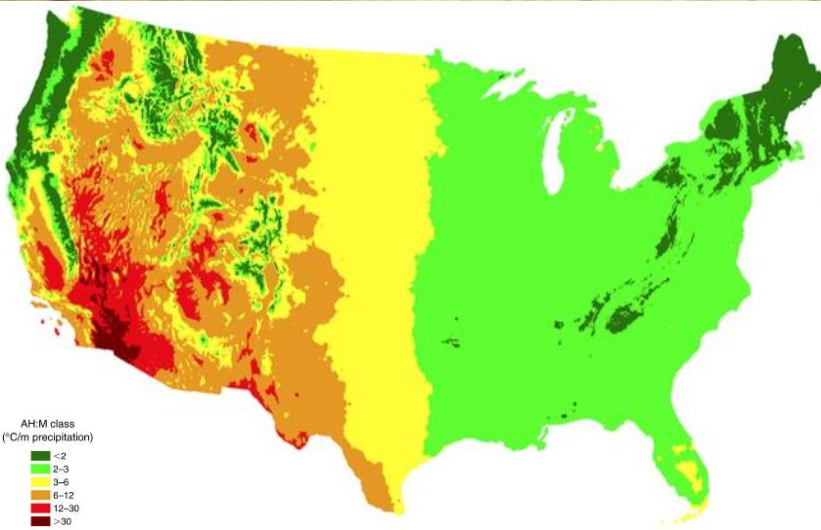


Assessing seed zone efficacy using two-year old bluebunch wheatgrass

Holly R. Prendeville
USDA-FS
Pacific Northwest Research Station



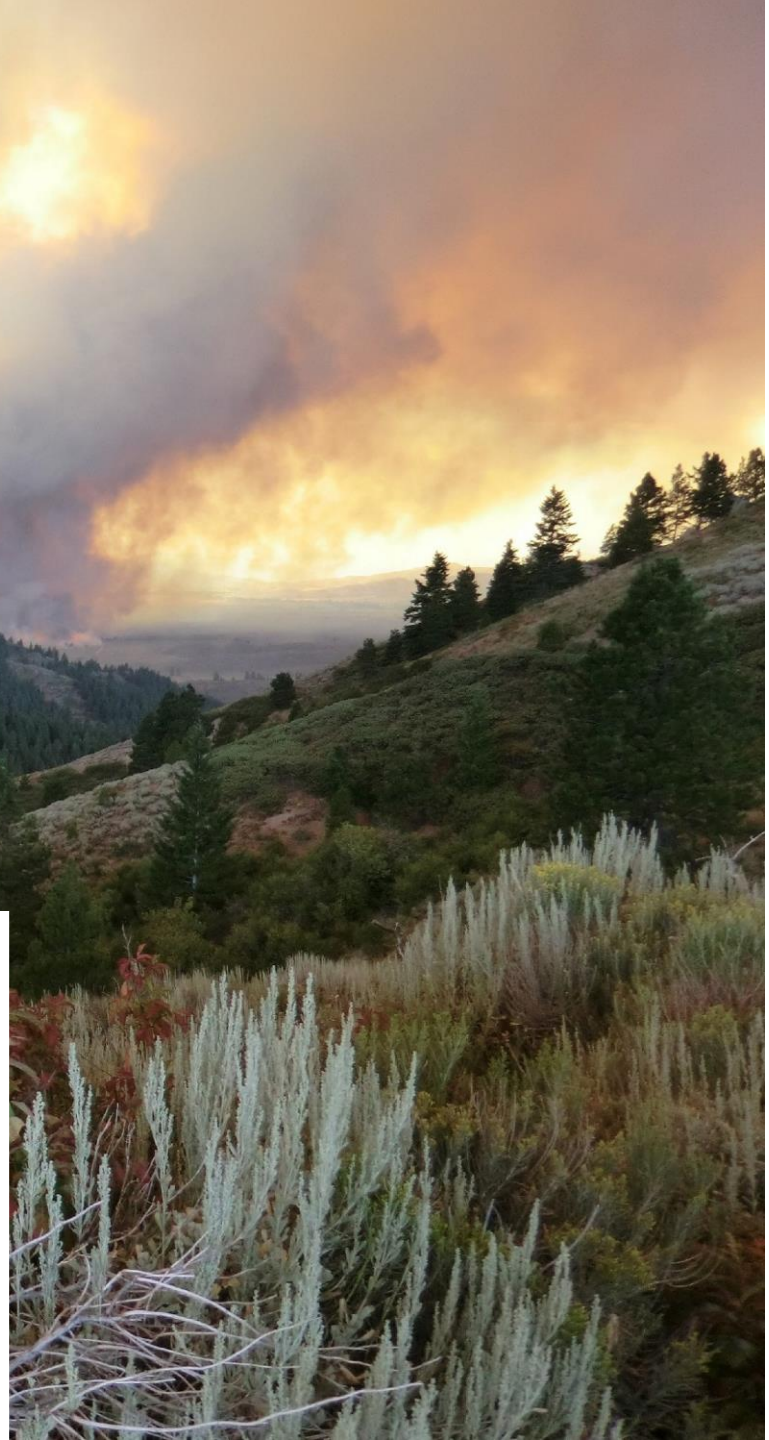
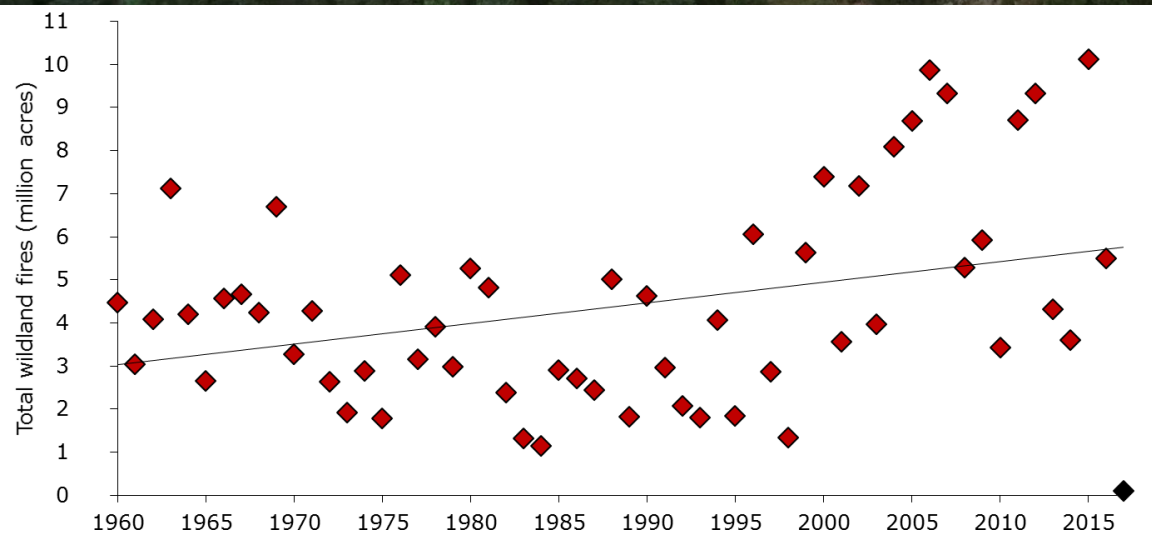
Prairies and shrublands



Invasive and non-native species



Fire



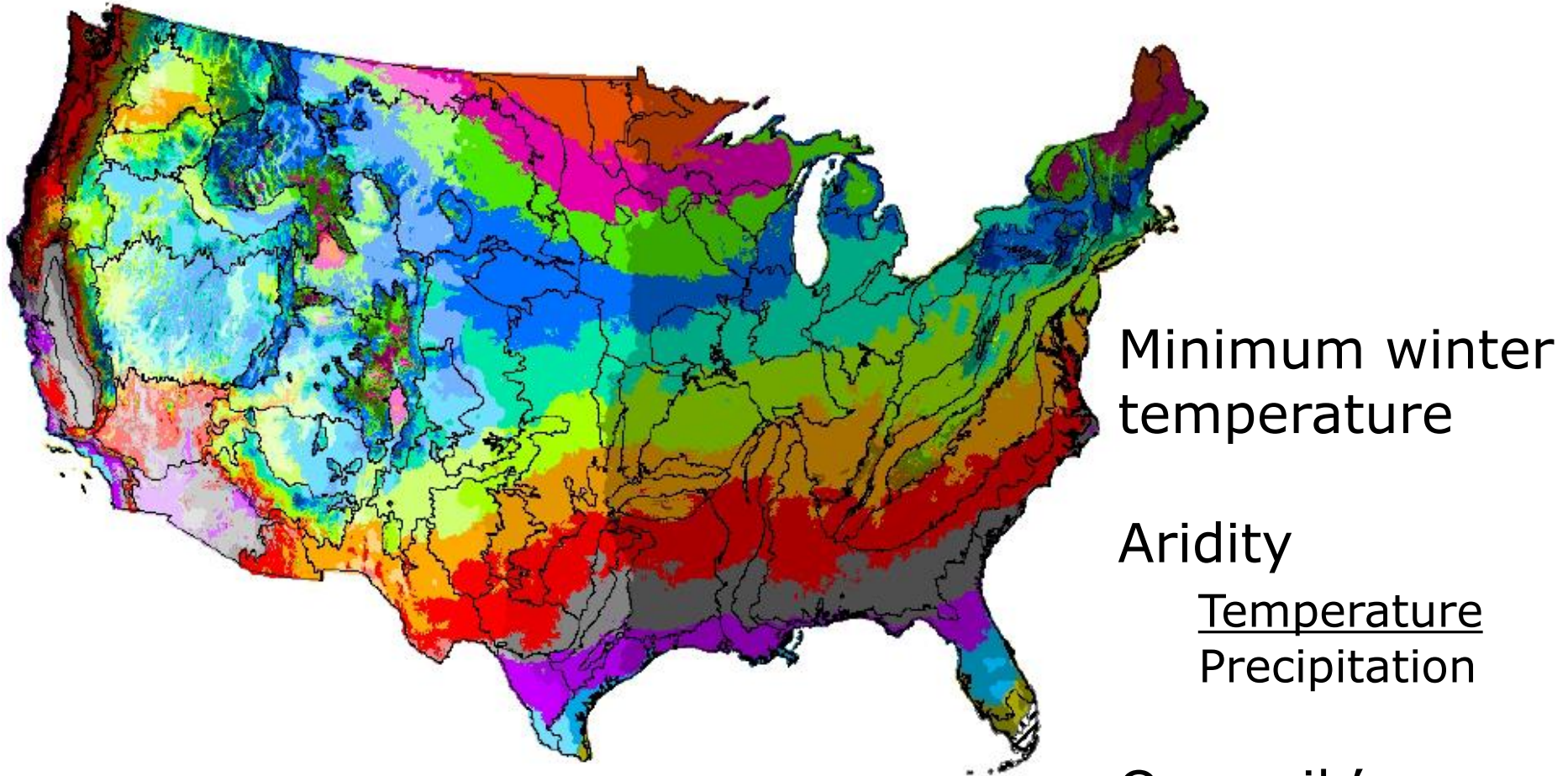
Land of Many Uses



Healthy ecosystems



Provisional seed zone map



Seed zones

Species specific or Empirical seed zones

Common gardens

Plant traits

Morphology

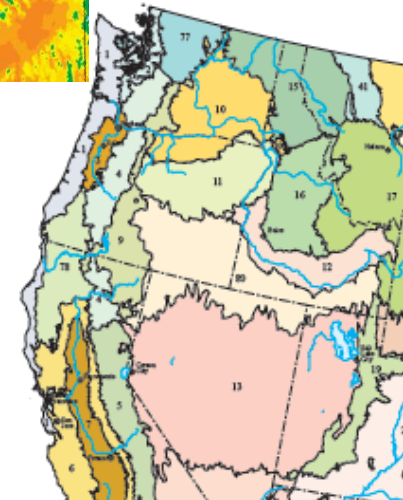
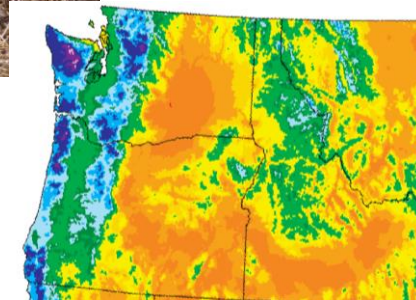
Phenology



Wild populations

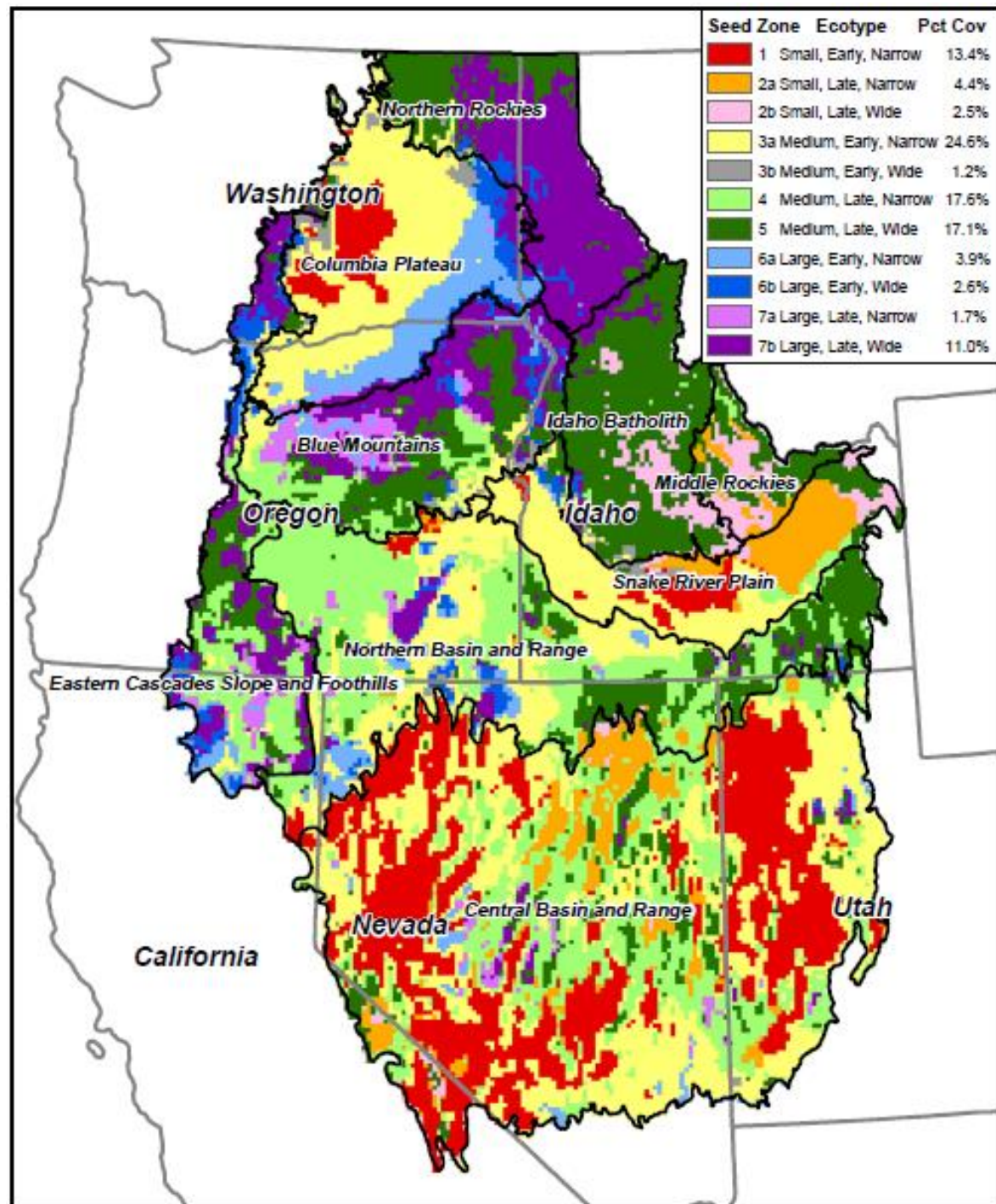
Climatic variables

Ecoregions level III



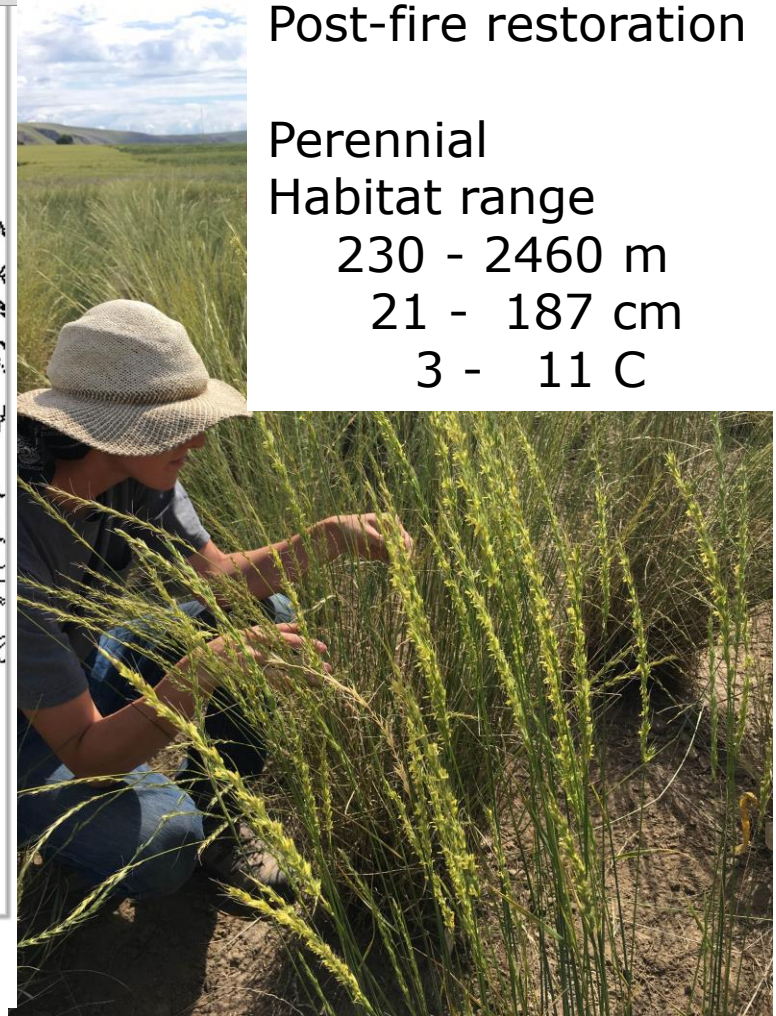
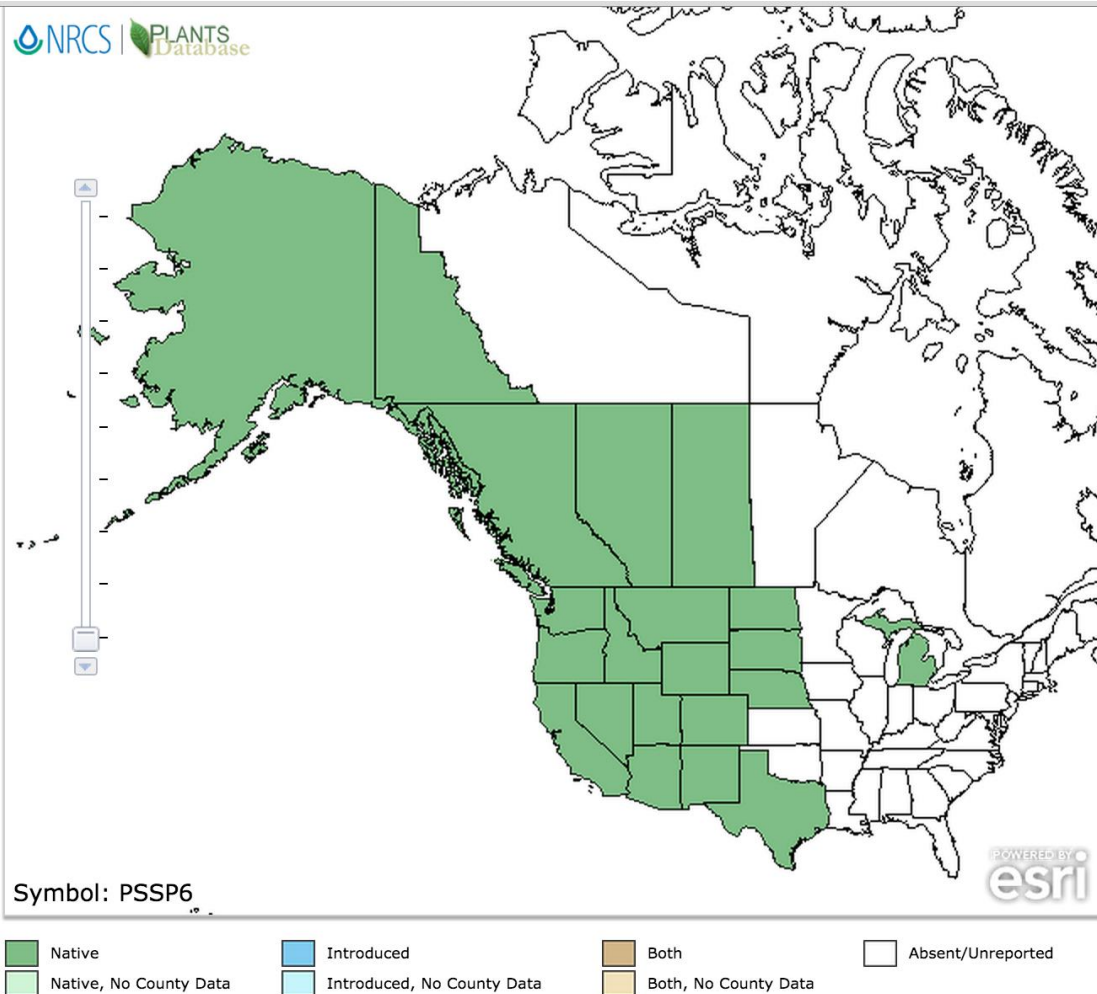
Seed zone map for bluebunch wheatgrass

11 zones



Bluebunch wheatgrass

Pseudoroegneria spicata (PSSP)



Nancy Shaw



Francis Kilkenny

Brad St. Clair

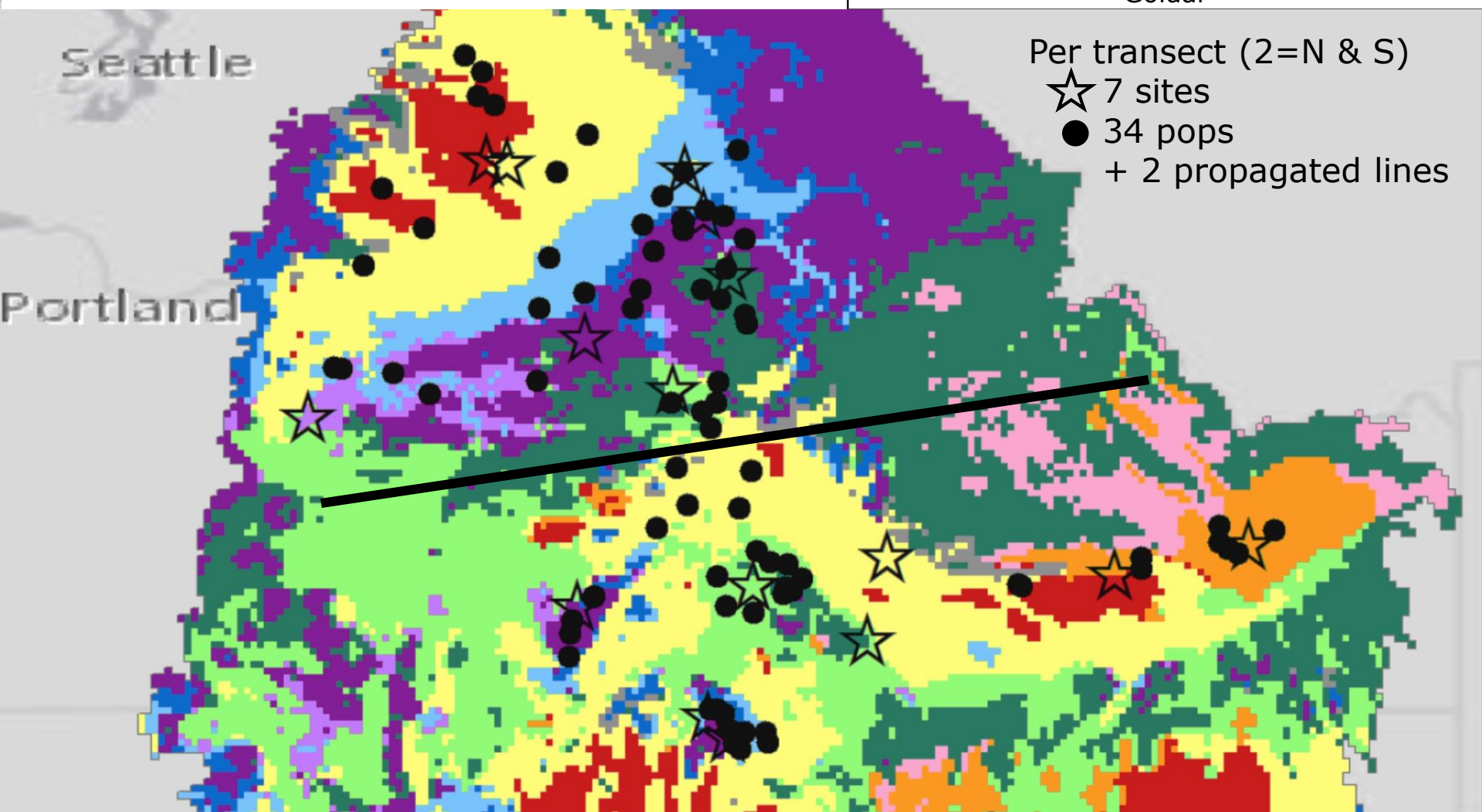


SEED ZONES



Warmer/Dryer climate (Smaller plants) -> Wetter/Cooler climate (Larger plants)

Anatone
Goldar



Fall 2014



Fall 2014



Data collection 2015 & 2016



Successful restoration

Survival

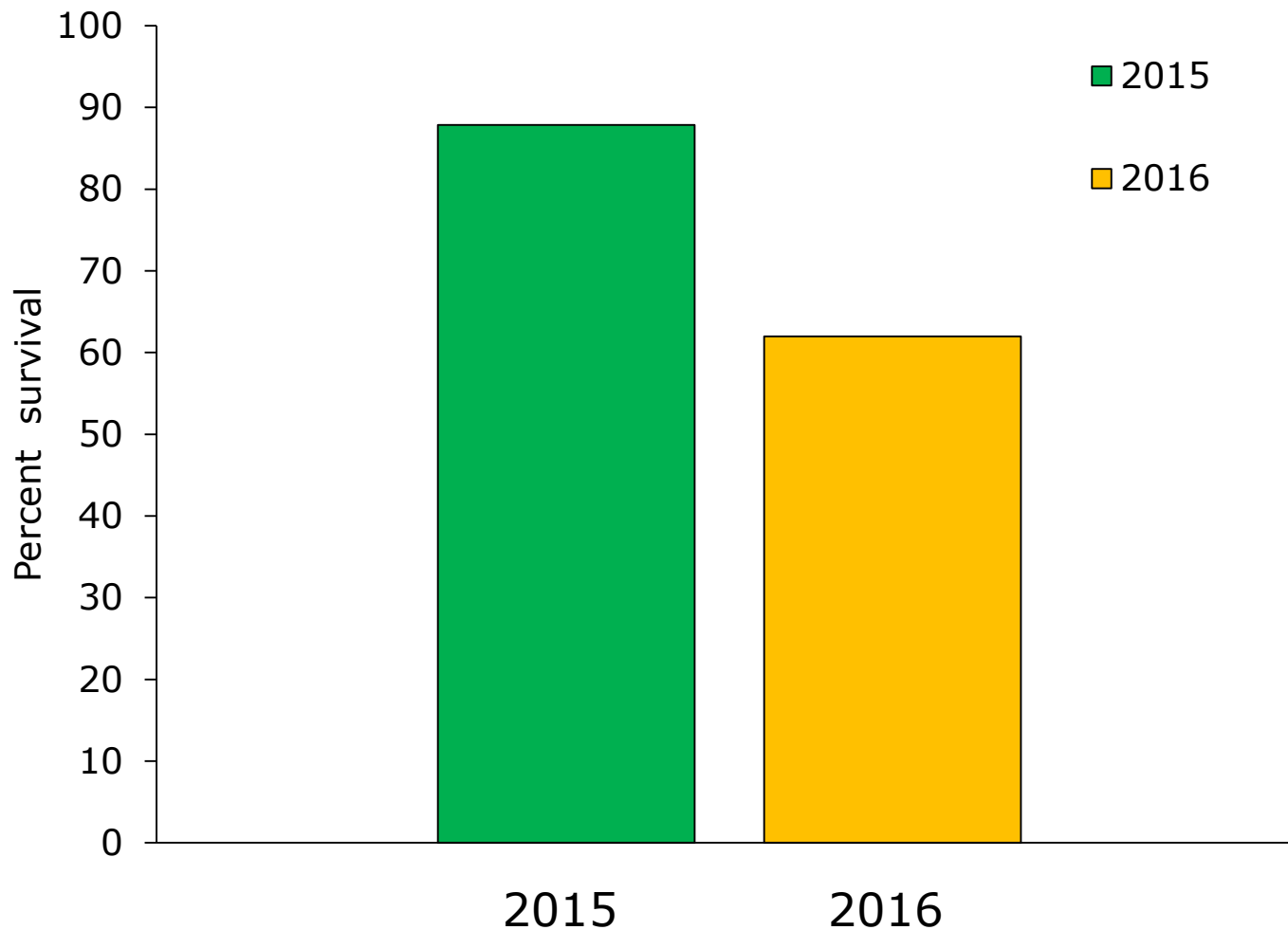
Growth

Reproduction

Germination

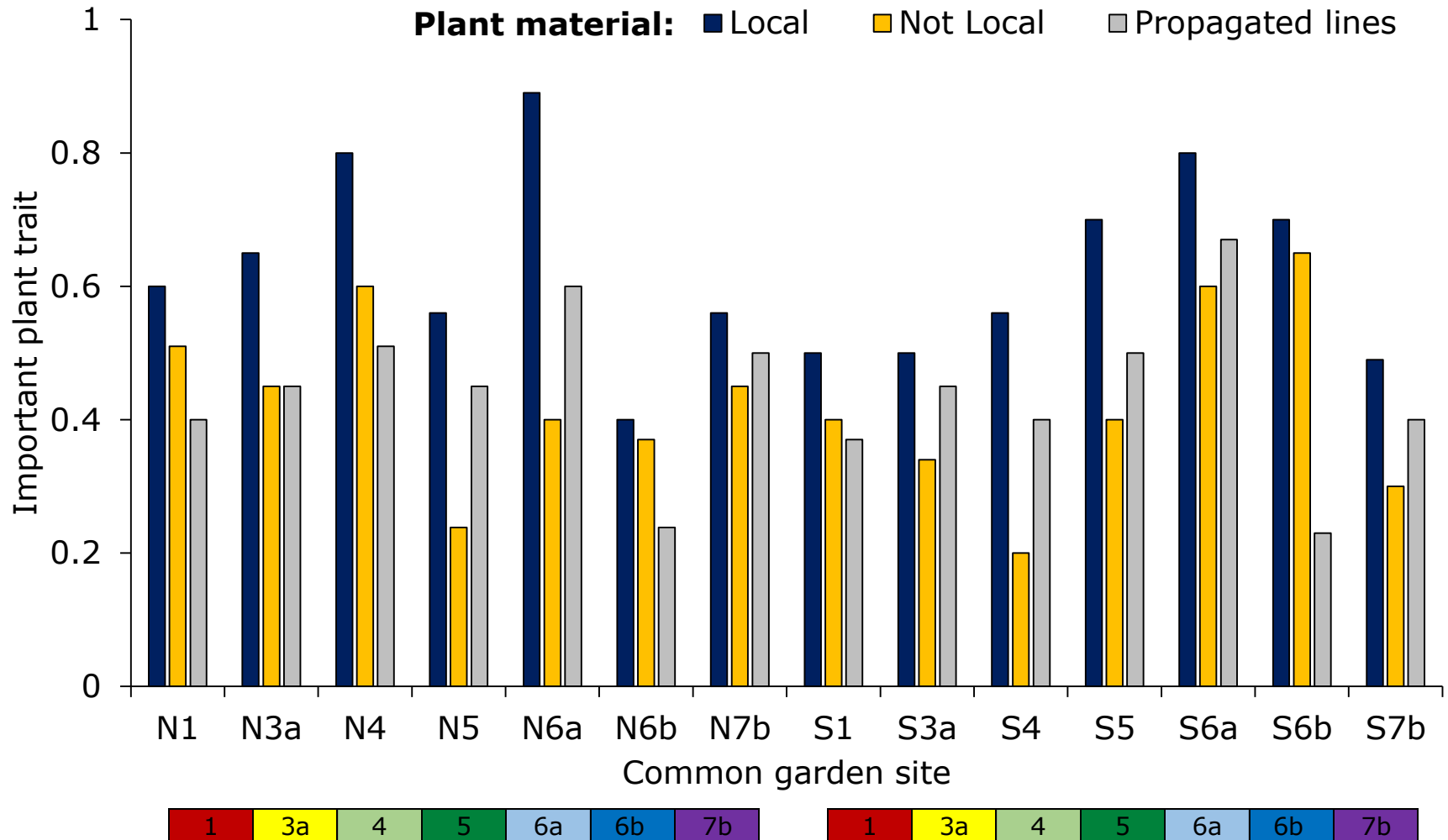


High survival in Year 1 Reduction in survival in Year 2



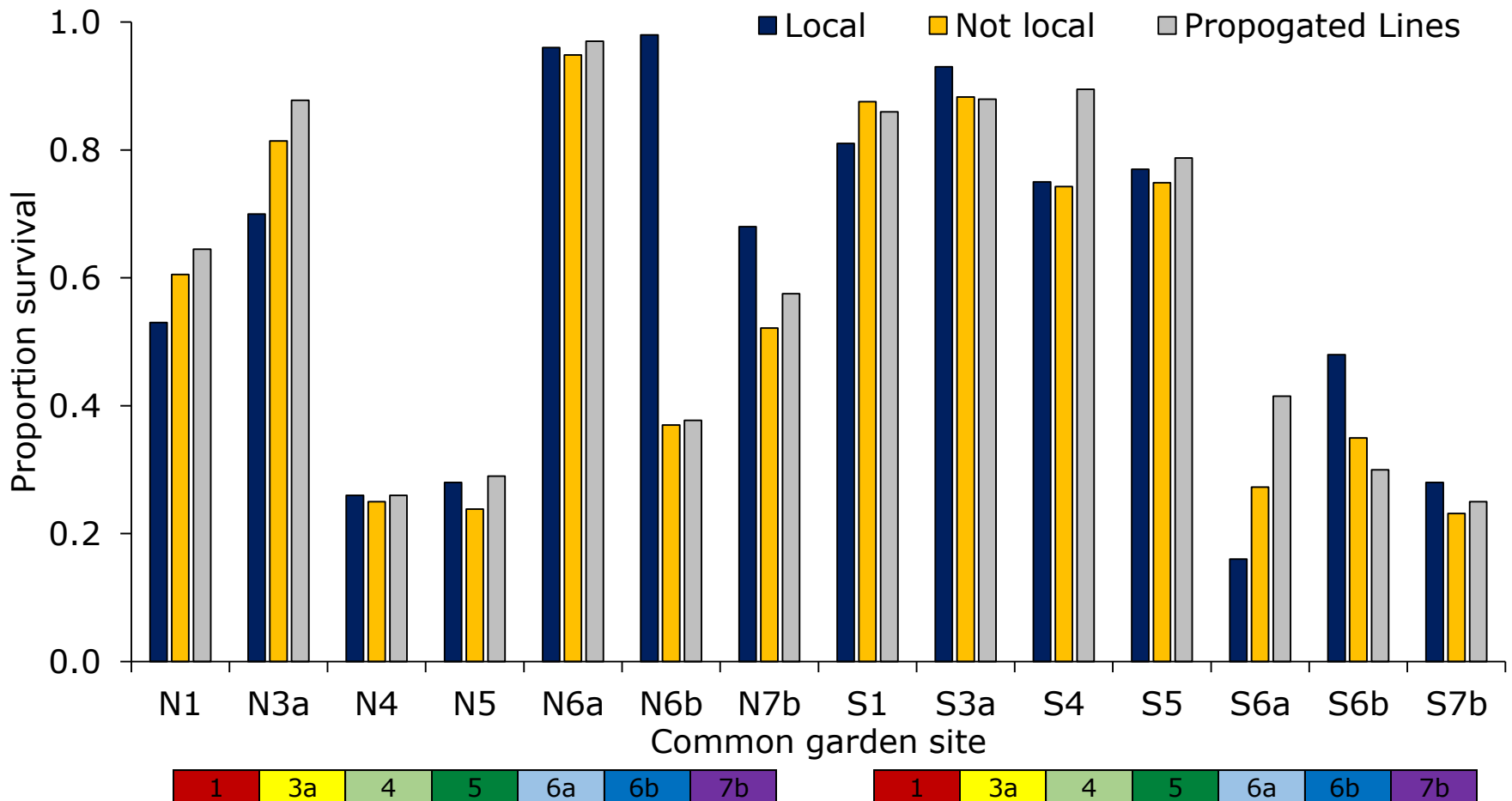
Is local best?

An example:



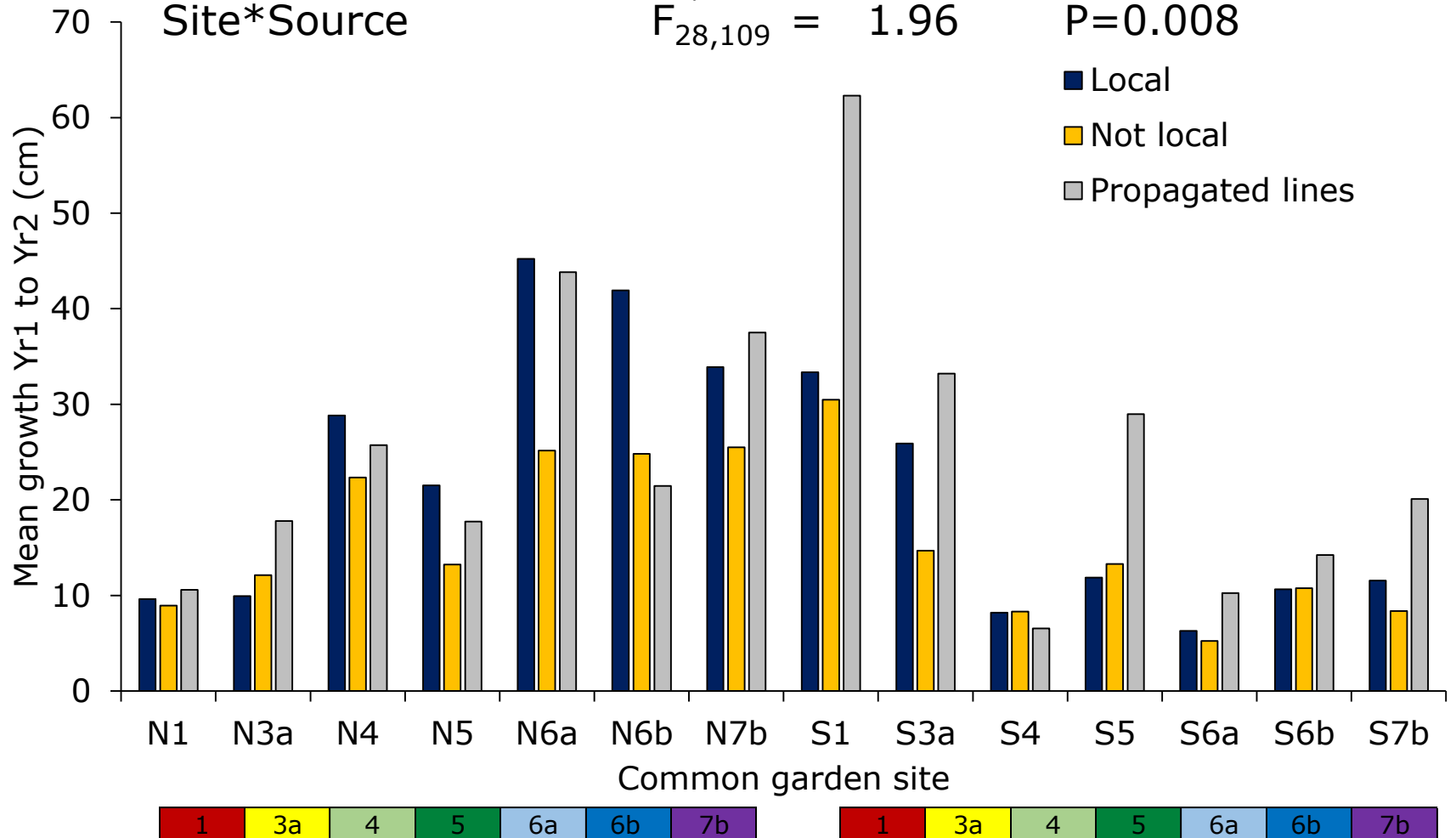
Survival differs among sites

Site	$F_{14,109} = 37.65$	$P < 0.0001$
Plant material source	$F_{2,109} = 2.00$	$P = 0.1406$
Site*Source	$F_{28,109} = 0.84$	$P = 0.6950$



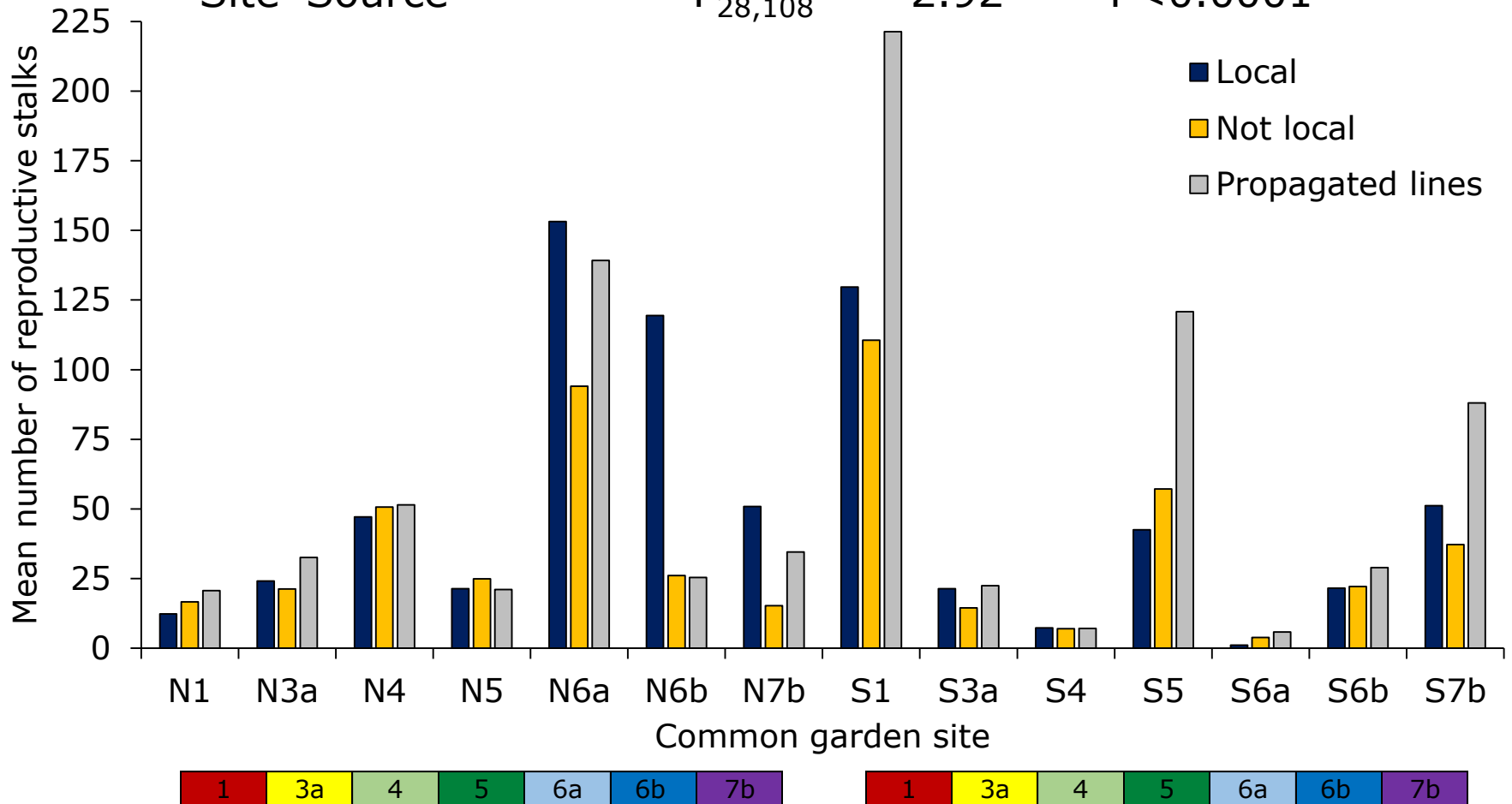
Growth differs plant material source across sites

Site	$F_{14,109} = 16.38$	$P < 0.0001$
Plant material source	$F_{2,109} = 27.67$	$P < 0.0001$
Site*Source	$F_{28,109} = 1.96$	$P = 0.008$



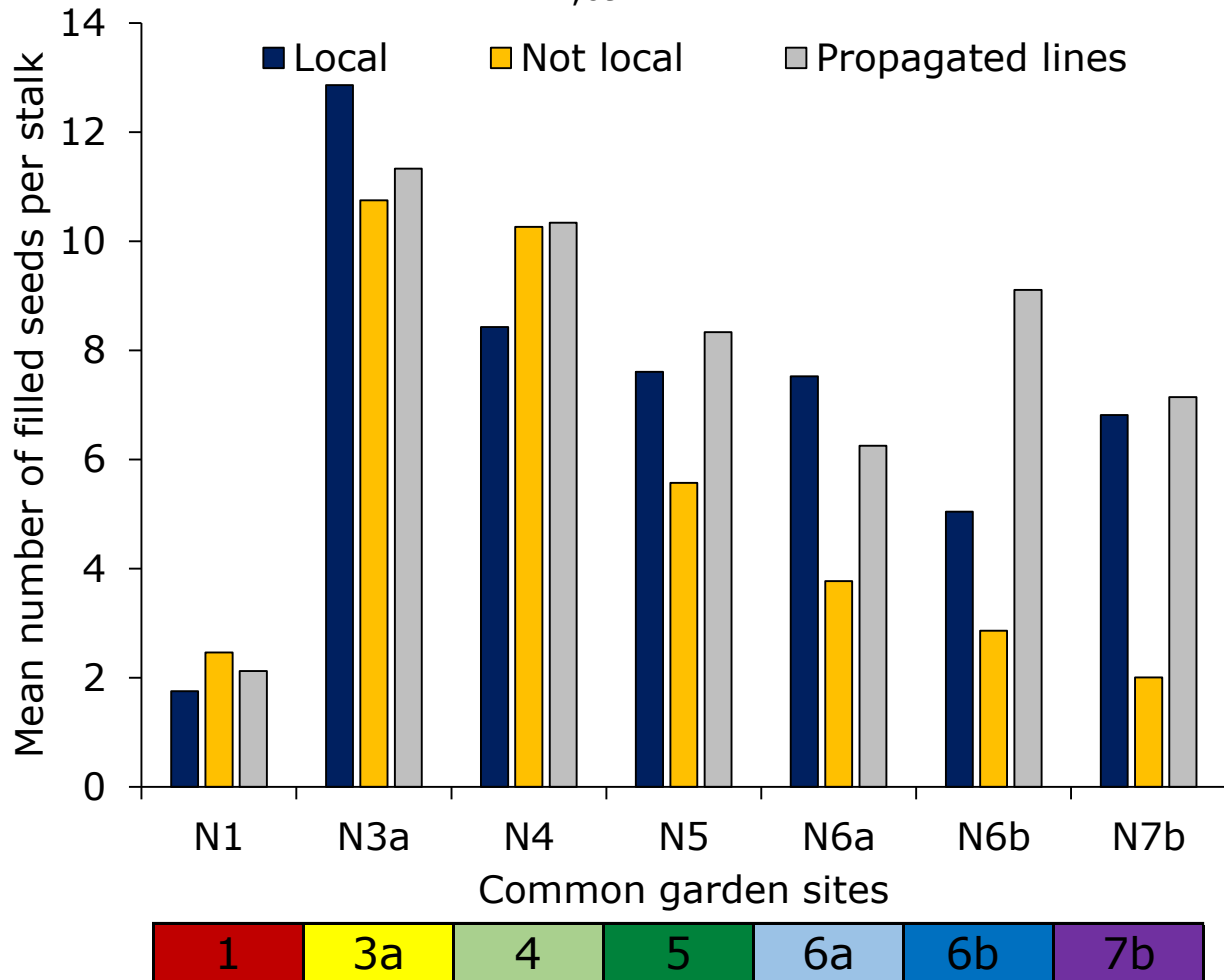
Reproductive stalks produced differs by plant material source across sites

Site	$F_{14,108} = 33.10$	$P < 0.0001$
Plant material source	$F_{2,108} = 18.70$	$P < 0.0001$
Site*Source	$F_{28,108} = 2.92$	$P < 0.0001$



Seed production differs by site and plant material source

Site	$F_{7,69} = 18.82$	$P < 0.0001$
Plant material source	$F_{7,69} = 17.40$	$P < 0.0001$
Site*Source	$F_{7,69} = 1.06$	$P = 0.3991$

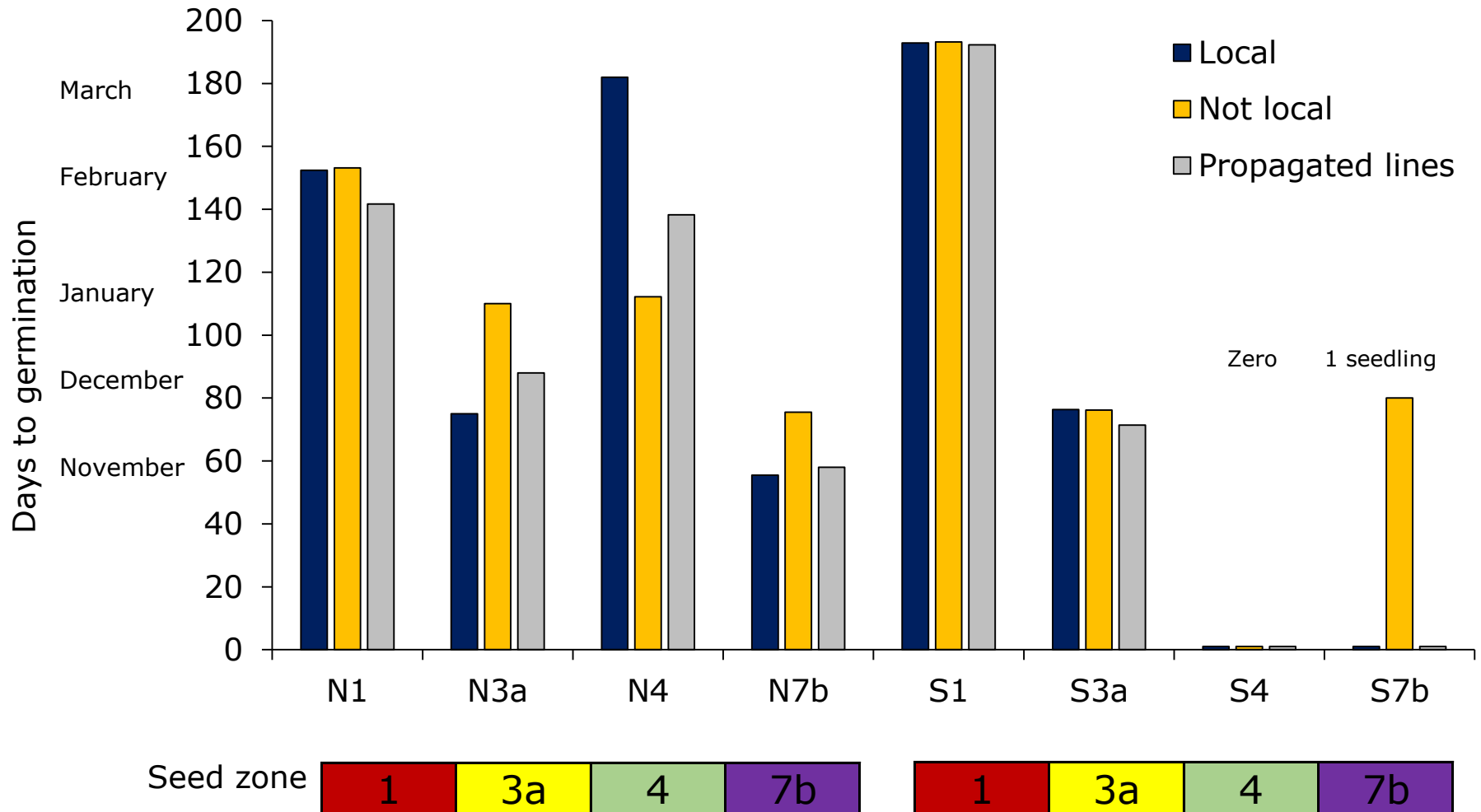




Field germination timing varies by site

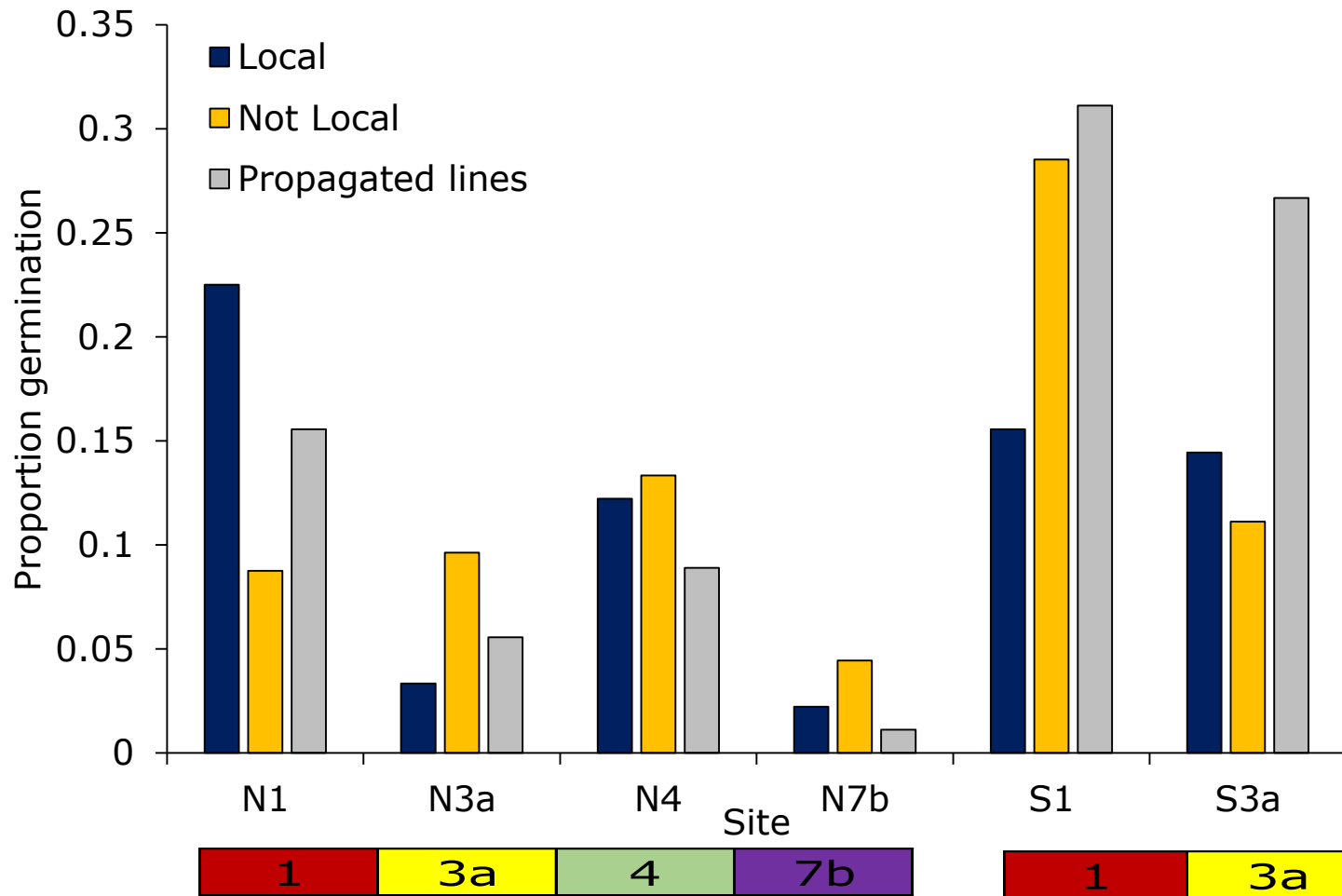
(Time lapse cameras)

Site	$F_{6,266} = 134.33$	$P < 0.0001$
Plant material source	$F_{2,266} = 1.00$	$P = 0.3682$
Site*Source	$F_{10,166} = 2.89$	$P = 0.0019$



Proportion of germination differs by seed source across sites

Site	$F_{5,2682} = 13.17$	$P < 0.0001$
Plant material source	$F_{2,2682} = 0.63$	$P = 0.5321$
Site*Source	$F_{10,2682} = 3.69$	$P < 0.001$



For successful restoration is local best?

Survival	No
Growth	Yes, depending on site
Reproduction	Yes, depending on site
Germination	Yes, depending on site

Survival and reproduction data

2015-year 1

2020-year 5

2016-year 2

2030-year 10

2017-year 3*

2040-year 20

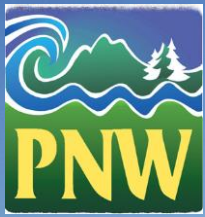


Conclusions

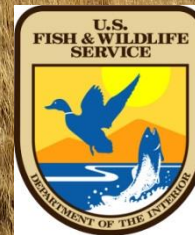
Preliminary data suggest that using seed zones guidelines should improve restoration success

Transplanting seedlings





**Private
Landowners**



Comments / Questions?

hollyrprendeville@fs.fed.us



Seed zones on Google maps

<https://www.fs.fed.us/wwetac/threat-map/TRMSeedZoneMapper.php>

<https://www.fs.fed.us/wwetac/threat-map/TRMSeedZoneMobile.php>

