Landscaping on the New Frontier
Schultz, Bettina, Varga, William A., Morrison, Darrel G., Kjelgren, Roger K., Meyer, Susan E.

Published by Utah State University Press

Schultz, Bettina, et al.
Landscaping on the New Frontier: Waterwise Design for the Intermountain West.
Project MUSE. muse.jhu.edu/book/9402.

For additional information about this book
https://muse.jhu.edu/book/9402

For content related to this chapter
https://muse.jhu.edu/related_content?type=book&id=203854
Now that you have completed your tour of native landscapes, imagine some possibilities for taking a new approach to designing landscapes in the Intermountain West. What might be some characteristics of these landscapes? First, they would be experientially rich. Their spatial character would incorporate a sense of mystery or intrigue, making us want to explore them further. The forms, colors and textures of the plants would be harmonious, just as the forms, colors, and textures of plants growing together in the natural landscapes of the Intermountain West exhibit harmony.

Second, these designed landscapes would be ecologically sound. Plants would be matched both to the regional environment and to the microhabitats in which they are placed. Because of this matching, the need for supplemental water would be reduced. And because there would be few, if any, areas of mowed turf, there would be little need to use fossil fuels to mow them. These landscapes would not include invasive introduced species that have the capacity to escape into the native landscape and reduce the natural diversity there.

Third, these landscapes would be “of the place”. The character of the designed landscapes would draw on the rich menu of regionally distinct landscapes. These designed landscapes may or may not be naturalistic in form. They may very well be artistic distillations of native plant communities of the Intermountain West. But because they draw on the plant species and patterns of the region, they would speak unmistakably of the place.

Finally, these landscapes would be dynamic, changing over time. They would exhibit the rich change in color through the seasons that we see in the natural landscapes of the Intermountain West. And there would be other, longer-range...
changes as well, such as those resulting from the reproduction and spread of some species, or the phasing out of some species and the phasing in of others as the amount of shade increases under expanding tree canopies. Hence, there would be new things to discover in the landscape over the years. A whole new concept of landscape management would apply: one that is not oriented toward “freezing” the landscape in time, but instead guides the direction and rate of change.

Getting Started on Design

How do you go about designing landscapes that would have these characteristics? What do you need to know? What are the logical steps you might go through? One starting point, certainly, would be to familiarize yourself with the distinctive aesthetic characteristics of the natural landscapes in a variety of habitats in the Intermountain West. In the end, you will not necessarily be copying them in design, but trying to capture their essence. Two environmental psychologists in the School of Natural Resources at the University of Michigan, Drs. Steve and Rachel Kaplan, have identified four characteristics that occur frequently in natural landscapes, ones to which people seem to have a positive response. These are: mystery, complexity, coherence, and legibility. We will discuss how these features are exhibited in western landscapes, and we will also characterize the prevalent lines, forms, colors, textures, and patterns in representative intermountain habitats. These could provide a vocabulary for designing landscapes on sites with particular sets of environmental characteristics.

Mystery is the quality of having part of the landscape concealed, thus leaving more to be discovered. A meandering stream typically provides the element of mystery as it bends out of sight beyond peninsulas of rocks or vegetation. Similarly, open, riverlike spaces—some broad and some narrow—can occur on dry land, where clumps of trees or shrubs partially block the view. Mystery is also
found in layers of one mountain range behind another, then behind another, luring your eyes forward until they fade into the distance.

*Complexity* implies the qualities of diversity and intricacy in line, form, color and texture. In the natural landscape, this property is manifested by a diversity of plant species. It is not uncommon in nature to find at least six or eight plant species growing together within a square yard, and in the mountain meadows of high elevations, this number may be doubled or tripled. This leads to the possibility of always having more to discover as well, and a diversity of flowering at different times. Contrast this with the monocultures we have come to expect in designed-and-managed landscapes, as in lawns and single-species ground cover plantings.

*Coherence* is reflected in the fact that the complexity in natural landscapes is balanced by a logical order in the distribution of species diversity. There is patterning, with individuals of a particular species showing various degrees of aggregation, or gathering together, based both on the way plants reproduce and interact and on minor differences in soils, moisture, or light. Pattern is perhaps most obvious in open landscapes such as marshes and salt flats, where vegetation is clearly grouped according to minor differences in water depth or salinity.

*Legibility* refers to our being able to read how we can move through the landscape, and thus is related to its spatial configuration. Again, rivers or river-like spaces, which are visual pathways through the landscape, provide legibility. The most basic form of legibility is space, and in the Intermountain West, there is space in abundance, both on a landscape scale and on the scale of individual plants.

As mentioned earlier, a central source of inspiration for designing landscapes that have a distinctive Intermountain West aesthetic is the natural landscape of the region, and the plant communities that occupy different portions of the landscape. These may be sharply separated or, more often, grade or feather gradually from one to another. In observing such communities, we will be looking for the ecological and aesthetic characteristics that can be translated into designs for landscapes that capture their essential qualities.
Design Features of Native Landscapes

Species Composition

A primary feature of a natural plant community is its species composition. Rarely would we have the opportunity to replicate a native community in all its species richness, but we should be especially aware of the following categories in the plant community that is our source of inspiration:

**Dominant species**: These are typically the biggest plants in a particular community, namely, the canopy trees in a forest community, the shrubs in a shrub steppe, or the tallest grasses in a grassland community. The dominant species constitute much of the visible mass in the mass/space composition of the community. They are also influential from an ecological perspective, in that they frequently shade or otherwise compete with smaller plants, and often drop leaves which contribute to the organic matter and water-retaining capacity of the soil.

**Abundant species**: The plants that may be small but that occur in the largest numbers within a community are important as well, both ecologically and aesthetically. They may be trees, shrubs, grasses or perennials. Because of their abundance in a natural community, they logically have a place in a designed landscape that is inspired by that community.

**Visual essence species**: These species are important to the landscape, not because they are necessarily dominant or abundant, but because they are uniquely representative and almost symbolic of a particular environment. They may be indicator plants that only occur within a particular type of community. They could be dominant species that are visually important, such as the spire-like conifers of mountain forest communities. Or they may include abundant species such as quaking aspens, which are visual essence species because of their shimmering leaves, especially in the fall when they turn yellow to gold in contrast with the dark conifers. But the visual essence species of this community can include diminutive plants, as well; the delicate Rocky Mountain columbine, for example, adds a distinct flavor to this landscape.

Spatial Configuration

Just as it is important to observe species composition, it is also useful to note how the plants are spatially distributed in a wild plant community. Different plant species exhibit different densities and patterns of distribution. One possible arrangement is truly random, where there is no perceptible pattern, with some individuals of the species more widely spaced and others closer together. A second possibility is for a species to be regularly distributed. We may see this phenomenon in very arid situations, where individuals of a species are spaced at
nearly equal intervals, probably because each individual preempts the available water within a certain radius.

The majority of plant species are not distributed in either a truly random or a totally regular pattern, but occur with some level of aggregation, or grouping. This is very obvious with species like quaking aspen, which tend to spread clonally, with young shoots occurring at the edges of ever-larger patches, until they reach a barrier or a limitation of resources. Other plants may be aggregated not because of their reproductive strategy, but because they have specific

Examples of dominant, abundant, and visual essence species for four representative Intermountain West plant communities. The dominant species are generally the largest and most conspicuous, while the abundant species are comprised of numerous individuals and may cover large areas. The visual essence species are highly representative of a community type, and usually have notable features that make them stand out.
microhabitat needs, and hence are gathered together where those needs are best met.

A particular type of aggregation pattern that seems to occur frequently in natural plant communities is called a drift. This occurs where there is a concentration of a particular species which then thins out at the edges, with smaller, often younger individuals trailing off the central aggregation. This pattern can be readily adapted in a planned design, with drifts of different species interacting in a directional flow across the landscape.

Structure

Another important characteristic of natural plant communities is structure, namely the proportion of the space that is occupied by plants, and by plants of different heights and growth forms. Structure is related to productivity, as we discussed earlier. Intermountain West landscapes range from riparian gallery forest and mountain forest communities with high tree canopy cover, to the mountain brush community that typically has moderate tree canopy cover, to foothill woodland communities that usually have 50 percent tree canopy cover or less, to the desert landscape with no tree canopy cover at all. Shrubs also contribute to the structure of a plant community, creating mass at eye level or below that contrasts with the more open space formed by low-growing herbaceous vegetation.

Aesthetic Elements

In any natural landscape, certain aesthetic elements are present: lines, forms, colors, and textures. In our study of natural plant communities as models for designed

Individuals of the same species within a plant community may be randomly or nearly regularly spaced, or they may show different degrees of aggregation. A common grouping pattern, termed a drift, has individuals more closely spaced at the center of the group and trailing away at the edges.

As an example of the way structure influences aesthetic character, consider the mountain brush community, common in the foothills where much of the urban development is occurring. The spatial structure of this community characteristically possesses a pleasing amount of both mystery and legibility, with grassy spaces flowing between islands and peninsulas of small trees and shrubs.
landscapes, it can be useful to identify the elements that make them distinctive. Then, in designing landscapes in environments that match those of the natural communities, we are better prepared to capture their aesthetic essence.

Lines occur in many different aspects of the landscape. There are the lines where land meets water, such as along the edge of a river or lake, and those where land meets sky. In the Intermountain region, these lines range from the broadly horizontal sweep of a desert or a salt flat to the gently to steeply ascending lines defining mountain slopes. Lines occur in the vegetation of plant communities, as well. The trunks and branches of trees, especially those of deciduous trees in winter, are lines against the sky. They may be arching lines, ascending vertical lines, or irregular, angular lines. Lines occur in the narrow leaves of grasses and grass-like plants, often arching or in fountain-like clusters, and in the foliage of desert plants such as yuccas and green Mormon tea.

Forms include the three-dimensional shapes of the plants: the narrowly conical shapes of conifers in high-elevation landscapes; the irregularly rounded contours of pinyon pines and junipers set against fountain-like clumps of grasses and the low, mounding forms of sagebrush and other shrubs; or the consistently low mounds or billows of shrubs that blanket the shrub steppe community. Form, of course, also includes landforms and the shapes of rocks, both critical to the unique character of the Intermountain West.

Color is one of the most important aesthetic elements, clearly setting Intermountain West landscapes apart from those of the rest of the country. These include the colors of rock, which vary within the region, of exposed soil, and of vegetation. Eastern landscapes (as well as intensively irrigated western landscapes) tend to be overwhelmingly green. The native landscape of the Intermountain West, on the other hand, has a distinctively different color tone. Particularly characteristic is the prevalence of silvery green tones at the shrub level in many native regional landscapes. This is attributable to the abundance of sagebrush, as well as rabbitbrush, shadscale, and other drought-hardy shrubs. Tan to copper-colored grasses contrast with the silvery shrubs. Especially in the foothill communities, the warm, light tones of grasses contrast with the woody vegetation. In the foothill woodland association, they stand out against the dark muted greens of pinyon pine and Utah juniper. In the mountain brush community, they contrast with the colonies of bright green Gambel oaks and bigtooth maples. That community has the added attribute of having patches of fiery red in October, when bigtooth maples and sumacs take on their fall colors.

At higher elevations, a key color characteristic is the stark contrast between the blackish-green conifers and the light-colored aspen leaves, which are warm green in summer and yellow to gold with tinges of orange in the fall. Also distinctive in meadow openings at high elevations are the jewel-like colors of such
Exercise Your Vision

Look at this scene the way an artist might.

*Lines:* The tree trunks form vertical lines; the distant ground forms horizontals. What other lines can you find?

*Forms:* Notice how the rounded shapes of the shrubs are repeated. How are the tree shapes different from the shrub shapes?

*Colors:* The warm, sunny colors of the vegetation contrast with the cool shadows. If you were taking color notes for this scene, what would you name the various colors? How would you distinguish the green of the shrub in the lower left from the green of the yucca behind it?

*Textures:* See how the rumpled texture of the foreground shrubs contrasts with the fine, twiggy textures behind them. Even the snow on the ground has a texture. Compare the texture of the snowy foreground to the distant rocks.

Finally, ask yourself how you feel about this place. Is it a place you would like to be? What do you like or dislike about it? If you were painting a picture of it, would you change anything?

flowers as Rocky Mountain columbine, sticky geranium, Wasatch penstemon, showy daisy, and meadow fire, set amidst the grasses.

Texture is also of key importance in the aesthetic of native communities. In arid climates, leaves are often diminutive in size, as an adaptation to avoid excessive water loss. As a result, there is an abundance of fine textures in the landscapes of the Intermountain West, for example, the above-mentioned grasses and silver-gray shrubs that form a background matrix of fine lines. Conifers, whether pinyon pines and junipers in lower elevations or spruces and firs at high elevations, with their narrow needle-like leaves, are also fine-textured. Quaking aspens, with their small fluttering leaves, have a fine texture, and even Gambel
oak and bigtooth maple leaves appear relatively fine from a distance, due to the "teeth", or indentations, in the leaves. This abundance of fine-textured foliage is one reason why adding rocks, which are coarse textured and bold in their aesthetic effect, creates such a powerful contrast.

The aesthetic essence of a plant community is not easily quantifiable, and may seem elusive. Rather than trying to objectively calculate the aesthetic component in the field, one approach is to sketch or do watercolor interpretations of the landscape. Pencil or pen-and-ink sketching is particularly useful for grasping the essential lines and forms in the landscape. Watercolor can be very helpful in observing and capturing the subtleties of landscape color. Even if you are not an accomplished artist, the very process of observing a landscape closely enough to render its essential lines, forms, colors, and textures on paper can provide lasting impressions which will be useful as you proceed to design a regionally appropriate landscape. Photography can also be helpful as a way to record the aesthetic characteristics of natural landscapes, to use as a reference during the design phase.

Another useful exercise is to write down your observations and feelings about a particular native landscape, which will help you connect to the essence of the landscape. Ask yourself the following kinds of questions when you are experiencing a native landscape that you find appealing: What is it about this native landscape that I find attractive? What is the most noticeable or striking thing about the landscape? What are the predominant colors and forms? How are the spatial and structural themes repeated at various scales? Are there important elements that are not so much visual as kinesthetic, or perceived by other senses, such as the rough feel of netleaf hackberry bark or the smell of cliffrose foliage in the afternoon sun? By making a written record of the answers to these sorts of questions, and thinking about how you could create a landscape that evokes similar pleasant feelings, you have accomplished a lot of the preliminary work needed to create a native landscape design.

Step-by-Step Native Landscape Design

Now that you have some ideas for the aesthetic effect you would like to achieve in your native plant landscape, it is time to settle down to the actual work of creating the design. This process has several steps: characterizing your site, considering how you will use your landscape, planning the landscape watering zones, creating the mass/space diagram, laying out the landscape plan, selecting the plants, and preparing the planting plan. Each of these steps involves feedback from the other steps, so it is a good idea to read through the description of the entire process before trying to apply what you have learned.
Inspiration from Natural Landscapes

Color studies by four different individuals based on an outing to the Wellsville Mountains near Logan, Utah, in autumn. A photo of the scene is shown for comparison. Color studies like these can form the basis for the beginnings of design work using natural landscapes and native plants communities as inspiration.
Characterizing Your Site

The first step in the design process is to spend some serious time investigating your site. Perhaps the best place to start is to consider your site in the context of the place where it is located. This includes its geographic location, elevation, and macroclimate—in other words, the habitat it will provide for the native plants you plan to include in your landscape.

A critical next step in the design process is to take an inventory of existing conditions on and around the site itself, starting with the preparation of a base map. This base map is the framework upon which the remaining design steps are developed. The base map should illustrate the major existing features while remaining uncomplicated and basic. It should be drawn to scale, with the scale and cardinal directions indicated. It will be useful to make several photocopies of the base map. Use an oversized piece of paper if you can—there will be a lot to record. Once the base map is obtained or prepared and copied, use a copy to record the information you collect during the inventory you make on your next hike around your site.

Property Lines: This information may be contained on the house plan or deed statement, or it may be obtained from the county assessor.

Existing Building Outlines: Include notes on the heights of buildings, because height will affect the extent of cast shadows. Window and door locations should also be identified on the building outlines, because they will affect foot traffic and viewing patterns.

Existing Hardscape Features: Hardscape includes driveways, walkways, and any other paved or finished surfaces or features, such as walls, fences, decks, and patios. You may also include features such as outside lighting, air conditioning units, and gutter downspouts.

Utility Lines and Easements: Indicate the location of overhead and underground utility lines, including cables, along with information on easements and setbacks, as well as the location of water and electric meters. The location of underground lines can be obtained from Blue Stakes or similar community services that provide utility line marking. Easements and setbacks can usually be found on a house plan or plat map.

Site Position: The site position relative to the surrounding area may suggest possible opportunities and constraints for the design. Adjacent features could be things that you want to emphasize in the design (such as a good view) or de-emphasize (such as the side of your neighbor’s house). Neighboring land uses may create microclimate effects, such as shading. Paved roads may create hot conditions and increased salt in the adjacent soil. Views, good and bad, both within the site and off-site, should be noted on the base map.
How to Get the Base Map

The base map is a scale diagram of your property and the outside dimensions of your house, with the scale and cardinal directions marked. There are four ways to obtain a base map of your property:

- If you have the paperwork from the purchase of your house, you should have a scaled base map tucked away with your deed.
- You can go to the county assessor’s office, which has legal descriptions of all properties in your county. Someone there can help you obtain a copy of your plat map or house plan for a small fee.
- You can create your own base map by doing the measurements yourself. You will need a long measuring tape or measuring wheel and at least one assistant to record the measurements. First measure the boundaries, then the distance from the house to one boundary, then the dimensions of the house. The measurements can be written on a rough map, and the map can be redrawn to scale later. You will also need a compass to determine which direction your house faces on the property.
- You can have your property professionally surveyed. This might be worth it if the property is large, if the house has a complex shape, or if there is a lot of topographic relief.
Topography, Slope, Aspect, and Drainage: If your site has areas that are sloping, make note of the steepness and orientation (aspect) of the slopes. If your site has a lot of topographic relief, a good approach is to sketch contour lines onto the base map. Contour lines connect points that have roughly the same elevation, so that hills and hollows are apparent as roughly concentric sets of closed lines. Be sure to note whether the spot inside the innermost closed line is a hill or a hollow. These relationships are important, because south- and west-facing slopes tend to be hotter and drier than north- and east-facing slopes. North slopes will hold snow the longest. Similarly, the north side of a building will be cooler and shadier than the south side. The lay of the land is also important in determining drainage patterns on the site, which can be an important element when designing with native plants. By recognizing where the water discharges from the roof and where it drains onsite, you can utilize these areas for higher-water-use plants. This makes better use of the water than installing structures to drain it away offsite.

Soils: Understanding the characteristics of the soil on your site is important to the success of a native plant landscape. The best way to begin is to get down and dirty, dig some holes, and carry out a few Johnny-on-the-spot soil tests. Soon you will know whether your soil is sandy or heavy, whether it contains gravel or cobbles in the subsoil, whether it has an organic surface layer and, if so, how thick, and whether it has a hardpan (relatively impermeable layer) near the surface. You will also find out if you have compaction problems as a result of construction equipment or other heavy traffic in the past. It is important to check your soil in more than one spot. Often topsoil is applied after construction, to different depths depending on the distance to the house, so one part of the property may have a relatively deep organic soil while another part might have a very thin soil over a gravelly or cobbly subsoil. This soil assessment will give you an idea of which parts of your site are suited to different kinds of plants. If your soil is deep and highly organic, you will do best with plants from the foothill and mountain zones, where such soils occur naturally. Conversely, if your soil is rocky and “poor,” that is, low in fertility, it may be admirably suited to plants from the desert and semi-desert zones.

One important soil property that is not easily observed on the spot is salinity, though a white, powdery deposit on the surface of drying soil is likely to indicate this problem. High salinity is generally confined to heavy bottomland soils in semi-desert or desert environments. If this fits your site description, you should have your soil tested to determine whether it is saline. High salinity can also be a problem locally, where de-icing salts are used in excess.

Existing Landscaping: Evaluating the existing vegetation on the site is important for several reasons. This process will be very different depending on the age...
Characterizing Your Site

Use this checklist to make sure you record all the information you need about your site:

- Location (latitude, longitude) and elevation—quick ways to obtain this are a GPS unit or a map website (see resources)
- Climate, including mean annual precipitation—use online climate websites (see resources)
- Plant cold-hardiness zone—call your state’s extension service or use online resources
- Natural plant communities that occur in the area
- Existing hardscape features
- Utility lines and easements—call Blue Stakes or another utility marking service for the locations of underground lines
- Site position and adjacent features
- Views—good and bad
- Slope and aspect
- Topography and drainage
- Soil features—texture, drainage, depth, organic matter
- Existing landscaping—evaluate whether to keep or remove it
- Current watering system—location of hose bibbs/sprinkler system
- Existing weed problems—weed identification and seriousness
- Microhabitats
How to Test Your Soil

*Texture*: Moisten a handful of soil and try to roll it into a cylinder. If it crumbles, the soil is sandy. If the cylinder forms but breaks when bent, the soil is loamy. If the cylinder can be molded into a curved shape, the soil is clay. Or shake a cup of screened soil with a tablespoon of powdered dishwashing detergent in a straight-sided bottle of water. Fine gravel will settle out in a few seconds, sand within 1–2 minutes, silt within 1–2 hours, and clay within 1–2 days. Measure the total thickness of soil in the jar, divide the thickness of each layer by the total thickness and multiply by 100 to get the percentage of each. A coarse soil will have >70% sand and gravel, while a clay soil will have >50% clay, and a silty soil will have >70% silt. Soils with <40% clay, <70% silt, and <60% sand are usually loamy. You can use a texture triangle graph (see resources) for a more accurate texture description.

*Drainage*: Drainage describes how quickly water moves down through the soil. Determine your drainage by digging a hole 16” deep and filling it with water. If the hole drains within one hour, drainage is “rapid;” if the hole drains in a few hours, the drainage is “good;” if water stands for a day or more, drainage is “slow.”

*Soil Chemical Properties and Fertility*: Inexpensive home soil test kits can give you a rough idea of the pH (acidity/alkalinity) of your soil and ballpark levels of major nutrients such as nitrogen, phosphorus, and potassium. These kits

of the landscaping. If your house is newly constructed, the landscape may present an essentially blank canvas that you can design from scratch. More commonly, there is already existing landscaping, if only the lawn and foundation shrubs installed by the developer. Older properties often have well-developed landscaping, including mature trees. These too can effectively be converted to native plant landscaping, but there will be many decisions to make. You will need to identify which plants you want to remove or keep, based on several criteria. For example, perhaps you currently have high-water-use plants in areas where low-water-use plants would be more appropriate. The existing vegetation may include invasive introduced plants, such as Russian olive or tamarisk, that would be best removed. And, if you plan to have an area dedicated to an exclusively native plant landscape, it will of course be necessary to remove existing
usually involve mixing a small amount of soil with water, then adding a test reagent to the mixture and comparing the resulting color with a set of standard colors printed on paper. Test kits are sold in most places where you can buy gardening supplies, and are also readily available for purchase on the Internet. The results will not be highly accurate, but as you just want to find out whether your soil falls within broad ranges of acceptability for native plants, they will probably be adequate.

A pH range of 6.5 to 8.5 is suitable for most natives, with desert and semi-desert plants more tolerant of the higher pH. If the fertility level, especially the nitrogen level, falls in the “high” range for crop plants, it is probably too high for desert and semi-desert plants to perform well, though it should be all right for foothill and mountain plants. Don’t worry if the nitrogen level is in the “low” range unless you are growing foothill and especially mountain plants. In this case, add weed-free organic amendments to the soil. Never fertilize native plants with chemical fertilizers. If your pH is very high (greater than 8.5), it is possible that your soil is sodic (too high in sodium)—this is a pretty serious problem for just about any plant. A white powder on the soil surface is also usually a bad sign, indicating possible high salinity. If you suspect that your soil is saline or sodic, it is best to get it laboratory tested (see resource list). These laboratories can also perform more rigorous versions of other tests.

non-native plants, including traditional turf, from that area. Make notes on the base map of any plants you plan to keep, as well as the extent and type of shade they are likely to create.

Weed Problems: You need to mark areas of weed infestation on the base map and indicate the identity of the problem weed. Weed problems can be a major obstacle to a successful native plant landscape, so it is important to identify the problem early and deal with it, preferably before the new landscape is installed.

Annuals like pigweed and cheatgrass can generally be controlled by hand pulling, though some species have seeds that persist for many years. Mulches can be used in the installed landscape to control annual weeds, and once the natives are well-established, they can suppress weed growth. Perennial weeds, particularly those with underground rootstocks or rhizomes, present more of a problem, as
Landscaping on the New Frontier

Hand pulling is temporarily effective at best and mulches are not good deterrents. These problem perennials include field bindweed (wild morning glory), whitetop, quackgrass, and, yes, Kentucky bluegrass, as well as others, such as Russian knapweed and Canada thistle, that may be locally important. It is essential to do your best job possible of eliminating these weeds prior to installation. If you are removing a Kentucky bluegrass lawn, be sure not to leave behind living pieces of rhizome. To make matters worse, some of these weeds, such as field bindweed, also form persistent seed banks, so that vigilance is necessary to prevent reinfestation from seed.

Microhabitats: Patterns of microclimate variation are created as the effects of sunlight, temperature, snow cover, and wind are modified by topography, structures, and existing vegetation. These effects can have a major impact on the growing environment for plants. If this variation in microclimate is used wisely, the site can support a much broader array of native plants, and even different plant communities, than a site that is perfectly uniform. Areas of the property where the microclimate is expected to be exceptionally cool and shady, such as underneath a tree, or hot and dry, for example, a south or west
exposure, should be indicated on the base map. Remember to note the effects of buildings, fences, trees, and pavement, both those that are located on the site itself and those on adjacent properties. Variation in slope, aspect, drainage, and soils will also impact the microhabitats for plants and should be taken into account.

**Considering How You Will Use Your Landscape**

Once you have looked at the characteristics of your site, the next step is to think about the human requirements for the design. Consider what kind of activities will take place on your property. Do you need a place for children to play? A vegetable garden? A dog run? A place to play basketball? Don’t forget a place for mundane items like garbage cans, composters, or recycling bins. Another common outdoor activity to think about is entertaining, whether it is just the family around a picnic table or a full-fledged dinner party on the deck. A place to hang a hammock for reading in the shade could be another consideration, or a strategically placed bird feeder that can readily be seen from a window.
The landscape you are about to create will probably be much more interesting and inviting than those you have experienced before, so think about making it easy to access and enjoy. What is more appealing than the perfect nook that beckons from a far corner of the yard? A native landscape is a place to experience, rather than just a place to look at from the street or the front porch. You will want to go out into your landscape, as you would go to a wild place, just for the pleasure of being there. Take this possibility into account when considering how you will use your landscape.

You also need to think explicitly about how you want to be able to move through your landscape. Identify destinations and consider the best way to travel from one to another. A large block of landscaping that offers no obvious access will not feel welcoming. At the very least, consider maintenance access for these areas.

The different areas around the front, back, and sides of a building often lend themselves to different uses. Even though you want to create a native landscape, there can still be a place for non-native plants that you want to keep. You can continue to have those daffodils you got from your grandmother. And there may still

---

Some of the worst perennial weeds of the Intermountain West.

- **Cheeseweed** *Malva neglecta*
  - Seedlings have distinctive heart-shaped cotyledons
  - Small pale pink flowers
  - "Cheese" shaped seed capsules
  - Bright green leaves
  - Seedlings are easy to pull; mature plants difficult because of tough roots

- **Bindweed** *Convolvulus arvensis*
  - Seedlings have notched cotyledons
  - Seedlings may be bright or dark green, reddish or yellowish
  - Flowers pale pink
  - Seed capsules tan
  - Pull seedlings immediately
  - Comes back from deep roots; seeds extremely long-lived in the soil

- **Dandelion** *Taraxacum officinale*
  - Toothed leaves are edible before flowers appear
  - Yellow flowers close up and lie down after pollination
  - Stem goes erect when seeds are ripe and ready to fly

- **Knapweed** *Centaurea species*
  - Several species are similar in appearance
  - Dull green leaves
  - Lavender flowers
  - Seed heads are fluffy—seeds fly
  - Wear gloves to pull—somewhat toxic

- **Quackgrass** *Elymus repens*
  - Plants are rhizomatous, with very tough roots
  - Pale green seedhead spreads out as seeds ripen to tan
  - Leaves clasp stem

- **Whitetop** *Cardaria draba*
  - Comes up early from rootstocks
  - Leaves are light or dark green, sometimes speckled with black
  - Flower clusters are white, fragrant, attract pollinators
  - Plant smells cabbagy as it ages
  - Pulled before they go to seed, plants may be composted

---
be a place for lawn—it just needs to be restricted to the areas where it actually fulfills a function. It is even possible to successfully mix natives and non-natives in the same section of the landscape, as long as the species planted together have the same water, soil, and light requirements. But we strongly recommend dedicating whole areas of the site to exclusively native landscaping, in order to create the powerful sense of place that is the concept at the heart of this book.

Another factor to think about at this stage of the design process is how much time and money you want to put into your landscape. If you love to be outside tending to the plants, you will have a different approach than if you want simplicity and ease of maintenance. If cost is a limiting factor, you may want to plan to install your landscaping in phases. This also has the advantage of providing a learning experience whose early lessons can be applied in the later phases.
Now that you have walked through your landscape one more time and thought through the human activities that will take place there, it is time to get a fresh copy of the base map and sketch in these use zones and the circulation corridors (paths) that will connect them. This does not have to be a careful work of art. In fact, these kinds of sketches are called “bubble diagrams” for a reason.

Planning Landscape Water Zones

Once you have a clear idea of the possibilities presented by your site, as well as a vision of how you want to use it, there is one more important step before you begin the actual process of designing your native landscape. That step involves making a provisional plan of how your landscape will be laid out spatially in terms of watering zones. As we discussed before, the most basic attribute that describes your site is its precipitation zone, but this may be modified locally by the effects of slope and aspect. The best clues about local climate are often provided by the plants themselves. The native plant community adjacent to your site, or on similar sites in your area, is probably the best indicator of the macroclimate you will experience. The plan for watering zones that you develop needs to incorporate this basic climate information, and it should also take into account existing microhabitat differences on the site. The plan can also call for modifying the site, either by using irrigation or water-harvesting to create habitat for plants from wetter places, or by modifying topography (slope and drainage) or soil to accommodate plants from drier places.

The most straightforward way to design a native plant landscape is to use plant communities characteristic of your precipitation zone as the inspiration for your landscape. This minimizes the need for irrigation or other habitat modifications, but limits the range of plant communities that you can use. If your site is located in the desert precipitation zone, for example, it will be easy for you to create designed landscapes that use plants from this zone to capture elements of the desert aesthetic, whereas creating foothill plant communities will require considerable modification, and creating mountain communities may be next to impossible. Conversely, if you live in the mountain precipitation zone, you will have an easy time creating a designed landscape that reflects mountain native plant community aesthetics, but it will be difficult or perhaps even impossible to create landscape conditions for true desert plants. If you live in the semi-desert precipitation zone, you will have more flexibility in creating a variety of native plant community aesthetic effects. In general, though, it will be easiest to establish and maintain a native plant landscape if the plan for most of the area is based on a suite of plants that would naturally be found in your precipitation zone.

A fundamental principle of native plant landscaping, and of waterwise landscaping in general, is to group plants with similar water requirements. Our system
Considering How You Will Use Your Landscape

Think about the needs of the people who live in your house, and the kinds of things they like to do outside in the yard. Ask yourself and your fellow residents the following kinds of questions:

- Do you need a place to entertain outside? How formal would you like this to be?
- Do you need a place for small children to play? Does the back or front yard need to be fenced?
- Do you need an area dedicated to pets?
- Do you want to have a vegetable garden?
- Do you want to retain a space for traditional high-water-use flowers?
- Are there areas that will receive little use because of their location?
- What are the natural patterns of traffic flow through the landscape?
- How will the utility areas be accessed?
- Do you like to relax by working in the garden, or are you looking for super-low maintenance that suits your super-busy lifestyle?
- Are there particularly nice views, either from outdoor vantage points or from certain windows, that you want to preserve?
- Are there objects, either in your yard or in adjacent yards, that you would like to screen from view?
- How much is privacy in the back yard an issue?
- How important is shade as a way to cool your house in summer?
- How important is water conservation as a goal in your design?
Landscaping on the New Frontier

for describing plant water requirements has five categories: minimal water, low water, medium water, high water, and very high water. The first four categories correspond to the precipitation zones described earlier for desert, semi-desert, foothill, and mountain plant communities. We define plant water requirements in terms of ranges of natural precipitation. If the species grows naturally in a desert environment where the average annual precipitation is ten inches or less, that plant has minimal water needs. If the species grows naturally in a semi-desert environment, where the average annual precipitation is between ten and fifteen inches, the plant has low water needs. Plants with medium water needs grow in the foothill zone, where annual precipitation averages fifteen to twenty inches, while plants with high water needs grow in the mountain zone, where the average annual precipitation is over twenty inches. Streamside and wetland plants from all precipitation zones could be described as having very high water requirements, as they generally need a surface soil environment that is wet much of the time regardless of precipitation.

To put these precipitation ranges in perspective, it helps to know that most cities and towns in the Intermountain West are located at valley edges in the semi-desert precipitation zone, where the average annual precipitation is ten to fifteen inches. Communities on the benches and in the high valleys are mostly in the foothill zone, with fifteen to twenty inches of annual precipitation on average. The high precipitation zone is found up in the mountains, but even there precipitation rarely averages more than forty inches per year. It is educational to compare these figures with yearly averages for some cities in other parts of the United States and Europe—cities like New York, Chicago, Washington DC, and Seattle average between thirty and forty inches, putting them well into the high precipitation zone in our system. Virtually all the major cities of northern Europe also experience what we define as the high precipitation regime. At the other extreme, warm desert cities like Las Vegas (five inches) and Phoenix (eight inches) are well below the threshold for the desert zone, and even Los Angeles barely makes it into the semi-desert zone with twelve inches per year on average.

The take-home message here is that in the mountain precipitation zone, many traditional garden plants can grow with little supplemental water, as they do in the eastern United States and in northern Europe, but when these same plants are grown in a semi-desert or even a foothill water zone, substantial water must be added in the form of irrigation to make up the difference. On the other hand, if we use plants that can prosper in nature in the desert zone, it stands to reason that they will rarely if ever need supplemental water after establishment if planted in a location within the semi-desert zone. The total water provided to the plant is essentially the sum of natural precipitation and supplemental irrigation (though harvested water and subsurface ground water are also part of the
Sketching in the Landscape Water Zones

Your preliminary ideas about water zones should be based on the characteristics of your site, especially the precipitation zone where it is located, and on the expectations you have for your landscape. This example is located in the semi-desert precipitation zone with 15” of annual precipitation.

- The parking strip and the area next to the front sidewalk receive little use and are a long way from a hose bibb. Making these areas a minimal water zone means that they will virtually never need supplemental water. Because your site is sloping and well-drained, you will not need to make special provisions to grow minimal-water-use plants.

- The shadier, cooler areas on the north and east sides of the house are a logical place for a high water zone. This also places a more lush planting adjacent to the back door, a high-use area. This planting grades into a low-water planting to the north.

- Trees are useful as a screen in the northwest corner of the lot and will also serve to shade the high-use area near the back door. Trees to the south and west of the house will help keep it cool in summer. Using medium-water-use trees from the foothill zone means you can achieve this with less added water.

- The rest of the property will be landscaped with low-water-use plants that will rarely need supplemental water. Some of these plantings are tentatively shown as shrub plantings.

- All the blank areas on the plan are assumed to be in the low water zone, which corresponds to the precipitation zone at the site.
total available water in some situations). If post-establishment needs for a plant are met by natural precipitation, there is generally no need to add supplemental water. This principle forms the basis for the watering recommendations in this book. The idea is to “top up” the water that is provided as natural precipitation with enough inches of supplemental water to reach a total that approximates the water requirement of the plant.

In general we recommend “topping up” to the maximum for the precipitation zone of origin, in the interests of keeping the plants looking their best. If you are located in the desert zone, for example, and want to grow desert plants, we recommend that you “top up” the natural precipitation to the level of ten inches. The translation is that, after establishment, these plants would rarely need supplemental water and then only under drier-than-average (drought) conditions. If your site is in the semi-desert zone, plants from the desert zone, designated as minimal-water-use, will virtually never need supplemental water after establishment, while those designated as low water use (semi-desert zone) may benefit from occasional watering, up to five inches of added water per growing season, to “top up” the total water to fifteen inches. Plants designated as medium water use will need regular but infrequent watering (five to ten additional inches in an average growing season), while those designated as high water use will need to be provided with ten to fifteen inches of supplemental water per growing season. Compare these water requirements to those for a Kentucky bluegrass lawn in the semi-desert zone, which requires twenty to thirty inches of supplemental water a season to maintain an acceptable summer appearance.

A good thing to remember is that precipitation varies dramatically from year to year in any given spot, and wild plants for the most part have little trouble coping with this variation. This means that you just have to get ballpark close in your watering zone planning, not accurate down to the last inch. You need to focus on three things. First, native plants vary widely in their water needs, depending on what precipitation zone they come from. Second, the water that falls out of the sky as natural precipitation does count toward meeting those water needs. You only have to make up the difference. And third, there is definitely such a thing as too much water.

Overwatering can be at least as much of a problem in a native plant landscape as underwatering. When moving desert and semi-desert plants into precipitation zones with more water, it is often necessary to modify site conditions to compensate for the excess water that these plants will be receiving naturally. Placing desert and semi-desert plants in the hottest, sunniest, driest microclimates, adding inorganic amendments to make a coarse soil texture or replacing the soil entirely with a sand-gravel mix, making sure the soil does not contain excess organic matter, and placing the plants on berms or slopes to improve drainage.
The water needs of a plant in your landscape depend on the relationship between the precipitation zone where it grows in nature and the precipitation zone at your site.

- If these match, the plant will rarely need extra water, and it will not suffer the negative effects of too much water. Plants along the diagonal in this diagram are matched with their site precipitation zone.
- If the plant is from a zone wetter than the zone at your site, you will need to add water to meet its needs (blue added water in beakers below the diagonal in this diagram).
- If the plant is from a zone drier than the zone at your site, it will on average be receiving more water than it needs, just from natural precipitation (pink excess water in beakers above the diagonal). Not only will it need no added water, it may also need to be protected from the effects of too much water.
are some tactics that improve their chances for survival. It is often quite difficult to grow plants in environments more than two precipitation zones removed from their optimum zone. This means that growing typical desert plants in mountain environments or typical mountain plants in desert environments should generally be attempted only by experienced gardeners, if at all. It also explains why it is nearly impossible to grow desert and semi-desert natives in the context of a very-high-water-use traditional landscape.

As you plan your watering zones, bear in mind that even native trees generally have medium or high water requirements. Many people find a landscape without shade uninviting at best, so that high water zones with a few well-placed trees are often a good idea even in a semi-desert or desert landscape. But trees are not the only way to create shade. Taking advantage of shade created by existing buildings, or including shade structures such as trellises, awnings, ramadas, or arbors, are some other design options.

Now it is time to sketch your ideas for the watering zone plan onto another copy of the base map. This means designating each area in the landscape as a minimal, low, medium, high, or very high water zone. Very high watering zones include those that will be maintained in traditional lawn, traditional annuals and perennials, and vegetables. The remaining zones correspond to the precipitation zones described earlier. You will need to plan for supplemental water to support plants in water zones that need more water than is provided by the natural precipitation on your site. And you will also need to plan to counter the effects of excess water for the plants in water zones that need to be much drier than your precipitation zone.

The watering zone plan is not cast in stone at this point. The reason for considering water first, before carrying out the aesthetic activity of creating the design, is to make sure that you take water into consideration at the most fundamental level. Most landscape designers have worked in environments that are not water-limited, whether because of adequate natural precipitation or because of a cultural perception that unlimited supplemental water is available. This is why design dogma has always held that landscape choices can be determined primarily or entirely by aesthetic considerations. But if you want your intermountain landscape to truly be ‘of the place’, it will need to reflect the way that plant community patterns are shaped by water in nature. That means carefully considering how the designed landscape will also be shaped by water.

Creating the Mass/Space Diagram

The next steps in designing a native landscape require a degree of melding. After mapping existing site conditions on the base map, considering how you will use your landscape, and thinking about watering zones, you are ready.
to develop a mass/space diagram. In a mass/space diagram, spaces are the open areas: pathways, decks, terraces, dry stream beds, and areas of low vegetation or mulch. Masses are areas with vegetation, relief, or structures that rise above the spaces. These may include shrubs, tall grasses or perennials, large rocks, raised planting areas, and canopy cover. Canopy cover consists of masses that rise well above eye level. They may be formed by trees or may be constructed, such as trellises and arbors. It is also possible to conceive of mass and space in three tiers: open areas or space, mid-height masses, and canopy masses. Try to visualize the area in three dimensions, and hearken back to the wild landscapes that formed the heart of your original design conception. What were the mass/space relationships of those wild landscapes, and how can you re-create that feeling of mass and space in your designed landscape? Remember the idea of landscape patterns on multiple scales. How can you recreate the ambience of a grand landscape using similar mass/space relationships, only on a smaller scale?

You are now ready to tap into your “inner designer,” and, trust us, you have one in there. At this stage of the process, it is important to be as “fluid” as possible, allowing spaces to move river-like through the composition, and masses to drift in patterns that reinforce the flow of space. As you are diagramming these patterns, it can be helpful to listen to some “flowing” music as an inspiration. Make several quick mass/space designs in chalk pastels or colored pencils on thin-paper overlays over the base map, or work directly on photocopies, using different color tones for different kinds of masses and spaces. It can also be helpful to walk around in the area and physically feel the flow of the space. Now is the time to remember mystery, complexity, coherence and legibility. And stay loose—no one is going to judge the results of this exercise except you.

The mass/space diagram is not created in a vacuum. Instead, it represents a distillation of all the information you have gathered and an integration of this information into the design of an aesthetically satisfying landscape. Give the process of creating the mass/space diagram enough time. If you find this design exercise difficult, just think of your first few efforts as practice—you will get the feel of the process.

When you have completed a number of provisional mass/space studies, you are in a position to select one of the studies as “the best,” or you may incorporate features from several of them to blend together in a more refined mass/space diagram. The importance of the mass/space diagram cannot be overstated. It becomes the basis for the remaining steps in the process of designing a landscape. It can make the difference, ultimately, between a unified, harmonious overall landscape composition and a patchwork collection of plants, rocks, and other landscape features. It is this process of creating a unified composition that
will transform your landscape into a place, one that will invite you to enter and encourage you to stay and explore.

Laying Out the Landscape Plan

The mass/space diagram you have created provides a focal point for the next steps in the process of designing your landscape. Now you need to think more concretely about how these mass/space relationships will be translated into paths, use areas, landscape features, and planting areas on the ground. You have already considered many of these issues, and probably have a good idea of what most of the masses and spaces on your mass/space plan actually represent. For example, you have thought about how you will move through the landscape. The mass/space diagram helps you lay out these pathways in a manner that is aesthetically appealing as well as functional. You have considered where you need screening and where you need to leave openings for appreciation of more distant views. The mass/space diagram helps you visualize how you will incorporate these screens and openings into a harmonious design. You have decided which areas you will dedicate to native plant landscaping as well as determined whether some areas will be maintained in more traditional landscaping. The mass/space diagram helps you make sure that contrasting areas are connected and integrated into the overall design, rather than representing discordant elements. And you have thought about the kind of place you want your native plant landscape to be, a place that is experientially rich as well as ecologically sound. The mass/space diagram helps you see how you will achieve that goal, by echoing the mass/space relationships that you have found to be beautiful in wild landscapes, and by providing a way for you to enter the landscape and be comfortable and at home there.

You have also thought at least provisionally about site modifications you might need to carry out in order to accommodate plant communities from wetter or drier precipitation zones. This may include providing supplemental water in zones for higher-water-use plants, as well as ameliorating the effects of too much water in zones for lower-water-use plants. Water zones are often implicit in the configuration of mass and space; now is the time to make them explicit. Mid-height masses may be areas of shrubs, tall grasses, or perennials; they may represent rock groupings or hardscape structures; or they may be areas that are planted with low vegetation but that are topographically raised, either naturally or through the creation of berms or retaining walls. As mentioned earlier, canopy masses may represent trees or shade structures, such as gazebos, arbors or trellises. And space may be created as paths and other hard surfaces, as areas of ground cover or other low vegetation, or as areas of mulched open ground, as in the dry wash concept that many find appealing. Remember that canopy, mid-height mass, and space can be somewhat relative
Creating the Mass/Space Diagram

This is the first step of the design process where aesthetic considerations become the most important element.

- The goal is to create a visually pleasing design that integrates masses and spaces into a configuration that exhibits organic unity.
- Mass/space diagrams often use color to distinguish between masses and spaces.
- Tentative shapes for the canopy masses can be roughed in if desired.
- Make several quick sketches, then combine and refine them until you have a finished pattern that pleases you.

concepts. In a forest of tall trees, shrubs eight feet tall could function as mid-height mass, but in a desert landscape, an eight-foot-tall tree or arbor would definitely function as canopy.

Which option you select to represent space, mid-height mass or canopy for a particular area will depend partly on how you plan to use the area. It will also depend on the water zone and the native plant community that provides inspiration for the area. Water zone and native plant community are, of course, inextricably linked, and together they provide the underlying logic for the design of the planted areas.
Your next step in the design process is to take another copy of the base map and lay out your landscape plan. Basically, this involves recording the decisions you have made about the space, mid-height mass, and canopy mass relationships in the mass/space diagram, that is, how you will translate each area of space, mid-height mass, and canopy mass into paths, use areas, landscape features, and planting areas. To do this properly, you will need to take into account all the planning you have already carried out, as recorded on earlier versions of the base map—namely your site inventory, bubble diagram of human use patterns, and water zone map—as well as your most refined version of the mass/space diagram. Spread all these out on the table, and keep your creative juices flowing, because this is the step where you will decide how your landscape will actually look and feel. First, lay out all the areas that are or will be hardscape—the paths, patios, and decks, as well as any other paved or finished surfaces. In areas where topographic modification is planned, show the project as completed, for example, a berm or raised bed or a terraced area behind a retaining wall.

Next, consider the non-hardscape areas on your mass/space diagram. In areas that are designated as canopy, which will be planted to trees and which will have constructed canopy, such as trellises or arbors? Check on your water zone map to see how you had intended to water a particular canopy area. If it is in a high-water-use zone, you will be able to plant trees from the foothills or mountains, whereas if it is in a medium-water-use zone, you will be limited to trees from the foothill woodland or mountain brush communities. If the canopy area is designated as a low or minimal water zone, you will need to use constructed canopy. Of course, it is possible to change water zone designations to fit your revised concept of mass/space and plant community configuration. Remember, the water zone map was intended to be provisional. But also remember to take microhabitat considerations into account. There may have been a good reason to designate the area shown as canopy as a low- or minimal-water-use zone. You may need to check your site inventory to jog your memory on this. If the area is not suitable for trees but definitely needs to be canopy in the design, constructed canopy can be an attractive and functional solution.

In non-hardscape areas that are designated as space, your decision on how to create this space should again take watering zones into account. These areas may be planted, or they may be mulched bare ground. If the area is designated as very high water, it can support traditional lawn as a ground cover. In fact, it may already support lawn that you intend to keep, which would be one of the few reasons for designating a very high water use zone on the water zone map. Spaces in medium- or high-water-use zones can support low ground covers
Laying Out the Landscape Plan

The landscape plan makes the masses and spaces in your mass/space diagram into a concrete design, with hardscape features, mulched open areas, and planting areas representing canopy, mid-height mass and space. Each planting area is designated as belonging to a water zone. Notice that the placement of the individual plants inside each planting area is still somewhat tentative. Once you select the species and determine the number of plants of each, a formal planting plan can be prepared.

- This design possesses minimal hardscape other than the driveway and front sidewalk.
- Decorative stone paths lead from the east-side utility area to the back yard and from the back door to the circular stone patio. Remaining pathways are planted with low vegetation.
- Areas of canopy and mid-height mass surround a large play space in the back yard, while the back door area features low perennials for a cozy but open feeling.
- In the front yard, a sweeping planted pathway draws attention through a mixed planting of low-water-use perennials accented with shrub and canopy areas, and ties the front and back yards.
- The east side features low ground cover and mid-height shrub masses, with another canopy area to the south.
- Low perennials fill the spaces between the shrub and canopy plantings.
such as blue grama (which can be mowed as a lawn grass), trailing daisy, or mat penstemon, as well as shorter shrubs, grasses, and perennials from foothill and mountain communities. But much of the space in the design will likely be designated as low or minimal water use, because the small plants of desert and semi-desert communities best lend themselves to creating the impression of space.

If you live in the foothills or mountains and do not want to use water-loving ground covers to create space, your best option may be to use mulched bare ground. Make sure that the mulched areas look inviting, not hostile. The cobble fields that are becoming popular under the name “rock lawn” definitely do not qualify as inviting. A coarse organic mulch, such as bark chips over a weed barrier fabric, would be a much better solution.

Last, consider the areas on the mass/space diagram that are designated as mid-height masses. For areas that will be planted to mid-height masses, the water zone may be low, medium, or high. Few if any minimal-water-use plants are tall enough to serve as mid-height mass, but some of the taller shrubs of the semi-desert zone would certainly qualify, and there are many large shrubs in the foothill and mountain zones. If you have or plan to create topographic relief on your site, you can sometimes use it to create the feeling of safe enclosure that would be achieved with a mid-height planting. Landscape features, such as rock groupings or structures of various kinds, can also be a part of mid-height mass.

Before you finalize your landscape design, check to make sure that you have incorporated all the relevant information generated during the process of inventorying your site, considering how your landscape will be used, deciding on site modifications, and sketching in watering zones. Now is the time to perform a quick quality control on the design process to this point. Your finished landscape plan should show all existing and planned hardscape, landscape features, and structures; each area of mulched bare ground; and each area to be planted. Each of the planting areas should be described as space, mid-height mass, or canopy, and each should have a water zone designation.

Now is the time to hearken back once again to the plant communities that provided inspiration for this whole process, and to designate each of the native planting areas in the landscape design as a particular plant community. This does not mean that you will create a perfect replica of any plant community. It just means a return full circle to the idea of taking your inspiration from natural landscapes. Even if you have limited experience with native landscapes in the Intermountain West, by following this design process and consulting the descriptions of natural landscapes provided earlier, you will be able to choose plant communities that are true to the aesthetics of your design as well as being adapted to the water zones and microhabitats your site can provide.
The Final Planting Plan

A – Rocky Mountain Juniper
B – Pinyon Pine
C – Shining Muttongrass
D – Cliffrose
E – Utah Serviceberry
F – Alderleaf Mountain Mahogany
G – Blue Grama
H – Green Mormon Tea
I – Grass Mix:
  Bluebunch Wheatgrass and Alkali Sacaton Grass
J – Flower/Shrub Mix:
  Hopi Blanketflower, Firecracker Penstemon, Bridges Penstemon, and Winterfat
K – Transitional Flowers:
  Utah Sweetvetch and Lewis Flax
L – Mountain Flowers:
  Sticky Geranium and Mountain Puccoon
M – Creeping Oregon Grape
N – Mountain Snowberry
O – Desert Four O’Clock
P – Bigtooth Maple
Q – Desert Mix:
  Indian Ricegrass, Sundancer Daisy, Silver Daisy, Showy Sandwort, and Shortstem Buckwheat
R – Rubber Rabbitbrush
S – Low Water Mix:
  Utah Penstemon, Winterfat, Palmer Penstemon, and Hopi Blanketflower
T – Gambel Oak
Planting Plan Detail—Back Yard

This plan shows the placement of individual perennial plants in the back yard planting.

- Notice how low-water-use perennials are used in the understory of the medium-water-use canopy planting.
- The perennial planting grades from high to low water and from shady to sunny as you move out from the north wall of the house. The middle section contains a transition buffer of low-water-use plants that can tolerate more water than those on the southern edge.
- Individuals of some species are arranged in drifts that overlap with the drifts of other species, creating a naturalistic meadow-like design.
Choosing the Plants

If you are like most people, the first thing you did when you opened this book was to turn to the Plant Palette section and browse through the pictures of plants. Now it is time to revisit this section of the book with a more systematic goal in mind, namely, selecting the plants to populate the native plant communities that will occupy the different water zones in your landscape. Using your landscape plan as a basis, make a list of the different planting areas, along with information on mass/space relationships, water zones, and the approximate size for each area. It is usually easiest to think about the canopy areas first. For each area marked as canopy, consider the water zone that you intend to implement there.

**Foothill Zone Plant Selection Example**

Suppose you have planned a canopy area that is in the medium water or foothill plant community zone. What is your vision of the plant community you would like to create there? Perhaps you love the sight of maple-cloaked foothills aflame in autumn, and have chosen a mountain brush community featuring bigtooth maple for one or more planting areas in your foothill water zone. Bigtooth maple represents both a dominant species and a “visual essence” species in the mountain brush community, and is an excellent choice for a canopy species in a medium water zone.

A planting composed of a single species, bigtooth maple, would meet the design requirements for canopy structure and coherence, but such a planting would definitely be lacking in complexity, with only one structural layer and only one type of foliage texture and color. In natural mountain brush communities, the maples are mixed with other species. Adding a few additional species will make the composition more interesting, especially if the plants chosen have contrasting forms, textures, and colors. You can find some of your options by going to the medium water section of the woody plant group in the Plant Palette, or by looking on the table provided for woody plants. Perhaps you want to add another tree, such as Gambel oak or netleaf hackberry, to the suite of species. These trees both have crooked trunks with rough bark that would contrast nicely with the straight, smooth trunks of the maples, and they also have leaves that turn gold in the fall, rather than red, as the maples do. Or perhaps you would like to add flowering shrubs like Utah serviceberry, mallowleaf ninebark, or littleleaf mockorange to the mix. These provide interest by blossoming in early summer, and they have a fine foliage texture that would contrast with the somewhat coarser texture of the maple leaves. They also present contrasting forms—the upright vase shape of the Utah serviceberry is quite different from the tight mounds of the ninebark and the arching, fountainlike shape of the littleleaf mockorange. These shrubs
Gambel Oak
Bigtooth Maple

Mallowleaf Ninebark
Littleleaf Mockorange
Bridges Penstemon
Showy Sandwort

Lewis Flax
Sulfurflower Buckwheat
Utah Sweetvetch
Shining Muttongrass
can tolerate either full sun or the partial shade created by the canopy trees as they grow. The shrubs also grow more quickly, so they will provide structure and interest in the period before the trees attain their mature size.

Another consideration in the mountain brush community planting is how you will treat the ground beneath the trees and shrubs. One possibility is mulch, and in this case, something organic like bark mulch would be appropriate. As this mulch breaks down over the years, it will be replaced with natural mulch created through leaf fall from the planted species. Another possibility is to use shade-tolerant perennials in the understory. In nature, you will often see a combination of understory cover and mulched bare ground under the canopy and mid-layer woody species in a mountain brush community, and that is probably the best solution. If the areas surrounding the trees are kept free of competing vegetation, the trees will grow much faster. This is a good reason to keep the understory species in the interspaces. A good choice to represent an abundant understory species is shining muttongrass, which is shade tolerant, stays green all season, and is especially attractive when the pearly pink flowering stalks appear in very early spring. Possible wildflowers to plant in drifts among the grass clumps in the openings are dusty penstemon, Utah sweetvetch, sundrops, and Lewis flax. Some of these species are listed as low-water-use plants in the Plant Palette. But, as discussed under cultural requirements in the Plant Palette section, a species can usually be planted in the next higher water zone without a problem, for example, plants from the low-water-use category can be planted in the medium water zone. All of these wildflowers will reproduce readily from seed and will move around over the years into even more naturalistic arrangements. You could also use some understory species that are not shade tolerant, such as shortstem buckwheat or showy sandwort, to increase the initial complexity of the understory planting, with the knowledge that these would probably disappear over the years as canopy shade increases.

The total number of species to use depends on the size of the area—in general, larger areas can support higher diversity without looking cluttered. It is important to use enough individuals of each species to avoid the polka-dot penny candy look—one of these and one of those. You should end up with a list of perhaps seven to fifteen species, depending, again, on the size of the area and whether the understory will be planted. If you have several foothill water zone areas that need to be canopy in the mass/space diagram, for purposes of coherence it is usually best to use the same or nearly the same species assemblage in multiple areas.

Desert Zone Plant Selection Example

Next, we will work through a plant selection example for a minimal water zone planting. Let’s suppose that you love and live in the desert, and that you are
intrigued by the possibility of creating a livable and attractive landscape using a minimum of added water. You have taken advantage of microhabitats, some existing and some created, to increase the palette of plant species you will be able to use in this landscape. By constructing a wash area that collects runoff from the roof of your house, you have provided habitat for some shrubs that can create mid-height mass. And by adding areas of landscape rocks artfully arranged on top of bermed earth, you have created additional mid-height mass and have also provided a water collection system of rocks to provide extra water for the species planted into this “rock outcrop” as well as at its base. You have three kinds of planting areas in this desert landscape—the open flat areas, the wash, and the rock outcrops. You also have an area with created canopy—an informal ramada (shade structure) that will let you enjoy the views of your landscape from a shady retreat. How do you go about selecting species for these different areas?

First look at species options for the open flat areas, which will provide the Zen-like feeling of space that is the essence of a desert garden. You will probably want to keep the composition for this part of the landscape quite simple: perhaps two or three species of small shrubs and a pretty clump-forming grass with two or three kinds of perennial wildflowers for the interspaces. Shrubs in the Plant Palette for the minimal water zone include shadscale, desert sage, big sagebrush (the Wyoming form is best for desert landscapes), winterfat, lacy buckwheatbrush, and sand sagebrush. All of these shrubs feature some version of the fine, silvery green foliage color typical of desert shrubs, but they differ in form and in other features. Desert sage is at its best in late spring, when the plants are covered with blue-purple blossoms, while the shell pink or sulfur yellow flowers of lacy buckwheatbrush appear in late summer to autumn, as do the satiny, rosy fruits of shadscale and the luminous white cotton wands of winterfat. If your site is sandy, then sand sagebrush is an obvious choice, as it is the quintessential “visual essence” species of desert sand dunes. Possible choices for perennial understory species in the desert landscape include Indian ricegrass, gooseberryleaf globemallow, sundancer daisy, Utah penstemon, and Indian paintbrush.

The rock outcrop area in your desert landscape gives you an opportunity to provide a focal point of diversity and interest. Suitable plants for the base of the outcrop include green Mormon tea, dwarf or datil yucca, and some of the taller perennials, such as prince’s plume and Palmer penstemon. For the pocket planting areas that stud the rock outcrop, some choices of plants with compact growth forms but contrasting foliage would be showy sandwort, silver daisy, and silver buckwheat.

For the wash areas of the desert landscape, you need to pick large shrubs that will really add some volume to the mid-height masses. Good choices would be Apache plume, rubber rabbitbrush, and oakleaf sumac. These are all low-water-
use plants that should do well in a desert landscape as long as they receive some harvested water. They are also fast-growing shrubs that will fulfill their role in the mature landscape relatively quickly.

**Semi-desert Zone Plant Selection Example**

Our third plant selection example will be for a landscape in the semi-desert water zone, where so many suburban dwellers in our region make their homes. Suppose that you live in a subdivision with some pretty strict rules governing the landscaping that surrounds your home, particularly the front yard “commons” that is visually continuous with adjacent yards. The chief expectation is usually that the landscape will look neat and well-maintained. Most of your neighbors have met this expectation using traditional lawn-centered plans, but you want to design an attractive, water-conserving landscape that reduces your “footprint” on the planet and also features many of the plants that characterized the local shrub steppe plant community that was present before development. You also would like to reduce maintenance time relative to traditional landscaping, so you can spend more time on that shady swing on the covered front porch, admiring your handiwork. How do you go about choosing plants to achieve these goals?

In the semi-desert zone, shrubs form the backbone of low-maintenance landscapes. Especially in the front yard, a relatively formal planting of shrubs integrated into a design with fairly extensive hardscape will go a long way toward creating a coherent landscape that meets the tidiness expectations of your neighbors. These mass plantings of shrubs—for example, big sagebrush, fernbush, or green Mormon tea—can be broken up with areas that include smaller plants with contrasting textures and structure. These beds could incorporate a signature succulent such as dwarf or datil yucca; a statuesque bunchgrass, perhaps alkali sacaton grass or basin wildrye; and perennials such as Hopi blanketflower, Utah sweetvetch, Bridges or littlecup penstemon, and dwarf goldenbush. The perennial flowers provide varied forms, foliage patterns and seasons of color, while the succulents and grasses provide year-round structure and textural interest.

To keep a semi-desert landscape within the bounds of neatness, it is usually best to keep perennial plantings fairly small and well-defined, rather than aiming for the “meadow” look. Meadows are among the most difficult native landscapes to maintain in a tidy condition, and are more appropriate in a less formal setting. Resist the urge to try to substitute a meadow for the more traditional lawn area. You will be better off with extensive formal paths that make clean boundaries between the planting areas. You might want to place a planting that features a native grass in an area adjacent to the neighbor’s lawn, so that the transition from flat, bright green turf to robust, mostly gray-green shrubs is somewhat softened.
If your neighbor has a sprinkler system that consistently oversprays onto
your property, you can take advantage of this extra water to plant species with
somewhat higher water requirements. You can also use microsites near eaves-
troughing downspouts to provide a little extra water for these species. Fairly
fast-growing screening shrubs might be useful in this context, and they can add
some mid-height mass to your landscape. A good choice in this situation would
be littleleaf mockorange. It can survive even in the low water zone, but will grow
much more vigorously with extra water.

If you have issues with small people cutting across your property or want to
attract a variety of native pollinators, Fremont barberry may be the shrub of
choice for a mass planting on a street corner or along a property line. If your
design calls for a vertical accent, you can use cliffrose, which thrives in the semi-
desert zone without any supplemental water and has a tall, rugged growth form.
Site this plant where you can enjoy its sweet, spicy scent.

You can use a similar strategy to choose lists of species for any plant com-
munity on your landscape plan. Think about structure, form, color, and texture
and how they combine to provide a balance between complexity and coherence.
Read carefully through the description of a plant you are thinking of using, to
make sure it has the right plant attributes and cultural needs to fill the niche you
have in mind. By the time you are finished, you will have plant lists for each of
the native planting areas in your landscape design.

Preparing the Planting Plan

At this stage of the design process, you know the size of each of the planting
areas, and the water zone and plant community that each will represent. You
have made a list of the species that you will include in each planting area and
have designated them as members of the canopy layer, the mid-height layer, or
the understory layer, as appropriate. Now it is time for the most interesting part
of the design process, actually deciding how the planting will be laid out on the
ground. This involves mapping out how the plants and hardscape features will be
spatially arrayed for each planting area. To carry out this design process effec-
tively, you will need once again to tap into your “inner designer.” You will need
to develop the ability to visualize how a planting will eventually look by work-
ing with a layout, or plan, view that shows how the plants will be placed in the
landscape. Your final product will be a map of each planting area that shows the
placement of individual plants of each species, along with a list that includes a
tally of the individual plants of each species that you will need.

The first step in preparing the planting plan is to make another overlay for your
base map, this time showing the planting areas and any relevant features included
within them. You will need to put a lot of detail onto this overlay, so increase the
scale as much as possible. You might want to divide the base map into sections showing individual planting areas, and to enlarge these sections individually. You need to keep track of what you have done to the scale, though. Make sure you have a scale indicator that shows, for example, five feet, on each of the expanded sections. This is important, so that you can make the diameters of the plants you symbolically place onto the planting plan match the scale of the plan. Enlarging all the sections to the same degree will make life a lot easier. Alternatively, you can just enlarge the whole base map and print it on super-sized paper.

Planning Plant Placement

There are various ways to proceed with the development of the planting plan at this point, but we like the “paper-doll” approach. Using this method, you first make several to many copies of scaled, labeled circular cutouts for each species. Construction paper or index cards are stiff enough to work well for this. For example, if your enlarged plan has a scale of four feet to the inch, then plants with a mature diameter of four feet would be represented by circles an inch across, plants two feet in diameter would be represented by circles a half inch across, and so on. As you work, it is easy to make more of these circles as needed. Plant diameters at maturity are given in the plant attribute table for each species in the Plant Palette. You can use code letters on the cutouts for each species and even use color-coding as well, to make species’ differences easier to see. The advantage to using cutouts is that you can try many different configurations before deciding on the one you like, without having to erase as you make changes. If you know your way around computer graphics software, a “virtual paper-doll” design process also works well and has the same advantages as the hardcopy version described here.

Suppose you chose a mountain brush community dominated by bigtooth maple for a medium water zone in your landscape. Your species list includes bigtooth maple and Gambel oak as canopy species, mallowleaf ninebark, Utah serviceberry, and littleleaf mockorange as mid-height mass, and an understory of shining muttongrass with interspersed drifts of Utah sweetvetch, sundrops, and Lewis flax. Based on the plant attribute table, the maples would be represented by circles scaled to twenty feet and the oaks by circles scaled to fifteen feet in diameter. The serviceberry circles would be scaled to eight feet in diameter, and the mallowleaf ninebark and littleleaf mockorange circles would be scaled to six feet. Each of the understory species would be represented by circles scaled to one foot. Making the muttongrass circles green, the flax circles blue, the sweetvetch circles pink, and the sundrops circles yellow would make it easy to distinguish them in the design. Your planting area is a roughly elliptical area fifty feet long and thirty feet wide, for a total area of about 1,200 square feet.
Now is the time to remember the native landscape that inspired your design, especially the aesthetic features that give it the special feeling that you want to create. Start with the canopy layer. It is OK if the mature crowns of the trees overlap, especially for trees of the same species. A common look in the mountain brush community is a pattern with multi-trunked clumps of trees and fairly wide interspaces. Two trees planted with their crowns overlapping will tend to grow into the shape of one tree with two trunks, quite appropriate for this community. To give the feeling of rivers of space flowing through the clumps of trees, create masses of canopy cover over about 50 percent of the area. Then place the shrubs as mid-height mass along the edges of the canopy. Don’t try to crowd in too many plants. Two or three maples, one or two oaks, and one to three of each of the shrub species would probably be plenty for this space. Try placing cutouts of the trees onto the plan, and you will see what a substantial fraction of the area they will eventually cover. But it will be many years before these trees reach mature size. Keeping an area around the young trees free of understory plants will help them grow faster, but this bare area only needs to extend out a few feet, not over the whole area that the canopy will eventually cover. The remaining canopy area can be planted to understory species.

The shrubs need to be placed fairly far out from the center of the tree canopies, especially the serviceberry, which can be ten feet tall when mature. Move the cutouts of the trees and shrubs around until you have a pattern that pleases you. Think in terms of the design principles of coherence versus complexity, mystery versus legibility. By using a limited number of species and by placing multiple individuals of these species in a repeating pattern in space, you give the design coherence. On the other hand, by using several species rather than a single species, you increase the complexity and interest. Complexity is also increased by using multiple layers to create structure. Both legibility and mystery are served in the design by creating open spaces around and through the shrub and tree plantings. A solid thicket of trees and shrubs looks impenetrable and uninviting rather than mysterious and beckoning. This is what you will have if you fail to take the mature size of the plants into account and try to cram too many trees and shrubs into the planting area.

Once you have a placement that you like for the trees and shrubs, work on the understory layer. You will obviously need a lot more copies of plant circles for these species, but, again, open space is good. In general, leave spaces between understory plants that are roughly the size of the plants themselves, for a total cover of around 50 percent in the planted areas. Do not place the plants evenly, either in rows or on a grid. Deliberately vary the spacing, with some plants closer together and others further apart, for a more naturalistic feel. You could even leave slightly wider areas that are not planted as informal winding
paths to further increase both symbolic legibility and actual physical access to the planting. Use the shining muttongrass as the matrix species, and introduce the flowering perennials into the matrix in patches or drifts that taper off from dense centers and interfinger with one another. This looks more coherent, and also more natural, than just dotting the flowers around at random through the grass planting.

If the planting area includes any hardscape features, such as landscape rocks or an informal seating area, be sure to consider these in the planning process. Don’t forget to take any topographic relief into account, as it will affect both the microenvironments for individual plants and the visual aspect of the planting as a whole. For example, if the planting is on a steep slope, make sure that any physical access path traverses the slope, the way a deer trail would, rather than charging straight up from bottom to top. This would be an invitation to erosion as well as being visually unattractive and uncomfortable for walking.

**Visualizing the Plan**

When you have a design that you think you like, try visualizing what the planting will look like when mature. Pick a hypothetical vantage point, such as the front walk or the living room window, and imagine the way the tree and shrub masses will look in relation to the openings. If you can sketch this on paper, so much the better. Remember, this is not art. This is just a temporary design device for your eyes only. Does the design look attractive? Does it have a pleasing balance of complexity and coherence, of legibility and mystery? Does it look like a place that would welcome you to enter? Does it capture the visual essence of the plant community you are trying to create? Using this process can help you detect problems, such as noticing that there is really no visual access to the landscape once the planting is mature. Or perhaps the planting is too sparse, with more of a savanna feel than the cozy mountain brush atmosphere you were trying to create. Go back to the paper doll version, and make any changes suggested by this visualization process. If you like, you can repeat this visualization process as many times as necessary, until the design feels right.

When you are satisfied with the design, trace the circle for each individual plant onto the base map and label it by species. You can save out the paper doll circles that you remove as you do this, then use them to tally the total number of individuals of each species that you will need for the planting.

The process for preparing the planting plan for any area will be similar to the process described above, regardless of what plant community you are trying to create. In general, plantings representing drier water zones should include more unplanted area than those representing wetter water zones. Fifty percent cover is about right for the foothill water zone, whereas seventy to eighty percent cover
might be appropriate for a mountain planting, and cover as low as twenty percent might be about right for a minimal-water planting. Again, the cover should not be uniformly distributed, but instead should reflect natural patterns based on underlying or designed microhabitat variation. In desert communities, for example, the plants often occur in multi-species clumps with wide interspaces. This could be because an exceptionally good microsite can support many inhabitants. Or it could be that the presence of a mature plant of one species can facilitate the establishment of another, perhaps by acting as a nurse plant that shades the young seedling. The net result is a pattern that is far from either random or regular, and a minimal-water landscape will look and feel more realistic if some of the plants show this kind of spacing.

If you have multiple planting areas that represent the same plant community, make sure that the planting plans for these areas are prepared with careful reference to each other. Multiple areas that repeat the same suite of species with minor variants will visually integrate these areas across the landscape and greatly increasing the feeling of place that is generated.