Climate adaptation tactics

Holly Prendeville Coordinator USDA Northwest Climate Hub



How will trees grow in a warmer climate?

Low elevation, westside forest

Moisture limited

Growth will decrease:

- Douglas-fir
- Western hemlock
- Western redcedar
- Sitka spruce



How will trees grow in a warmer climate?

Eastside coniferous forest

Moisture limited

Growth will decrease:

- Ponderosa pine
- Douglas-fir
- Western larch



How will trees grow in a warmer climate?

High-elevation coniferous forest

Energy limited

Growth will increase:

- Subalpine fir
- Mountain hemlock
- Lodgepole pine



How will plants grow in a warmer climate?

Riparian areas, wetlands, groundwaterdependent systems

Water controlled

Growth and regeneration will <u>change</u>:

- Bogs, fens
- Species composition
- Fire susceptibility





Over 90% of all primary forests at lower elevation have been harvested at least once.

Most forest landscapes are fragmented by timber harvest, roads, agriculture, and urbanization.

lale

The definition of the definiti

Valsetz

Pedee Google

Lewisville

Eola Village

Hopville

Modeville

Buena Vista

Parker

Nationa Wildlife

Refuge

Talbot

Unionvale

Hopewell Wheatland

Whiteson

Bellevue

Sheridan

150

Some forests have a significant complement of non-native plant species, insects, and pathogens.

Climate-tolerant species have...

High production of seeds and other propagules

High seed dispersal or vegetative propagation

Tolerant of low soil moisture

high air temperature

wildfire

High competitive ability

Broad environmental tolerance

High genetic diversity

What is climate change adaptation?

An effort to reduce the potentially negative consequences of climate change AND

transition species and ecosystems to a warmer climate.

What is climate change adaptation?

Fine tuning and prioritizing current planning and management

Component of *sustainable resource management*

A form of risk management

Risk
mitigation
preventionRisk
avoidanceRisk
acceptanceRisk
mitigation
-prevention

Risk: magnitude of loss/cost

How do we manage for resilient forests in a warmer climate?

Change the restoration paradigm Older concepts

- Natural (historic) range of variation as a guide
- Species as targets for success
- Typically done at small spatial scales

Change to resilience building

Newer concepts

- Incorporate climate change information in planning and management
- Use <u>current</u> & <u>future</u> range of variation as a guide
- Implement across large spatial scales

Regeneration is a critical stage

Tree establishment in a warmer climate following disturbance will determine the forest

Seedlings must cope with variation in temperature and moisture at the soil surface

Pamper seedlings and saplings

Retain soil moisture for summer growth

Protect trees from herbivory

Consider recent weather & climate to time plantings

Be more flexible with seed zones

Ponderosa pine seed zone map

Seedlot Selection Tool

🍀 Se	edlot Se	lection 7	ōol					Purpose	Instructions	More
About	Tool Sa	ved Runs			3	S.L	NECHAKO PLA	TEAU	States .	Edmontor
Lat:	43.2932	Lon: -123.	566	1	Fee	At	FRASER	PLATEAU		
Eleva	tion: 2021 ft					Quern Charlotti Sound	and the second	contor	Children of the second	algary
3 Sele	ct climate s	cenarios			100	ġ.	the second	15-1	1 N O	
Which	h climate are th	e seedlots ada	pted to?	- 1		~	e the	Vancouver	The t	
196	61 - 1990 🔹						and I			
When	n should trees l	oe best adapte	d to the planting	site?			Sea	WASD IL	Pres and	0
207	71 - 2100 🔹	RCP4.5					ł	A A	See 1	L Z
O Sele	ct transfer l	imit method					T	1 - Sport	The .	24
Cus	stom Zone	1					Pola	a let	Sta. 1	Ser and
Sele	ct a specie	5						ORECON	DAHO	91 Y
We	estern red ceda	ır		•			<u>v</u>	Second.	the mostly	
Sele	ct zone						1		Serent to	- 0.5
Ore	egon (1996) we	estern redceda	r Zone 2, 0' - 999	99 7			2		1 R	1 5
6 Sele	ct climate v	ariables			1.00			coent (151
Units	: Metric Imp	perial			12.5			Sco o Fiesi	Lag	Cherry and
	Name C	enter Trar	sfer limit (+/-)		0			A LIF OF	Mrv. John	The second
×	MWMT 2	1.3 °C 3.90	°C	o				- Aller	- ? ·	Pho

Assisted migration or managed relocation

Select drought tolerant species where possible

Douglas-fir

Grand fir

Western white pine

TREE SPECIES	DROUGHT TOLERANCE	HIGH RISK SCENARIOS
Western redcedar Western hemlock Pacific silver fir Subalpine fir Engelmann spruce Sitka spruce Red alder Black cottonwood	Low	Western redcedar in sun- exposed areas with soils having poor moisture retention
Grand and noble fir Quaking aspen	Low – Medium	Grand and noble fir at low elevations in the Willamette Valley and on overstocked Christmas tree farms
Douglas-fir Lodgepole pine Western white pine Western larch Bigleaf maple	Medium	Douglas-fir growing in oak/ pine-dominated habitat or open-grown on poor sites
Ponderosa pine Incense cedar Western juniper Oregon white oak Pacific madrone	High	Even some of these spe- cies may be at risk during droughts if they are open- grown on poor sites such as rocky soils

Oregon Department of Forestry

Manage for future climate, including drought stress

Plant native species from sources suited for your region & conditions at planting site. Seedlot Selection Tool

About Tool Saved Runs Lat: 43.2932 Lon: -123.5566 Elevation: 2021 ft FRASER PLA Image: Select climate scenarios Which climate are the seedlots adapted to? Image: Select climate scenarios When should trees be best adapted to the planting site? 2071 - 2100 * RCP4.5 * Image: Select transfer limit method Custom Zone Select a species Select a species	Edmo TEAU Souver
Lat: 43.2932 Lon: -123.5566 Elevation: 2021 ft Select climate scenarios Which climate are the seedlots adapted to? 1961 - 1990 • When should trees be best adapted to the planting site? 2071 - 2100 • RCP4.5 • Select transfer limit method Custom Zone Select a species	TEAU Calgary Souver WASH C
Elevation: 2021 ft Select climate scenarios Which climate are the seedlots adapted to? 1961 - 1990 • When should trees be best adapted to the planting site? 2071 - 2100 • RCP4.5 • Select transfer limit method Custom Zone Select a species	Souver
 Select climate scenarios Which climate are the seedlots adapted to? 1961 - 1990 • When should trees be best adapted to the planting site? 2071 - 2100 • RCP4.5 • Select transfer limit method Custom Zone Select a species 	Souver 2 WATH CLUE
Which climate are the seedlots adapted to? 1961 - 1990 • When should trees be best adapted to the planting site? 2071 - 2100 • RCP4.5 • Select transfer limit method Custom Zone Select a species	NASS C T
1961 - 1990 • When should trees be best adapted to the planting site? 2071 - 2100 RCP4.5 Select transfer limit method Custom Zone Select a species	WASSO UN
When should trees be best adapted to the planting site? 2071 - 2100 • RCP4.5 • Select transfer limit method Custom Zone Select a species	WASH OL N
2071 - 2100 RCP4.5 Select transfer limit method Custom Select a species	2 3 74 C) 3
Select transfer limit method Custom Zone Select a species Image: Custom species	A TYPE COURSE
Custom Zone Poete Custom Zone	man Mercel
Select a species	
	ORECON DAHO
Western red cedar	Harry worth
Select zone	
Oregon (1996) western redcedar Zone 2, 0' - 99999 🔹	Carl Carl Star 1
3 Select climate variables	ent a start for
Units: Metric Imperial	SCO Design
Name Center Transfer limit (+/-)	LIFOTHA
× MWMT 21.3 °C 3.90 °C ⊙	

Manage for future climate, including drought stress

Maintenance: <u>space</u> between trees to handle future drought, reduce competition, & do not fertilize during a drought.

Manage for future climate, including drought stress

Prevent and control: be aware of insects and diseases. Remove weak, injured or extremely stressed trees that may risk spreading insects & disease to healthy trees.

Select drought tolerant understory and edge species

In praise of hardwoods

- Hardwoods add diversity, especially in riparian areas
- Wildlife habitat
- Red alder and bigleaf maple have high value for wood products
- Firewood
- Resistance to conifer
 diseases
- Red alder fixes nitrogen
- Can underplant western redcedar and grand fir

Increase species diversity and structure

Diversify landscape pattern: partition species by water needs

Keep forests healthy: Manage stand density (and fuels)

Thin dense stands to reduce competition

Manage forest density and fuels across landscapes

Collaborate with neighbors

Variable density thinning

Various spatial patterns of different tree densities

Target: 20% open stands 20% dense stands 60% standard thin

This can vary – there are no rules. 75 TPA

> 150 TPA

Skip

75 PA

Keep vegetation healthy, remove stressors quickly

In summary — What can be done

- Manage for warmer temperatures & more extremes.
- Diversify plant species, genotypes, and spatial patterns.
- Use disturbances as an opportunity for changing trajectories and experimenting.
- Implement risk assessment and risk management.
- Monitor, learn, and adjust as needed.

Consider short-term projections prior to management actions

http://www.cpc.ncep.noaa.gov/

NOAA National Weather Service Outlooks

Temperature & Precipitation

6-10 Day Outlook8-14 Day OutlookWeek 3-4 OutlookOne Month OutlookThree Month Outlook

US Hazard Outlook (8-14 days)

http://www.cpc.ncep.noaa.gov/

Climate Toolbox

The Climate Toolbox

A collection of web tools for visualizing past and projected climate and hydrology of the contiguous United States of America.

Applications

A collection of tools for addressing questions relating to Agriculture, Climate, Fire Conditions, and Water.

-collection of tools

Climate Toolbox

The Climate Toolbox

A collection of web tools for visualizing past and projected climate and hydrology of the contiguous United States of America.

Applications

A collection of tools for addressing questions relating to Agriculture, Climate, Fire Conditions, and Water.

Climate mapper

Past/Real-time observations

TOOLS -

Mean Daily Temperature, Last 90 Days

	Climate Toolbox	APPLICATIONS -	TOOLS -	DATA 🗸	GUIDANCE	NEWS	CONTACT					
Climate Mapper									Documentation	Example	Cite Tool	Take Tour
Choose Data -							Mean Daily Tempera 2019/09/04 -	ature, Last 90 Days 2019/12/02				
Select from the menus below Time Scale: Past/Real-Time: Observations Impact Area: ? Climate Variable: ? Mean Temperature (°F) Calendar Time Period: ? Last 90 Days Choose a Location - Change Mapping - Add Map Features - Download Data -			+		Andrew Contraction of the second seco	und.	Spok ans TOR Removide ARINE BASI	Telena Telena	NONTERIA Pillings		- F	100 20 30 70 50 40 30 20 10 -
Download Map+							Canson City NEVADA		Non S		5 Denver	

Mean Daily Temperature, Last 90 Days

	Climate Toolbox	APPLICATIONS -	TOOLS - DAT	A - GUIDANCE	NEWS C	CONTACT						
Climate Mapper									Documentation	Example	Cite Tool	Take Tour
Choose Data -						Mean Daily Te	mperature, Las /09/04 - 2019/12/02	st 90 Days				
Select from the menus below Time Scale: Past/Real-Time: Observations Impact Area: ? Climate Variable: ? Mean Temperature (*F) Calendar Time Period: ? Last 90 Days			+ Vittamus	Sh Vent Petto Mean Tempe @ 44.96 N, 12 Pottos	F erature 23.25 W		Silvetori WALCO HITES				11 9 8 7 6 5 4 4 3 2 2 1 1 1 1	00 0 0 0 0 0 0 0 0
Change Mapping+						salena ateman bangan Jefferson	Stayton and a second		HAIF City		EN.	
Add Map Features - Download Data -					Albany WILCAN							
Download Map-						etrarian how-						

Historical simulation, 1971 – 2000 (mean) Mean Temperature, Winter

Climate Toolbox APPLICAT		DLS - DATA	- GUIDANCE	NEWS	CONTACT
					Historical simulation, 1971-2000 mean
Select from the menus below		er.	W. See		Multi-model mean derived from 20 downscaled CMIP5 models
Future: Projections (through 2100)	+	19 SP - 3	Nanaimo o ^V	ancouv er	70
Impact Area: (?) Climate			Victoria	2	1 marcan Internal Deternal Control Control Con
Variable:				32.5	deg F Spokang
Calendar Time Period: ? Winter (Dec-Jan-Feb)			de l	Mean Ter @ 45.74 N	International In
Future Scenario: ? Historical simulation, 1971-2000 mean •]		-		Eillings -10
Model: ⑦ Multi-model mean derived from 20 downscaled CMIP5 models]			Portland . Li alem	
Choose a Location -					offExant Book I I Annual I
The data is available as a mean value over a grid cell. Select a point location to view the value of the containing grid cell.			1	Medford	HARNEY BASH
GeoLocate: Type a location description: Place or Location]		1	an Mo	
Drag: Click on the map to get a marker and drag the marker to your desired location				Shine ou	Cheyenne 200
Enter: Enter coordinates of a location: ? Latitude: 45.74 N			$\langle \rangle$		China
Longitude: 121.13 W			1		NW Climate Toolbox, Data: MACAv2-METDATA
Change Mapping-					

Higher emissions RCP 8.5 2070-2099 vs historical simulation 1971 – 2000 (mean **change**) Mean Temperature, Winter

Climate Toolbox APPLICATIONS	TOOLS - DATA - GUIDANCE NEWS CONTACT Documentation Example Cite lool Take
Choose Data - Select from the menus below Time Scale: Future: Projections (through 2100) Impact Area: ? Climate Variable: ? Mean Temperature Vinter (Dec.Jan-Feb) Future Scenario: ? Higher Emissions (RCP 8.5) 2070-2099 vs. historical simulation 1971-2000, mean c * Model: ? Mutil-model mean derived from 20 downscaled CMIP5 models Choose a Location -	Projected Change in Mean Temperature, Winter (Dec-Jan-Feb) Higher Emissions (RCP 8.5) 2070-2099 vs. historical simulation 1971-2000, mean change Mult-model mean derived from 20 downscaled CMIP5 model
 The data is available as a mean value over a grid cell. Select a point location to view the value of the containing grid cell. GeoLocate: Type a location description: ? Enter Place or Location Drag: Click on the map to get a marker and drag the marker to your desired location. Enter: Enter coordinates of a location: ? Latitude: 45.74 N 	Heddad Withing HARHEY BASTO

US Drought Monitor

Weekly map indicating dry conditions to aid in planning

droughtmonitor.unl.edu/

November 26, 2019 (Released Wednesday, Nov. 27, 2019) Valid 7 a.m. EST

The Drought Monitor focuses on broad-scale conditions Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

precipitation

Brad Rippey, U.S. Department of Agriculture

Anthony Artusa, NOAA/NWS/NCEP/CPC

Future climate information to aid with reforestation Seedlot Selection Tool

seedlotselectiontool.org/sst/

Adaptation planning

Adaptation partners- Adaptation library

- -Information from multi-resource assessments
- -Based on coordinated science-management expertise

adaptationpartners.org/

WHO WE ARE

Through the support of the U.S. Forest Service Office of Sustainability and Climate and Pacific Northwest Research Station, Adaptation Partners work with researchers and resource managers in the U.S. Forest Service and other organizations to provide scientific information on climate change effects and adaptation.

WHAT WE DO

Adaptation Partners facilitates climate change adaptation by forming collaborations between diverse organizations and stakeholders. By focusing on sustainable natural resource management, our adaptation efforts aim to reduce the undesirable effects of climate change as ecosystems transition to a warmer climate.

CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION PARTNERSHIPS

Bark Beetle Forecasts

USFS, Pacific Northwest Region

2019 Bark Beetle Forecast for California, Oregon and Washington

The forecast is based on history of drought (amount of precipitation) and bark beetle attacks in each 2.5' (6.5 square mile) grid cell from 1993 to 2018 for California and 1966 to 2018 for Oregon and Washington. Cells with similar histories of bark beetle activity and precipitation were then grouped together into ten risk (color) groups. These risk groups (R) forecast a range of the likely number of trees expected to die from bark beetles by the end of summer 2019.

California Oregon & Washington 2005-2018

https://www.arcgis.com/apps/MapJournal/index.html?a ppid=7b78c5c7a67748808ce298efefceaa46

Predicted Risk Level

USDA Northwest Climate Hub

Monthly newsletter

Tools

- Seedlot Selection Tool
- Climate mapper

Pacific Northwest Drought Early Warning System Webinars

 Bi-monthly (December, February, April, June, August, October)

USDA Resources and Program for Tribes to Adapt to Climate Change

U.S. DEPARTMENT OF AGRICULTURE

Thank you

For more information: holly.prendeville@usda.gov

https://www.climatehubs.oce.usda.gov/hubs/northwest