

Resource-efficient

Natural Landscaping

Design • Build • Maintain

May, 2007 This guide is divided into sections for the Design, Building, and Operations & Maintenance phases of a project, plus Resources.



WHY GO NATURAL?

Landscape professionals from around the Northwest have contributed and tested these ideas for resource-efficient, sustainable, cost-effective landscaping. They can be applied to any landscape design or use, from conventional lawn-and-bed designs to native restorations to innovative urban landscapes. Integrating these ideas from the initial project design stage through construction and into long-term maintenance will reap the most benefits.

Benefits

- More attractive landscapes
- Easier maintenance
- Lower water, waste, and energy bills; less need for fertilizers and pesticides
- Better storm water detention and filtration
- Better air and water quality
- Better habitat for wildlife and people
- Higher property values

5 Steps to Successful Landscapes

- 1) Build healthy soil** Preserve existing soil and vegetation (especially trees) where possible. Amend disturbed soils with compost. Mulch existing landscapes regularly with wood chip, coarse bark, leaves or compost.
- 2) Plant right for your site** Fit landscape uses to your site's conditions, and choose plants that need less water, have few pests, and thrive in the Northwest climate.
- 3) Water smart** After building healthy soil and selecting low-water use plants, group plants by water need, use more efficient irrigation methods like drip and soakers under mulch, and design and maintain irrigation systems to reduce waste.
- 4) Think twice before using pesticides** Proper plant selection, plant care, and integrated pest management techniques can practically eliminate the need for weed and bug killers, reducing health risks.
- 5) Practice natural lawn care** Start with less lawn – put turf only where needed. "Grasscycling" (mulch-mowing), and proper mowing height, watering and fertilization techniques can save time and money.

DESIGN PHASE

Use nature as your model

Natural systems:

- Recycle everything – water, waste, and nutrients – back into new life
- Are diverse, and therefore dynamically stable (tend to recover from pests, weather, etc.)
- Are defined by the resources (sun, soil, water) available on-site
- Have inherent beauty: elegance, complexity, and balance



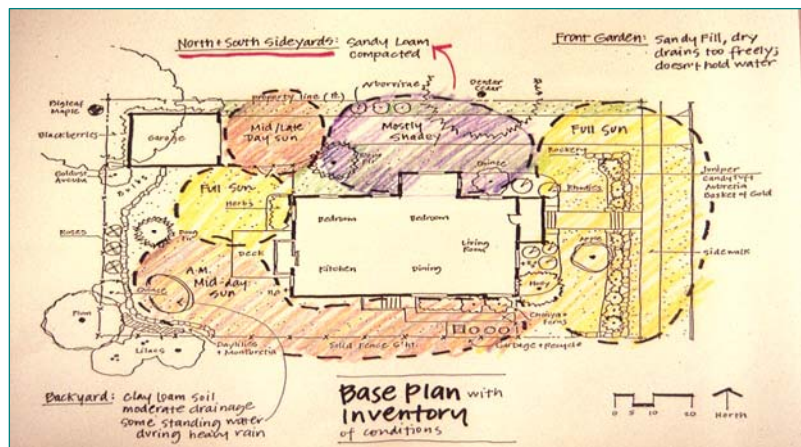
Choose the right plant for the right place

- Select plant varieties that will thrive in your site's conditions (sun, soil, water), the local climate, and that grow well together.
- Select for low maintenance needs: low water and fertilizer needs after establishment, high resistance to pests to eliminate chemical use, and minimal mowing or pruning needs.
- Select based on mature size, to minimize pruning.



Fit the design to the site

- Assess site soils, sun exposure, drainage, water table, grading and slope stability issues.
- Consider adjacent uses, nearby sensitive areas (wetlands and waterways, slopes, wildlife uses).
- Identify existing vegetation, and preserve (especially tree root areas) wherever possible.
- Involve owners and end-users in fitting the intended uses into the site's conditions.
- Involve landscape maintenance staff (or a maintenance expert) early in the design process.



Start with the soil

- Plan to protect soil around trees and preserved vegetation from compaction.
- Plan to stockpile and reuse site topsoil, if practical.
- Plan to amend disturbed soils with compost, prevent re-compaction, and mulch beds after planting (see *Building* phase).
- Consider getting a site soil sample, and any imported topsoils, tested at a soil lab. Follow the lab's recommendations, and verify proper installation.
- Design landscape for recycling fall leaves and chipped prunings as mulch, and mulch-mowing ("grasscycling") lawns, to help maintain long-term soil and plant health. Plan a composting or leaf/chip storage area on site.

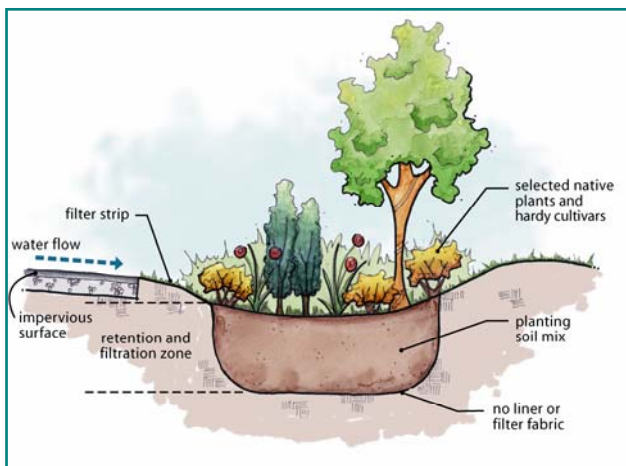
- Plan vertically in layers, like the forest: ground cover, understory shrubs, and trees. (Select low shrubs and limb-able trees where sightlines are important)
- Use native plant communities where they fit the site conditions and design – they often thrive with less maintenance and provide wildlife habitat.
- Plan native and natural "buffer" areas near waterways, slopes, and other sensitive areas.
- Use trees. Generally, plant conifers on north side to block winter winds, and deciduous trees to south for summer shading and winter light. (Consider mature tree size – see "tree selection" in *Resources*.)
- Select plants with multiple benefits, such as food ("edible landscaping"), habitat, shade, etc.
- Maximize green in dense urban areas – in public spaces, on building walls and roofs, in street tree placement – see Seattle Green Factor urban design guidelines in *Resources* section.
- Put lawn where it belongs: on sunny (or light shade to reduce water needs), well-drained, moderately sloped areas where needed for play or walking uses. Turf often requires a lot of maintenance and water, so choose other plant groups where turf is not necessary or won't grow well (heavily shaded, sloped, or poorly drained sites).
- Avoid invasive species – see www.kingcounty.gov/weeds





Slow the flow: manage and reuse storm water on-site

- Conform to existing drainage patterns as much as possible in designing site grading.
- Minimize hardscape (concrete etc.) in the landscape – use softer engineering or plants.
- Disperse drainage from hardscapes and roofs by spreading it out to sheet flow into landscape areas.
- Use Natural Drainage Systems to slow and filter runoff, such as:
 - Soil amendment with compost
 - Bio-retention swales, “raingardens” and planters
 - Curbless or curb-cut streets flowing to swale
 - Green roofs, green walls, and tree planting
 - Pervious paving for parking and paths
 - Other natural drainage techniques – see *Resources*
- Store and reuse stormwater beneficially:
 - Soil amendment and infiltration is the most cost-effective way to store rainfall for landscape use.
 - Stormwater detention vaults/cisterns, if required, may be designed to feed filtration and reuse for toilet flushing or vehicle washing, or to store late spring storms for summer landscape irrigation.



Design for water conservation

- Build deep soil with compost. Mulch regularly.
- Select low water use or drought tolerant plant communities – they need minimal or no irrigation after they’re established (2-3 years). This may allow sites to be built with no permanent irrigation – soaker hose, drip, or quick connect systems can be used during the establishment period.



- Minimize turf and other high water use plants. Avoid narrow, odd shaped, or isolated turf zones – they’re hard to water and mow.
- Reuse water: recycled water, greywater systems, and stormwater detention cisterns are all potential sources for landscape reuse. Just directing roof and pavement runoff into landscape soil helps.
- Group and zone plants by water need – match these “hydrozones” to irrigation system zones.
- Have irrigation systems designed, or designs checked, by an Irrigation Association certified designer (see www.irrigation.org). Tell the designer you want a water-efficient design.
- Reduce irrigation system waste with:
 - Evapotranspiration-based central computer controllers; or for smaller systems, weather and soil moisture sensor based “smart” controllers
 - Rain shut-off devices; flow sensors (to shut off zone if pipe breaks); check valves to stop low head drainage; and more efficient “high distribution uniformity” heads
 - Adequate piping size to minimize pressure differences, or pressure-regulating valves on each zone in sloped systems. Keep any pressure variation to within 10-15% of working pressure.
 - Separate zones for turf, and for each hydrozone
 - Drip, soaker, or other low-flow emitters
- Have designer prepare a landscape Water Budget, and plan to test the system during commissioning to verify efficient performance – to learn more, see *Resources*.

Make it last – naturally

- Write a Landscape Maintenance Plan that specifies integrated pest and weed management, turf and plant maintenance, soil building with mulch and mulch-mowing, and irrigation system inspections and maintenance. See *Resources* for maintenance plan examples.

BUILDING PHASE



Minimize impacts, to maximize benefits

- Protect tree root zones (twice the drip line diameter) and soil areas being preserved, by:
 - Fencing out vehicles, equipment and storage
 - Boring rather than trenching utilities past major roots
 - Where some equipment traffic is unavoidable, covering tree root zones with 4-6 inches of coarse wood chip (hog fuel) or crushed rock, or with metal plates.
- Stockpile site topsoil for reuse – cover piles with chip mulch or breathable fabric during storage.
- Prevent site erosion – compost blankets, berms, and socks are effective, and the compost can be reused later as soil amendment.
- Leave areas close to waterways and slopes undisturbed, in native vegetation.



Restore soil functions

- Amend disturbed soils with compost:
 - For lawns, 1-2 inches of compost tilled in to an 8-inch depth
 - For tree and shrub beds, 2-4 inches of compost tilled at least 12 inches deep. Or amend/install a soil-compost mix in multiple lifts (layers) to attain 16-24 inch root zone depth that's best for tree/shrub establishment.
 - Don't amend just the planting hole (it causes poor root development). If not amending the whole bed, plant trees and shrubs in the existing soil, then mulch with compost, then wood chips on top for weed control.
- Visually inspect any imported topsoils before accepting delivery, and verify they meet specs/lab tests. Install topsoils properly – rip in the first lift (layer) to mix it with the native soil, and promote deep root growth.
- Protect soils from compaction after amendment.
- Mulch landscapes after planting with 2-3 inches of arborist wood chips or coarse bark chips.



Plant it right

- Plant in fall for easiest plant establishment, or plant in springtime only if summer irrigation is available.
- Dig holes twice as wide as root ball; spread out roots
- Fill soil to same level on stem as at nursery – root ball completely covered and trunk flare at grade. Planting trees too deep and shrubs too shallow often kills them. Tamp soil, then water well to establish good root contact.
- Mulch after planting. Stake trees only if needed, loosely so they can move and bark is not constricted.
- Turf/lawns require at least 6-8 inches of compost-amended soil, whether for seed or sod. Seeding gives better long-term root establishment, hardiness, and drought-tolerance than sod. Single-species sod should be avoided. For best turf establishment, seed April 15-May 15 or Sept. 15-Oct. 15, and irrigate through the first dry season. Select a blend of Northwest-adapted grasses, plus broadleaf plants like clover and lawn daisies, for durable turf where a few "weeds" won't look out of place (see *Resources*).



Verify proper installation

- Verify proper soil preparation by inspecting delivery tickets for compost, digging a few test holes to verify blending, and pushing a bar in to verify uncompacted soil to at least 12 inch depth.



- Verify plants are planted at proper depth, are located as designed, and grouped to fit their irrigation hydrozones.



- Verify proper irrigation system installation and pressure-test while trenches are still open.
- Test (audit) irrigation system after installation to verify:
 - Uniform coverage in each zone
 - Application rates match design and Water Budget
 - No overspray onto pavement or dissimilar plant zones – replace or adjust heads as needed.

- Set irrigation controllers to match designed Water Budget and tested application rates. Set up ET (evapo-transpiration) based scheduling, or provide managers with manual scheduling to match application rates to seasonal needs – apply less in spring and fall or during cooler weather (see *Resources* for more irrigation tips).

Train end-users for sustainable care

- Provide users or maintenance staff with a written Landscape Maintenance Plan (see *Resources*), involve them in its design, and train as needed. Plans should include clear how-to methods and resources covering the activities described in the *Maintenance* section:
 - Integrated pest and weed management
 - Turf and plant maintenance
 - Special needs during the establishment period such as extra watering or weeding
 - Regular soil building with mulch: methods for recycling landscape wastes (leaves, prunings) into mulch; and methods for mulch-mowing turf areas
 - Irrigation system inspection and maintenance.
- Provide a Maintenance Budget Impact Statement as part of that plan that estimates staff, material, and equipment costs required, both during the establishment period and for the long-term.
- Build essential maintenance equipment (such as mulching lawn mowers and chippers) into the construction budget, or ensure that maintenance budget will provide them.
- Ensure that follow-up training will be provided as maintenance and operations staff change.



OPERATIONS & MAINTENANCE

Start right: plant establishment

- New landscapes need extra care during the establishment period (first 2-5 years):
 - More regular watering until roots go deep
 - Weeding and mulching until plants fill in
 - Replacement of unhealthy plants, or plants that don't grow well in their site conditions
 - Troubleshooting problems with plants, irrigation, drainage, pests, and public use of landscape
- Budget and plan for these extra needs. Educate public and staff to build their ownership and care.

Build the soil for healthier plants

- Recycle landscape "wastes" back into the site: fall leaves as mulch or compost, chipped prunings as mulch, grass clippings through mulch-mowing.
- Mulch tree and shrub beds every 1-2 years with arborist wood chips, shredded fall leaves, coarse bark, nut or coffee hulls, etc. to control weeds, conserve water in summer and prevent erosion and compaction in winter, reduce runoff, and slowly feed the soil. Mulch annual beds with non-woody materials like compost or shredded leaves.
- Poor soil can be improved by:
 - Tilling in 1-3 inches of compost and replanting, or
 - Mulching with compost to feed the soil, then covering with a woody mulch for weed control
 - Topdressing turf with compost (see below)
- Fertilize only if needed. Usually trees and shrubs get all the nutrients they need from compost-amended soil and regular mulching. Lawns and specialty plants like roses may need some fertilization. Select slow-release or natural organic fertilizers for healthier plants, fewer pest problems, and less runoff pollution.
- Get a soil test if plant problems appear; correct any pH, lime, or mineral deficiencies found.
- Watch drainage patterns in winter. Soggy soils or excess runoff may require drainage solutions, or replanting with more wet-adapted plants.



Use integrated pest, disease, and weed management to promote plant health

- **IPM steps include:**
 - 1) Prevention first: plant vigorous, pest-resistant, site-adapted varieties. Plan cultural practices to minimize pests (watering, mulching, pruning – see *Resources*).
 - 2) Identify/know the pest (weed, etc.) life cycle.
 - 3) Set action thresholds – tolerate some damage.
 - 4) Monitor regularly (keep records of monitoring).
 - 5) When pests exceed threshold, use control method with the least non-target impact. (Try cultural, physical, or biological methods first. As a last resort, use spot applications of least toxic chemical.) Only treat when the pest is most vulnerable and its natural enemies are in their least susceptible life stage.
 - 6) Keep records of control methods and results, evaluate, and adapt cultural practices.
 - 7) Replace problem plants/designs with more pest, disease, and weed-resistant varieties.
- Weed control methods:
 - Crowd out weeds with dense healthy plantings, ground covers and shade canopies.
 - Accept a few weeds – target the problem ones.
 - Mulch beds in fall, winter, or early spring.
 - Control weeds before they go to seed.
 - Hoe, pull, mow, or till (mulch makes hoeing easier).
 - Use flame or radiant heat weeders over pavement, cracks, fencelines, and building edges, or over mulch on rainy days (use fire precautions as per equipment labeling).
 - Use barriers: newspaper or cardboard covered with mulch, root barriers for spreading plants. Landscape fabric can create problems as weeds grow through it – paper or cardboard is better.
 - Don't over-fertilize – it promotes weeds and pests.
 - Spot apply the least-toxic chemical (e.g. soap and vinegar-based weed killers, or cut-and-paint stems with systemic herbicides) to minimize non-weed impacts.
- If a pesticide must be used, always post signs for at least 24 hours stating: area affected; date/time applied; specific pesticide used; re-entry cautions (from label); and phone number to call with questions. Always follow label for application and protection. Professional applicators (including users of "weed & feed," or even low-risk herbicides like vinegar) must be licensed by State law, see <http://agr.wa.gov/PestFert/Pesticides/>.
- See *Resources* for more IPM methods, pesticide hazard tier tables, and alternative controls.

Replace problem plants

- If a plant has repeated pest or disease problems, or isn't thriving in its site, it is cheaper in the long run to replace it with a better-adapted variety.
- Sometimes entire landscapes, or portions, don't fit site conditions or end-uses well, resulting in high maintenance needs and poor performance. They can often be converted to better-adapted plants or designs in sections or phases, during the annual maintenance cycles or at seasons when staff has more time.

Prune less, thin and mulch more

- Minimize pruning by choosing plants that will fit at their mature size. Pruned hedges are very labor-intensive – using fence and/or mature sized plants is more sustainable.
- Prune for plant health. Avoid topping cuts on trees.
- Recycle prunings as chips for mulch.
- Thin excess plants as the landscape matures, to allow adequate room for full growth.
- Keep on mulching until ground covers and canopy close completely – weeds love bare soil.



Maintain turf sustainably

- Mow higher (1.5-2.5 inches), mow regularly, and leave the clippings, to improve turf density and health. Professional mulching mowers save 40% of total mowing time by eliminating bagging and disposal.
 - Fertilize, if needed, in the fall with a slow-release, natural organic, or "bridge" (combination) fertilizer. Calcium (lime) improves soil pH; iron limits moss. Base long-term fertilization programs on regular soil testing – rely mainly on soil-building methods.
 - Water deeply, to moisten entire root zone, but less frequently. Apply about 1 inch of water per week at midsummer, less in spring and fall. Or let turf areas that don't get heavy wear go brown and dormant until fall – just water deeply once each rainless month to keep growing crowns healthy.
 - Improve poor lawn areas by aerating, overseeding with a locally adapted grass seed blend, and top-dressing with ½ inch of compost, in spring or fall.
 - Manage weeds by maintaining dense turf with proper mowing, fertilization, and overseeding. Accept some broadleaf plants in lawns, such as clover which is beneficial to turf. Decide which species are a problem, and just target those. Avoid broadcast herbicides like "weed & feed" – use manual control or spot applications instead.
- Consider changing turf areas that don't grow well (in shade, slopes, poorly drained soil, etc.) to other better-adapted plants.
 - See *Resources* for complete Lawn Care manual.

Water smart for irrigation savings

- Over-watering is a common cause of plant disease problems. Under-watering stresses plants. Know the plant's needs, and water just enough.
- Water deeply (to moisten the plant's whole root zone) but less frequently. Water annuals at the first sign of wilting, but perennials and turf only need water if they stay droopy after it cools off in the evening. Trees and shrubs in good soil with mulch rarely need water after establishment (first 2-5 years) except in extremely dry summers.
- Make every drop of water count, by:
 - Building soil with compost
 - Mulching regularly (re-mulch every 1-2 years)
 - Mulch-mowing lawns, at proper height
 - Choosing low water use plants
 - Grouping plants by water need, and matching to irrigation zones (with turf on separate zones)
 - Using soaker or drip systems in beds, covered with mulch, to reduce evaporation
 - Preventing runoff by slowing application rate
 - Watering early or late, to avoid mid-day evaporation losses (50% is wasted at mid-day!)
- Use automatic irrigation systems efficiently:
 - Schedule per Water Budget, then adjust downward to minimum needed for plant health. Learn about scheduling at www.IWMS.org.
 - Record schedule for reuse and fine-tuning.
 - Adjust schedule every few weeks based on seasonal need (less in spring and fall, or if it rains), or use an ET (evapotranspiration)-based computer controller.
 - Visually check spray patterns every few weeks – look for broken or misaligned heads.
- Inspect irrigation systems annually:
 - Run system, walk through looking for problems.
 - Check for broken, sunken, or misaligned heads.
 - Test backflow and check valves.
 - Test rain sensor and flow sensor (line break) shutoffs.
 - Replace parts with identical parts (e.g. heads).
 - Audit system completely (test flow rates, uniform application) every 1-2 years. See *Resources* for more on irrigation and watering.

Make space for nature

- Zone highly maintained landscape elements (lawns, flower beds) closer to buildings.
- Leave or restore wilder, “buffer” areas toward perimeter, near waterways or slopes.
- Use native plant communities where possible, and select plants, shrubs, and trees to support birds and beneficial insects (see *Resources*).
- Leave room for nature to move – trees to fall, plants to grow, or streams to meander – by limiting hardscaping and avoiding linear/geometric designs. Curves and softer engineering are more forgiving and easier/cheaper to maintain and repair.



Train and support staff and users, for long-term success

- Involve maintenance staff in planning, equipment selection, and redesign of problem areas.
- Provide or pay for annual training opportunities in Integrated Pest Management, turf and tree care, irrigation systems, soil building and composting, etc. to build skills and stewardship.
- Regularly review and update the Landscape Maintenance Plan, so that it guides current practices.
- Ensure training for new staff and managers.
- Educate users/public about the landscape’s benefits: low pesticide, fertilizer and water use, benefits to wildlife, water quality and public health – and how a few weeds, bugs, mulch, etc. help create those benefits.

Photos courtesy of: front cover (houses) Pt. Blakely Communities; page 2 (site plan) Stenn Design; page 3 (diagram) AHBL Planning; page 4 (fenced tree) Seattle Department of Transportation; page 5 (irrigation trench) Seattle Center; all others Seattle Public Utilities.

TO LEARN MORE: RESOURCES

Soil best practices, design specifications, examples, Soil BMP Manual, compost and mulch sources, soil testing labs, and more, www.SoilsforSalmon.org

Natural lawn & garden design and maintenance for the general public and for professionals, www.seattle.gov/util/services/Yard

See the Integrated Pest Management, plant selection and soil sections, example landscape maintenance plans, and the *Ecologically Sound Lawn Care* manual.

Expert advice is available at the Natural Lawn & Garden Hotline, call (206) 633-0224 or e-mail info@lawnandgardenhotline.org

Pesticide risk reduction tier tables and City of Seattle landscape guidelines www.seattle.gov/environment/Pesticides.htm

For alternative, less toxic weed, pest and disease control methods see the IPM section above.

Water conservation by design, operations, and efficient irrigation systems, www.SavingWater.org

Natural Drainage Systems design guidelines, examples, and related links in the Seattle Stormwater Code, www.seattle.gov/util/NaturalSystems

Tree selection for streets and other space-limited sites, City codes, tree maintenance, arborist mulch sources, www.seattle.gov/transportation/Forestry.htm

Seattle Green Factor guidelines for maximizing landscape values in urban development, www.seattle.gov/dpd/GreenFactor

Permitting requirements such as Shoreline, Critical Areas, and conservation codes, search www.seattle.gov/dpd Outside Seattle, contact your local planning department.

Green building information (green roofs, landscape materials, etc.), www.seattle.gov/dpd/GreenBuilding

