

Is Genetic Management Important in Urban Landscapes?

Why We Care About Genetics Vol. 12

The choice of plant species for urban landscapes is often guided by urban-design principles including aesthetic appeal, low maintenance, low impact on infrastructures, and minimal allergen production. When native plant species are chosen for urban landscapes — including greenbelts adjacent to roads, small pocket parks, and large urban recreational parks — consideration of the genetic source of the plants is also important.

[urban landscapes have
a potentially large impact
on nearby native plant
populations]

Some genetically based features are common to all plant species. The type of leaf and branching patterns, general size and longevity, and root morphology are some typically common features. However, there are many features that have genetically based diversity within the species. This within-species genetic diversity is the basis for specific varieties for agricultural and horticultural uses. Through selection and breeding, naturally occurring traits that are considered desirable are concentrated and emphasized until they are a fixed feature of that variety. Increasingly, genetic research offers potential solutions to urban forestry issues that meet both urban-design and ecological standards of acceptance.

Because there is such a high proportion of planted versus natural vegetation in urban landscapes (from home gardens to public parks), there is potentially a large

impact on nearby native plant populations. Reasons to make appropriate choices for the genetic source of native plants for urban landscapes include:

Ensuring the plants are well adapted to the planting site. To the extent that there are local adaptations within the plant species for different environmental conditions, choosing an appropriate geographic source will also help to ensure that the plants are well adapted and thus require less maintenance. This principle assumes that the planting situation is still fairly natural — rather than a highly disturbed, transformed environment — or that microclimate is a key factor to the plant's well-being.

Improving and maintaining the health of urban parks. Choosing genetically appropriate sources for the native plant species should improve their resilience to new stresses and increase their sustainability.

Providing continuity with local, neighboring populations of the same plant species. Through pollen (and possibly seed) dispersal, the use of genetically appropriate sources for native plants in urban parks can provide bridges to perhaps otherwise (unnaturally) disjunct plant populations. Consequently, thoughtfully designed urban parks can help to lessen the genetic impacts of ecosystem fragmentation in nearby natural areas.

Avoiding genetic contamination of neighboring native plant populations of the same species. Where there are natural and urban populations of the same species within the distance at which pollen could



National Forest Genetics Laboratory (NFGEL)
Pacific Southwest Research Station
USDA Forest Service
2480 Carson Road
Placerville, CA USA 95667
<http://www.fs.fed.us/psw/programs/nfgel/>



Genetic Resources Conservation Program
University of California
One Shields Avenue
Davis, CA USA 95616
<http://www.grcp.ucdavis.edu>

be dispersed, there is potential for the urban plants to pollinate (depending on the species' breeding system) plants in the natural areas. If the urban plants are chosen from geographic sources that do not reflect local conditions, this interbreeding could undermine the local adaptations and long term viability of natural populations. The California poppy (*Eschscholzia californica*) — the State flower — is a case in point. Genetic studies have revealed considerable differences among its populations in traits that may reflect local adaptation. However, commercially produced packages of poppy seeds are undoubtedly used for public landscaping and home gardens. Such mixes are neither produced nor marketed with local adaptations in mind. Consequently, there could be genetic consequences for native poppy populations when the domestic seeds are planted nearby. In the City of Monterey, CA, local seed collections are made for Monterey pine (*Pinus radiata*) and the resulting seedlings are used in planting projects within the city including pocket parks, larger city parks, and greenbelt areas. These efforts, directed by the City Forester, increase the likelihood that planted seedlings will be well adapted to local conditions, and that pines planted within the city boundaries will be



Photo credits: (left) Suncap, Joseph Dougherty/ecology.org; (center) Suncap, ©2002 Lynn Watson; (above) Joseph O'Brien; (below) William M. Ciesla www.forestryimages.org.

ecologically and genetically consistent with the neighboring native forests. This practice has been expanded, where possible, for California live oak (*Quercus agrifolia*) and Monterey cypress (*Cupressus macrocarpa*).

[choosing genetically appropriate plants... should enhance the sustainability of urban landscapes]

Avoiding problems arising from mistaken identity. Paying attention to the genetic or geographic source of plants in urban planting projects can help to avoid confusion when there are subspecies or even species that are similar in appearance. For example, there are two distinct subspecies of a California native, beach suncup (*Camissonia cheiranthifolia*). They have different natural ranges, but the nonlocal subspecies — *C.c. suffruticosa* — was accidentally introduced in 1982 in a restoration project in Golden Gate National Recreational Area, just north of San Francisco, CA. Since then, there has been hybridization with the native subspecies — *C.c. cheiranthifolia*, and both the hybrids and the nonlocal subspecies are becoming invasive, displacing the natives. Choosing genetically appropriate sources for native plant species can serve to avoid this kind of problem, at least in situations where the look-alike species or subspecies have different natural ranges.

Encouraging continuity in native biodiversity. Increasingly, it is being revealed that many animal species are sensitive to not only the species of plants that they use for food or other purposes, but to specific qualities of certain populations of the plant species. This suggests that some animals are selecting, and perhaps co-adapted with, genetically based features of the plant species — features that vary across the natural range. The most studied examples involve insect species that favor certain plant populations (of the same species) over others. Choosing genetically appropriate sources for native plant species that are grown in urban landscapes, then, would help to preserve these connections between plants and other species. This should enhance the sustainability of both the urban landscapes and the neighboring natural areas. ■

The United States Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at: (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write: USDA Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independent Avenue, SW, Washington, DC 20250-9410, or call: (202) 720-5964 (voice or TDD).



USDA is an equal opportunity provider and employer.
2006

