

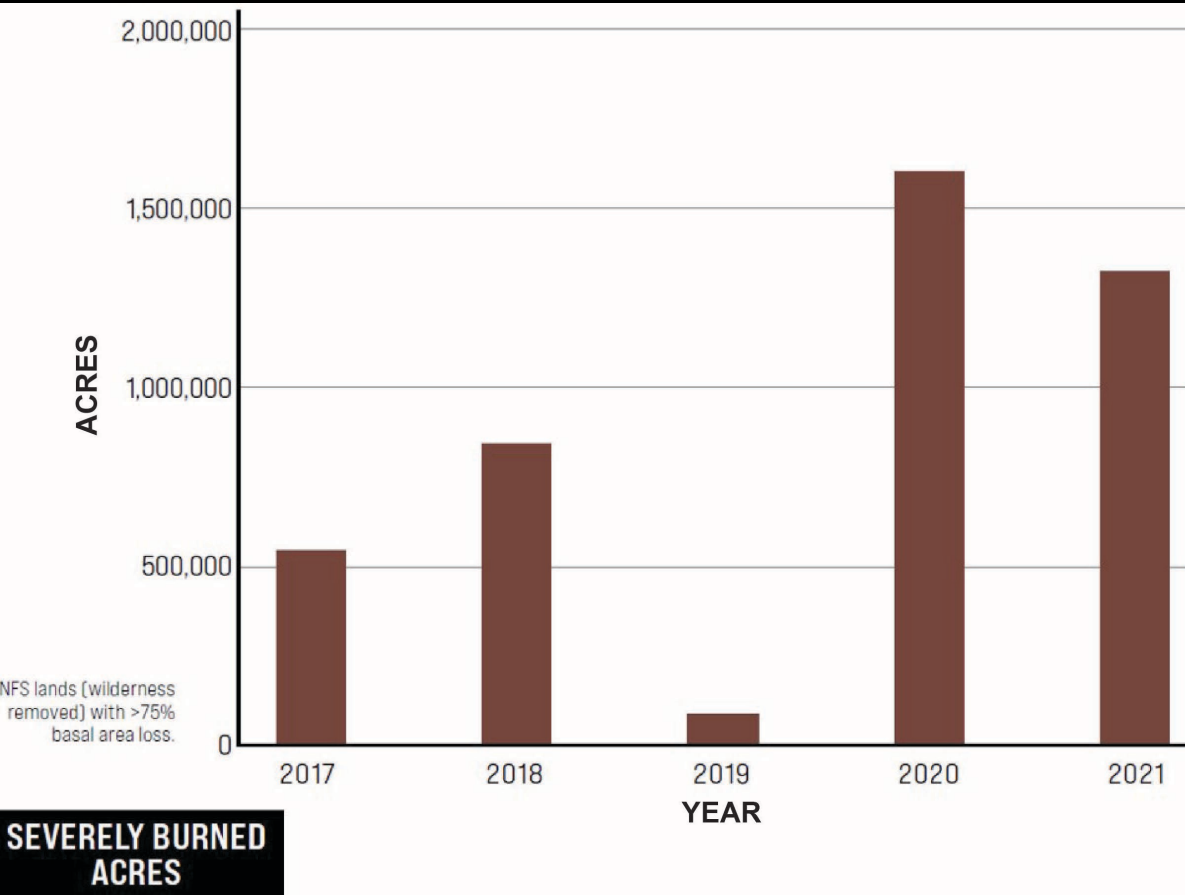
# Evaluating use of assisted population migration during reforestation for climate adaptation

Rob Slesak, Research Forester (PNW Research Station)

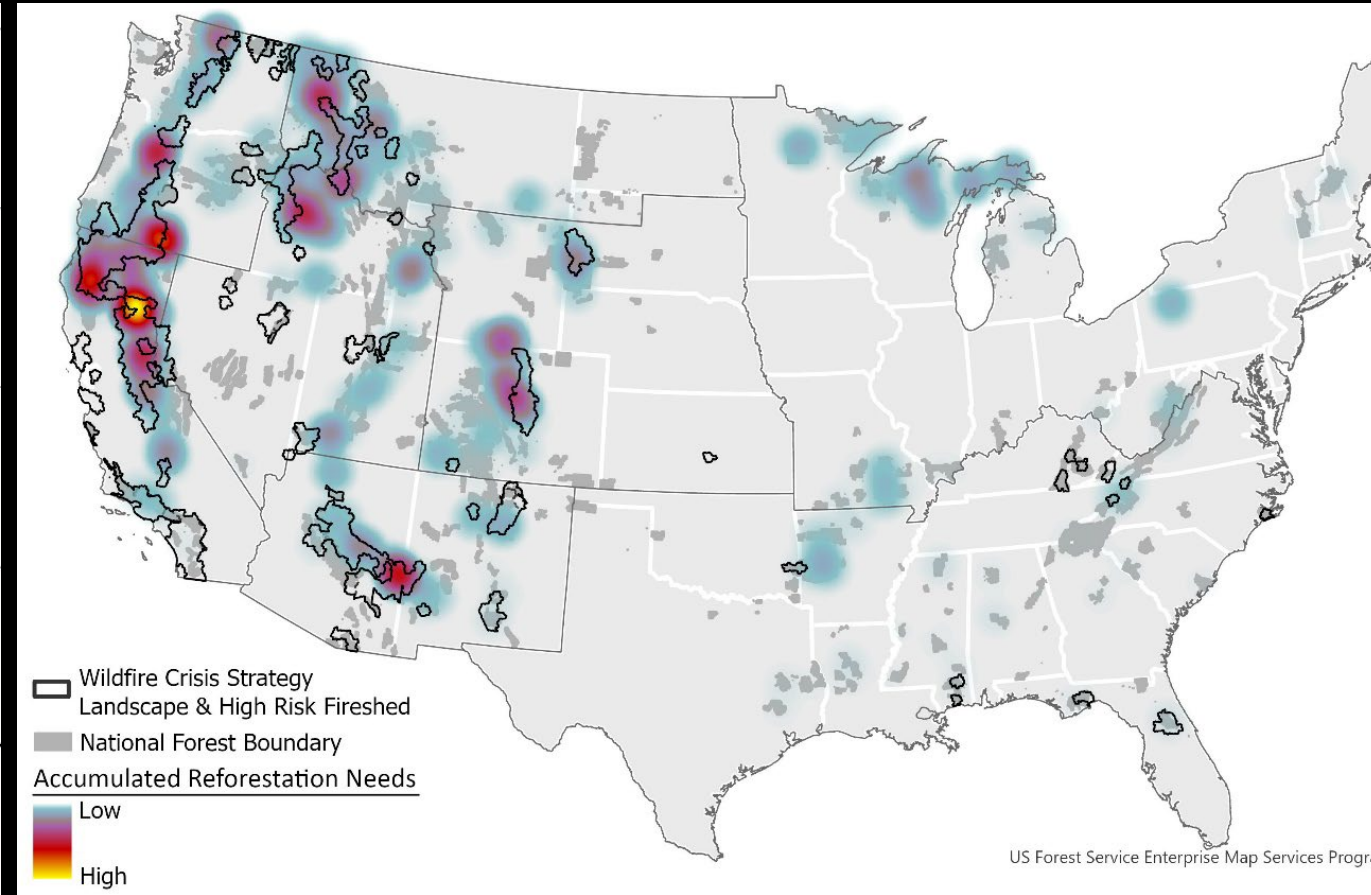
And many, many others



# Reforestation needs are at a critical level



Source: NFS Reforestation Strategy



Source: Olivia Fraser, WO Reforestation team

# Achieving reforestation success

## Two components:

1. Short term establishment
  - Immediate threats to survival and growth
2. Long-term resilience
  - Future-adapted species and genotypes

What should I plant and how should I plant it?



In general, trees are adapted to the climate where they are found

**Adaptation issue:** identify where that climate will exist in the future

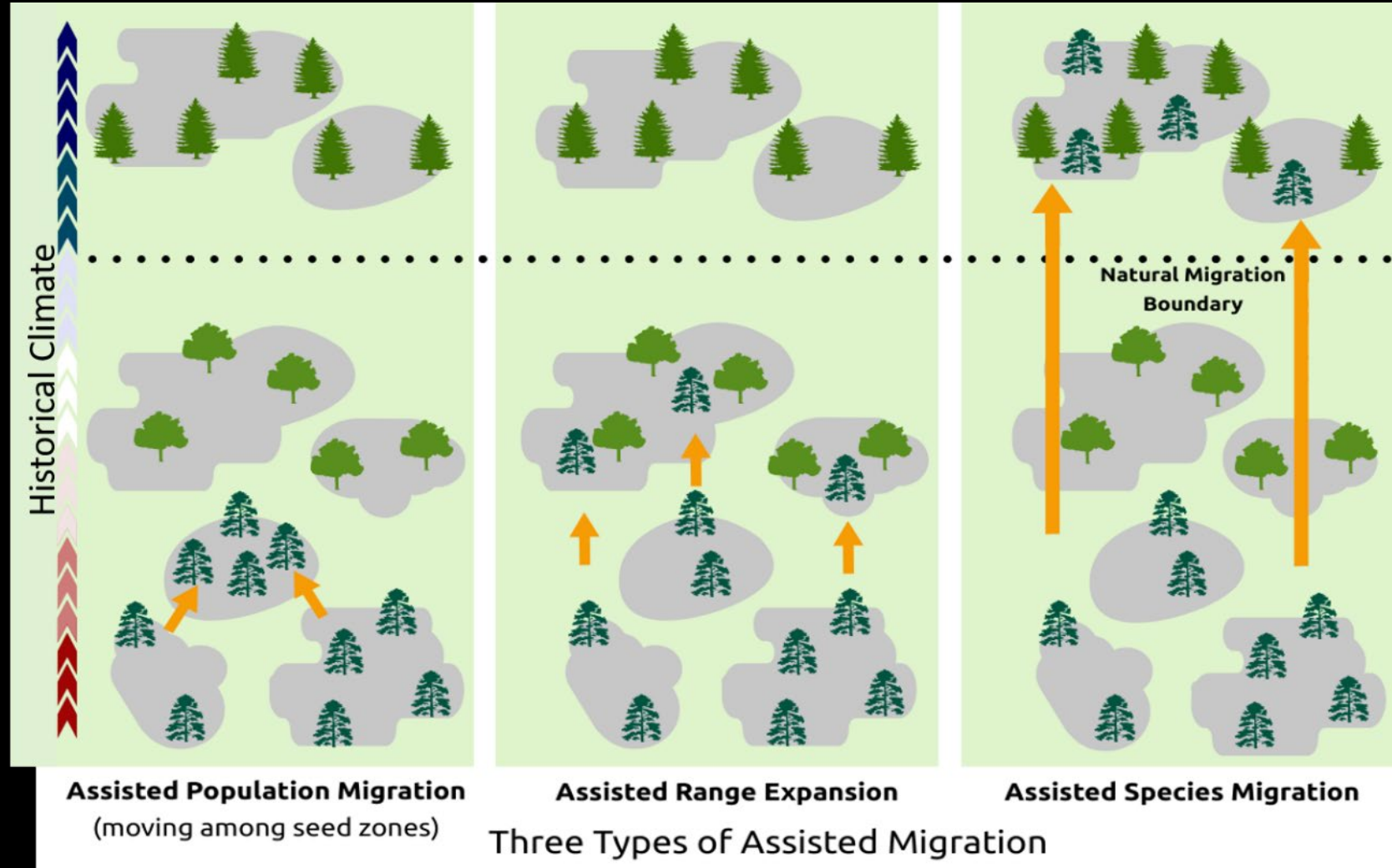


# Assisted migration

**Population migration** – movement of seed sources to new locations within an existing range

**Range expansion** – movement of populations just outside their range

**Species migration** – movement outside the range, farther than naturally possible



# Challenges to operational implementation

- Knowing on how far is too far to move in climate space
- Getting the trees to survive until climate change aligns with their population climate niche
- Hesitation at doing something new (uncertainty)
- Barriers – logistical, policy, and administrative



# Establishment practices are an important aspect

Practices to increase the likelihood of survival

Much existing research, but novel applications are needed

What practices are needed for reforestation using APM?



# Experimental Network for Assisted Migration and Establishment Silviculture (ENAMES)

Overarching objective: provide information on what seed sources to plant and the establishment practices needed for reforestation success

- Multidisciplinary
- Multiownership
- Coproduction with practitioners

Designed to be directly relevant to operational application



WASHINGTON STATE DEPT OF  
**NATURAL  
RESOURCES**



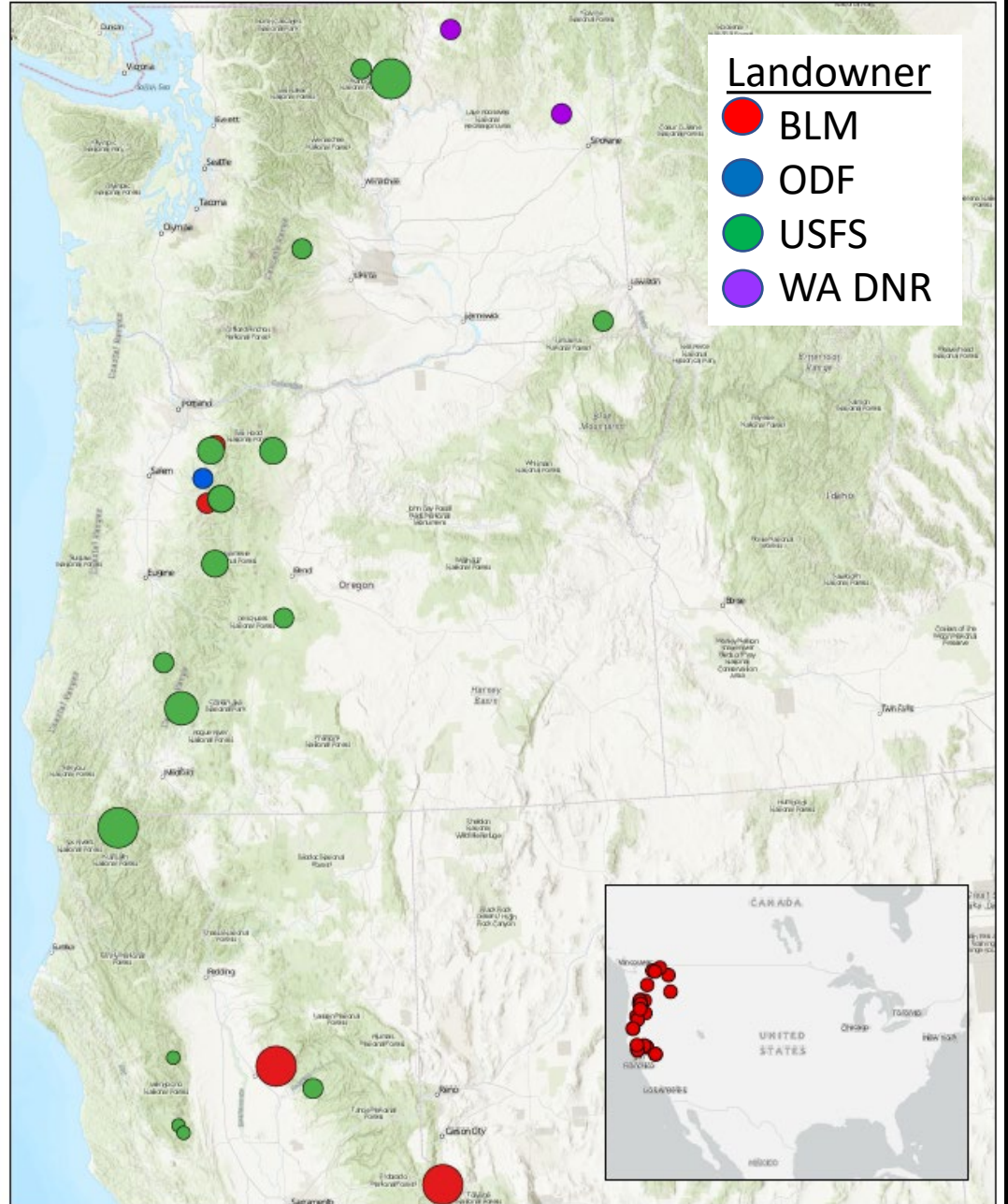




# Experimental Network for Assisted Migration and Establishment Silviculture site locations



0 25 50 100 150 200 Miles NAD 83 - UTMN 10



## Overview

- 30+ sites (CA, OR, WA)
- All ownerships
- Any setting of interest (salvage, underplant, etc)
- Any tree species of interest
- Fully replicated at each site

# Experimental design: Assisted migration

Common treatments across sites

Seedlot selection tool to ID seed sources  
<https://seedlotselectiontool.org/sst/>

Four climate-associated genotypes

- Historic climate / seed zone
- Current climate (+1 °C)
- Mid century climate (+2 °C)
- End of century (+4 °C)

**Seedlot Selection Tool**

About | Tool | Layers | Saved Runs

**4 Select climate scenarios**

Which climate are the seedlots adapted to?  
1961 - 1990

When should trees be best adapted to the planting site?  
2041 - 2070 | RCP8.5

**5 Select transfer limit method**

Custom | Zone | Function

**6 Select climate variables**

Units: Metric | Imperial

Name	Center	Transfer limit (+/-)
MCMT	0.8 °C	2.00 °C
SHM	139.5	52.5

Add a variable...

**7 Apply constraints**

Select...

**8 Map your Results**

Run Tool

Save Last Run | Export As...

# Experimental design: Silviculture practices

- Variable treatments that reflect differences in management intensity
- Partners determined which treatments to test at a given site
  - relevant to their objectives
  - specific information need
- Practices to date:
  - stock type
  - competition control
  - planting density



# Science Engagement

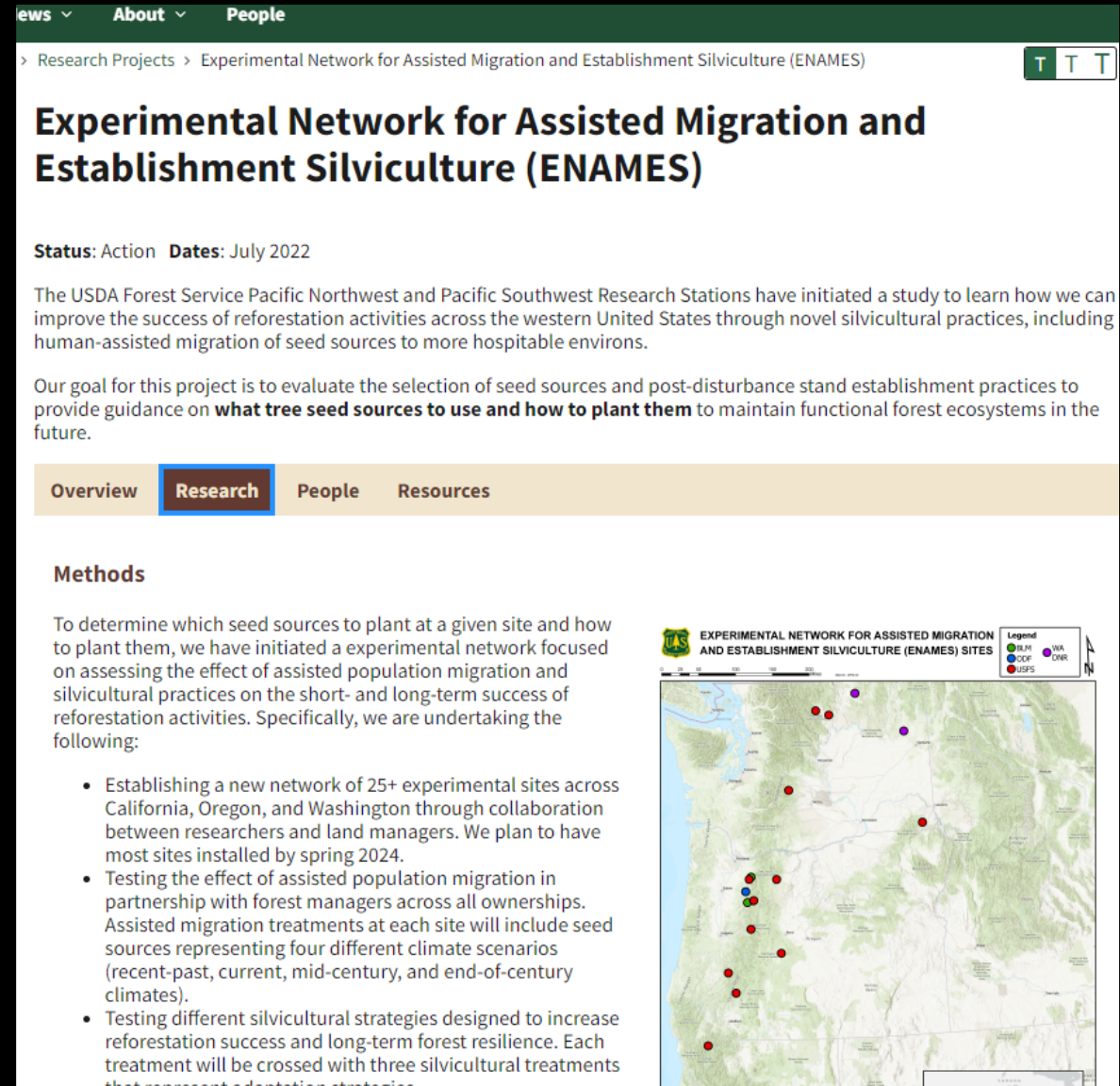
Engagement with stakeholders and the public is a core objective

Website interface attached to database

- Data uploading / storage
- Data summarization / visualization

Content features

- Assisted migration overview
- **Reforestation case studies**
- Topical briefs / summaries
- Site story maps



The screenshot shows the website for the Experimental Network for Assisted Migration and Establishment Silviculture (ENAMES). The navigation bar includes 'ews', 'About', and 'People'. The breadcrumb trail is 'Research Projects > Experimental Network for Assisted Migration and Establishment Silviculture (ENAMES)'. The main heading is 'Experimental Network for Assisted Migration and Establishment Silviculture (ENAMES)'. Below the heading, it states 'Status: Action' and 'Dates: July 2022'. The introductory text explains that the USDA Forest Service Pacific Northwest and Pacific Southwest Research Stations have initiated a study to improve reforestation success through novel silvicultural practices, including human-assisted migration of seed sources. The goal is to evaluate seed source selection and post-disturbance stand establishment practices to provide guidance on what tree seed sources to use and how to plant them. The 'Research' tab is selected in the navigation menu. The 'Methods' section describes the experimental network's focus on assessing assisted population migration and silvicultural practices. A map on the right shows the experimental sites across California, Oregon, and Washington, with a legend indicating sites in CA, OR, WA, and OWR.

**Experimental Network for Assisted Migration and Establishment Silviculture (ENAMES)**

Status: Action Dates: July 2022

The USDA Forest Service Pacific Northwest and Pacific Southwest Research Stations have initiated a study to learn how we can improve the success of reforestation activities across the western United States through novel silvicultural practices, including human-assisted migration of seed sources to more hospitable environs.

Our goal for this project is to evaluate the selection of seed sources and post-disturbance stand establishment practices to provide guidance on **what tree seed sources to use and how to plant them** to maintain functional forest ecosystems in the future.

Overview **Research** People Resources

**Methods**

To determine which seed sources to plant at a given site and how to plant them, we have initiated an experimental network focused on assessing the effect of assisted population migration and silvicultural practices on the short- and long-term success of reforestation activities. Specifically, we are undertaking the following:

- Establishing a new network of 25+ experimental sites across California, Oregon, and Washington through collaboration between researchers and land managers. We plan to have most sites installed by spring 2024.
- Testing the effect of assisted population migration in partnership with forest managers across all ownerships. Assisted migration treatments at each site will include seed sources representing four different climate scenarios (recent-past, current, mid-century, and end-of-century climates).
- Testing different silvicultural strategies designed to increase reforestation success and long-term forest resilience. Each treatment will be crossed with three silvicultural treatments that represent adaptation strategies.

EXPERIMENTAL NETWORK FOR ASSISTED MIGRATION AND ESTABLISHMENT SILVICULTURE (ENAMES) SITES

Legend: CA, OR, WA, OWR

<https://www.fs.usda.gov/research/pnw/projects/enames#research>

# Outcomes



## Removing barriers to operational use of APM during reforestation

- Recommendations on climate transfer distances for each species
- Recommendations on establishment practices needed for APM success
- Easily accessible /intuitive website for dissemination of network findings and information to assist managers in decision-making

# Questions?

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McKenzie District, Willamette NF. March 24, 2023  
Photo by Scott Kolpak