



DEPARTMENT OF
ECOLOGY
State of Washington

Low Impact Development

Plant Selection and Propagation for LID

May 14, 2013

How to Participate in a Webinar

The image shows a screenshot of a webinar application window. At the top, a blue navigation bar contains a 'RETURN' button with a left-pointing arrow, and three icons: 'Participants' (two people), 'Chat' (speech bubble), and 'Annotate' (pencil). Below the navigation bar, the main content area has a dark grey background with yellow text that reads: 'How Can Nurseries Prepare to Meet the Native Plant Needs of LID?'. Below this text is a photograph of a green plant with small white flowers. Underneath the photo, the text 'Associate Ecologist' and 'Herrera Environmental Consultants' is displayed in white. Two red arrows point from the text labels 'navigation bar' and 'chat feature' to the corresponding elements in the interface. The bottom of the screen shows a Windows taskbar with icons for Internet Explorer, File Explorer, and a media player, along with the system clock showing 12:19 PM on 5/13/2013.

You are viewing: Cascadia Consulting's Application

RETURN

Participants Chat Annotate

Viewing Cascadia Consulting's appli

How Can Nurseries Prepare to Meet the Native Plant Needs of LID?

navigation bar

chat feature

Associate Ecologist
Herrera Environmental Consultants

12:19 PM
5/13/2013

Using Chat

The image shows a presentation slide titled "How Can Nurseries Prepare to Meet the Native Plant Needs of LID?". The slide features a photograph of a plant with small white flowers. A red arrow points from the text "chat window" to the chat window. Another red arrow points from the text "Send to drop down menu" to the "Send to:" dropdown menu in the chat window. The chat window is titled "Chat" and has a "Send" button. The presentation slide also includes the text "Associate Ecologist" and "Herrera Environmental Consult". The Windows taskbar at the bottom shows the time as 12:22 PM on 5/13/2013.

You are viewing: Cascadia Consulting's Application

Viewing Cascadia Consulting's applic...

How Can Nurseries Prepare to Meet the Native Plant Needs of LID?

chat window

chat window

Send to: Cascadi... (Host & Presenter) Send

Send to drop down menu

Associate Ecologist
Herrera Environmental Consult

12:22 PM
5/13/2013

Polling

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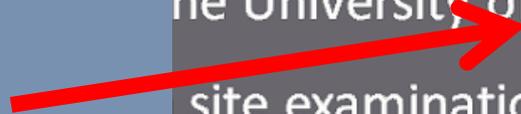
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polling window



Polling [Close]

Remaining time: 4:49 Time limit: 5:00

Poll Questions:

1. are you there?

- a.yes
- b.no

Submit

The poll has ended.

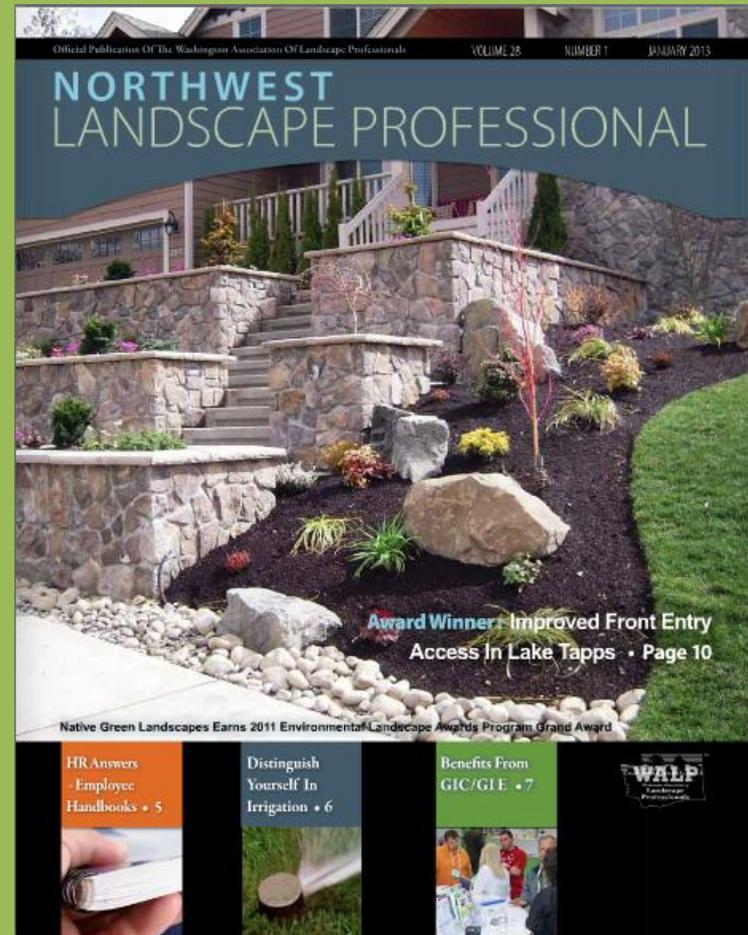
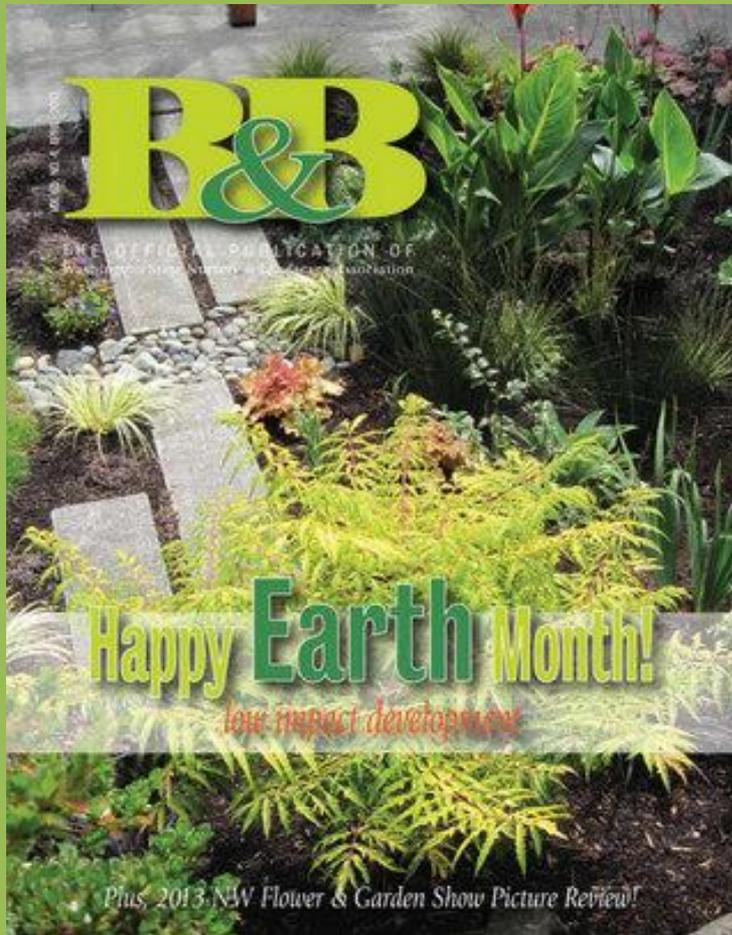


Patty Anderson
Executive Director
www.walp.org



Breanne Chavez
Executive Director
www.wsnla.org

Look for Upcoming Articles In:



Low Impact Development

Introduction



[Thirteen Of Clogs / Eater.com / CC BY-SA](#)

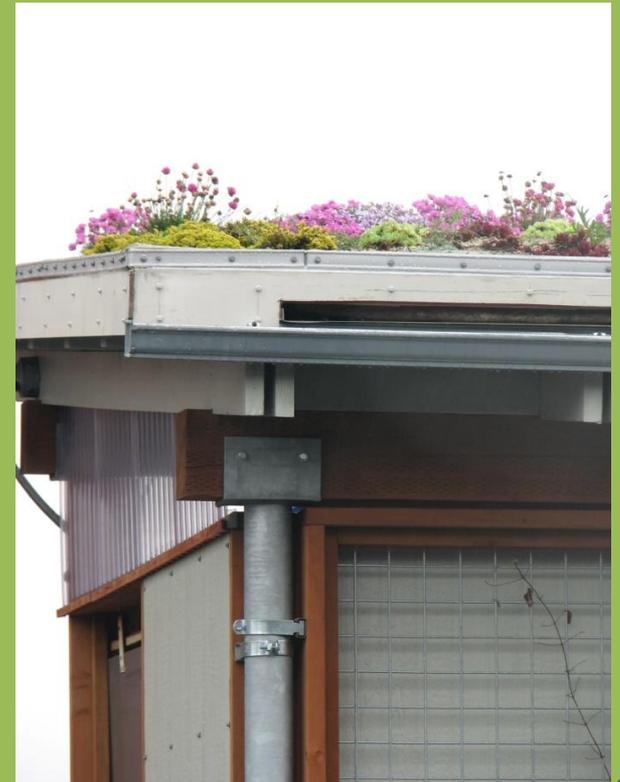


Low Impact Development (LID)

Is a design, planning and engineering approach to managing stormwater runoff

LID includes:

- Rain gardens
- Bioretention
- Permeable pavement / pavers
- Green roofs
- Rain water harvesting
- Green walls



Stormwater Runoff

- **Impervious Surfaces**
 - Roads
 - Roof tops
- **Pollutants**
 - Oil
 - Heavy metals
 - Silts
- **Affected Natural Areas**
 - Wetlands
 - Streams
 - Water bodies



Stormwater Runoff Can Lead To:

- Erosion
- Pollution of Soils and Water Bodies
- Sedimentation to Water Bodies
- Combined Sewage Overflows
- Loss of Wildlife Habitat



LID principles

Conserve

- trees
- plants
- healthy soils

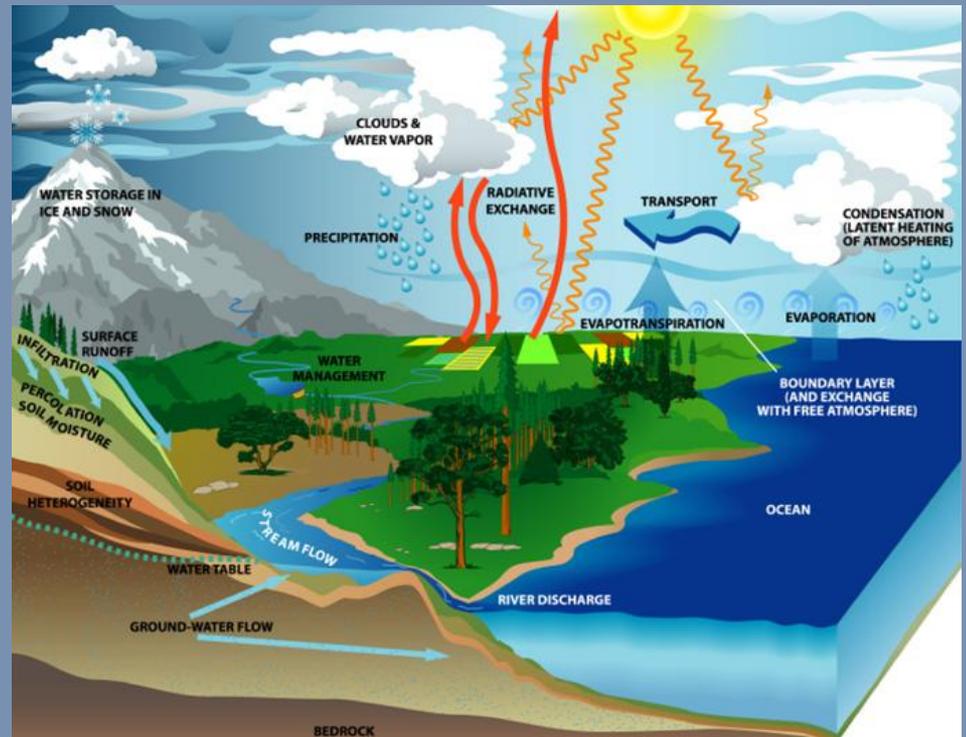
Minimize

- impervious surfaces
- native vegetation loss
- stormwater runoff



Benefits of LID

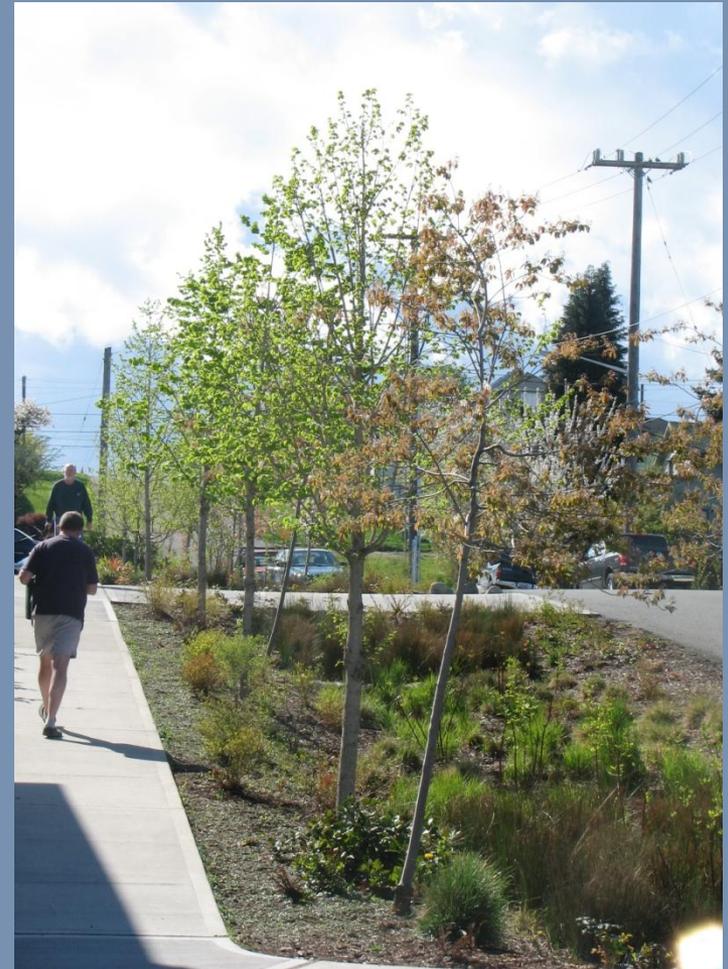
- Reduces and slows stormwater runoff
- Protects water quality
- Restores ecosystem services including:
 - Water infiltration
 - Groundwater recharge
 - Pollution interception and filtration
 - CO2 sequestration
 - Protection of habitat for beneficial wildlife



Hydrologic (water) cycle

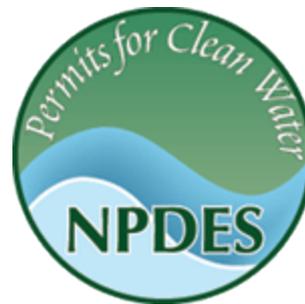
LID Strategies That Use Plants

- Rain Gardens
- Bioretention Facilities
- Green Roofs or Walls
- Some Permeable Pavers



Stormwater is Regulated

- Clean Water Act
- National Pollution Discharge Elimination System (NPDES)
- Washington State Department of Ecology
- Municipal permits



Regulatory Changes are Coming

- Western Washington - LID will be required in new development and re-development
- Eastern Washington - LID allowed
- Timeline depends on population size
 - Earliest: 2015 (Seattle and surrounding cities)
 - Latest: 2018

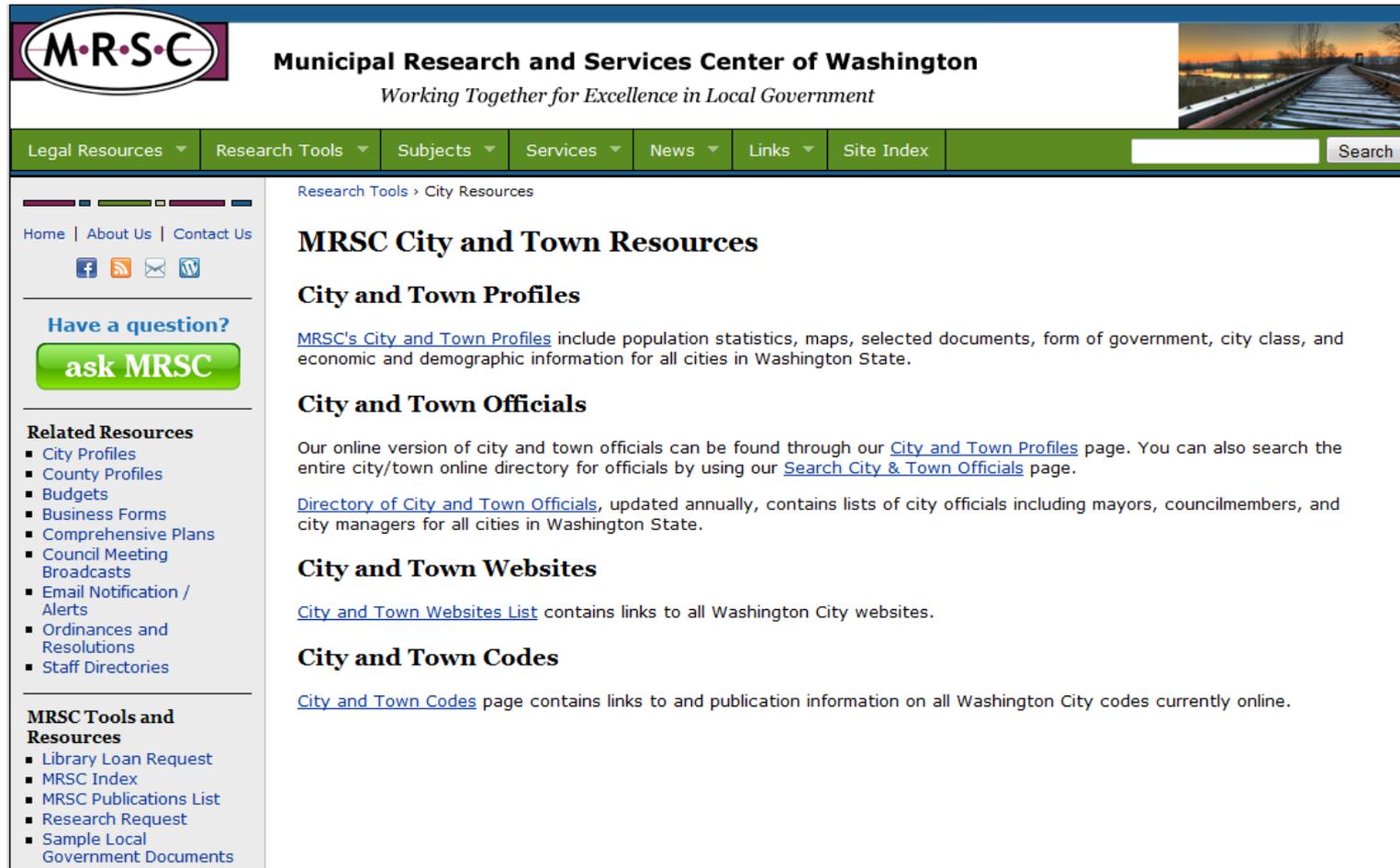


DEPARTMENT OF
ECOLOGY
State of Washington

Give Input

Get in touch with your local officials while regulations are being made:

<http://www.mrsc.org/research/research.aspx>



The screenshot displays the homepage of the Municipal Research and Services Center of Washington (MRSC). The header features the MRSC logo and the tagline "Working Together for Excellence in Local Government". A navigation bar includes links for Legal Resources, Research Tools, Subjects, Services, News, Links, and Site Index, along with a search box. The main content area is titled "MRSC City and Town Resources" and includes sections for City and Town Profiles, City and Town Officials, City and Town Websites, and City and Town Codes. A sidebar on the left provides additional resources and contact information.

M.R.S.C.
Municipal Research and Services Center of Washington
Working Together for Excellence in Local Government

Legal Resources ▾ Research Tools ▾ Subjects ▾ Services ▾ News ▾ Links ▾ Site Index Search

Home | About Us | Contact Us

Have a question?
ask MRSC

Related Resources

- City Profiles
- County Profiles
- Budgets
- Business Forms
- Comprehensive Plans
- Council Meeting Broadcasts
- Email Notification / Alerts
- Ordinances and Resolutions
- Staff Directories

MRSC Tools and Resources

- Library Loan Request
- MRSC Index
- MRSC Publications List
- Research Request
- Sample Local Government Documents

Research Tools > City Resources

MRSC City and Town Resources

City and Town Profiles

MRSC's [City and Town Profiles](#) include population statistics, maps, selected documents, form of government, city class, and economic and demographic information for all cities in Washington State.

City and Town Officials

Our online version of city and town officials can be found through our [City and Town Profiles](#) page. You can also search the entire city/town online directory for officials by using our [Search City & Town Officials](#) page.

[Directory of City and Town Officials](#), updated annually, contains lists of city officials including mayors, councilmembers, and city managers for all cities in Washington State.

City and Town Websites

[City and Town Websites List](#) contains links to all Washington City websites.

City and Town Codes

[City and Town Codes](#) page contains links to and publication information on all Washington City codes currently online.

Peggy Gaynor



<http://www.gaynorinc.com/>



Thornton Creek Water Quality Channel at Northgate



Madrona Park Creek Daylighting and Restoration

Len Ballek



- Ecologist at Herrera
- Co-founder of Bitterroot Restoration
- Forestry Technician with the USDA
- lballek@herrerainc.com

Plants for Low Impact Development

Presented
by:



Peggy Gaynor, FASLA
Principal Landscape
Architect



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Sustainability Acronyms, Trademarks & Terms

What do they all mean?

LID

Green Infrastructure

LEED

Leadership in Energy & Environmental Design

RainWise

Sustainable Sites
Initiative

SITES™

Eco-friendly

Natural Drainage Systems

It's all about WATER

- Protecting natural water bodies – streams, lakes, rivers, aquifers and ultimately Puget Sound
- Managing quantity & quality of urban stormwater runoff
- Conserving water

For Landscape Industry, this means:

- Efficient irrigation systems
- Reduced, temporary or no landscape irrigation
- Less lawn
- More native and drought-tolerant plants
- Onsite drainage treatment features like rain gardens, bioswales & green roofs
- Organic products & integrated pest management instead of chemicals used in landscape maintenance

How do plants contribute to LID

- Absorb, filter, detain and transpire stormwater runoff & rainfall
- Intercept rainfall before it reaches the ground - particularly evergreen trees
- Use of drought-tolerant and native plants reduce need for irrigation & conserve water
- Mitigate urban heat island effect, saving energy (air conditioning) & water (irrigation)

Beijing, China

Latitude: 39°48'N Longitude: 116°28'E Elevation: 54m Station: PC54511



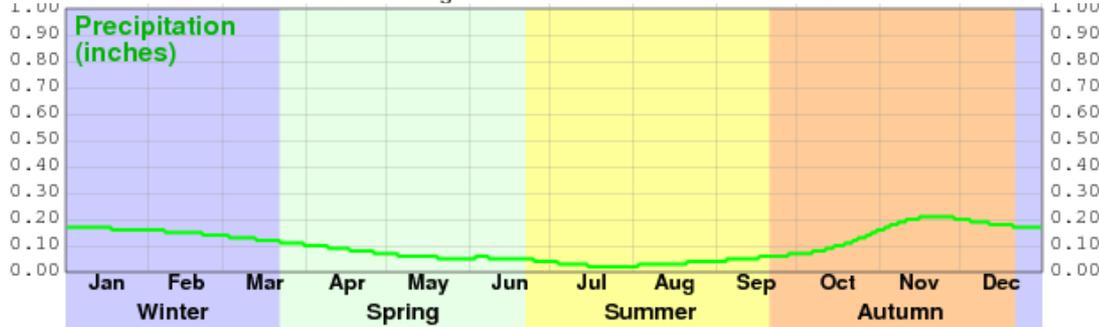
Columbia Univ Of Sc, SC

Latitude: 33°59'00" Longitude: -081°01'00" Elevation: 242' ID: 381944



Seattle Tacoma AP, WA

Latitude: 47°27'41" Longitude: -122°18'49" Elevation: 400' ID: 457473



Graphics from Climate-Charts.com

Precipitation Patterns

To address “why native plants” over ornamentals, compare the annual precipitation charts for Beijing, China, Columbia, South Carolina & Seattle.

Precipitation patterns vary by ecoregion & habitat.

NW China and SE USA – regions which provide many of our ornamental plants – are temperate broadleaf and mixed forest habitats with high – moderate summer rainfall.

Western Washington is a temperate coniferous rain forest. Rainfall here is lowest in summer / highest in fall & winter – the opposite of the other two regions.

What happens after planting ornamentals – from these & other higher summer rainfall regions – in the Pacific NW?

Why Native Plants

- Pacific NW native plants are adapted to our region's unique low summer rainfall precipitation pattern, as well as its overall climate and soils.
- Using NW native plants instead of ornamentals results in reduced need for supplemental watering, fertilization and pest control.
- Conclusion: Water conservation and chemical-free or low maintenance goals are better achieved with natives than ornamentals.

Answer, previous slide: Supplemental summer watering to meet ornamental plant needs!

But our native plants are so limiting!

Au contraire, mes amis! Our region (incl Oregon – N California) offers a much wider array of hardy, attractive plants – from trees to perennial wildflowers – than most realize. And more & more natives are becoming available from local nurseries.



Western Larch
(*Larix occidentalis*)

Subalpine Plant Community Species

Images: google.com sources except Sitka mt ash



Oval-leaf Blueberry
(*Vaccinium ovalifolium*)



Sitka Mountain Ash
(*Sorbus sitchensis*)



Green False Hellebore
(*Veratrum viride*)



Cascade or Coast Penstemon
(*Penstemon serrulatus*)

Increase your knowledge of NW native plants

Learn about Pacific NW plant communities* vs individual plant species

- Research specific native plant communities* – such as Wet Meadow, Riparian or Subalpine – to discover plants well-suited to rain gardens, bioswales or other LID & natural drainage situations
- Or Western Washington Prairie, Oak Savannah or Serpentine Soil plant communities to discover plants well-suited to green roofs and other droughty, poor, thin soil or tough urban situations



Image: google.com source

Western Washington Prairie: Visualize as a green roof?

Camas, Idaho fescue, violets, prairie lupine, grassland saxifrage, checker lily, balsamroot, sea thrift & more

*Plant Community = Plants co-existing in a shared habitat or environment. Similar: Plant Association.

Stock your “library” with native ecosystem and plant resources

A Short List of Resources:

- Natural Vegetation of Oregon and Washington, Franklin and Dyrness
- Natural History of the Pacific Northwest, Arthur Kruckeberg
- Gardening with Native Plants of the Pacific Northwest, Arthur Kruckeberg
- Plants and Animals of the Pacific Northwest, Eugene Kozloff
- Plants of the Pacific Northwest Coast, Pojar & MacKinnon
- A Manual of Native Plant Communities for Urban Areas of the Pacific Northwest, Charles Anderson
http://www.wnps.org/landscaping/herbarium/native_alliance_urban_complete.pdf
- Why Landscape with Native Plants web page by Washington Native Plant Society
http://www.wnps.org/landscaping/landscaping_why.html
- Library, book list web page by Washington Native Plant Society, Columbia Basin Chapter
<http://www.wnps.org/cbasin/library.html>
- Northwest Habitat Institute web page on native habitat types
<http://www.nwhi.org/index/habdescriptions>

Shop for natives at the growing number of local native plant nurseries

- Link to King County listing of native plant nurseries

<http://www.kingcounty.gov/environment/stewardship/nw-yard-and-garden/native-plant-nurseries-washington.aspx>



Serpentine Grassland
w/ California Goldfields
(*Lasthenia californica*)



Siskiyou Buckwheat
(*Eriogonum siskiyouense*)



Siskiyou Fireweed
(*Epilobium siskiyouense*)



Serpentine Dune Habitat
w/ Sedum

Serpentine Soil Plant Communities &
Note that many of these plants originate from
the Siskiyou Mountains in Oregon

Images: google.com sources

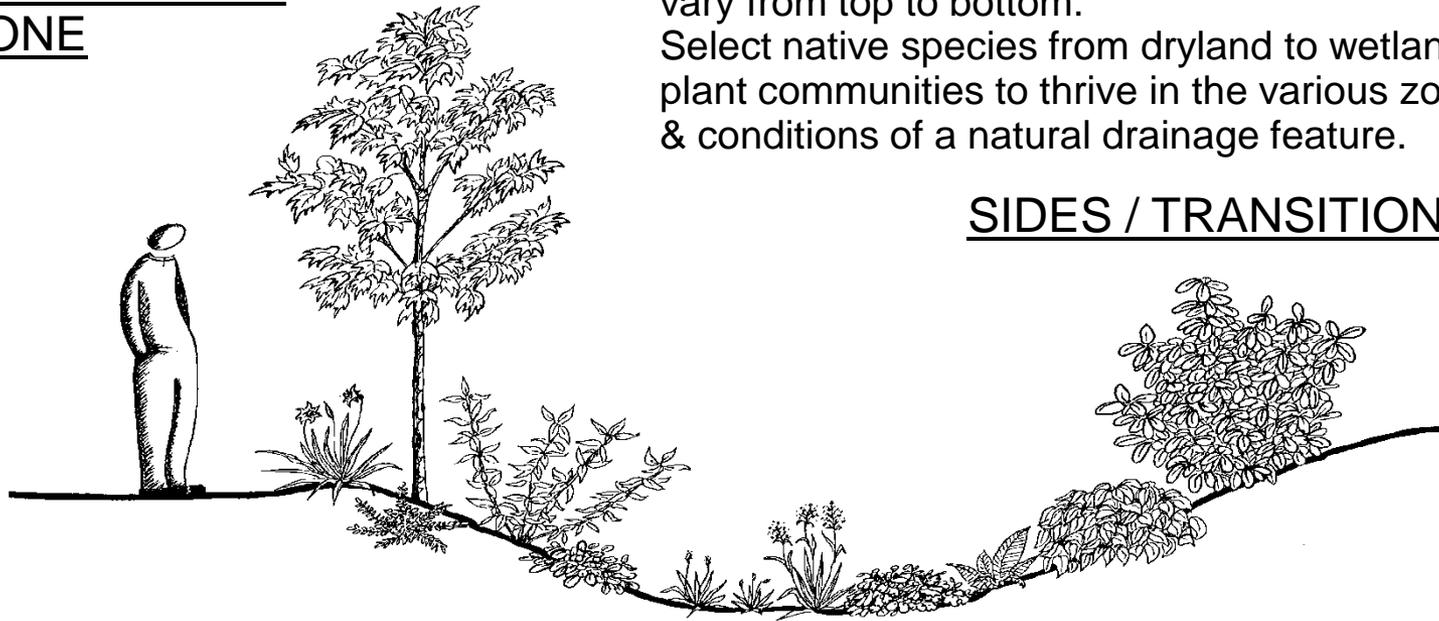
TYPICAL SECTION: RAIN GARDEN OR BIOSWALE

Planting a rain garden or bioswale can be more complex, diverse & interesting from an ecosystem and plant community perspective.

TOP / UPLAND
ZONE

Environmental and hydrologic conditions likely vary from top to bottom.
Select native species from dryland to wetland plant communities to thrive in the various zones & conditions of a natural drainage feature.

SIDES / TRANSITION ZONE



BOTTOM / WETLAND ZONE

Top of slope / Upland zone:

garry oak (*Quercus garryana*)
shrub tan oak (*Lithocarpus densiflorus* v
echinoides)
nodding onion (*Allium cernuum*)
Canada goldenrod (*Solidago canadensis*)

Top or Side slopes / Transition zone:

western azalea (*Rhododendron occidentale*)
western columbine (*Aquilegia formosa*)
nodding onion (*Allium cernuum*)
Oregon iris (*Iris tenax*)
Henderson's checkermallow (*Sidalcea hendersonii*)



Bottom / Wetland zone:

deer fern (*Blechnum spicant*)
fox sedge (*Carex vulpinoidea*)
bog laurel (*Kalmia microphylla*)

Peggy's "In Progress" Rain Garden

Natives from bog, wet meadow, riparian, subalpine, oak savannah & serpentine soil plant communities.
Site Conditions; Sandy, sun – part shade.

Upland plant communities: oak savannah, grassland, dry slopes, serpentine



Image: google.com source

Camas (*Camassia quamash*)



Image: google.com source

Garry Oak (*Quercus garryana*)



Image: google.com source

Shrub Tan Oak (*Lithocarpus densiflorus echinoides*)



Nodding Onion (*Allium cernuum*)



Image: google.com source

Wetland plant communities: bog, forested wetland



Bog Laurel (*Kalmia microphylla v occidentalis*)



Image: google.com source

Bog Rosemary (*Andromeda polifolia*)



Image: google.com source

Labrador Tea (*Ledum groenlandicum*)



Image: google.com source

Deer Fern (*Blechnum spicant*)

Wetland plant communities: forested wetland, riparian, subalpine



Western Azalea (*Rhododendron occidentale*)



Image: google.com source

Subalpine Spirea (*Spiraea splendens* or *densiflora*)



Image: google.com source

California Bay dwarf form (*Umbellularia californica*)



Image: google.com source

Swamp Currant, Black Gooseberry (*Ribes lacustre*)

Wetland plant communities: wet meadow



Henderson's Checkermallow (*Sidalcea hendersonii*)



Oregon Iris (*Iris tenax*)



White Shooting Star w/ Nodding Onion behind
(*Dodecatheon dentatum* w/ *Allium cernuum*)



Fox Sedge (*Carex vulpinoidea*)

Wetland plant communities: wet meadow, emergent wetland



Image: google.com source

Turfted Hairgrass (*Deschampsia cespitosa*)



Image: google.com source

Big-headed Sedge (*Carex pachystachya*)



Image: google.com source

Pacific Silverweed (*Potentilla pacifica*)



Image: google.com source

Daggerleaf Rush (*Juncus ensifolius*)

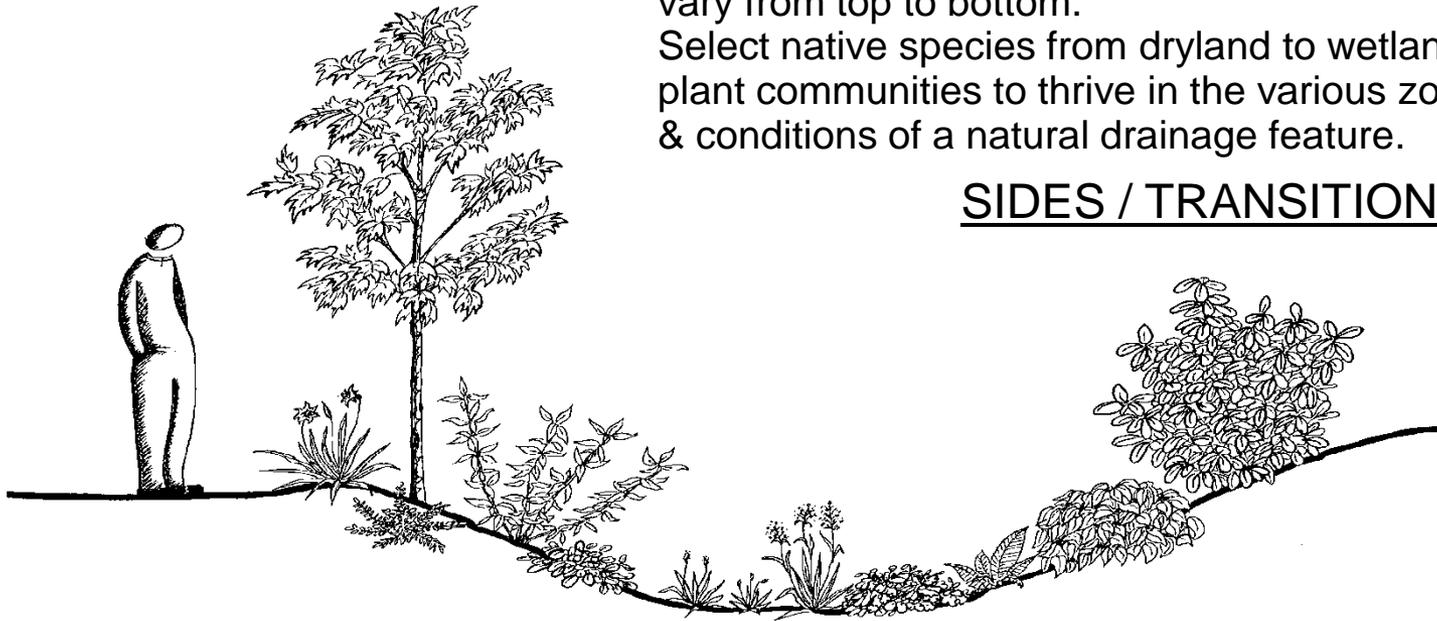
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Select native species from dryland to wetland plant communities to thrive in the various zones & conditions of a natural drainage feature.

SIDES / TRANSITION ZONE



BOTTOM / WETLAND ZONE

PACIFIC NW NATIVE PLANT PALETTE**FOR TYPICAL RAIN GARDEN OR BIOSWALE SECTION**

U = Upland Zone T = Transition Zone W = Wetland Zone

DECIDUOUS TREES

Paper Birch (*Betula papyrifera*) T/W Oregon Ash (*Fraxinus latifolia*) T/W Quaking Aspen (*Populus tremuloides*) T Garry Oak (*Quercus garryana*) U

EVERGREEN TREES (Coniferous & Broadleaf)

Tan Oak (*Lithocarpus densiflorus*) U Douglas fir (*Pseudotsuga menziesii*) U Pacific Yew (*Taxus brevifolia*) U/T Western Hemlock (*Tsuga heterophylla*) T
Shore Pine (*Pinus contorta* v *contorta*) U Canyon Live Oak (*Quercus chrysolepsis*) U Western Red Cedar (*Thuja plicata*) T/W California Bay (*Umbellularia californica*) T/W

DECIDUOUS UNDERSTORY TREES

Vine Maple (*Acer circinatum*) T/W Pacific Dogwood (*Cornus nutallii*) U/T Bitter Cherry (*Prunus emarginata*) T
Douglas' Maple (*Acer glabrum*) U Western Hazelnut (*Corylus cornuta*) U Cascara (*Rhamnus purshiana*) T
Black Hawthorn (*Crataegus douglasii*) T/W Pacific Crab (*Malus fusca*) T/W Red Elderberry (*Sambucus racemosa*) T

BROADLEAF EVERGREEN SHRUBS

Bog Rosemary (*Andromeda polifolia*) W Shrub Tan Oak (*Lithocarpus densiflorus* v *echinoides*) U Huckleberry Oak (*Quercus vacciniifolia*) U
Silk-tassel Bush (*Garrya elliptica*) U Oregon box (*Pachistima myrsinites*) U Pacific Rhododendron (*Rhododendron macrophyllum*) U/T
Labrador Tea (*Ledum groenlandicum*) W Oregon Grape (*Mahonia aquifolium* & cultivars) U Evergreen Huckleberry (*Vaccinium ovatum*) U/T
Bog Laurel (*Kalmia microphyllum*) W Pacific wax myrtle (*Myrica californica*) U/T Dwarf California Bay (*Umbellularia calif. dwarf form*) T

TALL DECIDUOUS SHRUBS (6 – 15+ feet)

Western Serviceberry (*Amelanchier alnifolia*) U/T Western Ninebark (*Physocarpus capitatus*) T/W Nootka Rose (*Rosa nutkana*) T
Redtwig Dogwood (*Cornus sericea*) T/W Red-Flowering Currant (*Ribes sanguineum*) U/T Salmonberry (*Rubus spectabilis*) W
Western Mock Orange (*Philadelphus lewisii*) U/T Baldhip Rose (*Rosa gymnocarpa*) U Sitka Mountain Ash (*Sorbus sitchensis*) U
Twinberry (*Lonicera involucrata*) T/W Peafruit or Wild Clustered Rose (*Rosa pisocarpa*) T/W Highbush Cranberry or Mooseberry (*Viburnum edule*) W

LOW DECIDUOUS SHRUBS (2 – 6 feet)

Swamp Currant (*Ribes lacustre*) W Subalpine Spirea (*Spiraea splendens* or *densiflora*) W Western Azalea (*Rhododendron occidentale*)* U/T
White or Birchleaf Spirea (*Spiraea betulifolia*) U/T Shrubby Cinquefoil (*Potentilla fruticosa*) T/W Snowberry (*Symphoricarpos albus*)* U/T/W
* May get taller in shade

GROUND COVERS

Maidenhair Fern (*Adiantum pedatum*) W Tufted Hairgrass (*Deschampsia cespitosa*) W Creeping Mahonia (*Mahonia repens*) U/T sun
Wild Ginger (*Asarum caudatum*) U/T Strawberry (*Fragaria species*) U/T False Lily-of-the-valley (*Maianthemum dilatatum*) T/W
Kinnikinnik (*Arctostaphylos uva-ursi*) U Salal (*Gaultheria shallon*) U/T Sword Fern (*Polystichum munitum*) U/T
Lady Fern (*Athyrium filix-femina*) W Twinflower (*Linnaea borealis* ssp *longiflora*) U/T Western Starflower (*Trientalis latifolia*) U/T
Deer Fern (*Blechnum spicant*) W Long-leaved Mahonia (*Mahonia nervosa*) U/T shade Inside-out Flower (*Vancouveria hexandra*) U/T

PERENNIALS

Western columbine (*Aquilegia formosa*) T/W Shooting Star (*Dodecatheon dentatum, hendersonii*) T/W Henderson's Checkermallow (*Sidalcea hendersonii*) T/W
Nodding Onion (*Allium cernuum*) U/T Showy Fleabane (*Erigeron speciosus*) U Blue-eyed Grass (*Sisyrinchium idahoensis*) T/W
Pearly Everlasting (*Anaphalis margaritacea*) U Tiger Lily (*Lilium columbianum*) U/T Yellow-eyed Grass (*Sisyrinchium californicum*) T/W
Sea Pink or Thrift (*Armeria maritima*) U/T Barrett's Penstemon (*Penstemon barrettiae*) U False Solomon's Seal (*Smilacena racemosa, stellata*) T
Goatsbeard (*Aruncus sylvester*) U Cascade Penstemon (*Penstemon serrulatus*) T/W Fringecup (*Tellima grandiflora*) T/W
Bunchberry (*Cornus unalaschensis*) U/T Douglas' Iris (*Iris douglasiana*) U/T Youth-on-age (*Tolmiea menziesii*) T/W
Camas (*Camassia quamash*) U/T/W Oregon Iris (*Iris tenax*) U/T Trillium (*Trillium ovatum*) U/T

WETLAND EMERGENTS

Big-headed sedge (*Carex pachystachya*) T/W Slough Sedge (*Carex obnupta*) W Pointed Rush (*Juncus oxymeris*) W
Dewey's Sedge (*Carex deweyana*) W Sawbeak Sedge (*Carex stipata*) W Pacific Silverweed (*Potentilla pacifica*) W
Fox Sedge (*Carex vulpinoidea*) W Daggerleaf Rush (*Juncus ensifolius*) W Small-fruited bulrush (*Scirpus microcarpus*) W



FIN

How Can Nurseries Prepare to Meet the Native Plant Needs of LID?



Associate Ecologist

Herrera Environmental Consultants

Len Ballek

- Greenhouse nursery work through High School and College
- B.S. in Forest Resource Management and Restoration Ecology Certificate from the University of Idaho
- Sixteen years with USFS in site examinations, habitat typing/native plant ID, reforestation surveys
- Bitterroot Restoration 1987-2006 nursery production of native plants and restoration services
- Herrera Environmental Consultants 2006-Present- native plant restoration planning, oversight and training

Personal Interests in Nursery Production and Native Plants



Presentation Outline

- **Natives vs. Non Natives**
- **Importance of Seed Sources**
- **Challenges in Growing Native Plants**
- **Types of Plant Stock**
- **Additional Resources**
- **Wider Variety of Natives**
- **Final Thoughts**

Natives vs. Non Natives



Why Use Natives

- Preserve our natural heritage for future generations
- Provide appropriate habitat for birds wildlife and native pollinators
- Native plants are becoming more popular with homeowners
- Native plants are recommended for LID applications by regulators



Why Move Away From Non-Natives?

- Non-natives generally require intensive input of fertilizer, pesticides and maintenance
- Non-natives are not adapted to harsh conditions such as periodic drought and/or inundation
- Can become invasive because of lack of natural controls
- Non-natives result in loss of habitat and bio-diversity



ENVIRONMENTAL AND ECONOMIC COSTS ASSOCIATED WITH NON-INDIGENOUS SPECIES IN THE UNITED STATES

David Pimentel, Lori Lach, Rodolfo Zuniga, and Doug Morrison
College of Agriculture and Life Sciences
Cornell University
Ithaca, NY 14850-0901
June 12, 1999

“Invading non-indigenous species in the United States cause major environmental damages and losses adding up to more than \$138 billion per year. There are approximately 50,000 foreign species and the number is increasing. About 42% of the species on the Threatened or Endangered species lists are at risk primarily because of non-indigenous species”

Importance of Seed Sources

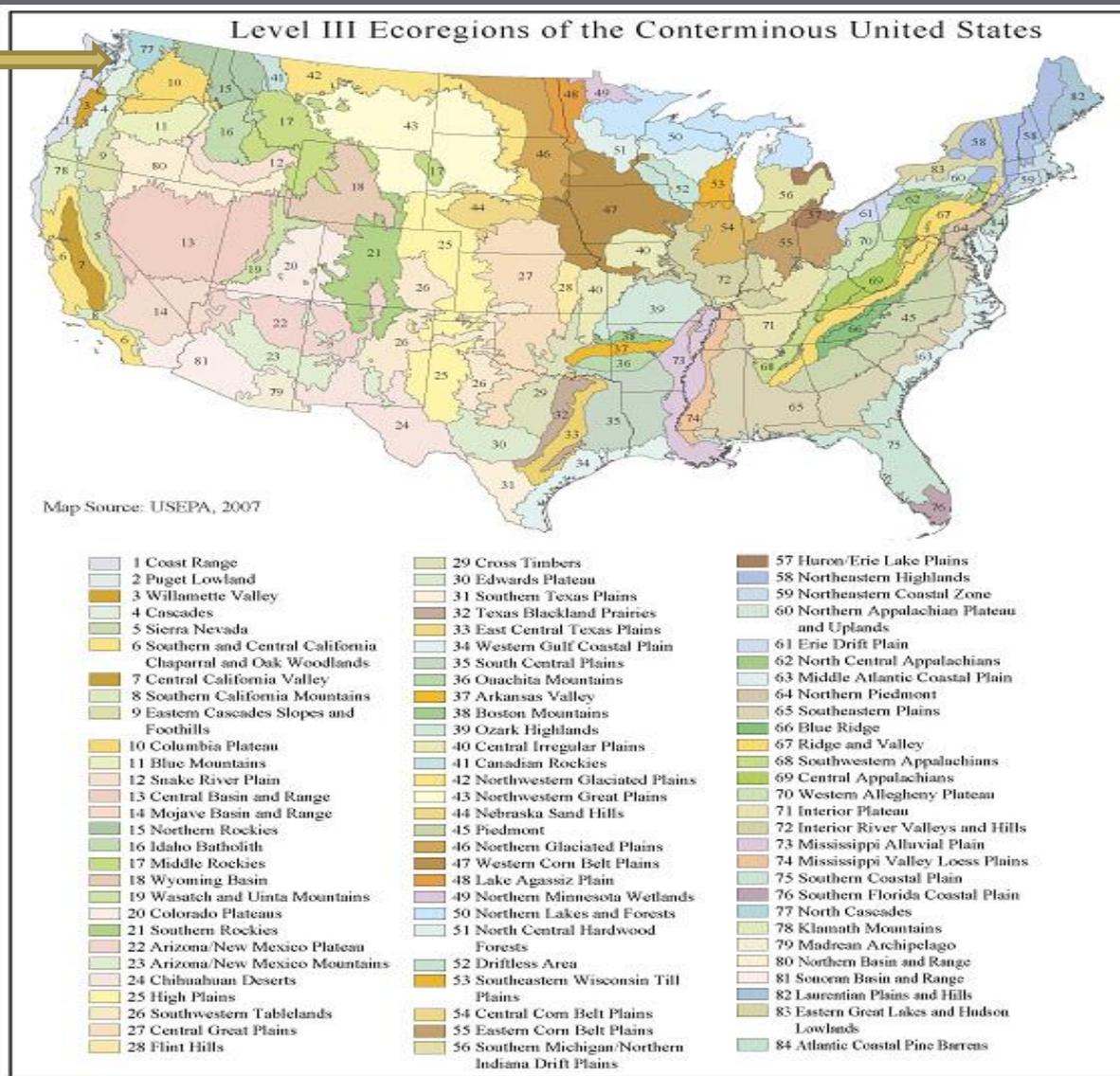
- Growing cycles tied to local climate
- Natural resistance to local insects and disease
- Habitat and food in the critical seasons
- Prevent contamination of local gene pool



Choosing Appropriate Seed Sources

EPA Ecoregions Map

2. Puget Lowland



Challenges in Growing Native Plants



Germination of Native Plant Seeds

- Native plants are not like tomatoes !!
- Each species has it's own requirements
- Some hard seeded species
- Light dependent species
- Seed stratification



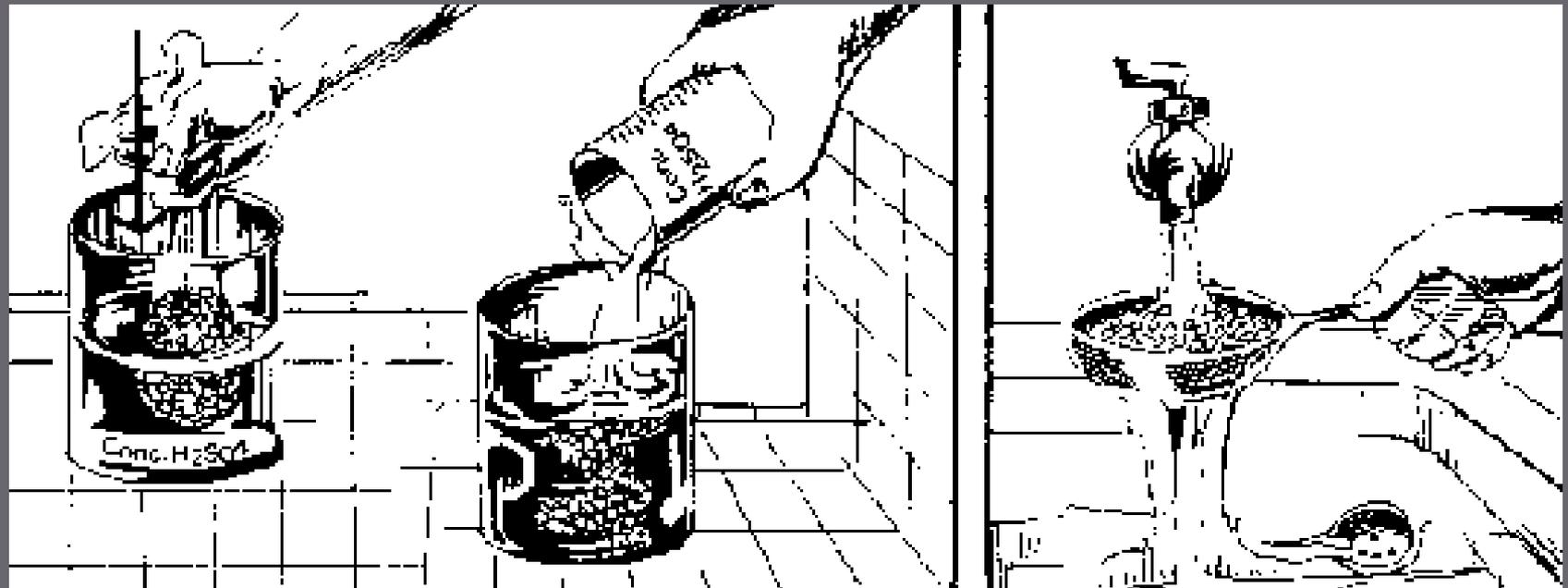
Nootka Rose Seed Cold Stratification



Seed Scarification With Rock Tumbler



Acid Scarification of Seeds



Examples of Seed Germination Requirements

- birch- requires light for germination- no stratification
- red osier dogwood- cold stratification 90 days
- Nootka rose – cold stratification 90 days
- snowberry- acid scarification- warm stratification 30-60 days- cold stratification 120-180 days

Data from "Seeds of Woody Plants in North America" Young, Dioscorides Press



Challenges in Cultivating Native Plants

- Widely differing water usage
- Day length issues
- Dependence upon soil microorganisms
- Disease problems from growing in moist environments



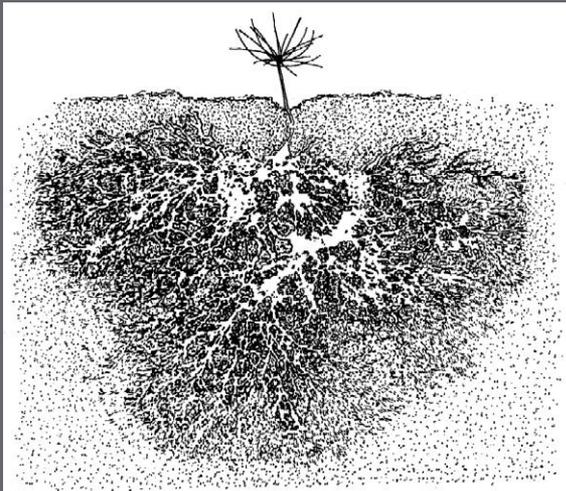
Differing Irrigation Needs

- Use well drained media for dryland species
- Group according to common water needs
- Shields to prevent overwatering edges
- Programmable irrigation booms
- Hand water small lots

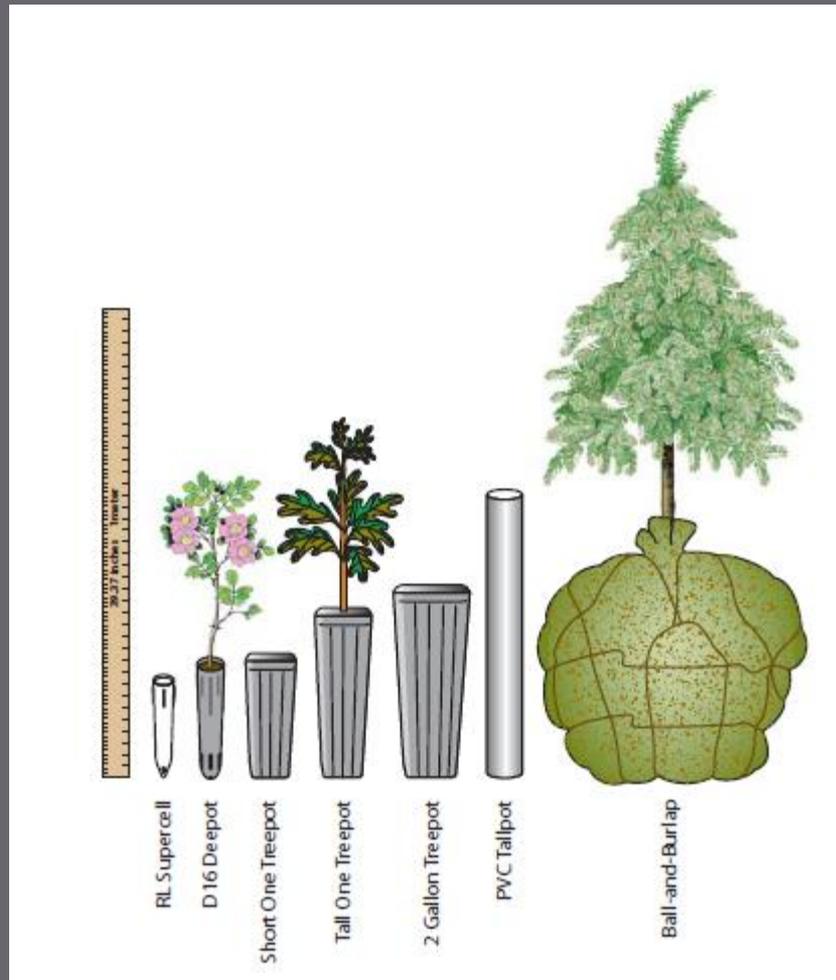


Beneficial Soil Microorganisms

- Mycorrhizal fungi (most native plants)
- Rhizobium (legumes)
- Frankia (birch, alder)
- Other organisms



Types of Plant Stock



Traditional Nursery Containers

- Widely available
- Problems with root spiraling
- Poor root to shoot ratio
- Shallow depth of container



Tubelings

- Less expensive than traditional containers
- More expensive than bare root
- Better survival than both
- Smaller initial top but rapid growth and establishment.



Container Grown Wetland Plants



- Grown in small inexpensive containers
- Install large numbers quickly
- Excellent survival if proper hydrology exists
- Plant when actively growing

Plant Stock - Bare Root

- Relatively inexpensive
- Easy to install
- No problems with root Spiraling
 - Require consistent moisture
 - Careful plant handling is critical
 - Limited season of availability and installation



Plant Stock - Cuttings

- **Advantages:**
 - Low cost
- **Constraints:**
 - Restricted collection and planting period
 - Storage time is limited
 - Labor intensive
 - Limited species
 - Low survival



Ball and Burlap

- Immediate visual impact
- Difficult to work with
- Expensive
- Some poor survival



Root Control Bags

- Immediate visual impact
- Easy to work with
- Less expensive than B&B
- Better survival than B&B



Plants for Green Roofs

- Sedums are the most common species because they can live in a lightweight shallow growing medium
- Can be grown as plants or mats
- Future designs may include other types of plants



Additional Resources and Skills for native plant production

- Seed storage and treatment facilities
- Effective seed source tracking system
- Programmable photoperiod light system
- Efficient and flexible irrigation system
- Automatic and programmable vent system
- Trained seed treatment staff
- Training in the use of inoculums for beneficial soil microorganisms
- Integrated pest management training

Photoperiod Lights



Traveling Boom Irrigation System



Venting Systems To Control Humidity



Wider Variety of Native Plants

- Suggested additional shrubs

- Kinnikinnik (*Arctostaphylos uva-ursi*)
- Oregon box (*Pachystima myrsinites*)
- Twin flower (*Linnaea borealis*)
- Labrador tea (*Ledum groenlandicum*)
- Mt. Balm (*Ceanothus velutinus*)
- Tree tea (*Ceanothus sanguineus*)
- Scoulers willow (*Salix scouleriana*)
- Mtn. Ash (*Sorbus scopulina*)
- Red elderberry (*Sambucus racemosa*)
- Blue elderberry (*Sambucus cerulea*)



- Suggested additional herbaceous perennials

- False Solomon's seal (*Smilacina racemosa*)
- Twisted Stock (*Streptopus amplexifolius*)
- Western trillium (*Trillium ovatum*)
- Bunchberry dogwood (*Cornus Canadensis*)
- Bedstraw (*Galium triflorum*)
- Twin flower (*Linnaea borealis*)
- Shooting star (*Dodecatheon hendersonii*)
- Purple monkey flower (*Mimulus lewisii*)

- Suggested additional emergent plants

- Chairmaker's bulrush (*Schoenoplectus americanus*)
- Hardstem bulrush (*Schoenoplectus acutus*)

Final Thoughts

- Regulations requiring native plants- increase the demand
- Green minded people using natives
- Climate change and water shortages
- Production of native plants will differentiate you from your competitors!



Arctostaphylos uva-ursi



kinnikinnick

Sambucus cerulea



blue elderberry



*Schoenoplectus
americanus*

chairmaker's bulrush

Nelson DeBarros @ USDA-NRCS PLANTS Database

© Nelson DeBarros

Mimulus lewisii



purple monkey-flower

Sorbus scopulina



Mountain Ash

Natives are Beautiful!!!















GLENCOE ELEMENTARY
RAINGARDEN
#NA691

Contact information

Len Ballek

Associate Scientist

Herrera Environmental Consultants

101 East Broadway, Suite 610

Missoula, MT 58802

406-721-4204 ext 1

lballek@herrerainc.com





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