Elwha Ecosystem Restoration Project: Plant Colonization and Establishment of the Dewatered Reservoirs after 2-3 Growing Seasons

NATIONAL PARK SERVICE

The Lower Elwha Klallam Tribe

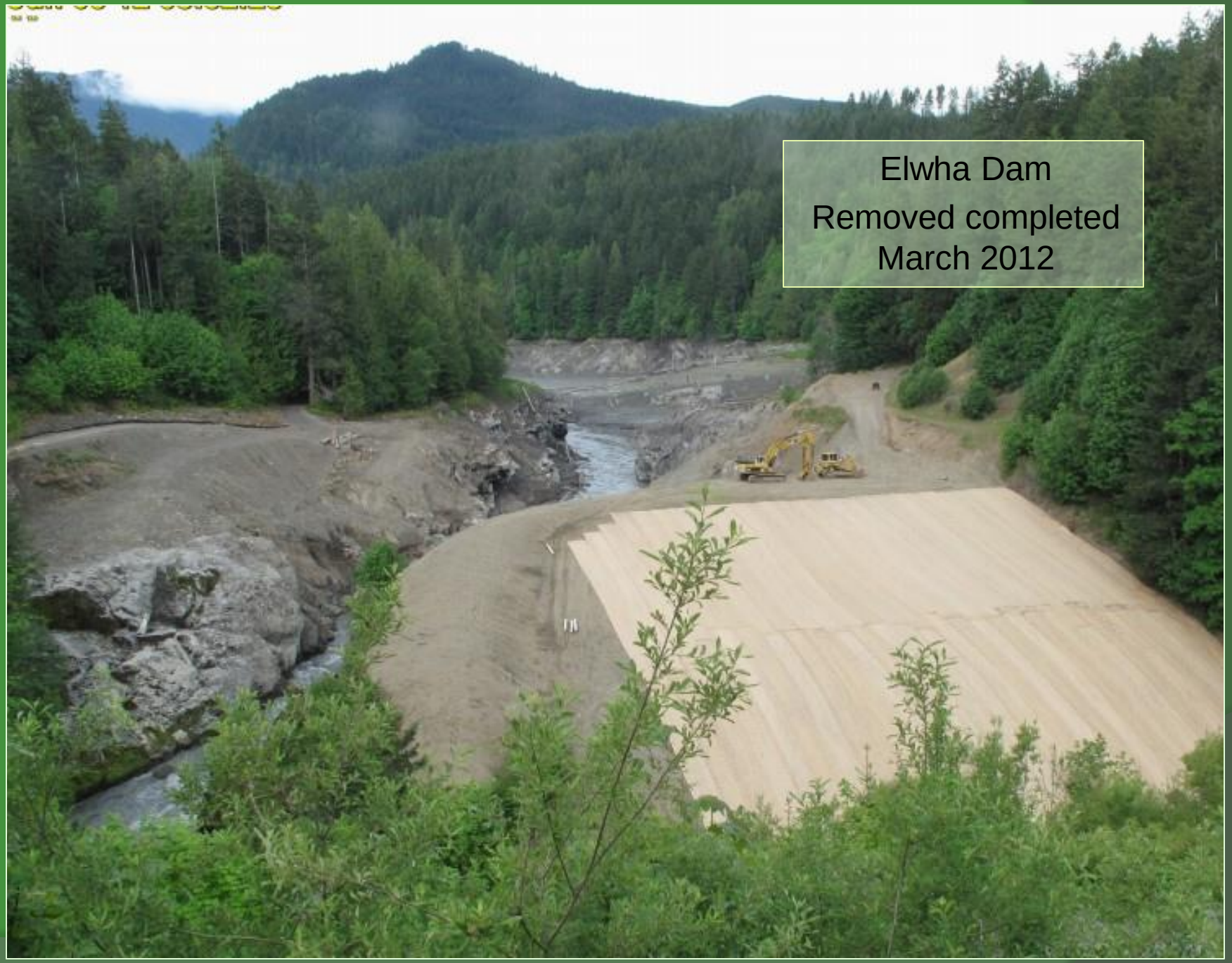
ʔəʔɬx̣ʷə nəxʷsƛ̓ayəm - "THE STRONG PEOPLE"

Washington Conservation Corps

Joshua Chenoweth

April 15, 2014


:09:49 Cam Temperature:34.7 Battery Voltage: 13.5
Elwha Dam
~105 ft
Original height


Elwha Dam
Removed completed
March 2012


Sep 04 11 16:31:26
Glines Canyon Dam
~205 ft
Original height


Jan 21 14 11:02:26
Glines Canyon Dam
~30-40 ft
January 21, 2014

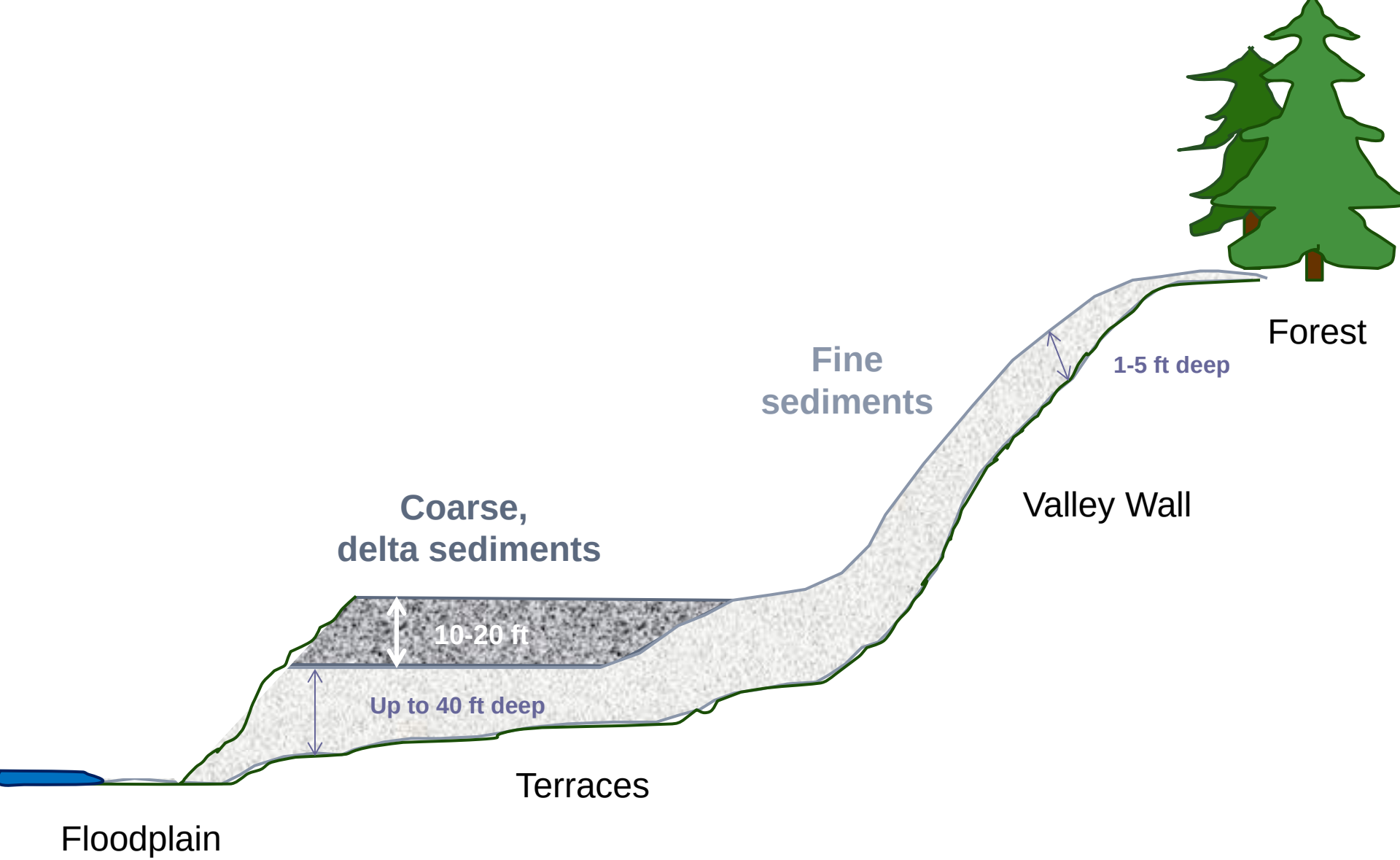

Apr 11 14 10:01:44
Glines Canyon Dam
~15 ft
April 11, 2014

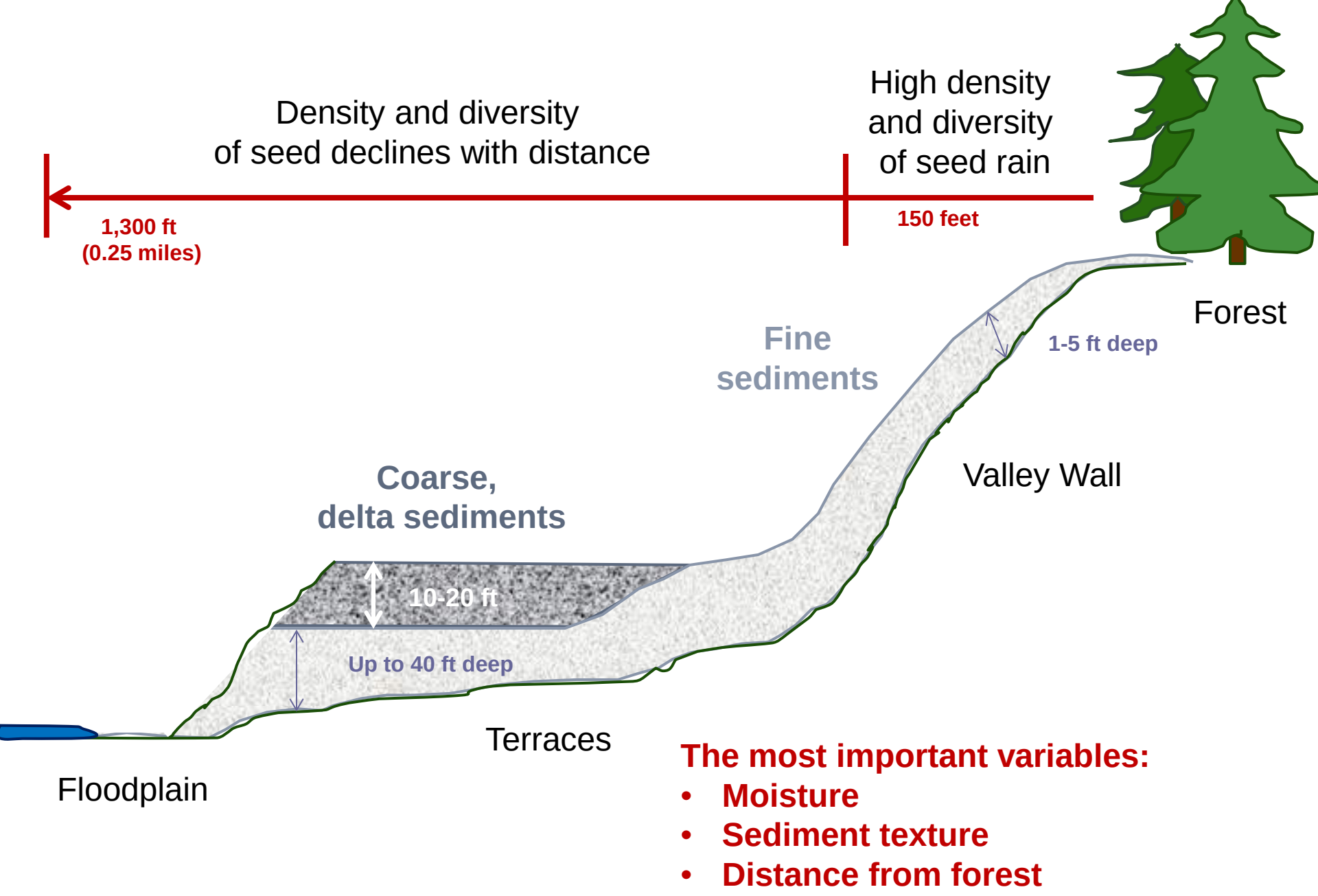

Lake Aldwell
2009


Lake Mills
2009


Lake Aldwell
2013


Lake Mills
2013


Forest
Fine sediments
1-5 ft deep
Valley Wall
Coarse, delta sediments
10-20 ft
Up to 40 ft deep
Terraces
Floodplain



The most important variables:

- **Moisture**
- **Sediment texture**
- **Distance from forest**


Former Lake Mills Reservoir
July 25, 2013


Former Lake Mills Reservoir
Coarse sediment terrace
July 11, 2013

Revegetation Project Overview

- Project goals:
  - Minimize invasive species populations
  - Restore ecosystem processes
  - Accelerate ***forest*** development
- Revegetate 525 Acres over 7 years
- Periods:
  1. Dam Removal Period (2011-2013)
     - Experimental plantings (~30,000 plants per year)
  2. Revegetation Installation (2014-2016)
     - Full restoration of exposed surfaces (100,000 plants per year)
  3. Post Installation (2017-2024)
     - Maintenance, monitoring, adaptive management
- Revegetation Plan calls for a total of 420,000 plants!

Planting during dam removal
(fall 2011-winter 2013)

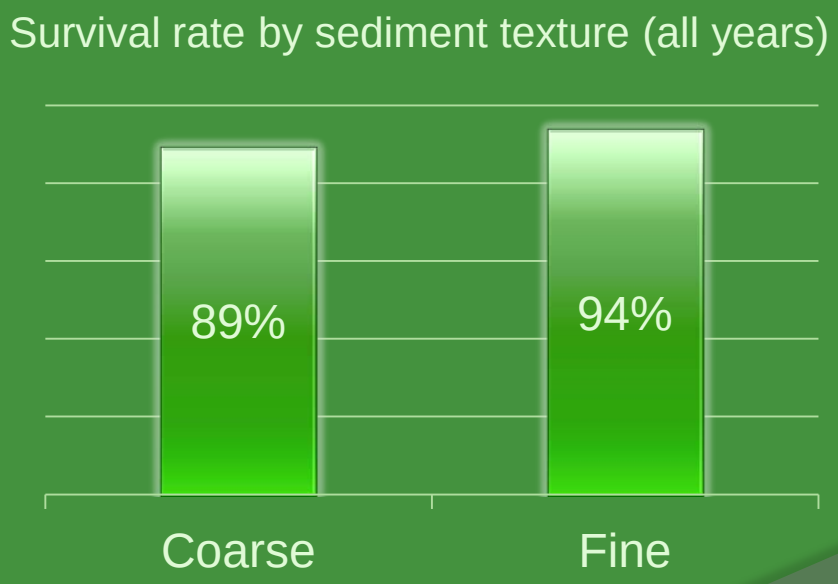
- Began planting in November 2011
- 253 acres planted/seeded
  - **48% of the 525 acres *proposed for planting***
  - **33% of the exposed land**
- ~175,500 native trees, shrubs and herbaceous plants
  - 59 native species
  - High diversity!
- 4,421 lbs of seed sown
  - 9 native herbaceous species

Testing species performance

- 1,535 individual plants tagged
  - 860 in 2012
  - 675 in 2013
- 10 species
  - Douglas-fir
  - Western red cedar
  - Western white pine
  - Grand fir
  - Black cottonwood
  - Big-leaf maple
  - Thimbleberry
  - Nootka rose
  - Scouler’s willow
  - Oceanspray

Testing species performance

- Overall rate of survival: 92%
  - 92% in 2012
  - 92% in 2013
- Worst performer
  - 2012: Douglas-fir (64%)
  - 2013: Scouler's willow (85%)
- Best performer:
  - 2012: Black cottonwood (99%)
  - 2013: Western white pine (98%)



OBSERVATIONS AFTER 2-3 YEARS

- Monitoring consists of 68 permanent plots (so far) and several university studies
  - Only 27 of the permanent plots are 2 years old
- Vegetation recovery (natural and managed) is directly related to the following variables:
  1. Time since exposure
  2. Season of exposure
  3. Sediment texture
  4. Distance from intact forests
- Vegetation recovery is highly variable

The extremes: sites like this.....

Stem density: **78,900!!** per acre

- Cottonwood (64%)
- Willows (30%)
- Red alder (6%)

24 meters from forest, fine sediment


M17-4
The extremes: .....to this.
Stem density: **0** per acre
215 meters from forest, coarse sediment

Former Lake Mills reservoir

Plant regeneration along a transect

Plant regeneration along a transect

Plant regeneration along a transect

Plant regeneration along a transect

Plant Cover
after two growing seasons (2013)

Cover Categories	Lake Mills (52 plots)	Lake Aldwell (16 plots)
Overall cover of bare-ground	46%	23%
Overall cover of native woody plants	13%	30%
Overall cover of herbaceous vegetation	35%	66%

Most frequent species:
Mills: common horsetail (39%)
(Equisetum arvense)
Aldwell: fringed willow herb (63%)
(*Epilobium ciliatum*)

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Woody species with most cover:
Mills: red alder (8%)
Aldwell: red alder (18%)

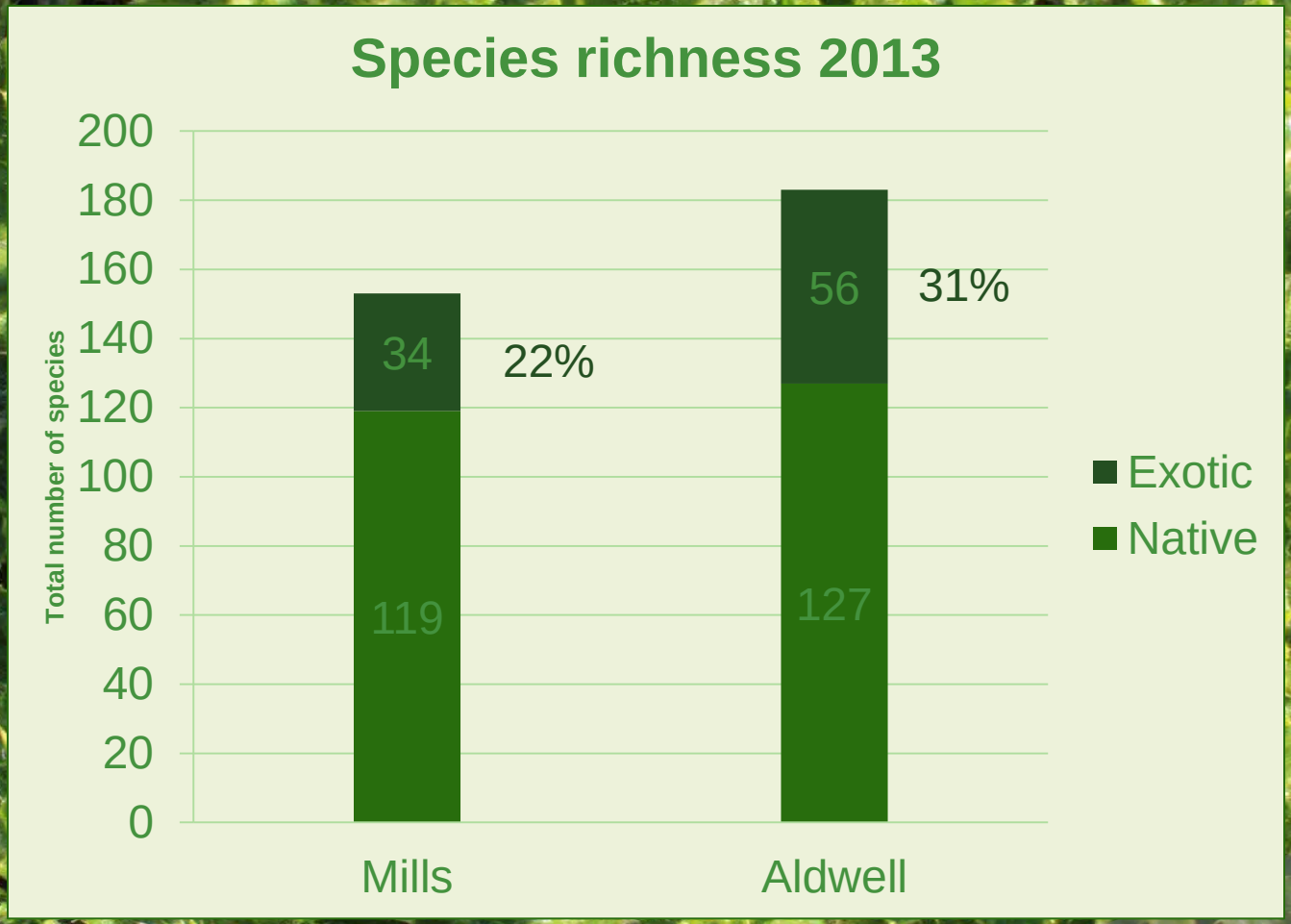
Plant Cover Changes
after two growing seasons

Lake Mills: 27 permanent plots	2012	2013	Difference
Cover of bare-ground	76%	26%	-50%
Cover of native woody plants	0.1%	12%	+11.9%
Cover of herbaceous plants	4.4%	50.7%	+46.3%

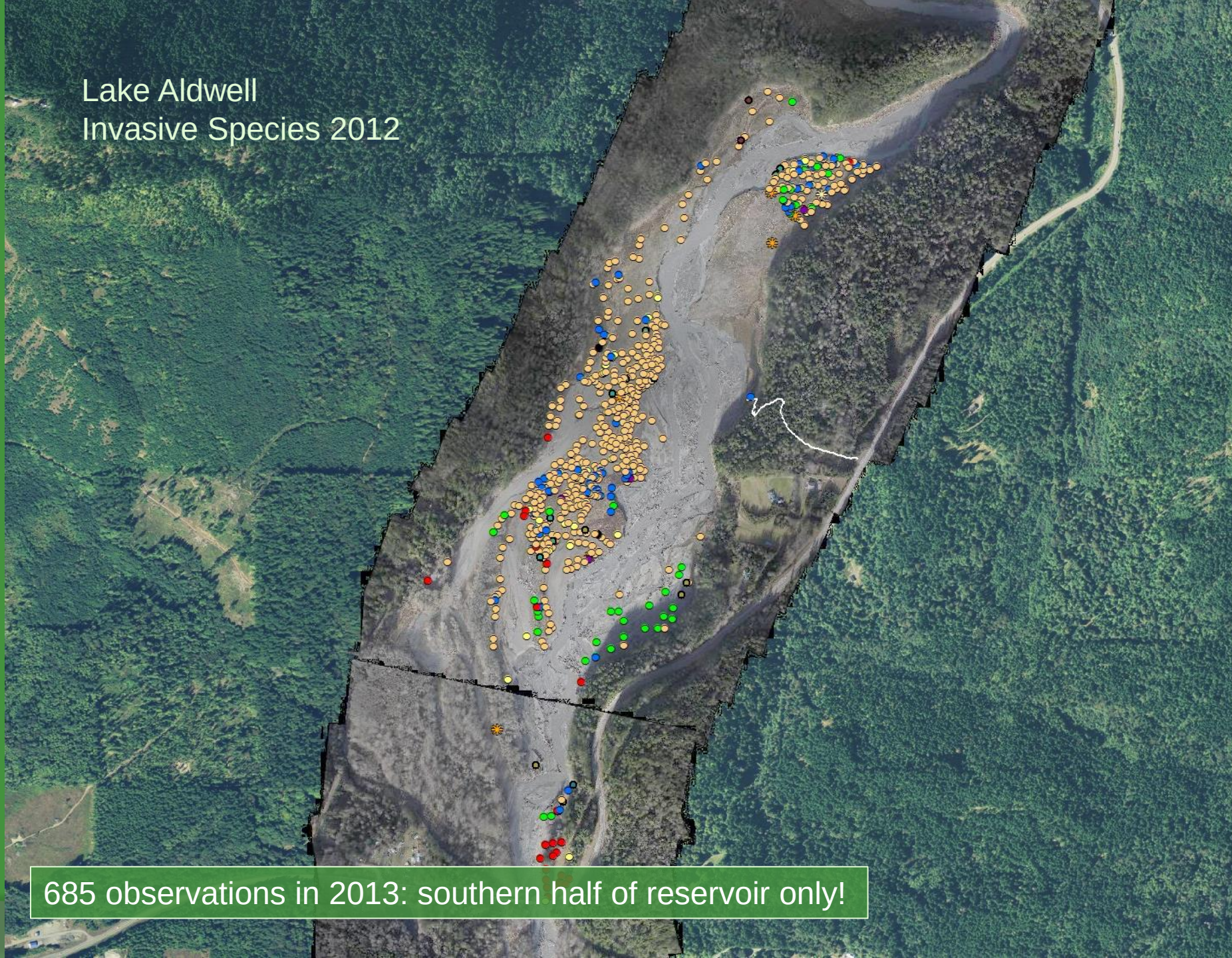
M10-1 SW: 2012

M10-1 SW: 2013

Total number of known species, planted and natural (both reservoirs): **186**



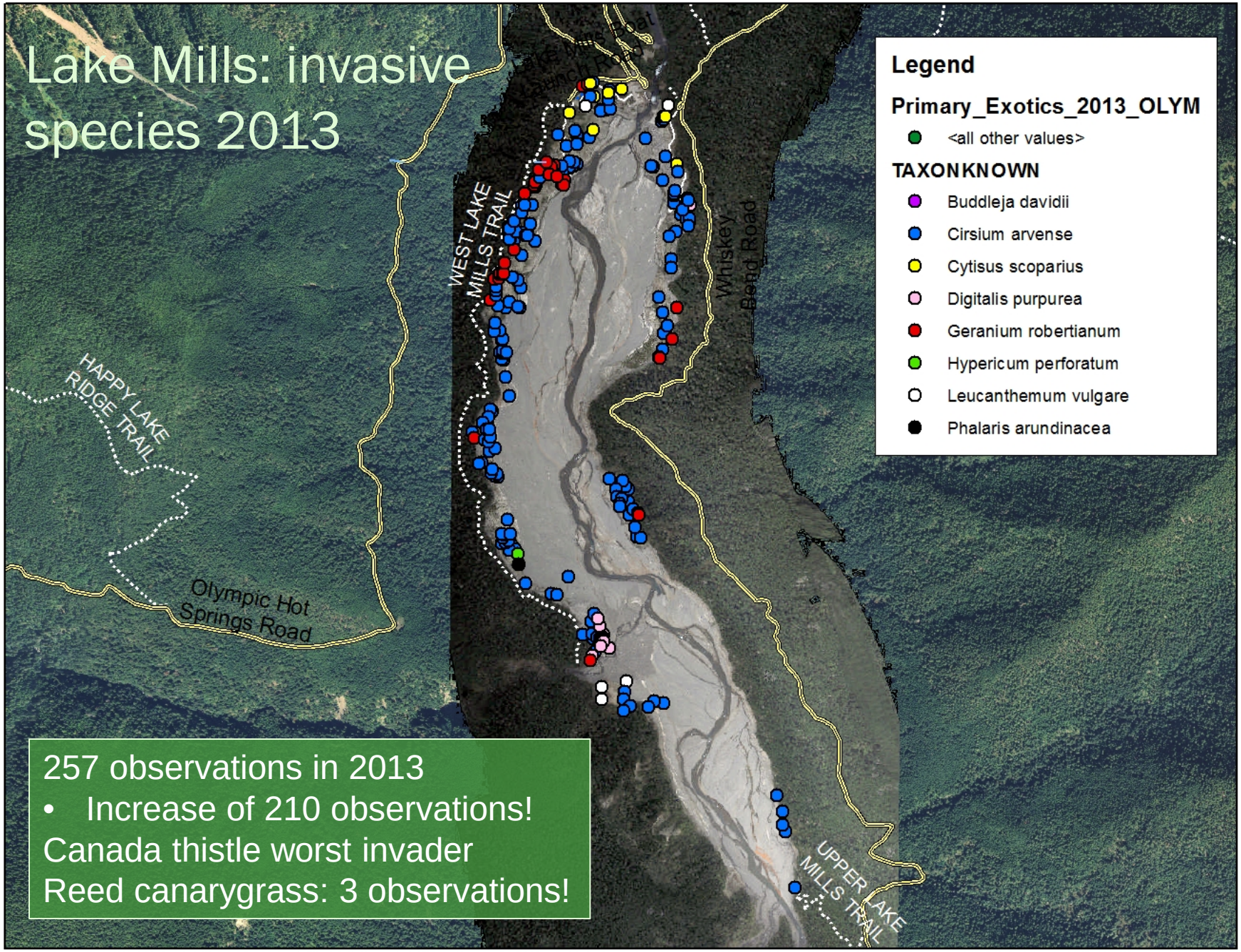

Lake Aldwell
Invasive Species 2012
522 observations in 2012


Lake Aldwell
Invasive Species 2012
685 observations in 2013: southern half of reservoir only!

Lake Mills: invasive species 2012

47 observations in 2012

Lake Mills: invasive species 2013



257 observations in 2013

- Increase of 210 observations!

Canada thistle worst invader

Reed canarygrass: 3 observations!

Monitoring photos: Untreated site

Monitoring photos: Untreated site

Planted sites: fine sediments

Planted site on coarse sediments

November 2011: before planting

1st summer after planting: August 17, 2012

2nd summer after planting: June 13, 2013

Plant Regeneration Facts
Coarse sediment terraces

2013 Mills	Fines (37 plots)	Coarse (15 plots)
Overall cover of bare-ground	29%	90%
Woody seedling density (per sq meter)	2.27	0.45
Sapling density (per sq meter)	1.09	0.26*
Species richness	114	51^

* All saplings counted were planted
^ Many of the species counted were planted

Wood Moved in October 2012

- Vertol helicopter (Columbia Helicopter)
- 6.9 hours of operation
- 440 pieces of wood
  - 818,400 pounds
  - 9.6 acres


Before


After

Benefits of wood

- Safe sites for plants
  - Shade from southern or western exposure
  - Better access to moisture
  - Protection from large herbivores
  - Wind protection
- Erosion control

Planting in 2014

Project Links

Webcams: http://video-monitoring.com/construction/olympic/js.htm

Revegetation Plan: http://www.nps.gov/olym/naturescience/elwha-revegetation.htm

Project blog: http://www.nps.gov/olym/naturescience/damremovalblog.htm