Selecting Woody Landscape Species to Enhance Biodiversity

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Trees and shrubs are the backbone to most managed landscapes and are integral to supporting a rich collection of wildlife. There are two components to successful plant selection: plant provenance (nativity) and plant quality (at the nursery). This publication provides a practical, science-based approach to plant selection that will enhance both wildlife biodiversity and the aesthetic appeal of managed landscapes.

PLANT PROVENANCE: NATIVE VS. NONNATIVE SPECIES AND ENVIRONMENTAL ADAPTABILITY

To maximize wildlife biodiversity, many people choose native trees and shrubs believing that native plants are superior choices for wildlife habitat. Most published research demonstrates, however, that the provenance of trees and shrubs has little influence on wildlife biodiversity. There are extensive, peer-reviewed literature reviews (Chalker Scott, 2015; Johnston et al., 2012; Nielsen et al., 2013; Sjöman et al., 2016) on this topic, all of which mirror the sentiments of Johnston et al. (2012) who state "… it is clear that any automatic preference for native trees when planting in urban areas cannot be justified." Trees and shrubs with the greatest chance to survive and thrive will provide the greatest benefits to associated locally native wildlife, regardless of their origins.

Woody plant structure, function, and diversity are the most important characteristics for enhancing wildlife biodiversity. Native woody species can be part of this scenario but may not be a major component. The ability of native trees and shrubs to live in our managed landscapes is determined by the environment—not by their genetics (Figure 1).

Urban and suburban environmental conditions are unlikely to resemble whatever existed prior to development. Consider these characteristics of managed landscapes:

- Hot, dry, and sunny conditions compared to a native forest ecosystem.
- Heavily compacted, poorly structured soils with reduced drainage, soil volume, and low oxygen levels, usually lacking woody mulch as would be found in a native forest ecosystem (Figure 2).
- Improper fertilizer application creating nutrient deficiencies and/or toxicities.
- Soil left uncovered suffers from increased evaporation and limited soil moisture in summer months.

***Figure 1*. *Arbutus menziesii*, the Pacific madrone, thrives in rocky environments but is ill suited for managed soils.**

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SITE CONDITIONS AND TREE CHOICES

Consider these research-based suggestions before selecting trees:

- Site considerations should always dictate plant selection and will determine the potential environmental stresses trees and shrubs may experience.
- Native, temperate forest trees and shrubs generally do well in larger landscapes with well-drained soils.
- Instead of using space-loving larger trees in smaller sites, use smaller trees or structurally sound shrubs that can be arborized (Figure 3).
- If landscape soils are dissimilar to native soils, choose woody species adapted to those conditions regardless of their origin.
- For sites with higher levels of reflected sunlight or heat, choose woody species adapted to hot, dry climates.
- Determine the food and nesting habitat needed for your wildlife species of interest.

PLANT QUALITY: A GUIDE TO SELECTING HEALTHY TREES

Nurseries offer trees as bare-root, containerized, or field-grown specimens, whose benefits and drawbacks are worth considering in detail.

- Bare-root trees are inexpensive and if handled properly will typically establish vigorous, healthy root systems once planted. While bare-root plants are smaller than those available in containers or field grown, their life spans are often longer as they have no hidden root flaws that might plague the latter.
- Containerized trees are planted in well-drained media, which means roots are usually healthy and plentiful. Plastic containers are used for producing smaller trees, while large trees can be grown long-term in irrigated wooden boxes. Rapid root growth leads to greater numbers of circling roots, especially in smaller plastic containers, leading to rootbound plants that will require correction. Long-term survival of containerized materials is excellent if roots are properly prepared, but poor if not.
- Field grown trees are available at retail nurseries as ball-and-burlap (B&B) trees. (Large field-grown trees are often boxed in place as they are dug, but these are less common in retail nurseries.) As the name suggests, B&B trees have root systems encased in clay soil (the "ball") and covered in burlap and twine. Sometimes these "field-grown" trees are actually container plants that have been moved to the field. Thus, field-grown trees often have buried root flares and structural root flaws. To ensure the tree's long-term success, these problems will require correction during transplanting.

***Figure 2*. Urban soils are frequently unprotected, compacted, and eroded, making survival difficult for many native woody species.**

***Figure 3*. This arborized rhododendron provides a tree-like function in a limited space landscape.**

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INSPECTING CONTAINERIZED AND B&B/BOXED TREES

- Look at the overall shape of your tree or shrub. Trees should have a strong central leader with branches well distributed along the trunk (Figure 4a). A tree that has been obviously topped during nursery production should be avoided (Figure 4b). Left uncorrected, this common pruning practice induces excessive sprouting and destroys the natural growth habit of the plant.

Figures 4a-b. A nursery tree with a strong, unpruned central leader (a) compared to a topped specimen.

- Now observe the root flare of your tree or shrub (Figure 5a). This is the point where the trunk meets the roots and is obviously wider than the rest of the trunk. In many specimens, especially B&B and boxed trees, you might not be able to find the root flare. This is because many trees and shrubs are situated too deeply in their container, burying the root flare beneath burlap or soil (Figure 5b). Gently peel back the burlap or remove soil to inspect the root flare for damage or disease.

Figures 5a-b. A tree with a visible root flare (a) compared to one that has been buried (b).

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- When choosing container plants look for surface roots and suckers (Figures 6a-b). Surface roots are indicators of plants that have not been potted up in a timely manner. Plants with significant surface roots should not be purchased unless major root renovation is performed at installation time. Suckers originate from the root crown and are often indicators of plant stress. Unless the species is normally multi-trunked, plants with many suckers should be avoided.

Figures 6a-b. Surface roots (a) and suckers (b) are indicators of impaired root systems.

You will not be able to thoroughly inspect your plant's root system until you are ready to transplant. When purchasing expensive trees, be sure to discuss with the nursery the possibility of returning plants that do not have structurally sound root systems.

MANAGING URBAN LANDSCAPES FOR OPTIMAL BIODIVERSITY

Support biodiversity in new plantings by following the recommendations in Table 1 summarizes general site and vegetation traits that are positively associated with animal species abundance and richness. Table 2 describes tree selection criteria that can be used to enhance ecosystem biodiversity by the judicious use of native and noninvasive, introduced species. Finally, Table 3 offers specific, practical actions you can take to enhance the wildlife biodiversity of your landscape.

***Table 1*. Site and vegetation traits associated with animal species abundance and richness found in the literature (adapted from Chalker-Scott, 2015).**

Vegetation trait	Birds	Insects	Mammals	Reptiles
Habitat structure (canopy cover, vertical diversity, tree and shrub density and diversity) (Figure 7)	X	X	X	X
Larger and/or connected sites	X	X	X	
Older, larger trees and hollow trees	X	X	X	X
Moderately disturbed sites	X			
Profusely flowering species with seasonal diversity		X		
Native vegetation (for specialist species only)	X	X		
Herbaceous/grass cover	X		X	X
Permanent water source (Figure 8)	X	X	X	

***Table 2*. Selecting tree and shrub species to enhance ecosystem biodiversity (adapted from Chalker-Scott, 2015).**

Goal	Activity	Information to collect
Determine the need for new trees	Conduct tree surveys	Age distribution, canopy cover, percent natives, species diversity
Determine potential environmental stresses	Evaluate site conditions	Air pollution, drought, heat, light, salt, soil conditions, pests, disease
Determine community needs for specific resources	Diversify plant palette	Food, nesting habitat needs for native species of interest
Determine potential invasiveness	Research possible introductions	Any relevant plant introduction regulations; data on invasiveness of related species

Table 3. **Managing greenspaces to enhance native community biodiversity (adapted from Chalker-Scott, 2015).**

Goal	Activity
Increase tree and shrub species diversity	Plant native as well as non-invasive introduced species
Maintain a vertically diverse assemblage of vegetation	• Plant ground and shrub vegetation for bird habitat • Plant trees in groups rather than as isolates • Retain deadwood and other nesting structures in place when possible
Improve tree size distribution	• Protect middle-aged trees to ensure longevity • Retain old, large trees • Use small "urban" tree species sparingly
Enhance ecosystem edges	• Increase diversity of plants in edge habitats • Reduce management of edges (e.g., no mowing, pesticide application, etc.)
Reduce predation on native animal species	Reduce managed, open lawns
Improve soil habitat for insects, reptiles and mammals	Reduce soil compaction with fresh arborist chip mulch (Figure 9)

***Figure 7*. Vertical structure in a small urban landscape. Note also the diverse groundcovers that have replaced the original lawn.**

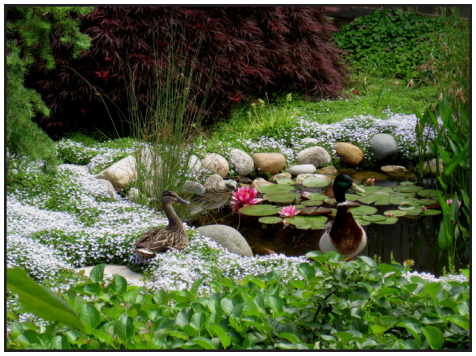

***Figure 8*. A permanent water feature can attract beneficial wildlife and be aesthetically appealing.**

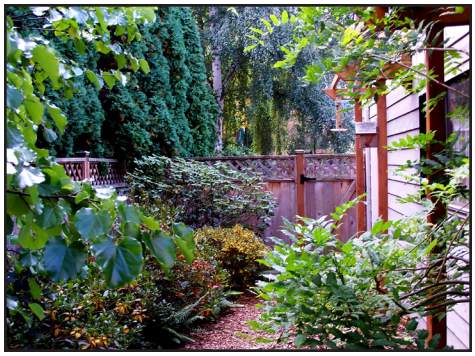

***Figure 9*. A diversity of native and nonnative woody plants, protected with coarse woody mulch.**

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