accepted:** Motor oil (only)  
**When:** regular business hours

- 3. South Tahoe Refuse, Inc.**  
2140 Ruth Ave.  
South Lake Tahoe, CA  
(530) 541-5105  
**Materials accepted:** Most automotive and household hazardous wastes, e.g., motor oil, compressed-gas cylinders, sealant, adhesives, pesticides, herbicides, solvents, pool chemicals, photo chemicals, all batteries, household cleaners; no infectious materials waste; no explosives; no radioactive materials.  
**When:** Tuesday, 9 AM to 4 PM, closed from noon to 1 PM; Saturday, 9 AM to 11:30 AM (*Serves residents of City of South Lake Tahoe, El Dorado and Douglas Counties*).

### Placer County Residents

- 1. Tahoe-Truckee Sierra Disposal**  
Highway 89/Cabin Creek Road  
Tahoe City, CA  
(530) 583-0148  
**Materials accepted:** Used motor oil, car batteries.  
**When:** Tuesday through Saturday, 8 AM to 4 PM, Closed noon to 12:30 PM. Ask about specific dates for drop-off of other hazardous wastes.
- 2. Sierra Country Tires & Automotive**  
8001 North Lake Blvd.  
Kings Beach, CA  
(530) 546-5927  
**Materials accepted:** Motor oil and transmission fluid.  
**When:** Monday through Friday, 8 AM to 5 PM

### Washoe County Residents

- 1. Waste Not HHW Collection Center**  
1220 Sweetwater Road  
Incline Village, NV  
(775) 831-8603  
**Materials accepted:** Acids, aerosols, fertilizers, flammable liquids, gasoline, contaminated oil, herbicides, lye, moth balls, oxidizers, oil-based paints, pesticides and poisons.  
**Materials not accepted:** Latex paints—dry them and put them out with the trash; bio-hazardous, radioactive or commercial vendor waste.  
**When:** Tuesday and Thursday 3PM to 5PM.
- 2. Waste Management**  
1076 Tahoe Blvd. (Highway 28)  
Incline Village, NV  
(775) 831-2971  
**Materials accepted:** Used motor oil, antifreeze, and car batteries (\$5.85 per battery).  
**When:** Monday through Friday, 8AM to 4:30PM.
- 3. Clean Harbors Environmental Services**  
1200 Marietta Way  
Sparks, NV  
(775) 331-9400  
**Materials accepted:** Any household hazardous wastes, paints, varnishes, glues, industrial chemicals, etc. (minimal fees for disposal).  
**Materials not accepted:** Hypodermic needles, radioactive waste, explosives (fireworks, flares, etc.).  
**When:** Monday through Friday, 9AM to 4PM.

### Additional Resource

Earth 911  
1-800-Cleanup (1-800-253-2687)  
[www.cleanup.org](http://www.cleanup.org)  
Enter zip code for local resources.

Don't let hazardous waste reach the lake! Please use these disposal facilities!



**ALWAYS CALL AHEAD**  
*to verify times and materials and quantities accepted*

## Lake Tahoe needs your help! Join our volunteers!

### Get involved with the Lake Tahoe Environmental Education Coalition (LTEEC)

Improving environmental education in the Tahoe Basin will require the work of many diligent volunteers and a coordinated effort among agencies working together on programs and projects. There are many ways to get involved. A few examples include: environmental education events, K-12 programs, stream monitoring, restoration projects, backyard conservation, storm drain stenciling, forest stewardship days and beach clean-up days. Jobs open to volunteers include organizing neighborhood education, making phone calls, distributing door hangers, entering computer data or doing physical labor.

Join one of the working groups below to help prevent the pollution of Lake Tahoe:

- ◆ Environmental Improvement Program (EIP) Outreach
- ◆ K-12 Watershed Education
- ◆ Higher Education and Research
- ◆ Earth Day Planning Committee
- ◆ Citizens' Monitoring: The Clean Water Team
- ◆ Fire Prevention and Forest Health
- ◆ Natural Resources Conservation
- ◆ Tahoe Basin Weed Coordinating Group

Call University of Nevada Cooperative Extension at (775) 832-4150, if you are interested in volunteer programs or if you would like to link your organization with these regional environmental education efforts. The Lake Tahoe Environmental Education Coalition (LTEEC) is a jointly sponsored program of University of Nevada Cooperative Extension and University of California Cooperative Extension.



*These Boy Scouts are helping to remind our neighbors of the importance of keeping pollutants out of storm drains by stenciling them “No Dumping—Drains to Lake.”*

### The Lake Tahoe Storm Drain Stenciling Program

This program trains volunteers to assist in public education by labeling storm drains throughout the Tahoe Basin with a message reading: NO DUMPING—DRAINS TO LAKE.



By stenciling, we hope to remind our neighbors of the importance of keeping pollutants out of storm drains—things like motor oil, anti-freeze, trash, dirt, paints, dog and cat manure, herbicides and pesticides. Once in the storm drains, these harmful pollutants are on their way to Lake Tahoe.

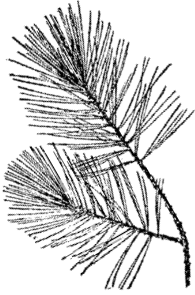
This project is a joint effort of University of Nevada Cooperative Extension, League to Save Lake Tahoe, Tahoe Regional Planning Agency and Americorps volunteers.

Permission to stencil near the storm drains has been granted by local jurisdictions and county governments.



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PLACE HOLDER



# Seasonal Maintenance Schedule for Lake Tahoe Landscapes

## Winter

### December 20 – March 20

Weather and elevation determine the amount of work a gardener does during winter at Lake Tahoe.

In December, before snow-loading problems begin—when snow is moved onto plants from decks, walks, driveways and roofs—protect shrubs and trees with plywood structures that divert the weight of the snow away from the plants' canopy. Mark young trees with tall stakes so they are avoided during snow removal. (See University of Nevada Cooperative Extension FS-88-74, "Preventing Winter Injury to Landscape Plants.")

Prune evergreen trees, shrubs and deciduous summer flowering plants. Prune fruit trees in February through spring, depending on the weather.

Water your ornamental (nonnative) trees and shrubs with a hose during periods when the soil is dry and there's no snow cover.

Deicing products contain salts that damage plants and can pollute ground and surface water, and eventually Lake Tahoe. Use them sparingly. Be careful where these products are used to pre-



*The time to protect shrubs and trees at Lake Tahoe is before the snowloading problems begin.*

vent damage to plants. They also can crack the surface of concrete. Cat litter and coarse sand are alternatives to deicing salts that provide traction without damaging plants.

## Spring

### March 20 – June 20

Spray dormant oils for insect and disease control in the early spring before bud break. Prune deciduous trees and shrubs, fruit trees and decidu-

ous summer flowering trees and shrubs, such as Golden-chain tree or Rose of Sharon. Prune forsythia or lilac after they bloom. Prune roses from May to mid-June. Prune out any winter damage.

Spring weather is unpredictable. Start tender seed such as petunias, marigolds, tomatoes or peppers, indoors in mid-April for early summer planting. Start them six weeks before placing them outside. After June 1, set out tender vegetable and annual plants.

Get your soil in shape. Start with a soil test at a University of Nevada Cooperative Extension office or a commercial certified soil-testing laboratory. Add amendments as indicated by the test. Work organic matter such as aged bark compost into the soil once it has dried out a little.

Fertilize lawns, ornamental trees and shrubs in early June, using a slow-release fertilizer to preserve water quality. (See Chapter 9 and contact University of Nevada Cooperative Extension for Fact Sheet-94-64, "Turf Fertilization at Lake Tahoe.") Avoid using weed killer/fertilizer combinations that can damage trees and shrubs. This is a good time for preemergent weed control and spraying horticultural oils for insect and disease control.

Water ornamental shrubs, trees, perennials and lawn if there is no precipitation. Repair lawn sprinklers and check for 100 percent overlap for complete irrigation coverage. Seed a new lawn when the soil warms up. Soil temperature should be above 50 degrees for active grass-seed



Photo of the Simone residence landscape

*Spring weather at Lake Tahoe is unpredictable. Start tender seed indoors in mid-April before placing them outside.*

germination. If the thatch is more than ½ inch thick, aerate your lawn to reduce soil compaction and increase water penetration.

Watch out for aphid infestations. When caught early, aphids can be hosed off with a strong stream of water.

Plant perennials, bare root trees and shrubs, and cold hardy vegetables, such as onions, spinach, peas, turnips or asparagus. Perennials can be divided and replanted when the snow cover is gone.

Clean up the yard. Remove dried-up fruit on and below fruit trees and dispose of them in the trash, not the compost pile. They harbor diseases and insects that attack fruit trees in spring.





*Don't forget to save time in the summer to enjoy the beauty of the lake.*

## Summer

### June 21 – September 20

If you can't tolerate a few wormy apples or pears, spray apple and pear trees after 90-percent petal fall for codling moth control. Use a home orchard or fruit and vegetable insect control, according to label directions. Alternate products to prevent development of insect resistance to one product. Thin apples, pears and peaches 4 to 6 inches apart.

Inspect and monitor all your plants. Pests are much easier to control when they're caught early. This reduces the need for chemical applications. Encourage birds, toads and beneficial insects by limiting your use of pesticides. They'll help maintain a healthy interaction of predator and prey. (See Chapter 10.)

### Plant after the last frost

The last frost date usually occurs between June 1 to 15. Plant your vegetables accordingly. Set out annuals, perennials, vegetables, herbs and strawberries in June. Trim blooming shrubs immediately after they bloom. Remove spent

flowers ("deadhead") to encourage more flowering. Allow the foliage of spring bulbs to completely dry out before removing.

### Feed perennials

Weed and work in compost or humus around perennials; then add mulch where necessary. Perennial flowers need supplemental nutrients a year or two after planting. Water in 2 to 3 pounds of a 16-16-16 slow-release or 16-20-0 slow-release fertilizer per 1,000 square feet

of bed. Wash off any fertilizer that spills on the leaves. Feed vegetables a complete fertilizer just after thinning and again as vegetables start to mature. Water fertilizer in thoroughly.

### Prevent mildew

Spray roses with an antidessicant as the leaves emerge and unfold to reduce powdery mildew problems later. An antidessicant puts a waxy coating on the surface of the leaves, preventing the fungal organisms that cause powdery mildew from infecting the plant. It's not a cure, but a preventive measure. Powdery mildew affects other plants as well, including apple, zinnias and dahlias. Thin the inner branches of roses to increase air circulation. If powdery mildew appears, a fungicide may be the only recourse.

### Control and remove weeds

In flower beds and under trees and shrubs, control and remove weeds before they go to seed to decrease the need for herbicides in future years. Chemicals should be used as a last resort. After

removing all weeds, mulch. Spread a mulch layer several inches thick around plants to retain moisture and reduce further weed production. (See Chapter 9.)

Don't use weed killer/fertilizer combinations in lawns, especially around trees and shrubs. These chemical combinations may seriously damage trees and shrubs. Instead, spot treat broadleaf weeds with a product containing 2,4-D. Hand weeding also works well. It's more effective, cheaper and safer for the environment.

### Check sprinkler systems, mow lawns

Proper watering is crucial. Check sprinkler systems to see if they're working properly. Deep waterings with a drying out period are more beneficial than shallow frequent waterings. Make sure your ornamental trees are watered deeply (12–18 inches) over an area two to three times the diameter of the drip line. Don't over-water lawns, trees, shrubs or other plants. Many problems result from overwatering and poor drainage, especially on evergreens.

Mow lawns to a height of 2 to 3 inches. Avoid fertilizing the lawn in early and mid-summer. The lush tender growth encouraged by fertilizing doesn't withstand the summer stress of drought and heat. Mulching mowers work best. This is a great time to lay sod lawns.

### Use pesticides as a last resort

Insects are a major summer problem. Take extreme care in the use of pesticides. Use them as a last resort. Learn what insect you have and find the right control. Insects like aphids can often be blasted off plants with a strong spray of water or sprayed with insecticidal soap. Sometimes living with the problem is the best solution. The preferred BMPs are pruning out damage, good

sanitation and biological controls. Don't apply insecticides if the wind is blowing or the temperature is above 85 degrees. Wear protective clothing. When finished, clean the sprayer and yourself. Launder the clothes you wear when spraying separately from household laundry. Store pesticides safely in their original containers.

Spider mites are a real dilemma. Evergreens that are fading in color and looking sickly may, on closer inspection, be found to have dirty webbing covering branchlets. A weekly shower with the garden hose in addition to your regular watering can help reduce spider mites. They thrive in hot, dusty environments. Miticides (mite poisons) are also available, but kill beneficial insects.

### End of summer tasks

During the last week of August or the first half of September, fertilize your lawn with 1/2 to 3/4 pound of actual nitrogen per 1,000 square feet. This late summer application should be done when the "average daily temperature" for three or more consecutive days is below 50 degrees. If a mulching mower is used, reduce the fertilizer application in half, 1/4 to 1/2 pound of nitrogen per 1,000 square feet. (See Chapter 9.)

Toward the end of August or in September or October, prune maples, birch, beeches, willows, poplars and elms. Disinfect tools with a solution of one part bleach and six to eight parts water before pruning trees. The best policy is to disinfect your pruning tools on each cut so you don't infest other parts of the tree. Disinfectant sprays such as isopropyl alcohol, can be used instead of a bleach solution.

*"The preferred BMPs (Best Management Practices) are pruning out damage, good sanitation and biological controls"*

## Fall

September 21 – December 20

### Fertilize and plant

Ornamental plants will benefit from fertilization after they go dormant (when the leaves have fallen off deciduous plants). This encourages healthy root production in soils still warm from summer. Next spring, plants will get a jump start from the nitrogen stored in their roots. Use 1/2 pound of quick-release fertilizer per 1,000 square feet of bed. Read Fact Sheet FS-95-37, "Tree and Shrub Fertilization for the Tahoe Basin," from a University of Nevada Cooperative Extension office. Lawns should be fertilized in late summer or very early fall, as described on the previous page. Aerate your lawn. "Harden off" trees and shrubs by gradually reducing watering.

Plant trees, shrubs and perennials. New plants need regular watering through the first rain or snow of winter. Transplant trees, shrubs (after a couple of hard freezes) and perennials. Plant hardy bulbs such as tulips, daffodils and hyacinths.

### What to prune

Prune evergreen trees and shrubs, and summer flowering deciduous plants if needed. Remember to disinfect your pruning tools – use a solution of one part bleach to six to eight parts water.

After the first frost when foliage has died down, dig up tender bulbs such as canna, gladiolas, dahlias and begonias and store them for winter at about 40 degrees. Cover tender vegetables, if freezes are expected, to prolong your harvest. Harvest fruits as they ripen on trees.

### Watering is the most crucial chore for the fall

Deciduous ornamental plants should be thoroughly watered after leaf fall. Water two to three times the diameter from the trunk to the drip line. Nonnative trees and shrubs, particularly evergreens, should be watered deeply every three to four weeks throughout the winter if there has been no precipitation and if water will soak in. Lack of winter water stresses a plant as much as lack of summer water. Stressed plants suffer more disease and insect problems. Unless there is an extreme drought, established native plants seldom need supplemental watering.

### Protect your plants for winter

Wrap or paint trunks of young thin-barked trees such as fruit trees, flowering plum, sycamores and birches to protect them from sunscald. Do not use oil-based paints, which damage the tree, instead use white, water-based paint. Mulch plants to conserve moisture. Use antidesiccant sprays on ornamental evergreens to help reduce moisture loss from the needles. Screen nonnative broadleaf evergreens, such as rhododendrons, to reduce leaf burning by using burlap wraps around T-stakes to protect them from drying winds. Protect all plants from heavy snow coming off roofs, decks and drives.

### General cleanup of all plants is in order

This includes perennials, annuals, vegetables, fallen leaves of shrubs and trees, old fruit, etc. Sanitation in the fall is particularly important around plants susceptible to disease such as mountain ash, fruit trees, etc. Pick dead fruit off and around trees. Pull up annuals and dead garden vegetables and compost them. However, don't compost plants that appear to be diseased.

*"Good fall garden cleanup is the best way to prevent disease and insect problems next year"*

Take fallen leaves and put them on the compost pile or place leaves over any tender plants that need protection through the winter.

Perennials that die back to the ground each winter can be clipped off and mulched lightly. Thin and cut back thickets of berries. Good fall garden cleanup is the best way to prevent disease and insect problems next year. By reducing the need for chemicals, you can cut back on the amount of pesticides running into the watershed.

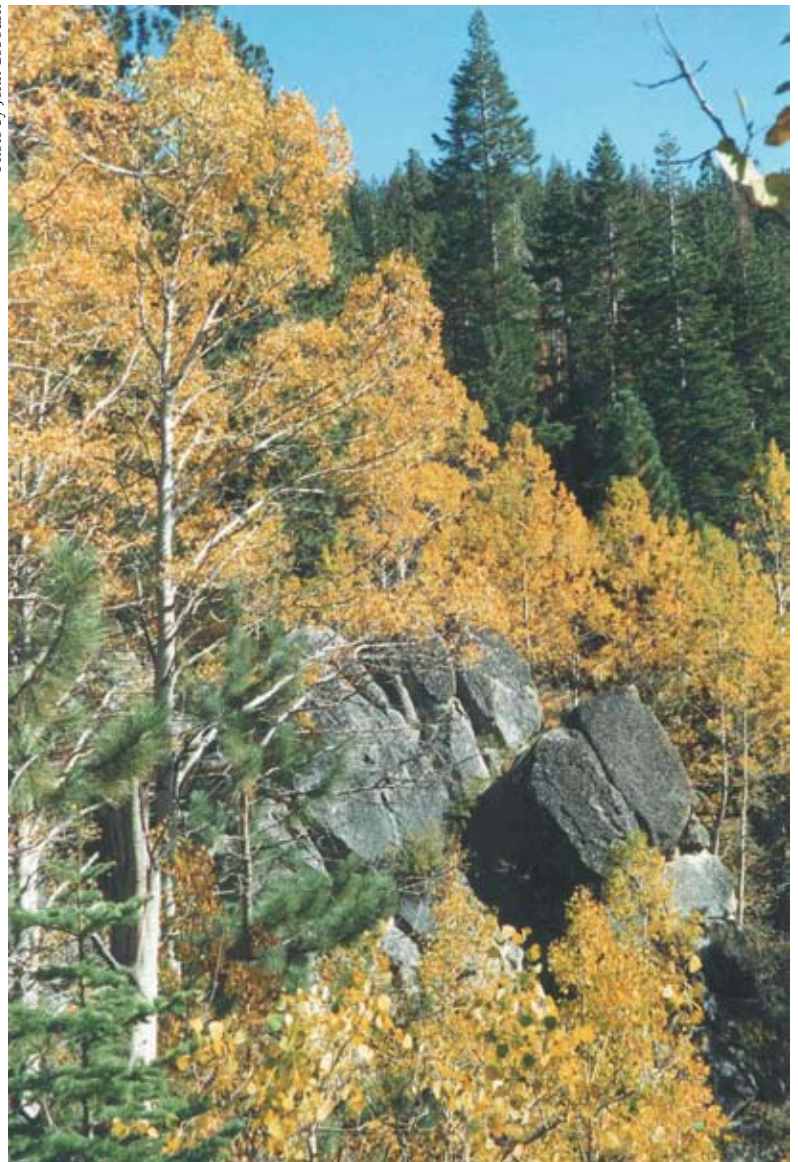
### **Protect your irrigation system from freezing and winter damage**

First, turn off the water supply, then open any manual drain valves. Make sure the system drains free of water. Self-draining valves may not open and drain properly and may need to be replaced. Next, wrap or cover exposed valves and hardware to protect them from snow and ice damage. Make sure the covers to valve boxes are securely closed. Flag or stake near valves, sprinkler heads, drip lines and valve boxes to guide snow removal equipment away from them. Running over them with tires or dumping snow and ice on them creates much unwanted repair next spring. Finally, turn off the control panel to the irrigation system.

### **Prepare garden equipment for winter**

Run your lawn mower until the tank is dry. Remove the spark plug and put oil in the cylinder. Pull the starter cord several times to clean out the cylinders. Oil the wheels and chains. Clean garden tools and lightly oil them to prevent rust. Store them in a covered area.

Photo by John Cobourn



*Fall is the time to do general cleanup and prepare your ornamental plants and irrigation system for winter.*

### **Keep garden records**

What worked? What didn't work? This helps you plan next year's garden.



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**A**

**acid soil, alkaline soil, neutral soil.** Acidity and alkalinity describe one aspect of the soil's chemical reaction: A pH of 7 means that the soil is neutral, neither acid nor alkaline. A soil with pH below 7 is an acid soil; above pH 7 is an alkaline soil. Many plants will grow well over a range of pH from slightly acid to slightly alkaline; some garden favorites are more particular.

**aeration.** The process of loosening or puncturing turf or compacted soil by mechanical means in order to increase water and air permeability.

**annual.** A plant that completes its life cycle in a year or less. Seed germinates and the plant grows, blooms, sets seed and dies—all in one growing season. The phrase “grow as an annual” or “treat as an annual” refers to perennial plants that are most attractive only during their first year and generally don't survive freezing, e.g., tomatoes. Grow them as new plants each year.

**aquatic.** Plant or animal life living in, growing in or adapted to water.

**aquifer.** Sand, gravel or rock formation capable of storing or conveying water below the surface of the land. Wells remove water from an aquifer for human use and consumption.

**available nutrients.** Mineral elements or compounds that plants absorb and synthesize into complex compounds of their tissues.

**B**

**backshore.** Lands immediately adjacent to the lakeshore whether sandy or rocky.

**bacteria.** Microscopic one-celled organisms that live everywhere and perform a variety of functions. While decomposing organic matter, bacteria can greatly reduce the amount of oxygen in the water. They can also make water unsafe to drink.

**Best Management Practices (BMPs).** Practices determined to be the most effective, practical means of preventing or reducing erosion and water pollution from nonpoint sources.

**biennial.** Plant that completes its life cycle in two years. Typically, seeds are planted in spring, and the seedling plants set out in summer or fall. Plants bloom the following spring, then set seed and die.

**biodegradable.** Broken down (decomposed) by microorganisms.

**biomass.** Woody vegetation composted or turned into energy.

**biotechnical methods.** The creative combination of structural elements and woody plants used to stabilize steep slopes and prevent soil erosion.

**broadcast seeding.** Applying seed to a soil area by hand or with the aid of a spreader.

**buffer zone.** Area that minimizes the impact of pollutants on the environment or public welfare. For example, a buffer zone is established between a composting facility and neighboring residents to minimize odor problems. A **buffer strip** is a grass or plant zone that acts as a protective barrier between an area used for livestock grazing or other soil-disturbing activities and a waterway.

**C**

**chlorosis.** Failure of plants to produce chlorophyll, caused by a deficiency of an essential element. Chlorotic leaves range in color from light green to yellow and almost white.

**clay pan.** Dense, compact layer in the subsoil, having a much higher clay content than the overlying material from which it's separated by a sharply defined boundary. Clay pans impede the movement of water and air, and the growth of plant roots.

**clay soil.** Also called “adobe,” or “heavy.” Soil composed of microscopically small mineral particles that are flattened and fit closely together; spaces between particles (less than 0.002 millimeters) for air and water are small. When clay soil gets wet, it dries out slowly because downward movement of water—drainage—is slow.

**coliform bacteria.** Bacteria inhabiting the intestines of humans or animals but also found in soil. While themselves harmless, these bacteria are sometimes indicators of pathogenic organisms.

**complete fertilizer.** Any plant food that contains all three of the primary nutrient elements - nitrogen, phosphorus and potassium.

**compost.** Organic soil amendment or mulch from organic waste materials (dead leaves, kitchen scraps, etc.). The materials are assembled in a pile where moisture and oxygen cause microorganisms to decompose the organic matter, releasing heat and forming compost.

**contaminant.** Physical, chemical, biological or radiological substance causing an impurity in the environment.

**cultivate.** To break up the soil surface, often removing weeds.

**D**

**deciduous.** A plant that sheds all its leaves at one time each year (typically in autumn).

**dissolved oxygen (DO).** Oxygen dissolved in water and readily available to fish and other aquatic organisms.

**dormancy.** Annual period when a plant's growth processes slow down. It occurs in most plants with the coming of winter as days grow shorter and temperatures turn colder.

**drainage.** Downward movement of water through soil. When it happens quickly, the drainage is “good,” “fast,” and the soil is “well-drained;” when it happens slowly, the drainage is “slow,” “bad,” and the soil is “poorly drained.” Plant roots need oxygen and water. Soil that remains saturated deprives roots of necessary oxygen. Water that can’t drain through the soil “ponds” and becomes “runoff.”

**drainage basin.** See watershed.

**drip irrigation.** System for watering at points on or just below the soil surface, so a plant’s root zone is thoroughly moistened without wasting water. Irrigation is accomplished with low pressure over a long period of time to wet the root zone of the soil profile.

**dry well.** Large infiltration trench for capturing clean runoff. The preferred name is “infiltration system” or “rectangular infiltration trench.”

**duff.** Layer of decaying plant matter, such as leaves and needles. It absorbs water and protects underlying soil from erosion.

## E

**ecosystem.** Community of animals and plants and the physical environment in which they live.

**erosion.** Detachment and movement of rocks and soil particles by gravity, wind and water.

**established.** Plant is firmly rooted and produces good growth of leaves. (An established plant needs time to reestablish itself after it’s transplanted.)

**eutrophication.** Degradation of water quality due to enrichment by nutrients, primarily nitrogen (N) and phosphorus (P), resulting in excessive plant (principally algae) growth and decay. When levels of N:P are about 7:1, algae will thrive. Low dissolved oxygen and reduced water clarity are common consequences.

**evapotranspiration (ET).** Loss of water to the atmosphere from the earth’s surface by evaporation and transpiration through plants.

## F

**fertilizer.** Organic or inorganic material of natural or synthetic origin (other than liming materials) that’s added to soil to supply nutrients essential to plant growth.

**fiber rolls.** Erosion-control devices similar to willow wattles, but composed of biodegradable fibers, sometimes called “sediment logs.” They’re installed along slope contours in shallow trenches and staked in a manner similar to wattling.

**filter fence.** Also “silt fence.” Temporary barrier of permeable fabric used on construction sites and designed to slow the flow of sediment-laden runoff. It allows the sediment to settle, while slowly releasing filtered water.

## G

**grade, final.** Soils prepared (shaped) for proper elevation slopes, drainage and prepared for planting or hardscape.

**grade, rough.** Soils prepared for proper elevation slopes, drainage and trenched for irrigation system, but not yet prepared for planting.

**ground water.** Subsurface water supply in the saturated zone below the water table.

**gully.** Form of soil erosion larger than a rill that forms on slopes of nonvegetated soil. They can enlarge rapidly in a storm, causing harm to water quality.

## H

**hazardous waste.** Solid, liquid or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as potentially dangerous and subject to special handling, shipping and disposal requirements.

**heavy metals.** Metals of high density; includes copper, iron, manganese, molybdenum, cobalt, zinc, cadmium, mercury, nickel and lead. They can pollute water.

**herbicide.** Chemical used to destroy undesirable plants and vegetation. *Preemergent* herbicides are applied to bare soil to prevent germination of weed seeds while *postemergents* are applied to the weed.

**humus.** Organic materials resulting from decay of plant or animal matter. Also referred to as “compost.”

**hydrologic cycle.** Movement of water in, on and through the earth and atmosphere as precipitation, evaporation, runoff, infiltration and ground water.

## I

**infiltration.** Entry of water from precipitation, irrigation or runoff into the soil profile.

**integrated landscape.** Area designed, constructed, planted and used in harmony with social, environmental, economic and aesthetic visions for a region. Incorporates human desires and protects natural conditions and resources.

**irrigation.** Applying water to soil when rainfall is insufficient to maintain desirable soil moisture for plant growth.

**insecticides.** Chemicals used to kill insects.

## L

**ladder fuels.** Vegetation that allows fire to move from lower to higher fuel layers (e.g., shrubs to trees).

**Land Capability District.** Soils unit designated on the TRPA land-capability map and denominated by a numerical rating of one through seven, e.g., Land Capability District 1. The system, devised by Dr. Robert Bailey for the U.S. Forest Service, is detailed in the Bailey Report.

**land coverage.** Man-made structure, improvement or covering that prevents normal precipitation from directly reaching the surface of the land underlying the structure, improvement or covering. Such structures, improvements and coverings include roofs, decks, surfaces that are paved with asphalt, concrete or stone, roads, streets, sidewalks, driveways, parking lots, tennis courts, patios. Also, lands used before February 10, 1972, for parking of cars and heavy and repeated pedestrian traffic so that soil is compacted to prevent substantial infiltration. A structure, improvement or covering is not considered land coverage if it permits at least 75 percent of normal precipitation to directly reach the ground, and permits growth of vegetation on the approved species list. Common terms related to land coverage are hard coverage—man-made structures as defined above; soft coverage—compacted areas without structures as defined above.

**land disturbance.** Disruption of land that includes alteration of soil, vegetation, surface hydrology or subsurface hydrology on a temporary or permanent basis, through actions including grading.

**landscape design.** Creative environmental problem-solving process to organize external space and attain an optimum balance of natural factors and human needs.

**landscaping.** Improvement of an area by design, construction and plantings.

**lawn.** Area planted with grass species, usually closely mowed.

**leaching.** Washing out or flushing of a soluble substance from an insoluble one. Gardeners leach soil with water when they remove excess salts. (See “Salinity.”) In high-rainfall areas, rainwater leaches both good and harmful substances from soil downward to groundwater.

**loam.** Gardeners’ word for soil rich in organic material, does not compact easily and drains well after watering; “ideal” garden soil. A soil containing sand, silt and clay particles, not necessarily organic matter.

## M

**manure.** Organic material excreted from animals, used as fertilizer and organic amendment to enrich soil. Also referred to as “animal waste.”

**microclimate.** Climate of a small area or locality (such as a backyard or a portion of it), as opposed to the climate of a county or state.

**mulch.** Loose, usually organic, material placed over the soil, such as bark chips, sawdust, straw or leaves. Mulching is the process of applying the materials. Mulch can retard loss of moisture from soil, or reduce or prevent weed growth, add nutrients to the soil and insulate soil from extreme or rapid changes of temperature.

## N

**nitrogen.** One of three major nutrients in a complete fertilizer and the first one listed in the formulation on the label, e.g., 10–8–6. Excess causes undesired algal growth in lakes.

**nonpoint source.** Entry of pollutants into a water body from widespread or diffuse sources with no definite point of entry. The source is not a readily discernible point like a discharge pipe.

**nutrient.** Mineral element or compound in soil that water or air readily absorbs and synthesizes into complex compounds of plant tissue, e.g., nitrogen, phosphorus, iron, potassium. In water bodies, nutrients are considered to be pollutants.

## O

**organic matter.** Material of organic origin—peat moss, ground bark, compost and manure—dug into soil to improve its condition.

## P

**pathogen.** Disease-causing biological agent such as a bacterium, virus or fungus.

**permeability.** Capacity of soil, sediment, porous rock or any substance to transmit water.

**perennial.** Any herbaceous plant living more than two years, in which the top growth dies down each winter and regrows the following spring.

**pesticide.** Chemical substance used to kill or control pests such as weeds, insects, algae, rodents, microorganisms and other undesirable agents.

**pH.** Symbol for the logarithm of the reciprocal of hydrogen ion concentration, used to indicate an acid or alkaline condition. A pH of 7 indicates neutrality, “less than 7 is acid,” and greater than 7 is alkaline. (See “acid soil.”)

**phosphorus.** Second element in a complete fertilizer, 10–8–6. Excess causes undesired algal growth in lakes.

**point source.** Release of a pollutant from a pipe or discrete conveyance into a water body or waterway leading to a water body (e.g., a wastewater treatment plant).

**pollutant.** Substance of such character and in such quantities that when it reaches a body of water, soil or air, it is degrading so as to impair usefulness or render them offensive.

**pruning.** Judicious removal of plant parts to obtain a more desirably shaped, productive or useful plant.

## R

**recharge.** Downward movement of water through soil to groundwater.



**recharge area.** Land area over which precipitation infiltrates into soil and percolates downward to replenish an aquifer.

**rill.** Small, intermittent waterway with steep sides, usually several centimeters deep, caused by waterborne soil erosion.

**riparian zone.** Transition area between an aquatic ecosystem and nearby, upland terrestrial ecosystem. Riparian zones are identified by plant communities and include the wet areas in and near streams, ponds, lakes, springs and other surface waters.

**runoff.** That portion of precipitation or irrigation water which fails to infiltrate soil and flows over the surface to streams or water bodies.

## S

**salinity.** Excess of salts, usually in soil or water. Salinity harms many plants, causing leaves to scorch and turn yellow, and stunts plant growth.

**sandy soils.** Soils that have large particles, between 0.005 and 2.0 millimeters. Compared to clay soils, sandy soils are porous, drain better and warm more quickly. They also dry out quickly, which necessitates frequent watering. Also referred to as “light” soils because they till easily.

**saturated zone.** Portion of the soil or rock profile in which all pores are filled with water.

**sediment.** Soil material, both mineral and organic, that is suspended, being transported or has been moved from its site of origin by erosion (by air, water, gravity or ice) and has come to rest on the earth’s surface.

**silt.** Intermediate soil textural class of particles between 0.05 and 0.002 millimeters in diameter. Causes runoff from disturbed areas to look muddy.

**silt fence.** Also “filter fence.” Temporary barrier of permeable fabric used on construction sites and designed to slow the flow of sediment-laden runoff. It allows sediment to settle, and then slowly releases filtered water.

**soil amendment.** Organic matter added to soil to improve texture, aeration, drainage, nutrient content and moisture retention.

**soil profile.** Arrangement of soil horizons or layers below the ground surface.

**soil texture.** Measure of the relative proportions of various components (sand, silt and clay) in soil.

**soluble.** Capable of being dissolved easily.

**Stream Environment Zone (SEZ).** Land area adjacent to stream, creek, wetland or lake that is influenced by flowing water or saturated soil for at least a week during the growing season each year. Can include riparian zones or streambeds that are dry except during rain or snowmelt. SEZs protect the lake’s water quality, and their boundaries must be delineated by TRPA staff before construction is allowed near them.

**storm drain.** Channel or pipe that carries rain or snowmelt from a roadside gutter to a river or lake without any treatment.

**stress.** Conditions that endanger a plant’s health. Examples are lack of water; too much heat, wind or moisture; low temperatures. The stressful condition varies according to the plant and its needs.

**systemic.** Chemical that is absorbed into a plant’s system, either to kill organisms that feed on the plant or to kill the plant itself. There are systemic insecticides, fungicides and weed killers.

## T

**taproot.** Main root that grows straight down. Dandelions have taproots, so do oak trees. Taproots grow deeply if there is water and oxygen throughout the soil profile. Most are less than a few feet long.

**thatch.** Dead stems that build up beneath ground covers and lawn grasses.

**thinning.** Removal of some trees from a stand where trees are growing too closely together, to improve tree health and vigor. When growing plants from seed, thinning out means removing excess seedlings so those remaining are spaced far enough apart to develop well.

**toxic.** Substances that even in small quantities poison, cause injury or death when ingested through the mouth, absorbed through skin or inhaled into lungs of animals and, likewise, affect plants.

## W

**waterlogged.** Saturated or nearly saturated with water.

**watershed (drainage basin).** Land area (catchment) which captures precipitation and conveys it to a water body. It’s bounded by ridges or “divides.” A large watershed like Lake Tahoe’s is made up of watersheds of all its tributaries, such as the Upper Truckee River and Incline Creek.

**water table.** Upper level of the saturated zone of an aquifer below the soil surface.

**weed.** Plant that grows out of place and competes with other plants for water, nutrients and space. Weeds are physically, economically, environmentally or aesthetically damaging.

**wellhead protection.** Practice of preventing pollutants from seeping into well water at or near an active or abandoned well.

**wetlands.** Areas that are regularly wet or flooded and have a water table that stands at or above land surface for at least part of the growing season.

**willow wattling.** Slope-stabilization technique whereby willow cuttings are tied into long bundles or “cables” and placed in shallow trenches running along contour lines of steep slopes. When staked and watered, these biotechnical structures slow water runoff and reduce erosion.



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UNIVERSITY OF NEVADA COOPERATIVE EXTENSION  
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