

## Assisted Migration:

Intentionally moving species or populations to mitigate changes in climate



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## Summary

- AM provides another option in our climate mitigation toolbox
- Move populations of a species, expand a species range, or long-distance as a last resort
- Pros and cons depend on the context

#### Plant-Climate Relationships

By the end of this century, most landscapes will have climates incompatible with current vegetation.



# Plants will need to adapt or move to avoid maladaptation

Observed rates: 10 to 50 m/year

Expected rates: 300 to 500 m/year

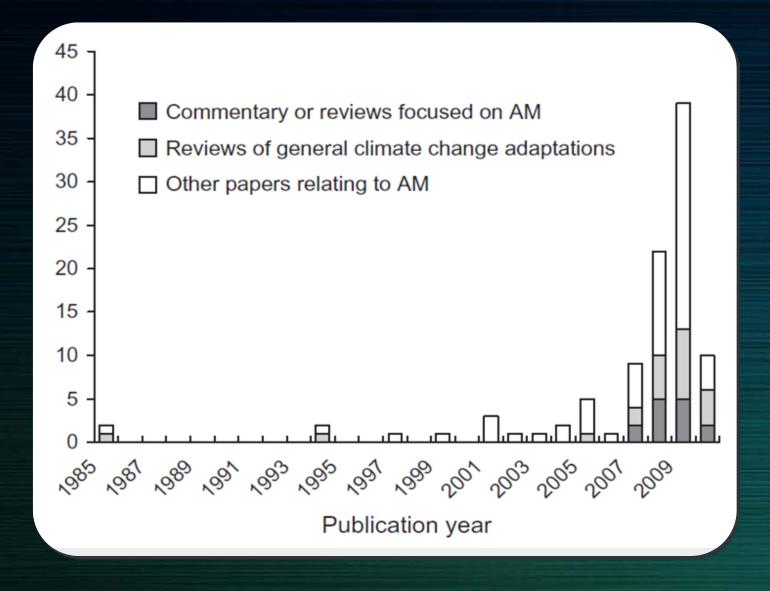
## Assisted Migration

Human-assisted movement of species <u>in response</u> <u>to climate change</u>

Ste-Marie et al. 2011. Assisted migration: Intro-duction to a multifaceted concept. Forestry Chronicle 87:724 –730.

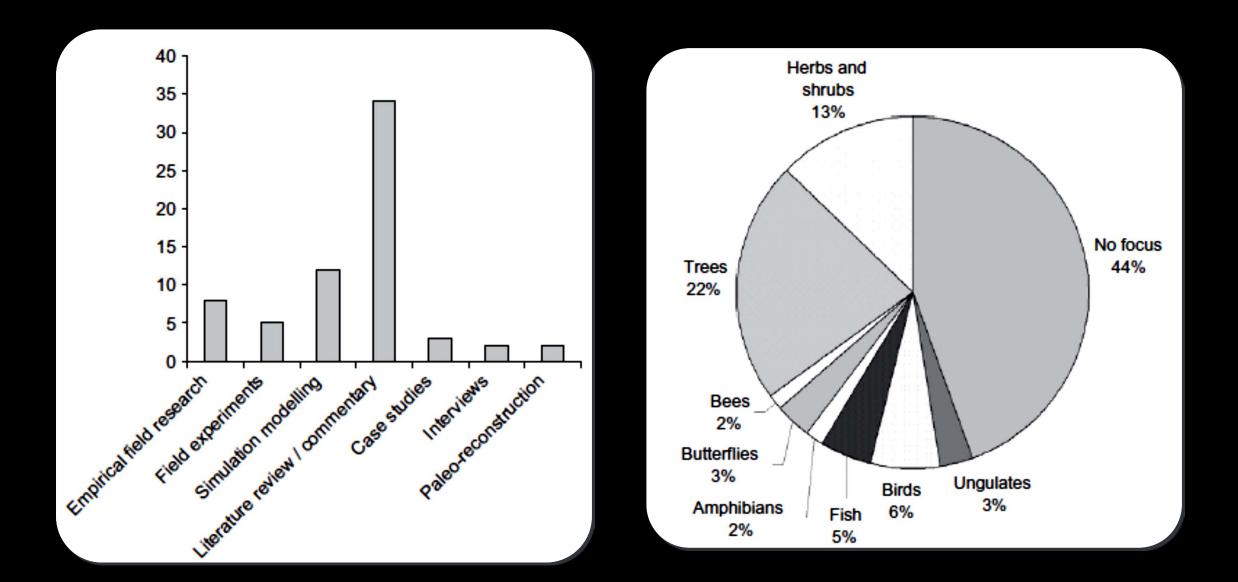
TRANSFER – human-mediated movement of tree TRANSLOCATION – any movement of a species from one germplasm, regardless of geographic scale (Koskela et al. 2014) location to another (Seddon 2010) ASSISTED MIGRATION - expanding the range of species that are at risk of extinction by climate change to new locations (McLachlan et al. 2007); human-aided translocation of species to areas where climate is projected to become suitable to reduce the risk of extinction due to climate change (Mueller and Hellmann 2008); purposeful movement of species to facilitate or mimic natural range expansion as a direct management response to climate change (Vitt et al. 2010); human-assisted movement of species in response to climate change (Ste-Marie et al. 2011) MANAGED RELOCATION - intentional movement of ASSISTED COLONIZATION - moving species that are threatened with extinction by climate change and ensuring organisms from current locations to locations projected to have future establishment in their new locations (Hunter 2007); moving species to suitable conditions for persistence in order to reduce the threat of locations outside their current and recent historic ranges (Hoeghclimate change, disappearing habitat, or biological invasions. (Richardson Guldberg et al. 2008); translocation of a species beyond its natural et al. 2009); conservation strategy involving the translocation of species range to protect it from human-induced threats (Seddon 2010) to novel ecosystems in anticipation of range shifts forced by climate change (Minteer and Collins 2010) **ASSISTED SPECIES MIGRATION -**ASSISTED POPULATION MIGRATION - intentional movement of populations **ASSISTED** (genotypes) within a species-established range in response to climate change RANGE (Johnston et al. 2010; Ste-Marie et al. 2011) **EXPANSION** intentional ASSISTED GENE FLOW - intentional **REENFORCEMENT** - movement of movement of ASSISTED LONG-DISTANCE translocation of individuals within a individuals to build up an existing species to areas MIGRATION - intentional species range to facilitate adaptation to population (IUCN 1987; Seddon just outside their movement of species to areas far anticipated local conditions (Aitken and 2010) established Whitlock 2013) outside their established range range in (beyond areas accessible via natural response to FORESTRY ASSISTED MIGRATION -**REINTRODUCTION** - intentional dispersal) in response to climate climate change, change (Vitt et al. 2010; Ste-Marie et movement of an organism into part of movement of forest tree populations facilitating or al. 2011; Winder et al. 2011) its native range from which it has within current range or within range mimicking disappeared or become extirpated in extensions to maintain forest SPECIES RESCUE - movement of natural range historic times (IUCN 1987) productivity and health (Pedlar et al. expansion. species far outside current natural 2012) (Johnston et al. range to avoid extinction by climate 2010; Ste-Marie change (Pedlar et al. 2012) TRANSLOCATION - intentional reintroduction of a species within its historic et al. 2011) range (Griffith et al. 1989)

Dumroese et al. 2015. Considerations for restoring temperate forests of tomorrow: forest restoration, assisted migration, and bioengineering. New Forests 46: 947–964.

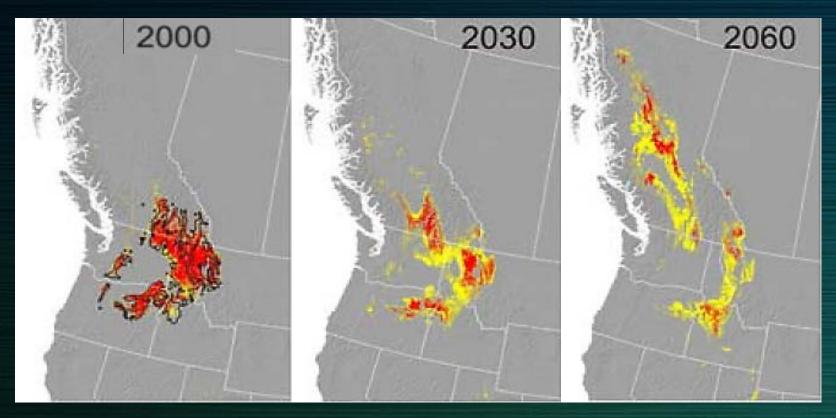


### AM Plants 2010 – 2015

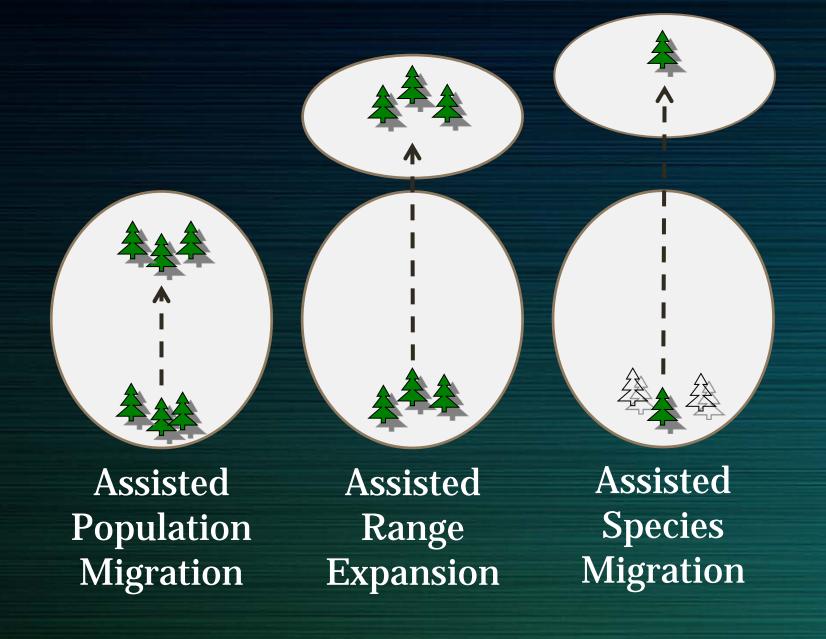
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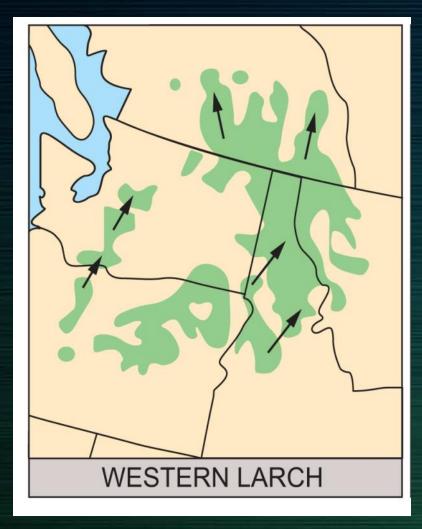
## Current and Projected Distribution of Larix occidentalis



Rehfeldt and Jaquish. 2010. Ecological impacts and management strategies for western larch in the face of climate-change. Mitig. Adapt. Strat. Global Change 15:283–306.

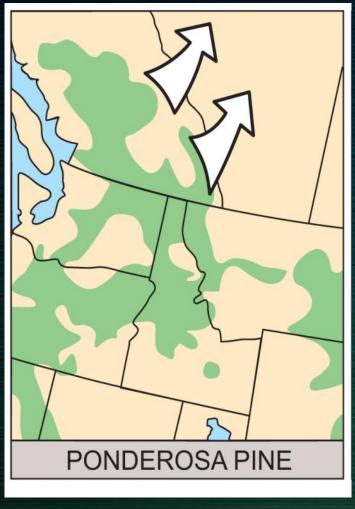


#### **Assisted Population Migration**



Move seed sources within existing ranges and to leading edges

#### **Assisted Range Expansion**



Move seed sources into anticipated ranges

#### Risks – Ecological and Economic

- Costs
- Effects on receiving ecosystem
- Effects on donor ecosystem
- Establishment failures

**Context! Context! Context! Context! Context! Context! Context! Context! Context!** 

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### Thank you!



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The views expressed were strictly those of the author and do not necessarily represent the positions or policy of the U.S. Department of Agriculture.