Adapting Tree Species Composition in a Changing Climate – A Planting Trial for Forest Resilience

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Ecosystem Resilience

-ability to **maintain** or **recover** ecological **functions** following a **disturbance**



Forest Productivity and Recovery of Ecological Functions





Landscape Perspective of the Cedar River Municipal Watershed – Habitat Conservation Plan and Biological Reserve







Overstory mortality in mature Douglas-fir forests cause by a combination of drought, wind, Douglas-fir beetle, Armillaria root disease – forest response.





Canopy tree and understory mortality in dry Douglas-fir forests





Adapting to Changing Climate and Disturbance Regime

- > Dry Douglas-fir Associations:
- Lodgepole Pine
- Grant Fir
- Western White Pine
- Garry Oak
- > Assisted Migration:
- Within Population Rage
- Range Expansion



Assisted Population Migration

Assisted Range Expansion

Williams and Dumroese 2014



Climate Projections and Analogs

Seedlot Selection Tool

Climate analogs for Puget Sound Lowland selected by

- annual heat moisture index and
- mean coldest month temperature



Generated by the Seedlot Selection To



Resilience Planting Trial Cedar River Watershed





Adaptive Management Framework -Operational Outplanting and Planting Trial





Tree Species

Western White Pine

Lodgepole (Shore) Pine

Garry Oak

Western Redcedar

Douglas-fir Washington (Kitsap) Oregon (Zone 262)





Early Tree Growth

3-year Height Growth by Species



City of Seattle

Spring Phenology – Tree species respond to warm and cool spring









Conclusions:

- Mixed-species can maintain forest productivity under changing climate and disturbance regime;
- Within-population assisted migration can add genetic diversity and adaptive capacity;
- **Phenology** (bud break) is important when considering climate change adaptation.



Stossell Creek Forest Restoration and Climate Adaptation Project

Seattle City Lights Seattle Public Utilities Mountains to Sound Greenway Northwest Natural Resources Group



Puget Sound (231) Oregon Coast Range (071) NorCal. Coast Range (092)

Western Redcedar

Puget Sound Oregon Coast Rage Incense Cedar NorCal. Coast Rage Garry Oak

Grant Fir Western White Pine





Recommendations

- Pay attention to productivity of the whole forest;
- Build adaptive capacity through species diversity;
- Integrate trials into silvicultural operations.

Thank you. Rolf.Gersonde@seattle.gov

