Climate-Ready Plants

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PNW SWS Chapter Meeting, October 10, 2024

King County

Background

- 2024 Best Available Science Review of King County land use code, comprehensive plan update as required by Washington State Growth Management Act.
- *New* Washington State GMA requirement to include climate adaptation and conservation.

Outputs

- 2024 Best Available Science Report.
- Annotated Bibliography.
- Develop recommendations and guidelines for native plants.
- Peer review survey of scientists, landscape designers, nurseries.
- Update King County Habitat Restoration Plant List plant list.
- Updated KC online NW Native Plant Guide.

2024 Best Available Science Review of King County code, comp plan update.

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

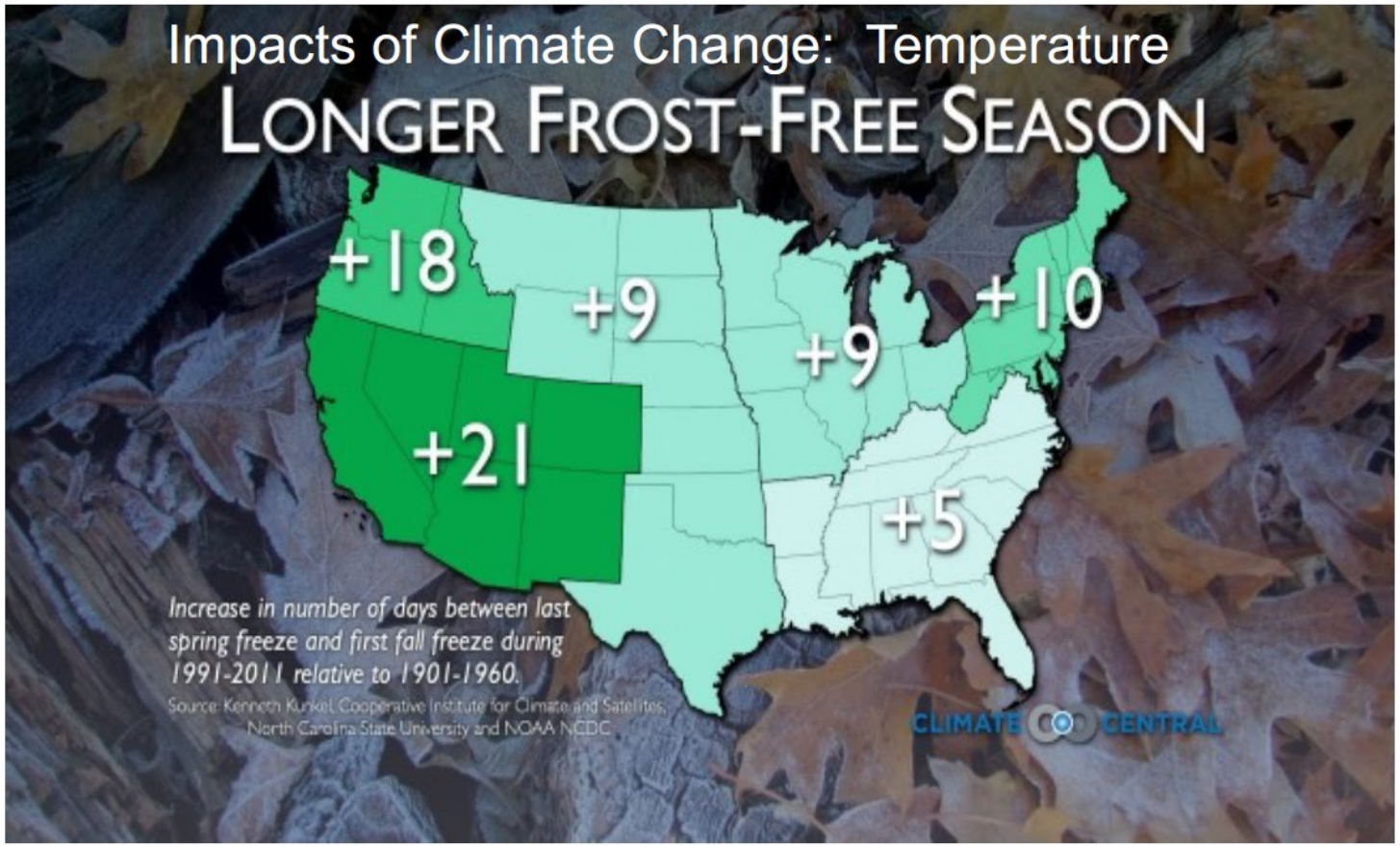
2. Changing hydrology
   - Less snow, more rain in winter
   - Less rain in summer

2024 Best Available Science
The “New Normal”

3. Changes to soils
    - Reduced summer soil moisture
    - Loss of soil carbon (oxidation)

4. Changes to plant communities
    - Rapid migration of invasive spp.
    - Slow migration of native spp.
    - Die-offs of native spp., e.g.: Western Redcedar

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

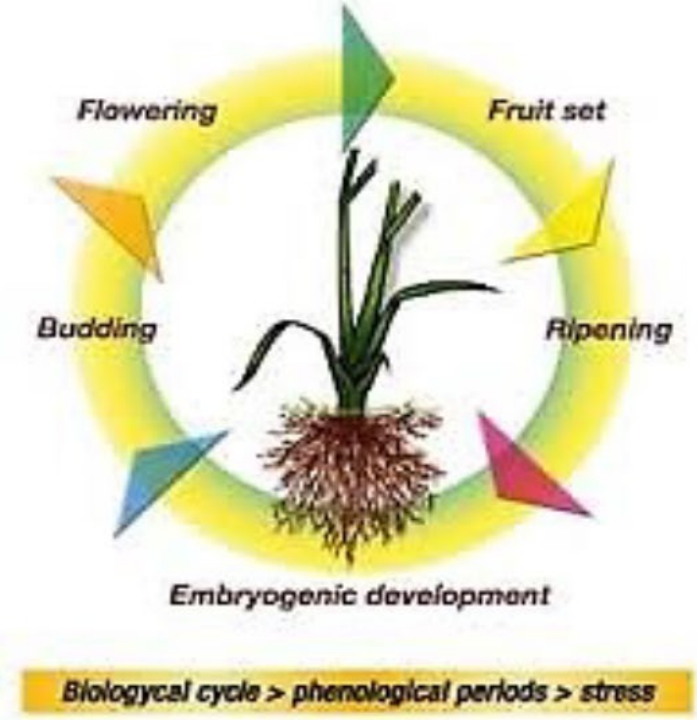
- competitive advantage over natives by taking space, water & nutrients

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

2024 Best Available Science

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

Dr. Sara Via, svia@umd.edu

2024 Best Available Science

WASHINGTON STATE UNIVERSITY

- Ornamental Plant Pathology
- Research Programs
- Education Programs
- Emerging Plant Health Issues
  - Overview
  - **Western Redcedar Dieback**
  - Sword Fern Die-off
  - Bigleaf Maple Dieback
  - Sooty Bark Disease
- Citizen Science
- Our Community
- Support Our Program
- Contact Us

Western Redcedar Dieback

Welcome

Welcome to our webpage about the dieback of western redcedar. The purpose of this page is to provide information about the western redcedar, summarize the dieback, and provide links to other media expressing concern.

Please contact us if you are interested in partnering to advance knowledge or if you have content or information to share.

2024 Best Available Science

Species in Decline*

- Western Red Cedar
- Western Hemlock
- Douglas fir
- Lodgepole pine
- Ponderosa pine
- Firs (grand, noble, white)

* Not all inclusive

- Bigleaf maple
- Paper birch
- Oregon ash
- Madrona
- Pacific Dogwood
- Salal
- Sword fern

2024 Best Available Science

The current King County native plant list omits many currently accepted already occurring 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
Summary

- Climate change is already affecting native plants.
- Each year more plants are added to the list of those in decline.
- There is a need to DO SOMETHNG NOW rather than wait till research catches up by which time it will likely be too late

New requirement to include climate adaptation and conservation.

Climate Conservation

USGS science for a changing world

SCIENCE PRODUCTS NEWS CONNECT ABOUT

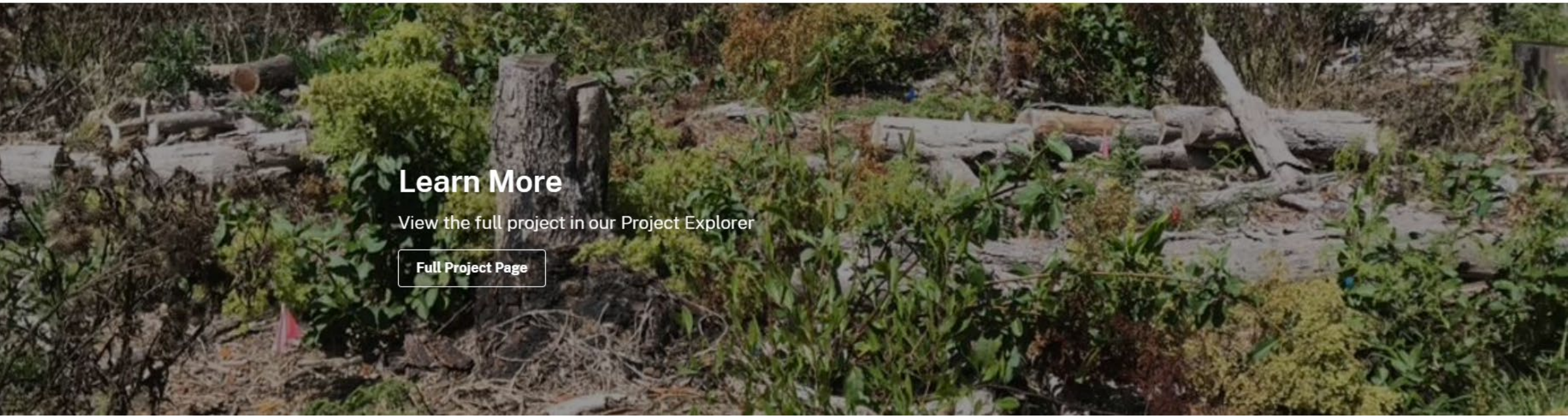
Latest Earthquakes

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



Climate Conservation

CLIMATE ADAPTATION SCIENCE CENTERS (CASC)

CASC Project Explorer

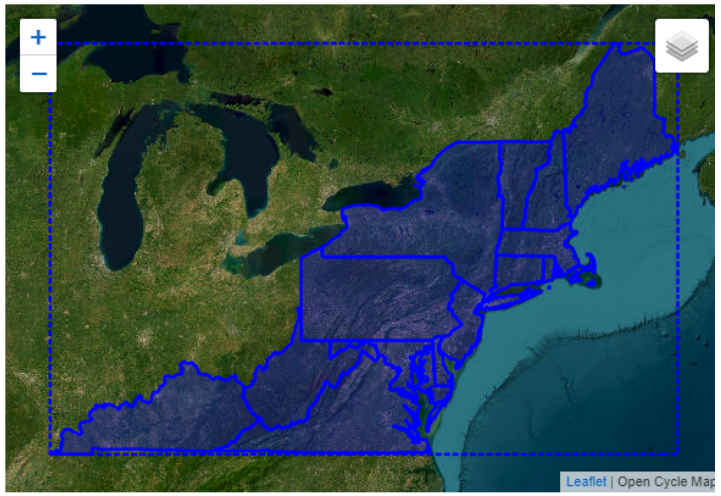
Discover regional and national climate science

Indigenous-led Restoration and Stewardship of Culturally Significant Plants for Climate Change Adaptation in the Northeast

Indigenous Nations are particularly vulnerable to the effects of climate change, due in part to their reliance on healthy ecosystems to provide culturally significant plants that are used for traditional foods, medicines, and materials. Further, many Indigenous communities have an under-resourced capacity for climate adaptation, resulting in significant environmental justice impacts that range from health disparities to heightened disaster risks.

There is growing recognition across the globe of the important role of traditional ecological knowledge (TEK) in climate change resilience and the innovative solutions that lie at the intersection of Indigenous and western knowledge. However, Indigenous knowledge has not been widely integrated into climate adaptation science. The goal of this project is to engage Indigenous Nations to improve our understanding of the threats facing culturally significant plant species and to collaboratively develop a research plan to address these concerns.

To complete this work, the Center for Native Peoples and the Environment (CNPE) at SUNY ESF will partner with Indigenous Nations in the Northeast to identify the plants of greatest concern and create maps documenting their occurrence and vulnerability to climate change. They will also convene an Indigenous Women's Climate Summit to bring together traditional plant knowledge holders and allied scientists to educate one another on possible approaches to cultural plant protection, such as restoration, assisted migration, and revitalization of traditional land care practices. The Summit will yield a working group of collaborators who will create an Indigenous-led research agenda. Lastly, the project team will initiate community-based pilot projects that prioritize collaboration among Indigenous Nations for the protection of cultural plants in the face of climate change.



Affiliation(s):

- Northeast CASC

Principal Investigator(s):

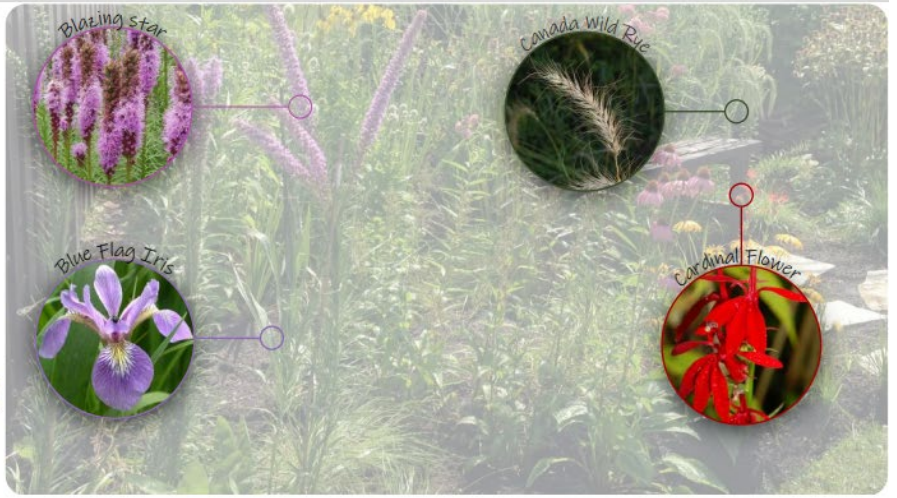
- Robin Kimmerer *(State University of New York)*

Climate Conservation

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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Larry Weaner Landscape Architects
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Planting for Resilience: Selecting Urban Trees in Massachusetts. A. McElhinney et al. 2019
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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Update King County Habitat Restoration Plant List

Update King County Habitat Restoration Plant List

Definition of Climate –Ready Plants

Native plant species currently or historically found within the Puget Trough, Willamette Valley, Georgia Basin, and Columbia Basin ecoregions that are predicted to maintain their presence and health and maintain biodiversity under predicted climate change conditions."

King County Habitat Restoration Plant List

Scientific investigation and planning for adapting plants and landscapes to rapid shifts in temperature and weather patterns have been identified with an emphasis on the following strategies:

- ✓ Assisted Population Migration
  "moving seed sources or populations to new locations within the historical species range
- ✓ Assisted Range Expansion
  " moving seeds or populations from their current range to suitable areas just beyond their current range
- ✓ Assisted Species Migration
  "translocation of seeds or populations beyond species ranges

Source: Traveling trees: Assisted migration for climate resilience | US Forest Service (usda.gov)

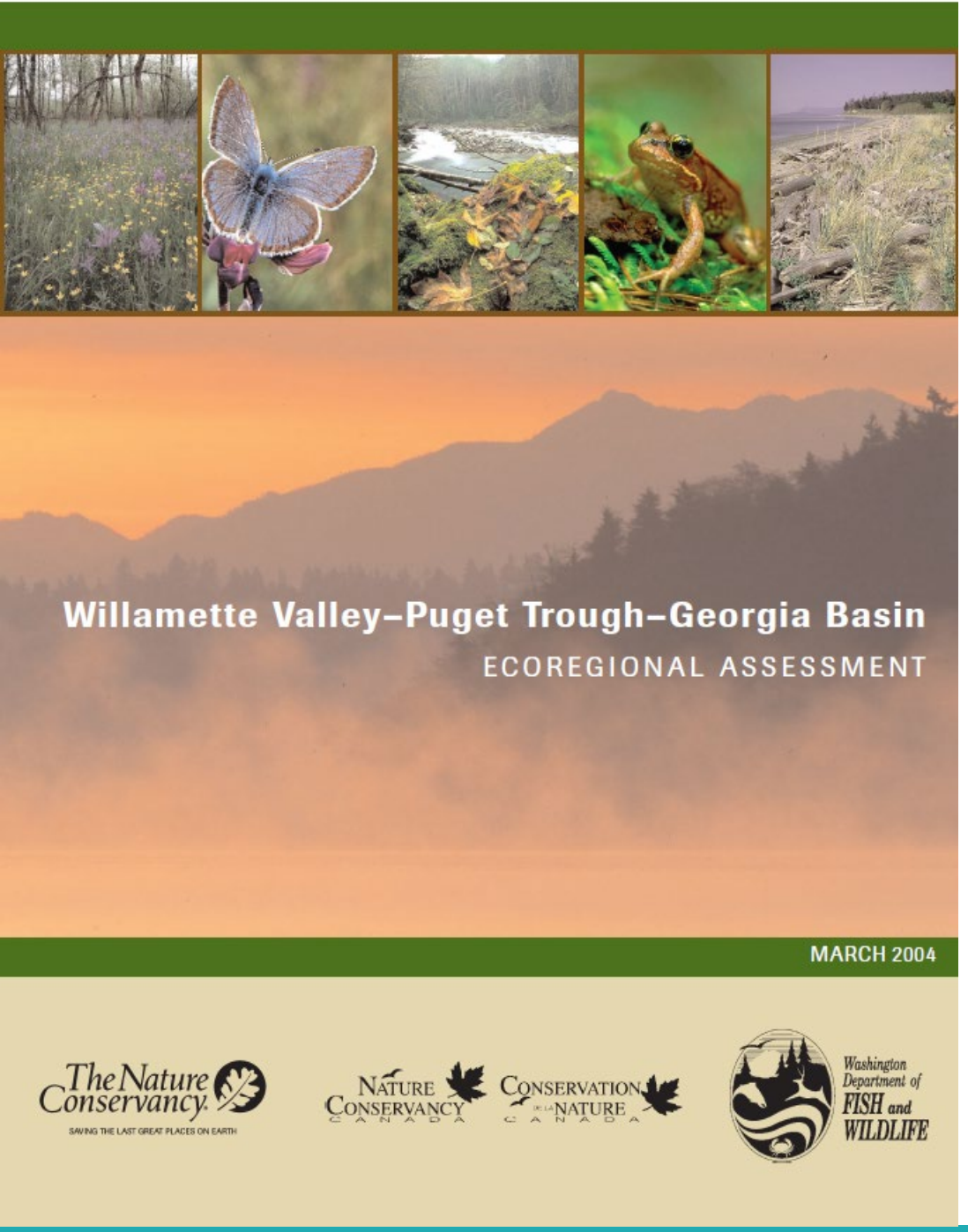
Develop recommendations and guidelines for native plants.

Juniperus communis
common juniper
- native climate-ready plant not on KC Plant List

Recommendations for Native Plants

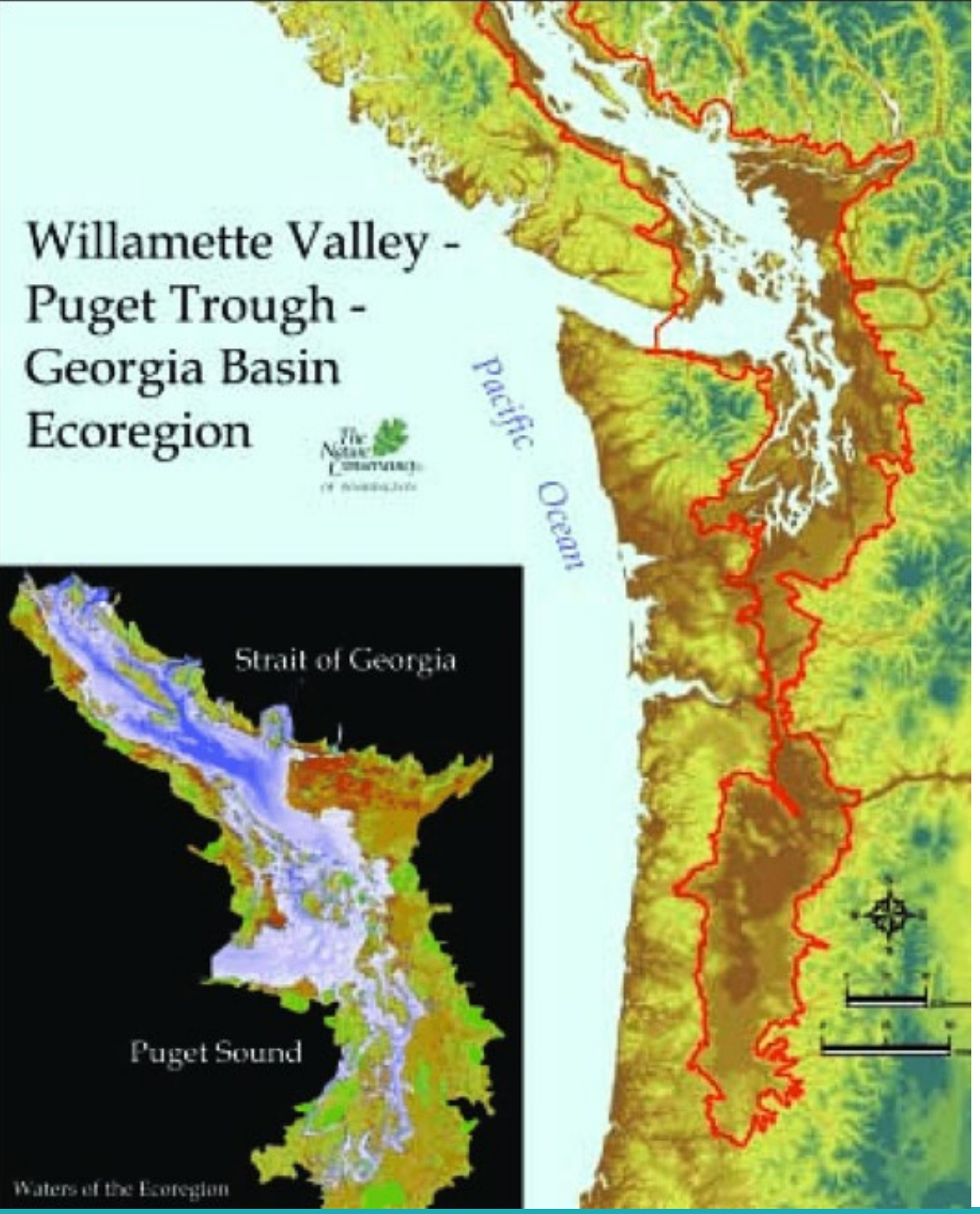
Proposed:

- Adopt ‘climate-ready’ conservation science.
- Use assisted range expansion and assisted species migration to include species from drier/warmer areas and includes species from when the climate was similar to what is projected for our future.



Recommendations for Native Plants

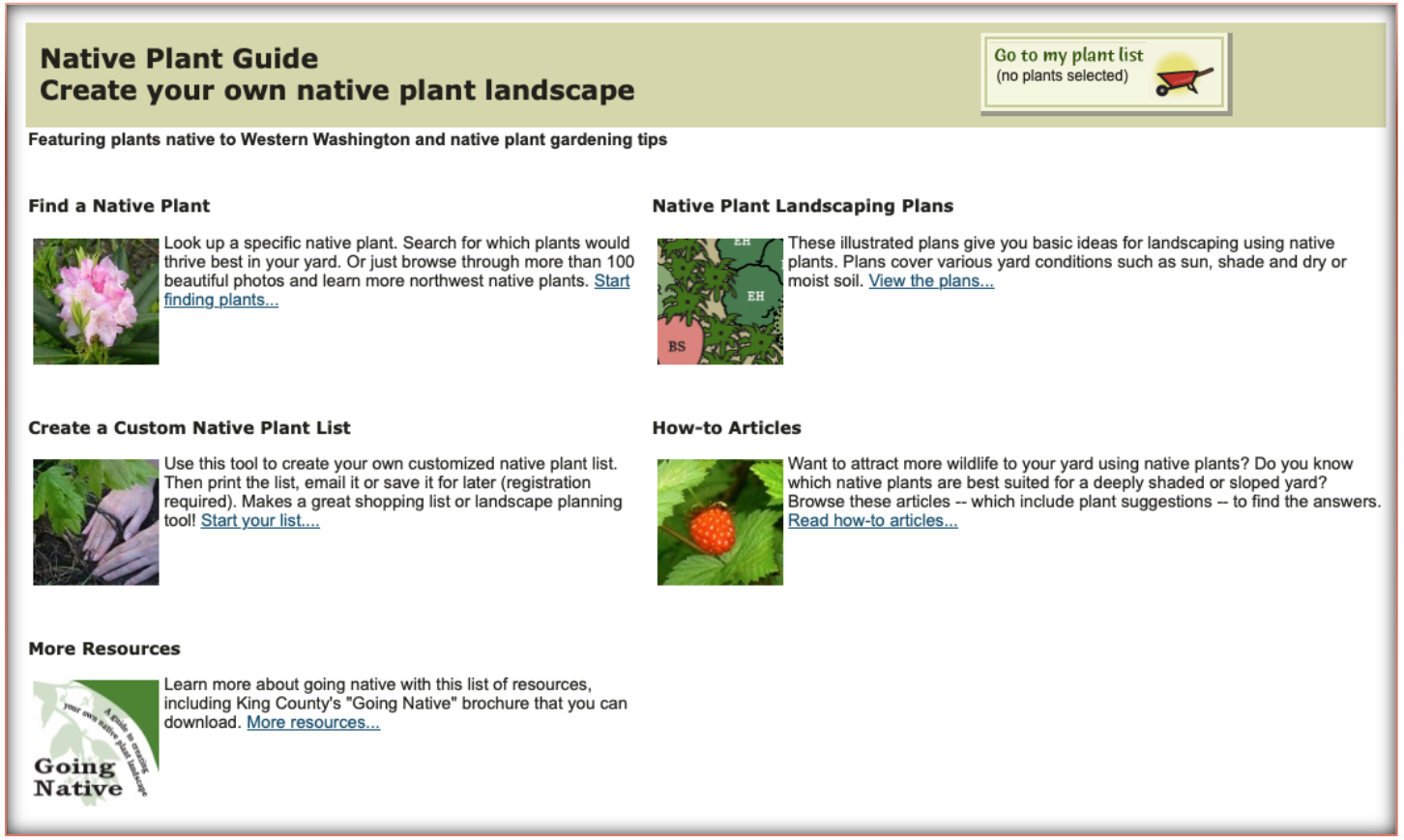
Proposed: Expand native plant list to include species found in Puget Trough-Willamette Valley-Georgia Straight ecoregion



Recommendations for Native Plants

Proposed: Expand native plant list to include species found in Puget Trough-Willamette Valley-Georgia Straight ecoregion- goes to southern Oregon/Northern Ca

Recommendations for Native Plants



Proposed: Update the KC Northwest Native Plant Guide plant list to include climate-ready species found in Puget Trough-Willamette Valley-Georgia Straight ecoregion

https://green2.kingcounty.gov/gonative/index.aspx

King County Habitat Restoration Plant List

General Justifications for Species Selections

1) Use species down to Northern California (The eco-region extends that far)
2) No mid to high elevation species (would expect lower elevation species to go up not visa versa
3) Included east side Columbia Basin drier species
4) Omitted bog species that do not transplant or are hard to grow
5) No exotic species such as Lombardy poplar, European birch
6) No currently invasive species even if they are native (E.g. Bittersweet nightshade)
7) No sagebrush species (e.g. artemisia, purshia) - we can talk about this but I just don't think this is viable on the west side ….yet
8) No toxic species like poison ivy, oak or sumac
9) Not recommending anything difficult to plant- devil's club, prickly rose, rice cutgrass
10) Included species that were present in times of drier hotter climates
11) Included species that should have been on the list but weren't

Perform peer review survey of scientists, landscape designers, nurseries.

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

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
Smooth Sumac	31
Wax Currant	29
Canyon Live Oak	28
Pinemat	28
White Alder	28
Yurba Buena	28
Burning Bush	27
Canadian Gooseberry	27
Showy Phlox	27
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

Peer Review

Peer reviewers were solicited working in the following fields were encouraged to comment on the plant list and complete the survey. These included :

- Landscape Ecologists, Restoration Ecologists.
- Researchers in private, non-profit and academic sectors
- Scientists
- Nursery Owners, Installation Contractors
- Botanists, People with interest in native plants.
- Practitioners whose work intersects with vegetation management

Peer Review

The feedback included comments on:

- Actual field knowledge of the species or genera
- Invasiveness of the proposed species
- Their utility as a native in existing plant communities
- Any additional species they felt should be included

Peer Review

Participant Concerns

Research Needed Before Developing List

A few participants felt additional research was needed before bringing these plants into the region. *"With no actual understanding of how they may change the ecosystems that they would be introduced into. Very possibly pushing out even successful native plant species that do not need more competition for resources, and impacting animal species that rely on existing habitat types and vegetation."* Additionally, a participant questioned called the plants on this list as "Climate-Smart Plants" without research being conducted to confirm that claim. Another noted that *"these plants have not been screened for disease or pest susceptibility."*

WSA, DNR and USFS Would Not Agree With This List

"WSU, DNR, and USFS are not recommending pulling species way out of their range to the Puget Sound area, like this list is proposing. They are largely advising to NOT use species like what is on this list. There is more to adaptation to a location than just temperature, or even just temperature and moisture regimes. Are ecosystems are balanced through co evolution such that these species from California are not simply drop-in replacements that will provide the same relationships with wildlife (especially arthropods) in terms of habitat and nutrition. Moving species this far also creates new and unpredictable pest/pathogen relationships. For instance, incense cedar is subject to pear rust, especially outside it's range (e.g., Puget Sound area). The alternate hosts are pears and apples such that bringing up incense cedar poses a serious threat to our state's agriculture. Also, geneticists and climate experts are saying that north-south movement is more likely to be successful than east-west."

Do Not Include Non-Native Species on a List of Native Plants

"I am opposed to suggesting the public start planting non-native species as a matter of course. I DO NOT think these species should be included on any list of 'native' species given to the public. These species are not currently native to western WA. Several of these species are no longer appropriate for western WA looking at the updated hardiness zones. Several have potential to hybridize with native species. Several others have known pest/growth issues that will make it difficult for them to thrive here. And several others have growth habitats that are already labeled "aggressive" and "mat-forming" which is concerning. Respectfully, let's do our best to not open a Pandora's Box. Restoration work and land stewardship/ management is already hard enough and costly dealing with aggressive species."

Consider Population Migration Not Species Migration

"Generally speaking, I'm not supportive of 'species migration' (moving a species outside of its current range) and would rather see an emphasis on population migration (planting lower elevation genotypes at higher elevation sites where a species is currently found, or southern genotypes in more northerly locations where a species is found). Most of the species on the list below appear to fall within the 'species migration' category and as such, I'm not supportive of introducing these species into our native ecosystems in western WA."

Many Plants Just Cannot Make it Here

Many raised concerns that some of the plants on the list will not do well in King County. Some specifically noted that they have seen (in their own yard or in the region) plants contained on the list not doing well. *"The Ribes aureum at Bellevue Botanical Garden is barely hanging on, due to rust. Viburnums all around are completely defoliated by Viburnum beetles. I don't think either of these is viable in this area."* Participants also pointed out that King County currently has pretty wet winters. One pointed out, *"It is very misleading to add non-native King county plants to the current native plant species list."*

Adopt Proposed "Plantability" Scheme

Data for each of the 39 plants has been organized (buy "plantability score") and presented in the following format

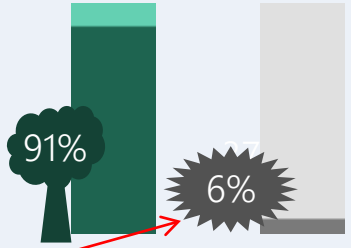
MALLOW NINEBARK
(*Physocarpus malvaceus*)

Common name & Latin name

Photo of plant species

A species from further south that is growing in drier warmer climates. Common east side hillside species bunchgrass and ponderosa ecosystems.

Description provided in the survey to explain the reasons why it was chosen to be included in the study



The percentage of participants who answered YES to "Would you use this plant in a native planting?"

The percentage of participants who answered YES to "Do you have concerns about the potential invasiveness of this plant?"

5

Plantability Score

A score on a scale of 1-5 based on the difference between the "Use in plantings" and "Invasiveness." The higher the "plantability score," the more people noted they would plant compared to those who felt it was invasive. In this example the plantability score is high because that difference is large.

35 answered this question
18 working knowledge
2 had invasive concern
32 would use in native plantings

The number of participants who answered questions for this particular plant. Note that sometimes the pool of participants can be quite low. In these instances the projectability of the results is questionable.

Key Findings and Recommendations from the Peer review

Update Definition of Plants	• Make adjustments to the definition to address comments shared during this peer review process
Be Careful with the use of "Native"	• Adjust the definition to explain that these plants are **not native to King County, but are native to the ecoregion**.

Adjust Compiled List of Plants	• Consider removing plants from the proposed list that
	  ○ Are considered invasive
	  ○ Received a low "plantability score"
	  ○ Participants strongly felt should be removed

Incorporate research findings that prove plants will do well in this region	• Participants felt additional review needs be conducted before publishing this information for public use

Next Steps

- Stratify plant list according to nativity categories (e.g.: King County native, ecoregion native) to guide King County natural lands managers, wetland mitigation planting designs.
- Send out a follow up survey with final recommendations.

Project Team

- Mason Bowles, Project Manager
- Sarah Cooke, Lead Scientist
- Nancy Hardwick, Hardwick Research
- Rahel Stampfer, Ecologist
- Daniel Sorenson, Ecologist
- Brian Lund, Ecologist
- Sarah Montgomery, Capital Project Manager

Thank You!