Climate Smart Plants

Mason Bowles, PWS, Senior Ecologist

UW Botanical Symposium
March 5, 2025

King County


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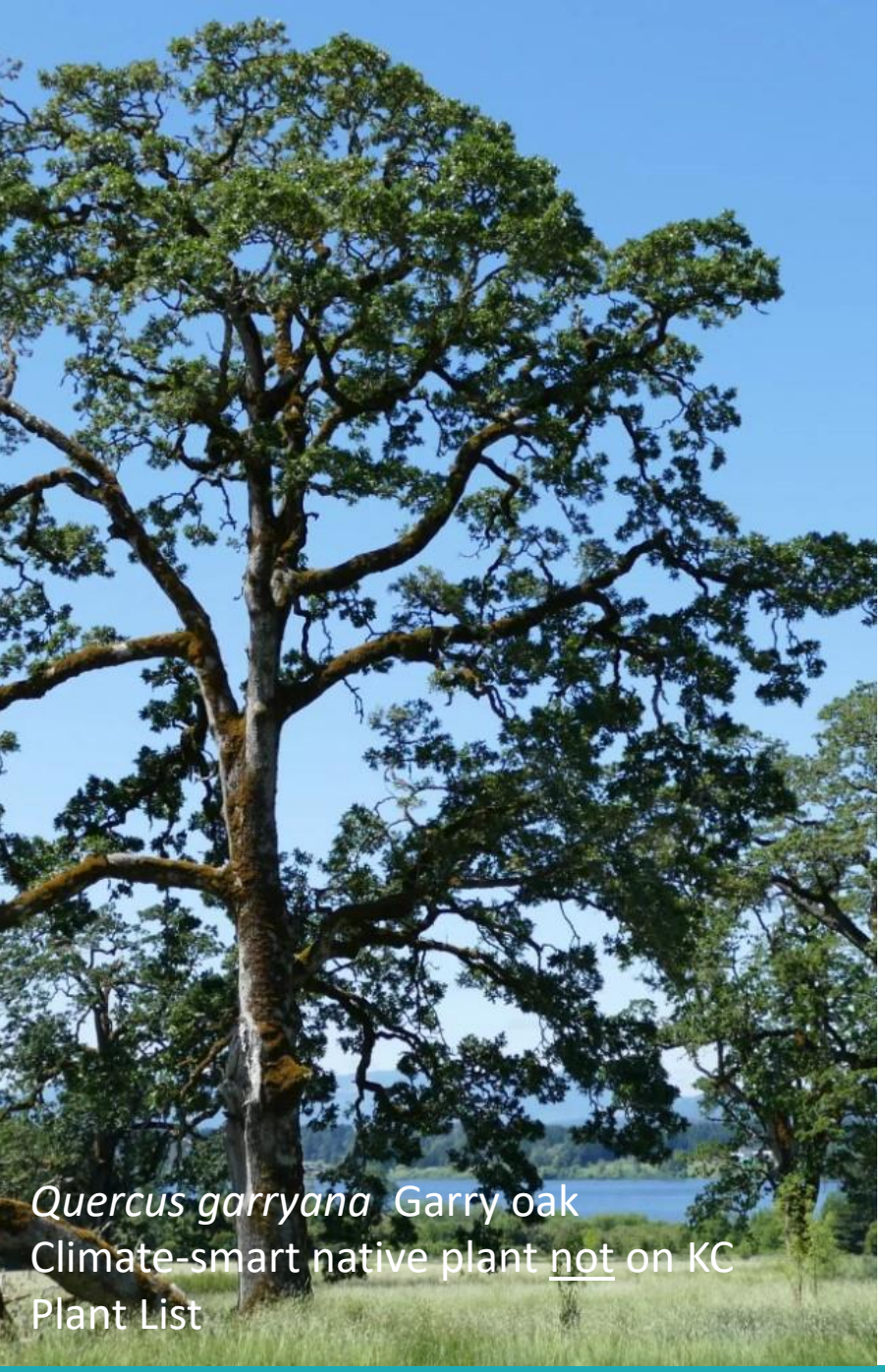


Quercus garryana Garry oak
Climate-smart native plant not on KC Plant List

Climate Smart Plant Team

King County

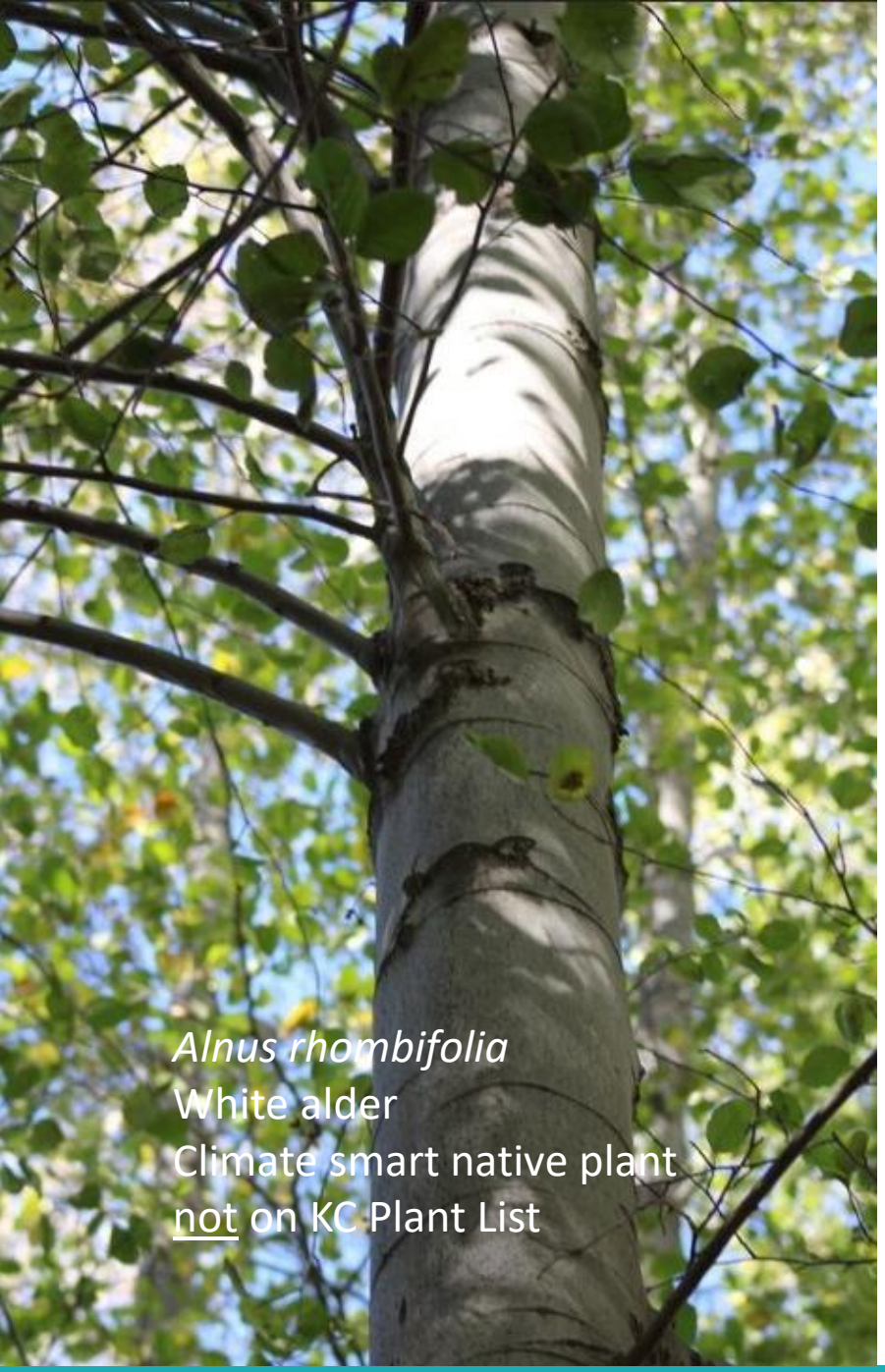
- Mason Bowles, PWS, Restoration Ecologist
- Dan Sorenson, Invasive Plant Ecologist
- Rahel Stampfer, Policy and Communications
- Brian Lund, Restoration Ecologist

Consultants

- Sarah Cooke, PhD, Cooke Scientific
- Hardwick Research

Purpose

Identify native plant species that are found in the Puget Trough region and that have a high probability of survival under projected climate change scenarios.



Objectives

- Regulatory - update the King County wetland and riparian mitigation plant list.
- Educational - Assist resource managers, homeowners, and nurseries with identifying these climate smart plants to address the intergenerational lag of tree succession.

Best Available Science Review

- ✓ Review literature on ‘climate smart conservation’ science to update ‘official’ native plant list
- ✓ Perform a peer review to survey scientists, landscape designers, nurseries
- Develop recommendations and guidelines for climate smart plants

2024 Best Available Science

Review King County wetland and riparian mitigation native plant list omits many currently accepted natives.

Scientific Name	Common Name	Links	Notes on added species
Achlys triphylla	Vanilla Leaf	https://calscape.org/Achlys-triphylla-	Common, should have been on KC list
Allium cernuum	Nodding Onion	https://burkeherbarium.org/imagecollect	Common, should have been on KC list
Armeria maritima	Sea Thrift	https://calscape.org/Armeria-maritima-	Common, should have been on KC list
Aruncus dioicus	Goats Beard	https://calscape.org/Aruncus-dioicus-var.-	Common, should have been on KC list
Berberis repens	Trailing Oregon Grape	https://calscape.org/Berberis-aquifolium-	Common, should have been on KC list

2024 Best Available Science

The “New Normal”

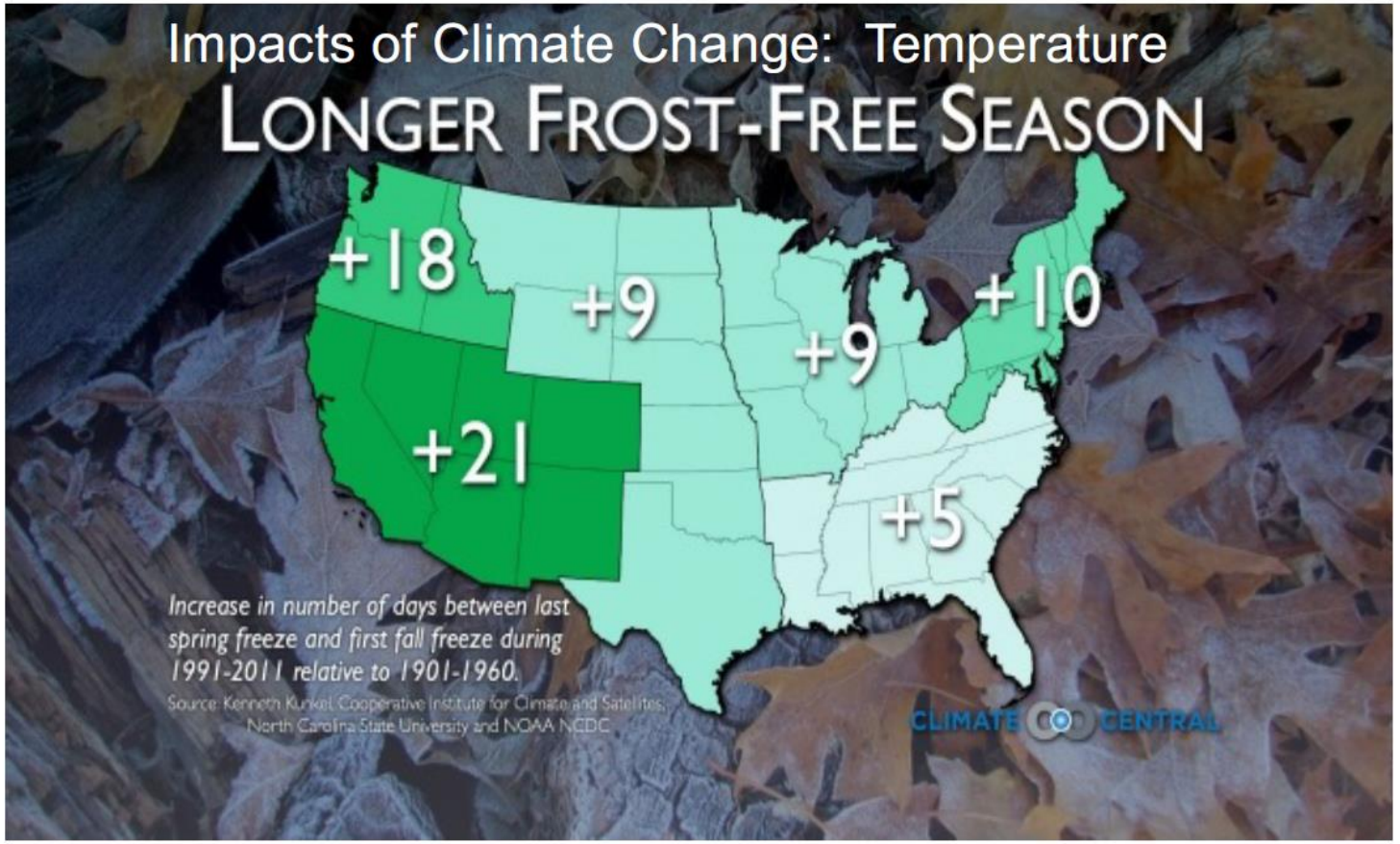
1. Rising temperatures (2-3F increase since 1990)
   - Warmer winters, earlier springs
   - Long growing season
   - More extremely hot days, fewer cool nights
2. Changing hydrology
   - Less snow, more rain in winter
   - Less rain in summer
3. Changes to soils
   - Reduced summer soil moisture
   - Loss of soil carbon (oxidation)

2024 Best Available Science

The “New Normal”

3. Changes to Plant Communities
   - Rapid migration of invasive plant and invertebrate spp.
   - Slow migration of native plant spp.
   - Die-offs of native plant spp., e.g.: Western redcedar, Western hemlock, Big-leaf maple, Oregon ash

2024 Best Available Science



- Fewer cold nights for perennials that need chilling
- Warmer winter can lead to domino effect on interactions

Dr. Sara Via, svia@umd.edu

2024 Best Available Science

Warmer winters favor invasives

- better overwinter survival
- earlier flowering time

- competitive advantage over natives by taking space, water & nutrients

Willis CG, et al. (2010) Favorable Climate Change Response Explains Non-Native Species' Success in Thoreau's Woods. PLoS ONE 5(1): e8878. doi:10.1371/journal.pone.0008878

Dr. Sara Via, svia@umd.edu

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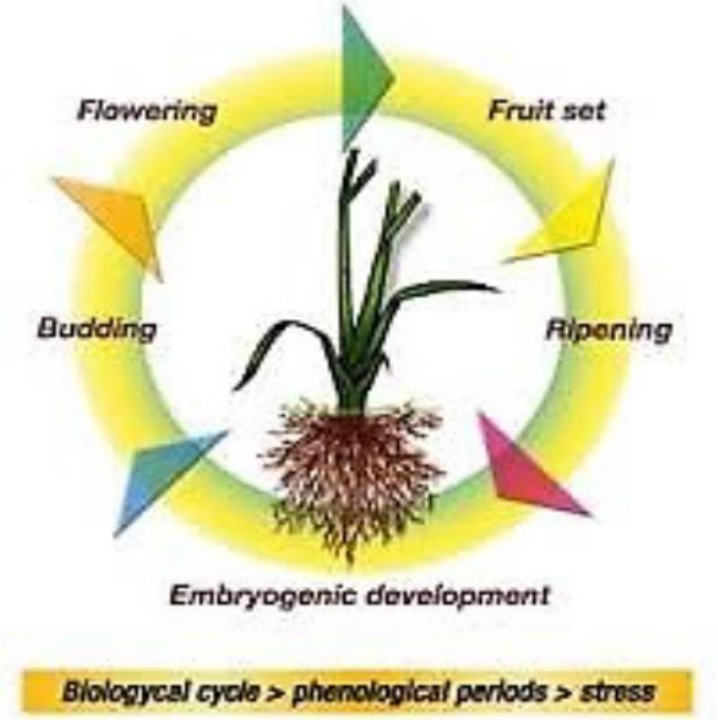
Heat stress from rising temperatures:

- reduces growth rate
  (less photosynthesis)
- increases water loss
- can impact every stage



very hard on forest trees
- reduced growth
- stress
- large trees die first

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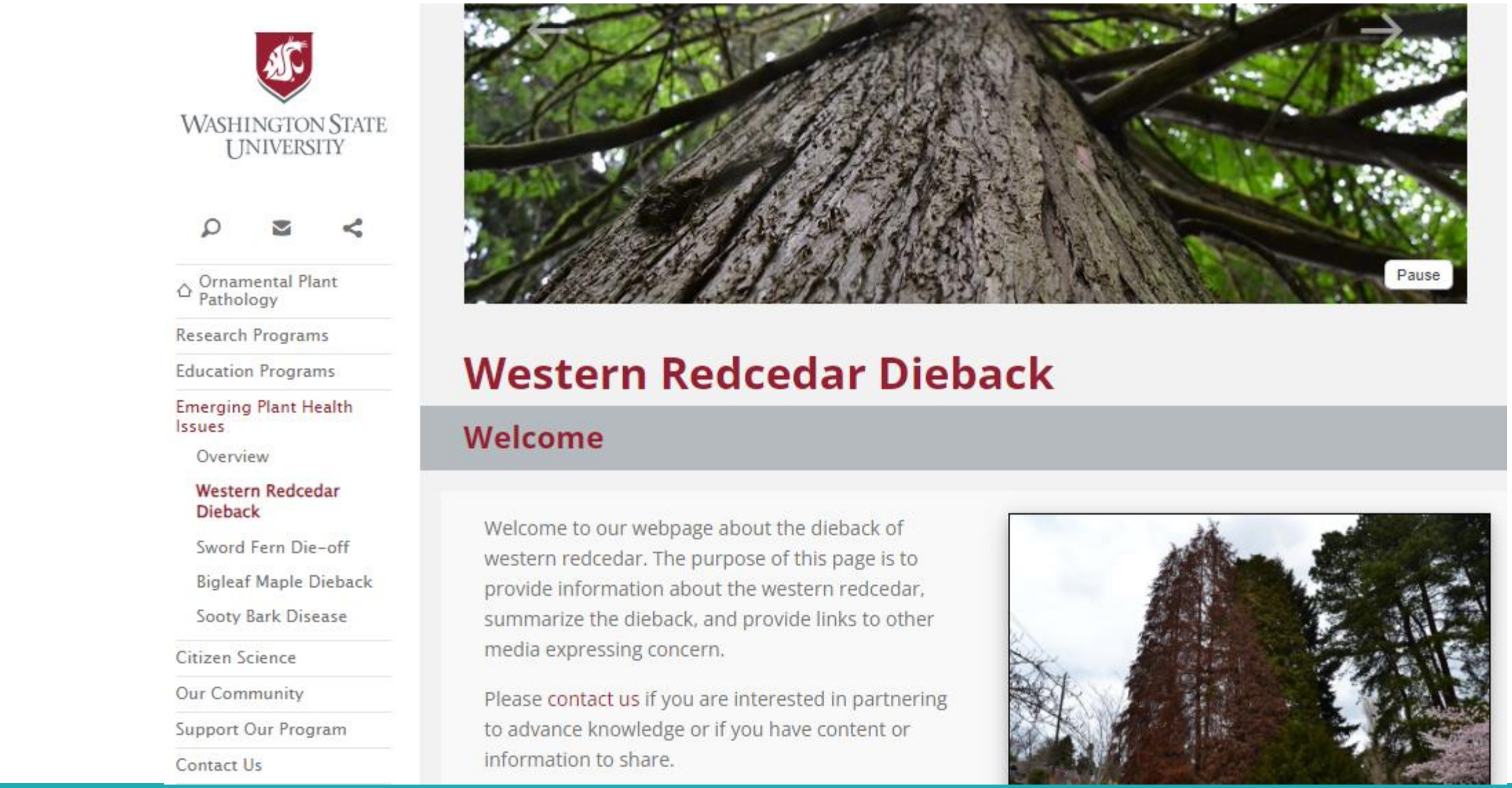

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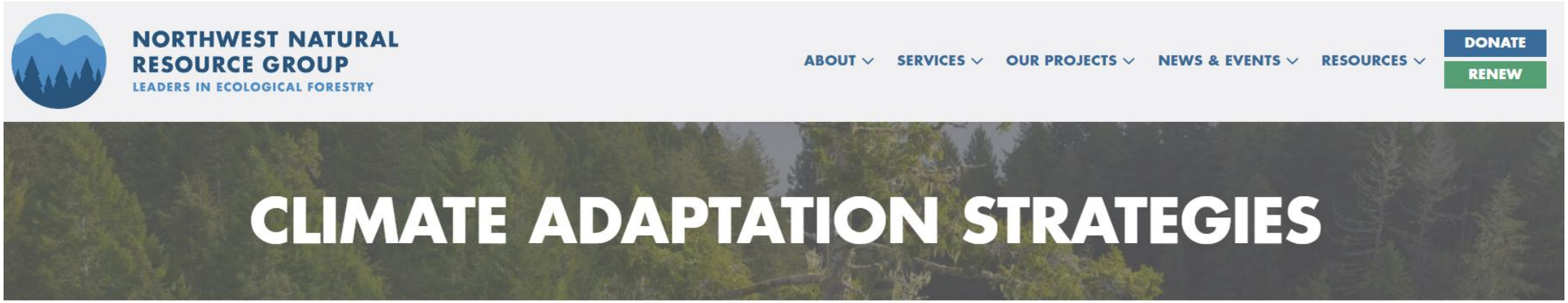
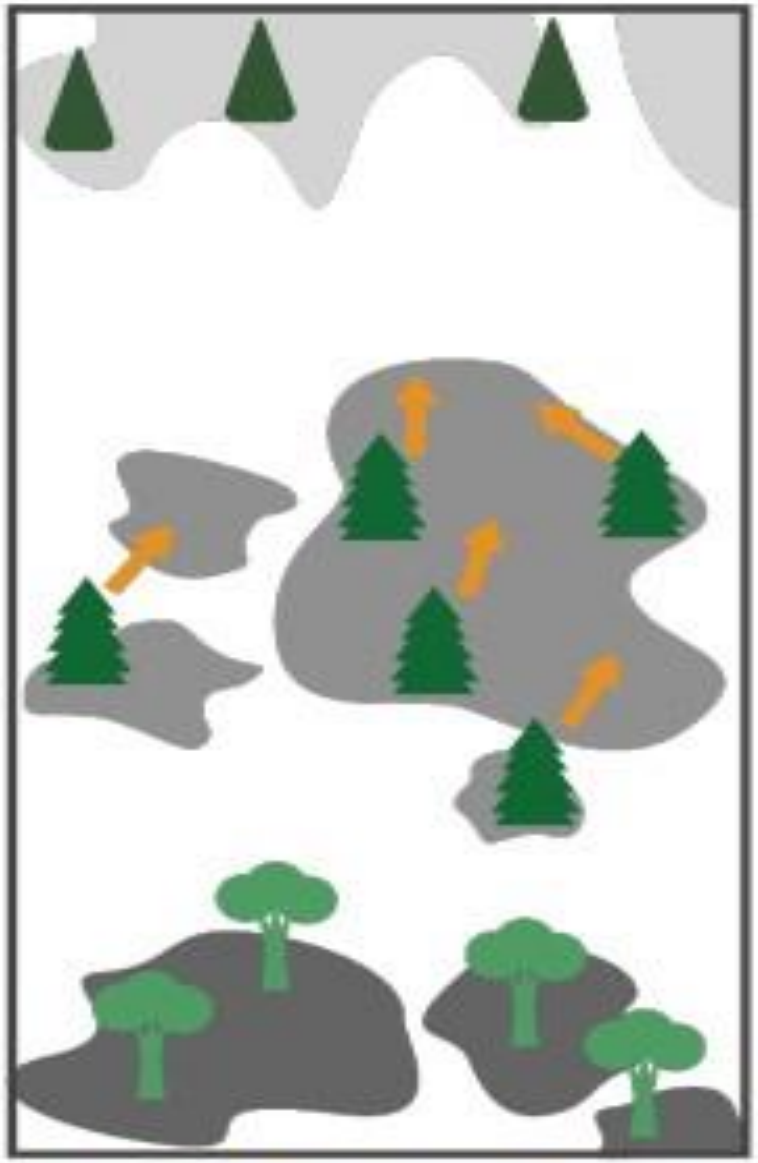


CLIMATE CHANGE POSES SIGNIFICANT CHALLENGES FOR FOREST OWNERS IN THE NORTHWEST

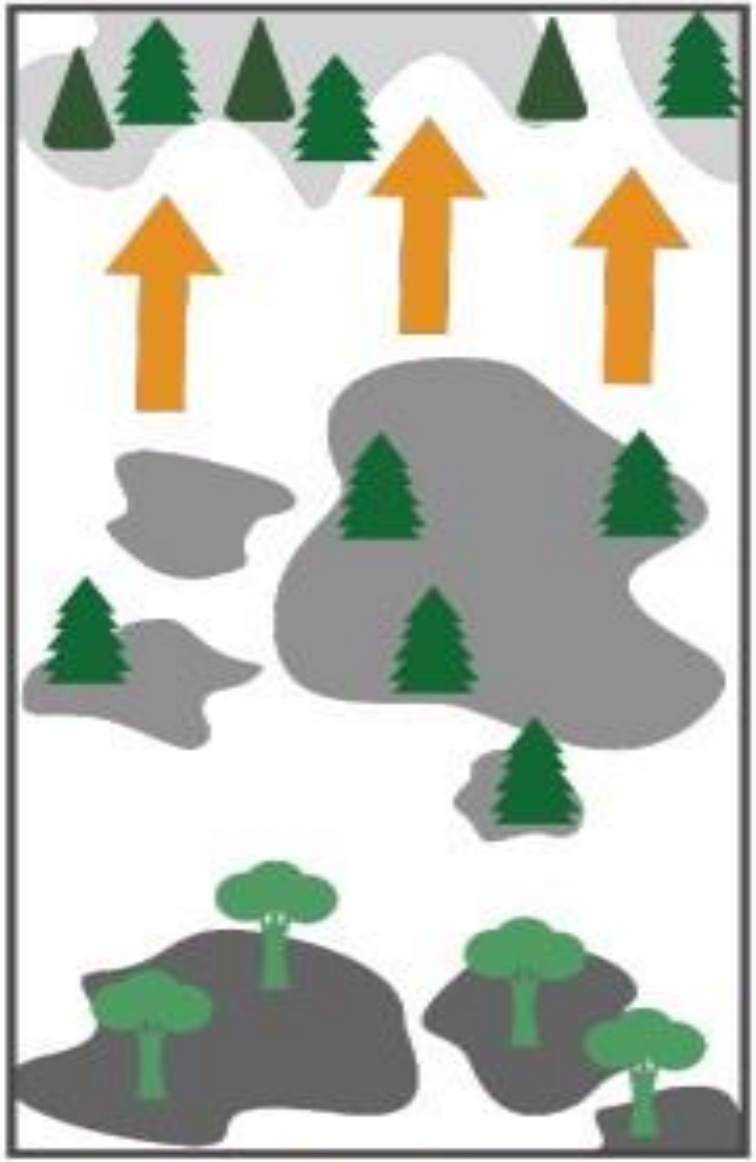
Recent analyses indicate that western Oregon and Washington will likely experience warmer temperatures, higher winter precipitation, reduced snowpack, and less precipitation in summer months. This means changes to the core conditions in which current forests thrive, heightened stress on fish and wildlife, and increased risks from insects, disease, and wildfire.

NNRG has developed a suite of resources for foresters and land managers to use in planning for the future of their forests. See below for video presentations, a guide, and other resources as part of this grant-funded project.

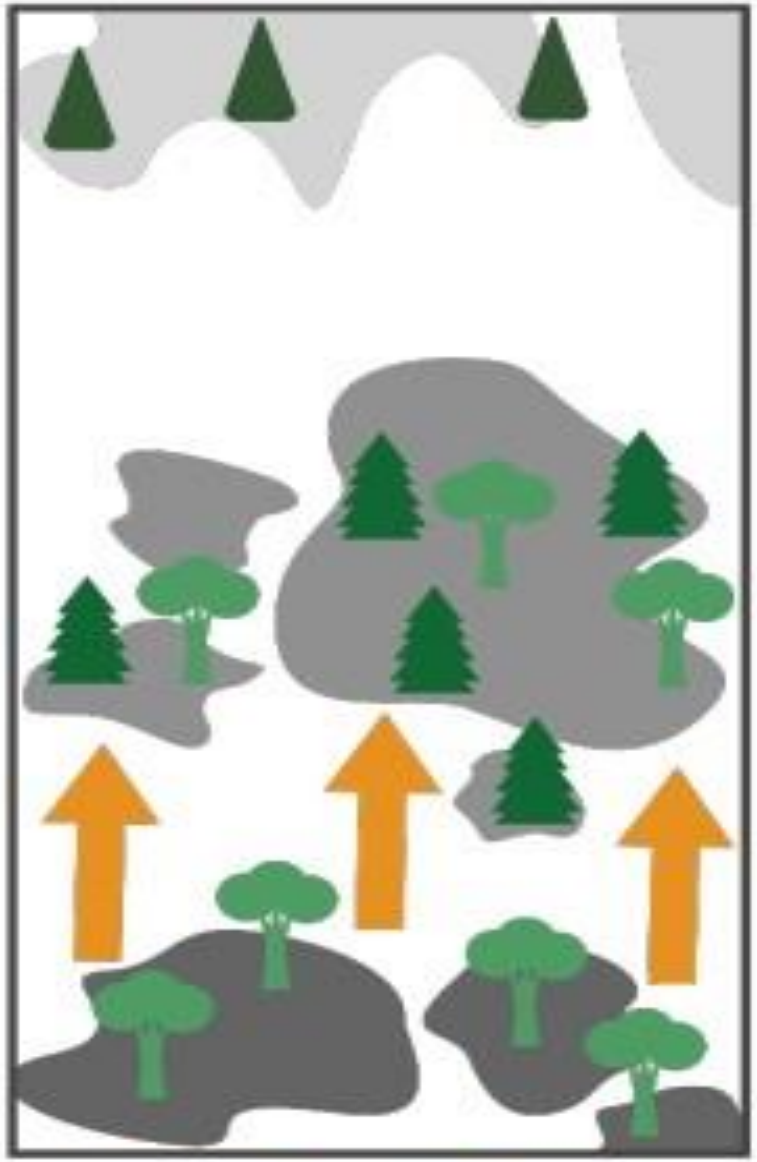
For a look at our ongoing climate research projects for planting trials, snow monitoring, and longer stand rotations, please click the links below.



Assisted Population Migration



Assisted Range Migration



Assisted Seed Migration

Handler, S.; Pike, C.; St. Clair, B.; 2018. Assisted Migration. USDA Forest Service

2024 Best Available Science

USGS science for a changing world

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CLIMATE ADAPTATION SCIENCE CENTERS | SCIENCE

Identifying Climate-Smart Native Plants to Support Ecosystem Resilience in the Northeast

ACTIVE

By Climate Adaptation Science Centers December 31, 2022

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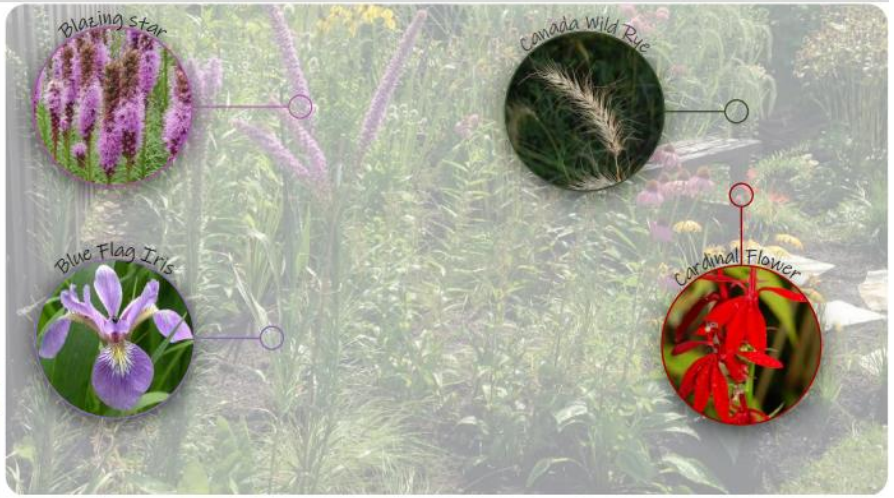
Gardening with climate-smart native plants in the Northeast

Northeast RISCC Management — Regional Invasive Species & Climate Change

UMass Extension NECASC NYISRI



Definitions

USDA Plant Hardiness Zone: Zones based on minimum temperature that are used to determine where plants can grow.

Non-native: A species unlikely to have arrived without human assistance.

Invasive: A species that is established and spreading with negative impacts to native species and ecosystems.

Climate-smart gardening: Planting for present and future conditions using native species adapted to both current and future hardiness zones.

Learn more about invasive species & climate change at:
risccnetwork.org

https://doi.org/10.7275/mvej-dr35

Sources

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Ten Tough New Native Shrub Alternatives for Barberry and Burning Bush. J. Lubell
USDA 2012 Plant Hardiness Zones Map. USDA-ARS
USDA Plant Sheets & Plant Guide. USDA NRCS
Why Native? Benefits of planting native species in a changing climate. RISCC Management Challenge E. Fusco et al. 2019
WorldClim - Global Climate Data
Images: Lady Bird Johnson Wildflower Center, Minnesota Wildflowers
Journal Articles: Burghardt et al. 2010 Ecosphere; Garden et al. 2015 Parasites & Vectors; Morandin & Kremen 2013 Eco App; Pimentel et al. 2005 Ecol Econ; Poelen et al. 2014 Ecol Info; Simberloff et al. 2012 Ecology; Tallamy & Shropshire 2009 Conserv Biol

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Peer Review Survey

Climate Smart Plants

Global climate change is now impacting the Puget Sound region's native forests and plant communities with changing temperatures and precipitation regimes that is making them vulnerable to disease and die-offs. Hotter and longer droughts are already occurring, with diebacks of Lodgepole and Ponderosa pine, Oregon ash, Western redcedar sword fern, and Bigleaf maple.

- Average summer temperatures are projected increase by +4.7°F - 16.7°F by 2080. Summer temperature highs are also projected to increase, with +8 days of above 90°F, with temperatures increasing +12.03°F.
- The Puget Sound region is projected to shift from USDA Plant Hardiness Zones 8 to Zone 9 completely, and from Heat Zone 2 to Heat Zone 6.
- Higher temperatures cause native plants to experience more heat-related stress. Heat stress causes higher water demand, a situation made worse by longer droughts.
- Higher atmospheric carbon dioxide (CO_2) levels promote the growth of invasive plant species, decreasing the space needed to support natural areas.

Peer Review Survey

- People working in the following fields were encouraged to complete the survey:
  - Landscape ecologists
  - Botanists
  - Landscape professionals
  - Researchers in private, non-profit and academic sectors
  - Nursery Owners
  - People with interest in native plants
  - Practitioner whose work intersects with vegetation management
- A total of 138 complete survey responses

Participants were provided a list of 39 plants and asked to indicate:

1. If they had working field knowledge of the plant
2. If they have concerns about the potential invasiveness of the plant
3. If they would use the plant in a native planting

For quick reference, a summary list of their responses by plant are provided

Details by plant can be found on slides

1. Working Field Knowledge

Plant	# of Participants
Trailing Oregon Grape	57
Oxalis/Redwood Sorrel	56
Incense Cedar	49
Coast Redwood	46
Chokecherry	45
Northern Inside-Out Flower	43
Gingko	41
Golden Currant	39
Creeping Snowberry	37
Port Orford Cedar	37
Sierra Redwood	37
Showy Milkweed	33
Common/Oval Leaf Viburnum	31
Western Redbud	29
Yellow Eyed Grass	29
Smooth Sumac	26
Burning Bush	24
Shiny leaf/White Spiraea	24
Wax Currant	22
American Red Raspberry	20
Water Birch	20
Deerbrush	19
Showy Phlox	19
Mallow Ninebark	18
Narrow Leaf Milkweed	17
White Alder	17
Canyon Live Oak	16
Yurba Buena	15
Blueoak	13
Canadian Gooseberry	13
Pinemat	13
Tanoak	13
Dwarf Bramble	12
Trailing Black Currant Trailing	12
Tufted Phlox	12
Hackberry	7
Klamath Plum	7
Macnab Cypress	5
Modoc Cypress	4

2. Invasiveness Concerns

Plant	# of Participants
White Alder	16
American Red Raspberry	14
Oxalis/Redwood Sorrel	13
Showy Milkweed	10
Burning Bush	9
Yellow Eyed Grass	9
Hackberry	8
Smooth Sumac	8
Tanoak	8
Western Redbud	7
Yurba Buena	7
Chokecherry	6
Dwarf Bramble	6
Klamath Plum	6
Port Orford Cedar	6
Creeping Snowberry	5
Incense Cedar	5
Narrow Leaf Milkweed	5
Pinemat	5
Shiny Leaf/White Spiraea	5
Showy Phlox	5
Blueoak	4
Canadian Gooseberry	4
Coast Redwood	4
Tufted Phlox	4
Water Birch	4
Canyon Live Oak	3
Northern Inside-Out Flower	3
Sierra Redwood	3
Trailing Black Currant Trailing	3
Common/Oval-Leaf Viburnum	2
Deerbrush	2
Gingko	2
Macnab Cypress	2
Mallow Ninebark	2
Modoc Cypress	2
Trailing Oregon Grape	2
Wax Currant	2
Golden Currant	1

3. Use in Native Planting

Plant	# of Participants
Trailing Oregon Grape	63
Creeping Snowberry	55
Incense Cedar	54
Oxalis/Redwood Sorrel	53
Northern Inside-Out Flower	46
Chokecherry	45
Golden Currant	45
Coast Redwood	43
Common/Oval-Leaf Viburnum	40
Port Orford Cedar	38
Showy Milkweed	37
Shiny Leaf/White Spiraea	36
Deerbrush	35
Sierra Redwood	35
Western Redbud	35
Yellow Eyed Grass	34
Water Birch	33
Gingko	32
Mallow Ninebark	32
Narrow Leaf Milkweed	31
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Trailing Black Currant Trailing	25
Tanoak	22
American Red Raspberry	21
Blueoak	21
Tufted Phlox	21
Hackberry	18
Klamath Plum	18
Dwarf Bramble	16
Macnab Cypress	12
Modoc Cypress	11

Definition of Climate Smart Plants

Participants were provided a new, draft definition of climate smart plants and asked to comment on it. This definition (included below) was developed to guide the climate smart plant selection process. Only 60 of the 138 respondents (or 43%) chose to comment on the definition. Of the 60, only 28% (or 17) said it was "good/fine." The remaining 72% (or 43 participants) shared concerns regarding the definition. Specific recommended changes are noted below.

Climate-smart plants: native plant species currently or prehistorically found within the Puget Trough, Willamette Valley, Georgia Basin, and Columbia Basin ecoregions that are predicted to maintain their abundance under climate change.

Change "climate-smart" because:
- On the verge of overuse
- Generic jargon
- Could be associated with smart devices
- Makes you ask, "what's smart about it?"

Consider:
- "Future-ready plants"
- "Climate forward plants"

(N=5 or 8%)

Change list of ecoregions because:
- What is Puget Trough?
- Never heard of Georgian Basin
- Why wasn't the Cascades or Eastern Washington included?

Consider:
- Expand list to include "Southern Oregon Rogue Valley" and "Southwest Oregon Siskyou Region"

(N=2 or 3%)

Change "abundance" because:
- It's not scientific and can mean different things

Consider:
- "Presence" instead

(N=1 or 2%)

Add in "and biodiversity" after abundance, *"since that would be the goal."*
(N=1 or 2%)

Change "prehistoric" because:
- It is vague and misleading
- They were in the region, but are not here now, not truly the same plant
- What do you mean by prehistoric? When?

Consider:
- "historically"
- Climate forward plants

(N=11 or 17%)

Participant Concerns

Some Plants on the List are Not Drought Tolerant

"Many of the plants listed here are restricted to riparian habitats within their normal ranges. Assuming they are 'drought tolerant' under some predicted conditions requires a stretch of the imagination."

Some Species Will Genetically Damage Native Populations

One participant shared, *"I'm of the opinion we should be extremely cautious about introducing plants not native to this region. Introducing a species into a new geography is also introducing/changing species interactions in their new ecosystems and could also introduce unexpected / unwanted pests/pathogens into a region and/or other species."* Another provided a specific example: *"Certain plant species on here will genetically damage native populations - Quercus douglasii, for example, is interfertile with Q. garryana (Q. x eplingii), and oak hybrids are known to facilitate gene transfer between parents even when a fully intermediate grade is not formed."*

Insects, Microbes and Birds May Be Harmed

Current native plants are home for microbes and insects. *"Plants that house bugs for other critters to eat are imperative to the creation/ maintenance of habitats that support migratory and endemic birds and other wildlife. Our allowance of horticulture to promote plants that don't foster these critters, along with the development that decimates the habitat which endemic birds REQUIRE to survive creates what Doug Tallamy has appropriately labeled a 'horticultural ethical dilemma.' "*

Please, No Ginkgo

A few participants were stumped by the desire to include Ginkgo in the native plants list. It's *"a tree whose ancestors are only in the Washington fossil record from about 15 to 16 million years ago, and is currently only endemic to East Asia."* Another participant added that *"Ginkgo biloba needs a moderate amount of water" so they would consider it drought tolerant."* Yet another noted, *"The fruit stinks is mildly toxic to humans… Also, it's been long enough since it appears in the fossil record, calling it native is a real stretch."*

List Needs Consumer Warnings

Participants also pointed out that some of the plants on this list need to come with a warning (and perhaps pros/cons) regarding planting them. *"I think it's critical to consider the consequences of including redwoods on widely distributed native plant lists, especially if those lists are intended as go-to-references for well-meaning homeowners with limited horticulture knowledge. Redwoods are HUGE! If improperly cared for, I would be concerned about the impact of having too many stressed out giant trees in neighborhoods. I also wonder if homeowners are prepared for cohabitating with giant trees in urban and suburban settings generally-- so much homeowner education would have to accompany these choices."*

Consider Creating Two Lists – Ornamental and Restorative

As many of the plants on this list are not native plants, participants suggested creating two lists. One list for plants to use in your gardens and landscaping (ornamental) and the other should contain plants that are for restoration (native). *"Many non-native species in my garden have shown great potential for ecological benefit with no invasive tendencies; but they are not native plants and should not be added to a native plant list under the guise of directly benefiting our local ecosystems." "If planting in a critical area, plants must be native sensu stricto. Climate forward plants miss this definition. See https://apps.ecology.wa.gov/publications/documents/2206014.pdf"* Another participant further explained, *"I believe this definition may be appropriate for selecting ornamental plantings on developed sites ('gardens'), but not for restoration plantings. Defining 'native' in this way is not consistent with the ecosystem benefits of native restoration plantings, which are based in large part on coevolutionary relationships over time. The suite of associated pollinators and invertebrate herbivores, which are a major basis of the food chain, would be greatly disrupted by mass plantings of species that are not native to King County, using the convention definition of native (present in the area at the time of arrival of European and Euroamerican settlers)."*

Key Findings and Recommendations

Update Definition of Plants	• Make adjustments to the definition to address comments shared during this peer review process
	  ○ Remove "prehistoric" as it is considered vague and misleading
	  ○ Take into consideration the other concerns raised by participants

Be Careful with the use of "Native"	• Many participants struggled with the fact that the list is positioned as "native" plants. They felt that many of the plants are not native to this region and that it would be misleading to claim they are. Consider adjusting the definition to explain that these plants are native to other areas, but would do well in this region

Adjust Compiled List of Plants	• Consider removing plants from the proposed list that…
	  ○ Are considered by participants as invasive
	  ○ Received a low "plantability score"
	  ○ Participants felt strongly should be removed
	  – Not really a native plant list (e.g., Gingko)
	  – May be more challenging than homeowners realize (e.g., Redwood trees)
	  – Will not make it through our Western Washington wet winters (e.g., Tufted Phlox)
	• Develop two plant lists – one for ornamental gardening and the other for habitat restoration

Incorporate research findings that prove plants will do well in this region	• Participants felt additional research needs be conducted before publishing this information for public use
	  ○ Concerns were raised about pulling plants from other regions and planting them in King County can be problematic. Participants are concerned about unpredictable behavior change, potential destruction of the native species, and the lack of habitat for native microbes and bugs
	  ○ One participant noted, "*WSU, DNR, and USFS are not recommending pulling species way out of their range to the Puget Sound area, like this list is proposing.*"

Next Steps

Update climate smart native plant list based on updated criteria:

- Limited to historical time (not pre-glacial)
- Ecoregional provenance (Willamette Valley- Puget Trough – Cascades - Georgia Basin)
- Adaptive Capacity evaluation (e.g. sensitivity to drought)
- Functionally support native inverts, birds, fish, mammals
- Not invasive
- Not hard to establish

Updated the Northwest Native Plant Guide with CSP species

Home
Find a Plant
Plant list
Browse photos
Search all plants
Landscape plans
How-to articles
my Plant List
Printable list
Log in
Help

Native Plant Guide
Create your own native plant landscape

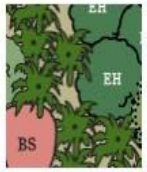
Go to my plant list
(no plants selected)

Featuring plants native to Western Washington and native plant gardening tips

Find a Native Plant

Look up a specific native plant. Search for which plants would thrive best in your yard. Or just browse through more than 100 beautiful photos and learn more northwest native plants. Start finding plants...

Native Plant Landscaping Plans



These illustrated plans give you basic ideas for landscaping using native plants. Plans cover various yard conditions such as sun, shade and dry or moist soil. View the plans...

Create a Custom Native Plant List

Use this tool to create your own customized native plant list. Then print the list, email it or save it for later (registration required). Makes a great shopping list or landscape planning tool! Start your list....

How-to Articles

Want to attract more wildlife to your yard using native plants? Do you know which native plants are best suited for a deeply shaded or sloped yard? Browse these articles -- which include plant suggestions -- to find the answers. Read how-to articles...

More Resources

Learn more about going native with this list of resources, including King County's "Going Native" brochure that you can download. More resources...

Thank You!

King County Climate Smart Plant Project