



Action Effectiveness Monitoring and Research Status Update

Science Work Group Meeting

February 24th, 2015

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2/18/2015

Overview

- 2015 AEMR Status
 - Programmatic AEMR Overview
 - Prioritization
 - Metrics
- 2014 Results
- Level 3 AEM Discussion

Action Effectiveness Monitoring and Research (AEMR) Objective

- Determine the success of restoration actions at site, landscape, and estuary-wide scales in terms of improved ecosystem functionality

Programmatic Action Effectiveness Monitoring

Columbia Estuary Ecosystem Restoration Program (CEERP) Objectives*

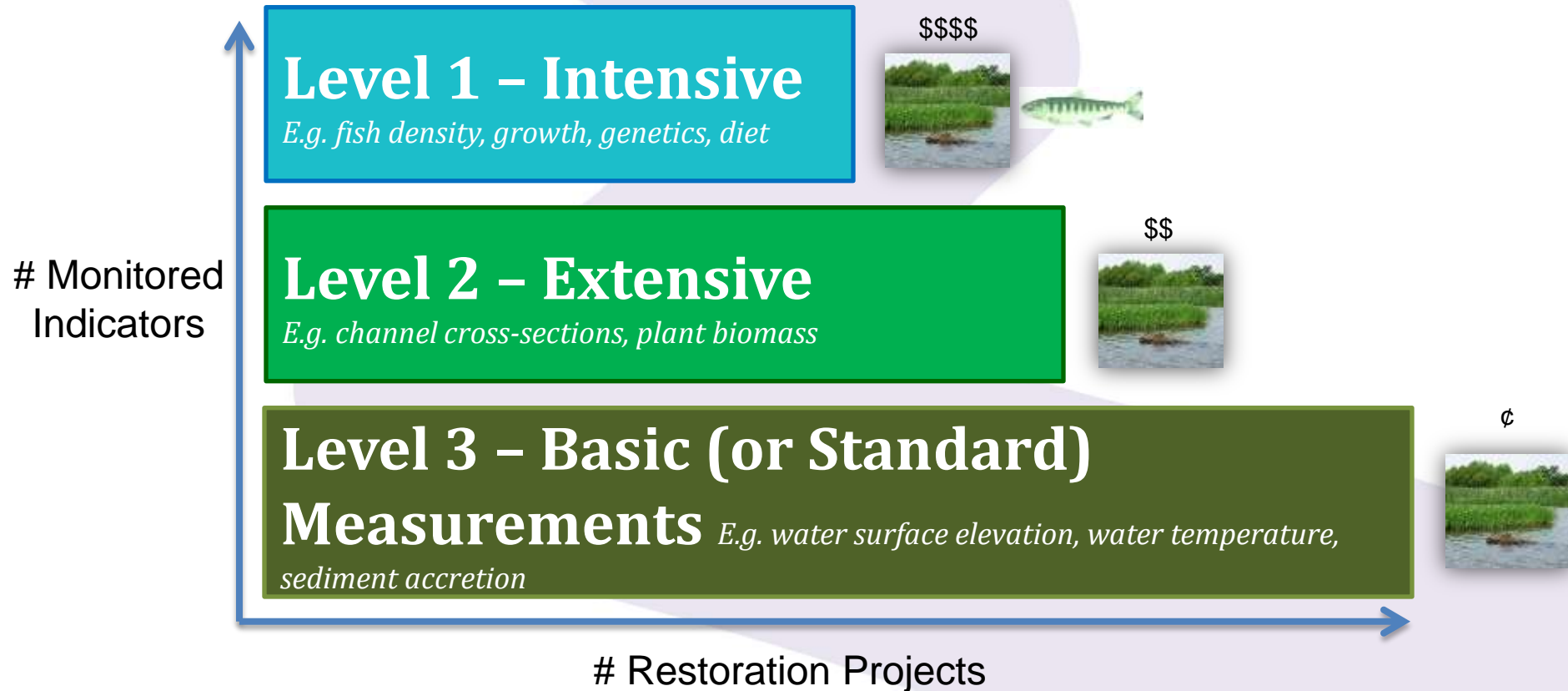
- Obj. 1. Increase the capacity (quality) of estuarine and tidal-fluvial ecosystems
- Obj. 2. Increase the opportunity for access by aquatic organisms to and for export of materials from shallow water habitats
- Obj. 3. Improve ecosystem realized functions for juvenile salmonids

Action Effectiveness Monitoring

Analysis Questions* - *Habitat-based* (ecosystem controlling factors, structures, and processes)

- Have hydrological processes been improved (e.g., tidal influence and flood regime) and are they self-maintaining?
- Has aquatic connectivity with the main stem river been improved and is it self-maintaining?
- Is the rate of sediment accretion at the restoring site at an expected level and is land elevation predicted to be self-maintaining?
- Are restored habitats self-maintaining in terms of channel cross-sectional area? Percent cover of native versus invasive plant species?
- Is habitat restoration resulting in improved (or normative) water temperatures?

Action Effectiveness Monitoring Programmatic Strategy - Levels



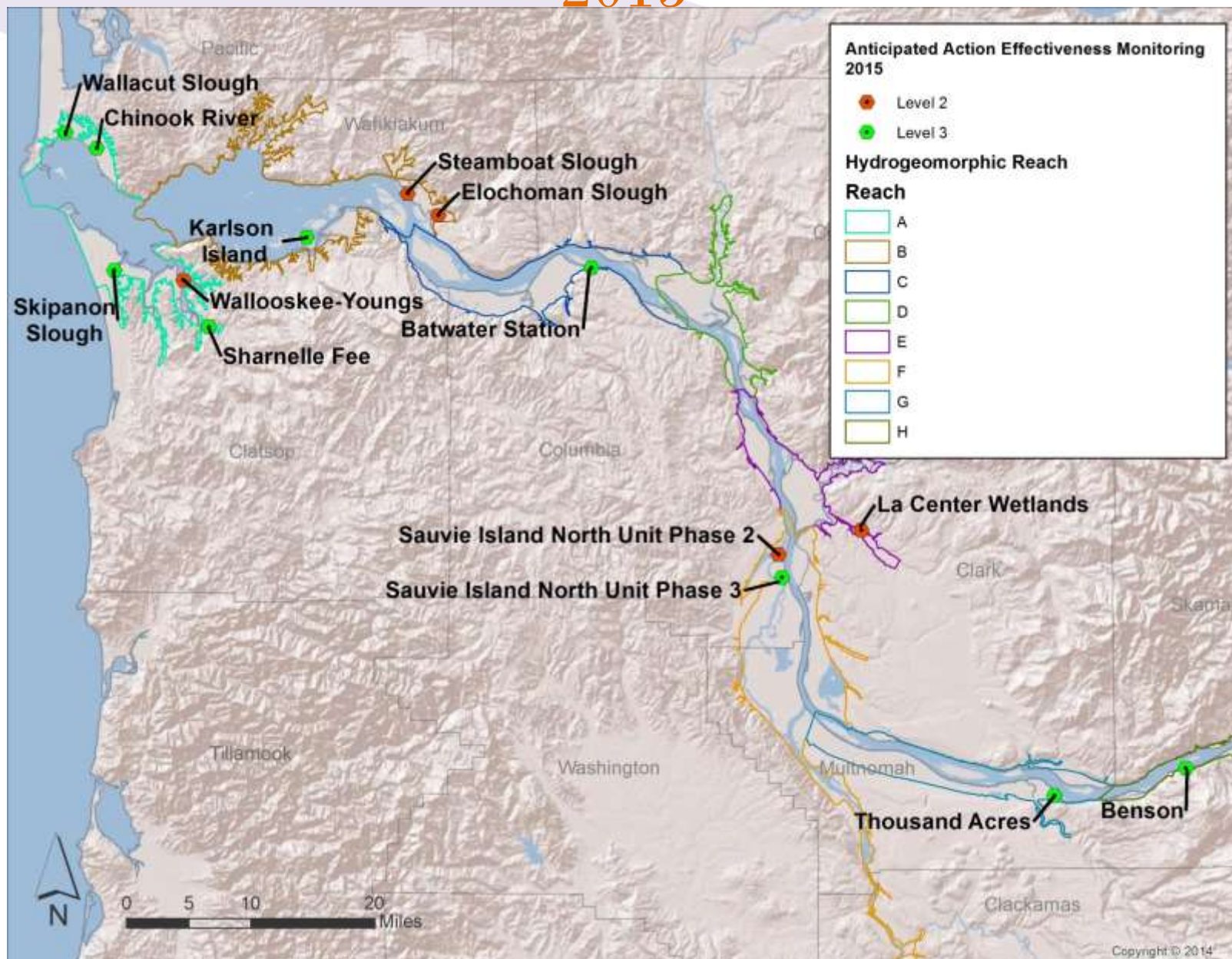
Prioritization Criteria for Action Effectiveness Monitoring in 2015

Topic	Criterion	Weighting	Scoring Measures
Addresses a key uncertainty in action effectiveness	ERTG Uncertainties	***	2 = very useful; 1 = applies; 0 = doesn't apply
Preliminary SBU	Project size; location relative to main stem; ecological uplift anticipated (see ERTG Doc# 2010-02)	**	3 = >3 SBUs; 2=1-3 SBUs; 1=.3-.99 SBU; 0=<.3
Landscape locations of AEMR study sites	Locations in landscapes where AEMR has occurred; reference site(s) are available	*	1- Little = 0-6; 2- Some = 7-12; 3- Much = >12

Prioritization Results for Action Effectiveness Monitoring in 2015

Project Name	Criterion 1: Landscape Scale	Criterion 2: CEERP management applicability	Ocean SBU's	Stream SBU's	Criterion 3: Combined SBU	2015 AEMR Prioritization Score
Columbia Stock Ranch (CSR) - Acquisition & Restoration	3	1	5.15	1.70	6.85	18.70
Buckmire Slough Restoration - Phase 2	3	1	3.30	1.21	4.51	14.01
Wallooskee Youngs	2	1	2.25	0.81	3.05	10.10
Sauvie Island, North Unit (Ruby Lake) Restoration - Phase 1	3	2	0.92	0.29	1.21	9.42
LaCenter Wetlands, Lewis River East Fork (Site 43 and 43B) Restoration	3	1	1.49	0.47	1.96	8.92
Sandy River Dam Removal	3	2	0.44	0.16	0.60	8.20
Sauvie Island, North Unit (Millionaire, Widgeon/Deep Lakes) Restoration - Phase 2	3	1	1.06	0.34	1.40	7.80
Grays Bay Kandoll Farm Restoration - Phase 2	2	1	1.25	0.42	1.67	7.34
Reach C Floodplain Slough Reconnection (R)	3	1	0.86	0.29	1.15	7.29
Crooked Creek Upstream - Acquisition & Restoration	2	1	1.05	0.34	1.39	6.77
Trestle Bay Jetty Breach	2	1	1.00	0.31	1.30	6.60
Skipanon Slough, 8th St Dam Restoration	2	1	0.91	0.36	1.27	6.54
Chinook River WDFW - Acquisition & Restoration	2	1	0.84	0.42	1.26	6.52
Elochoman Slough Thomas - Acquisition & Restoration	2	1	0.81	0.35	1.16	6.32

Anticipated Action Effectiveness Monitoring in 2015



2015 Monitoring Metrics

Site	Reach	Benthic Macroinvertebrates	Vegetation Community and Composition	Terrestrial Macroinvertebrates	Water Surface Elevation and Temperature	Sediment Accretion	Photo Points
Wallooskee-Youngs	A	X	X	X	X	X	X
Steamboat Slough	B		X	X	X	X	X
Elochoman Slough	B		X	X	X	X	X
La Center Wetlands	E	X	X	X	X	X	X
Sauvie Island - North Unit Phase 2	F		X	X	X	X	X
Chinook River	A		X	X	X	X	X
Wallacut River	A				X	X	X
Skipanon Slough	A				X	X	X
Sharnelle Fee	A				X	X	X
Karlson Island	B				X	X	X
Batwater Station	C				X	X	X
Sauvie Island - North Unit Phase 3	F				X	X	X
Thousand Acres	G				X	X	X
Multnomah Wakeena	H				X	X	X

Blue Carbon

- Blue carbon is the carbon stored and sequestered in coastal ecosystems such as mangrove forests, seagrass meadows or intertidal saltmarshes (<http://bluecarbonportal.org/>).
- Pacific Northwest tidal wetlands have high potential for carbon sequestration for several reasons including sediment delivery, high organic content in soils, and sheltered settings.
- Pilot study at Wallooskee-Youngs funded by USFWS and BPA
 - Quantify existing soil carbon storage at least disturbed and disturbed sites
 - Quantify rate of carbon sequestration at least disturbed and disturbed sites

Equipment and Technical Support

- **Technical or Field Support**
 - Site sampling design
 - Data management
 - Methods
- **Hydrology Monitoring Equipment**
 - Hobo Onset pressure & temperature data loggers (long-term)
 - Hobo Onset temperature (only) data loggers (long-term)
 - Flow/discharge meter and rod (short-term)
- **Survey and Mapping GPS Units**
 - RTK ProMark 200 survey and mapping units (base and rover) including tripod and monopod (short-term)
 - Auto Level including tripod (short-term)

Questions



2014 Level 2 Results



2014 AEM Questions

Estuary Scale

- What are the status and trends of metrics through the estuary and lower river at restoration and reference sites?

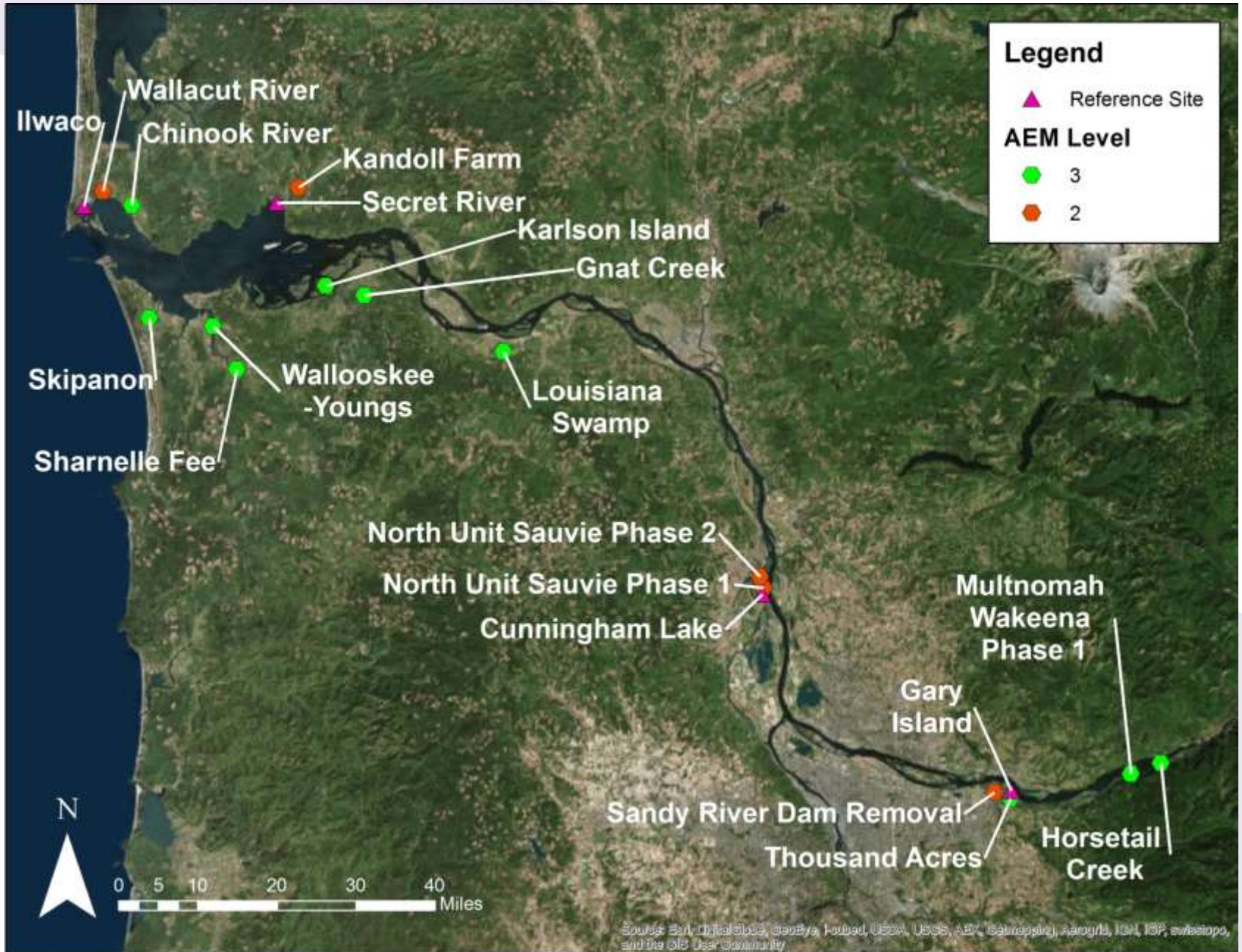
Landscape/Reach Scale

- What metrics can be used to evaluate effectiveness or ecological uplift of restoration actions at the reach scale?

Site Scale

- Does lowering wetland topography effectively control of Reedcanary grass?
- What species of salmonid prey items (terrestrial macroinvertebrates) are available pre vs. post restoration?

2014 AEM



2014 AEM

- Level 2 Metrics
 - Vegetation Community and Composition
 - Salmonid Prey - Terrestrial Macroinvertebrates
 - Channel Cross Sections



AEM Site Sampling Set-up

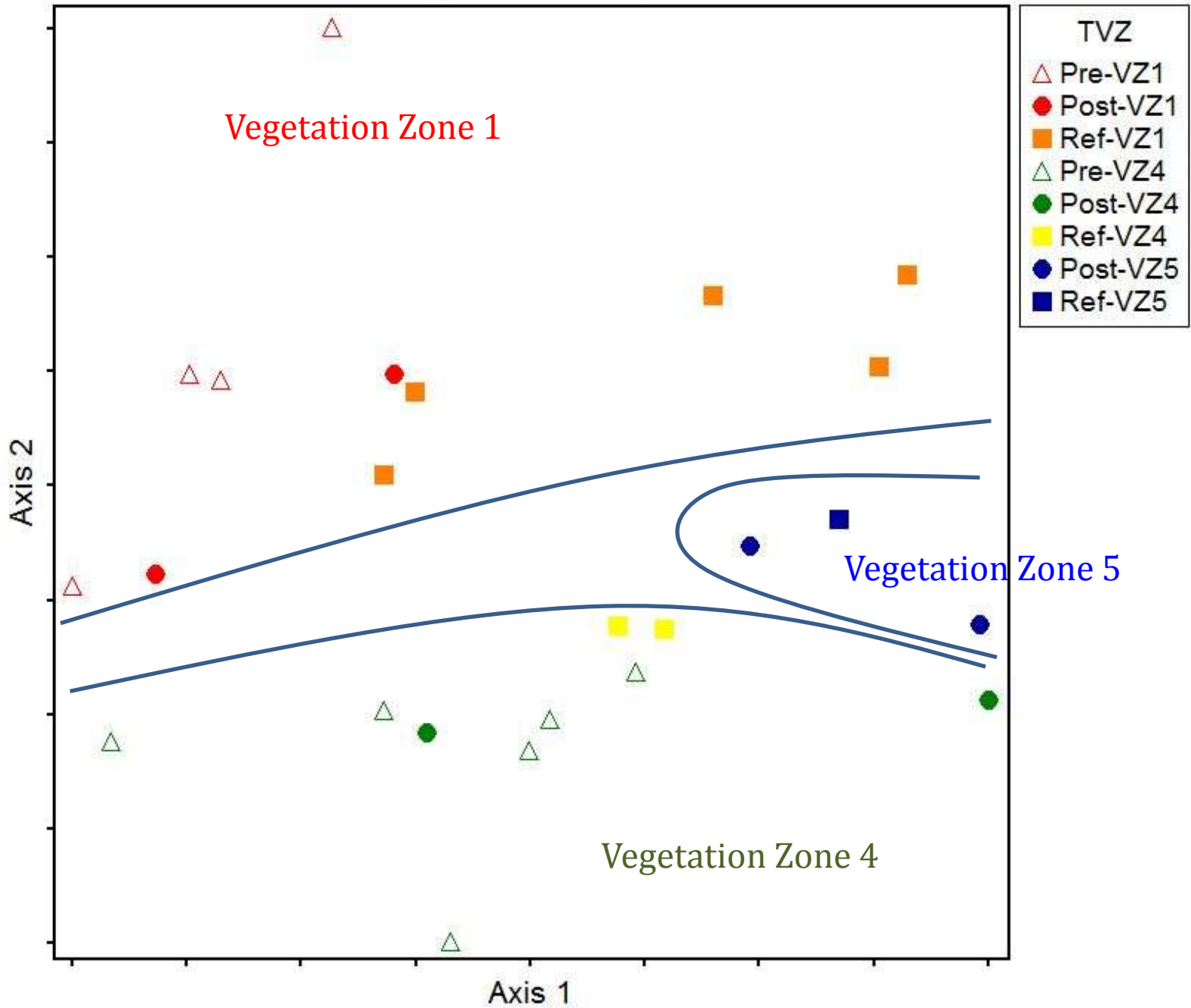


Non-Metric Multidimensional Scaling (Ordination)

(McCune and Grace 2002)

- In community ecology, we expect redundancy in species datasets to reflect the effects of the same underlying environmental gradients on different species, resulting in covarying of species' presence and absence
- Why NMS?
 - Well suited to data that are nonnormal or on arbitrary, discontinuous, or otherwise questionable scales
 - Avoids the assumption of linear relationships
 - Allows the use of any distance measure or relativization

NMS Vegetation Composition

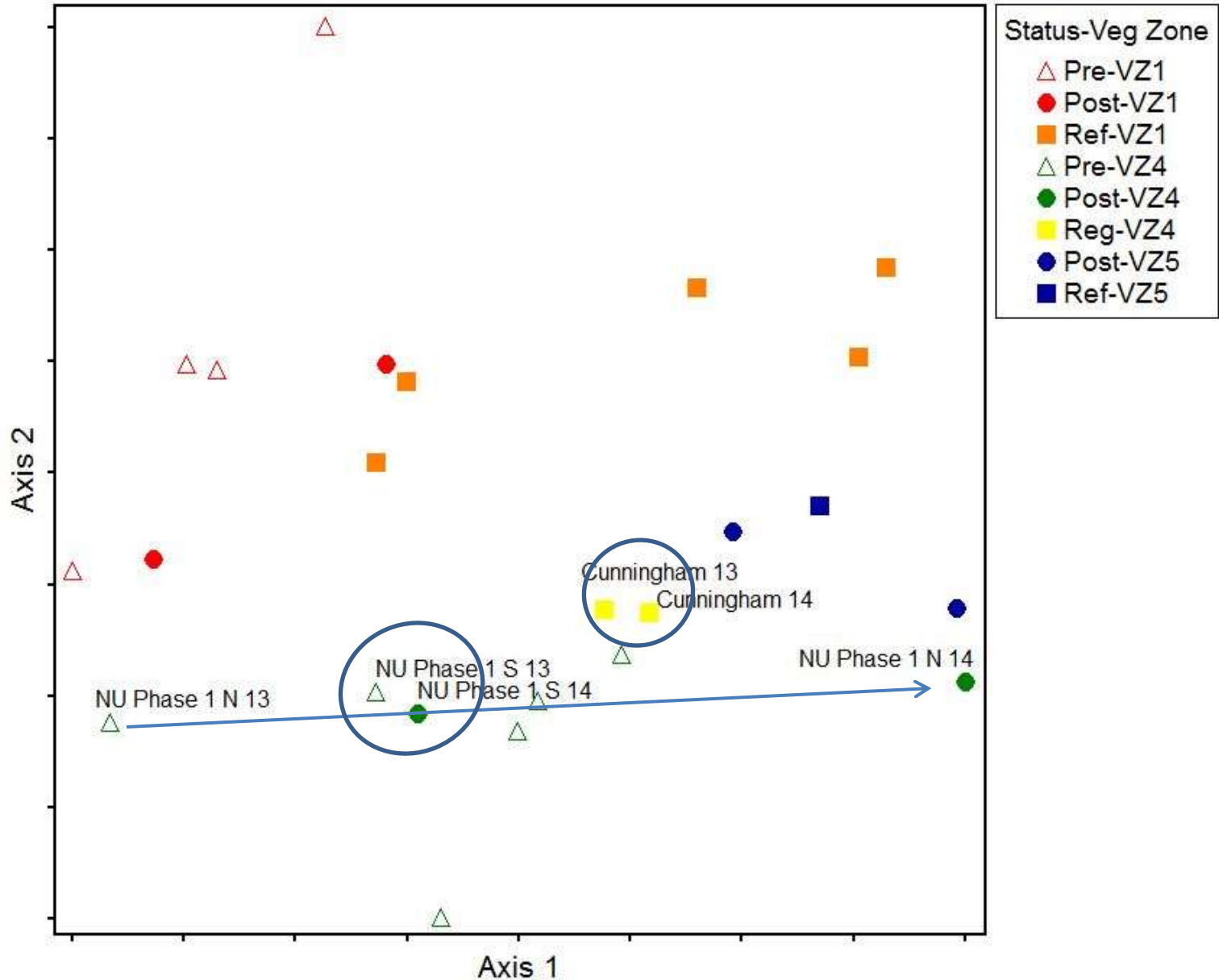




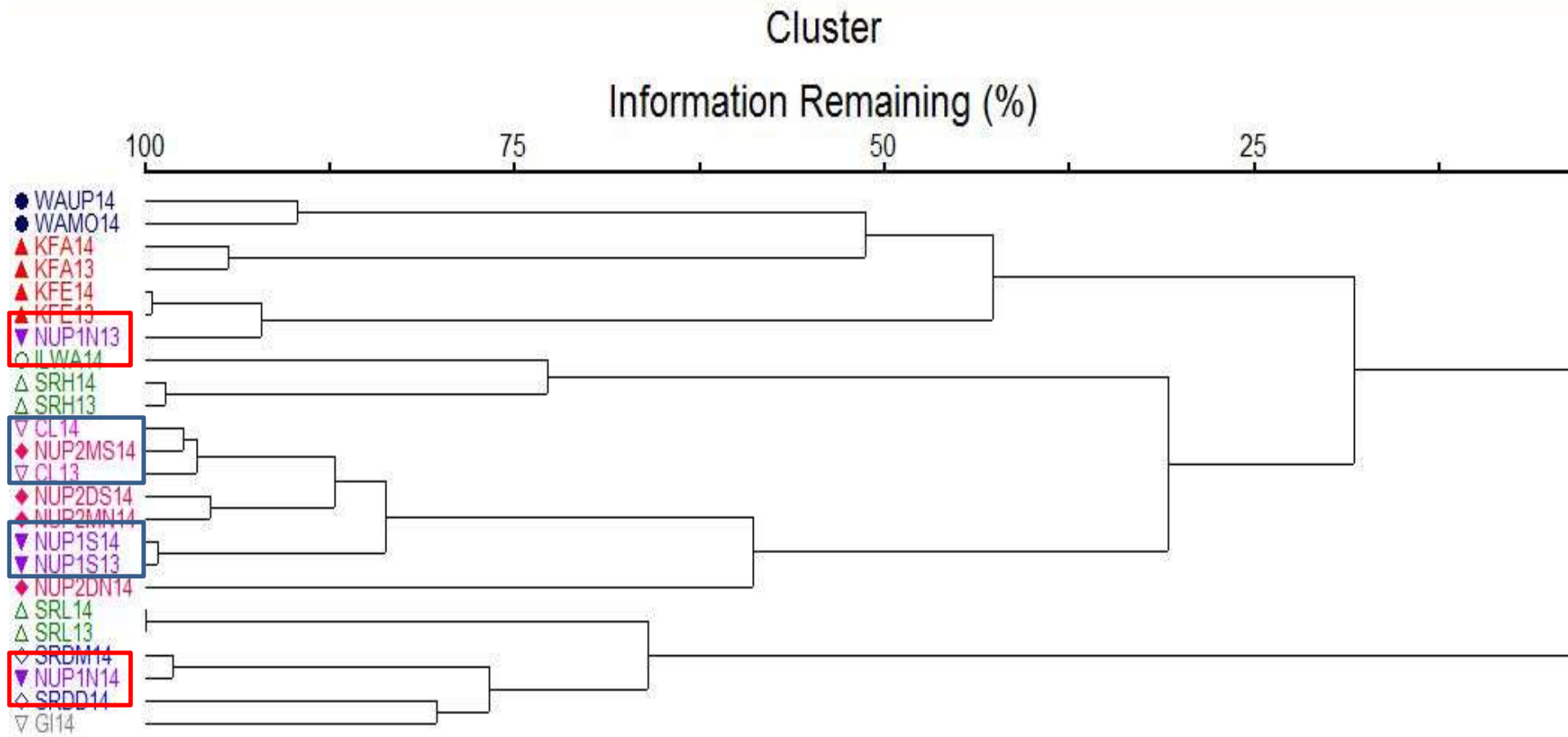


NU Phase 1

North Unit Phase 1 and Cunningham Lake



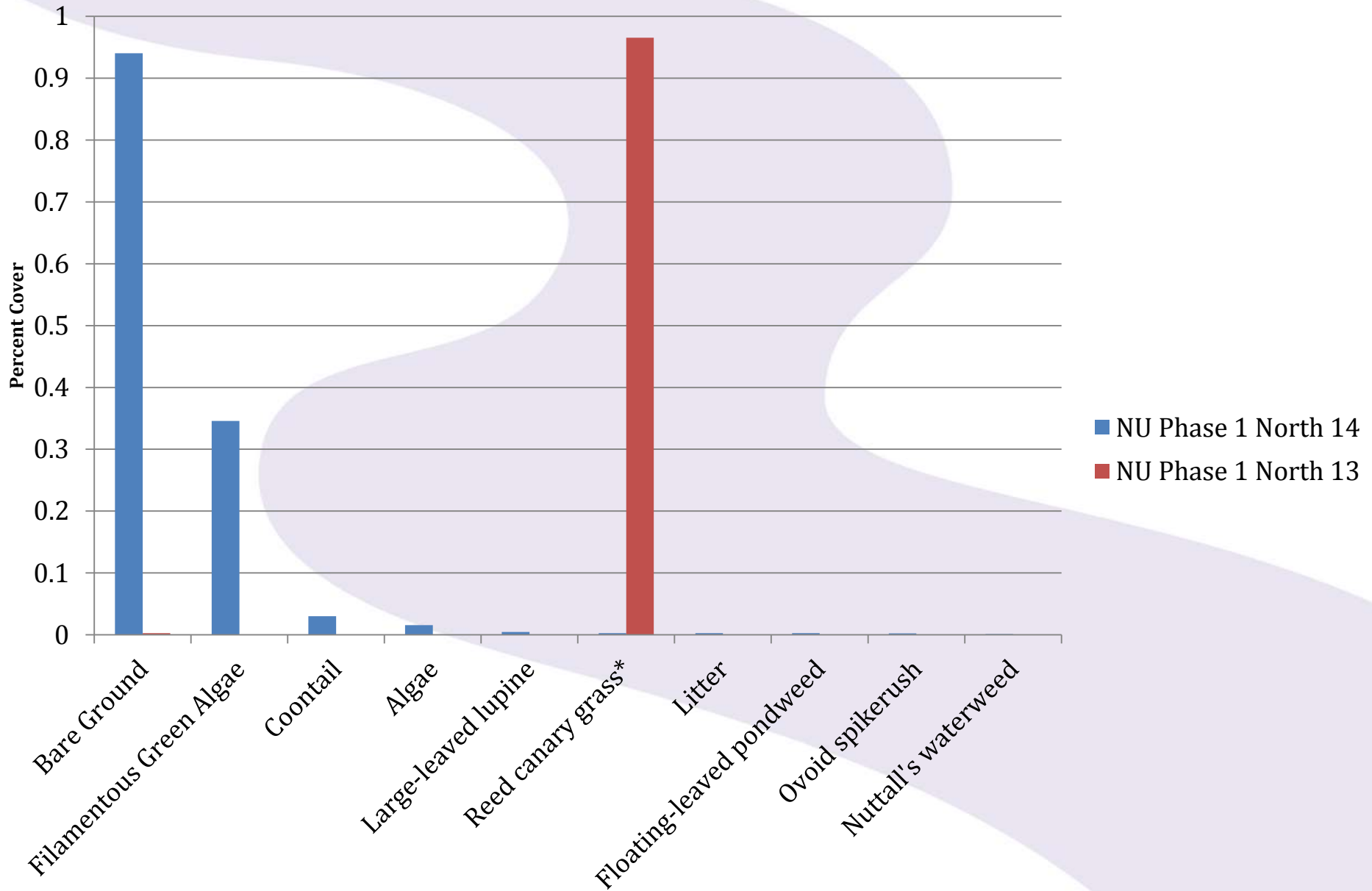
NU Phase 1



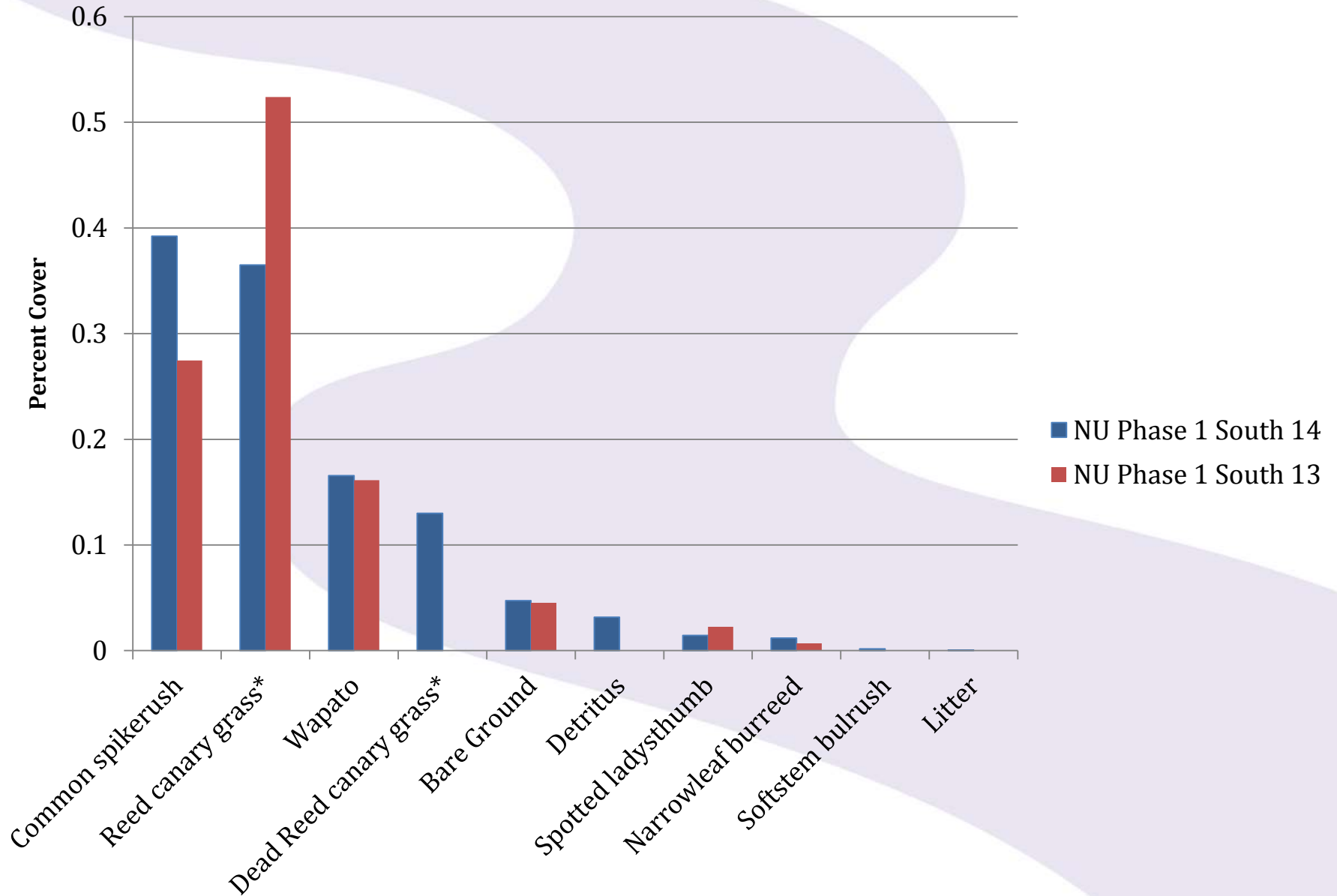
Site

▲ Kandoll Farm △ Secret River ▼ North Unit Phase 1 ▼ Cunningham Lake ● Wallacut ○ Illwaco ◆ North Unit Phase 2 ◇ Sandy River Delta ▽ Gary Island

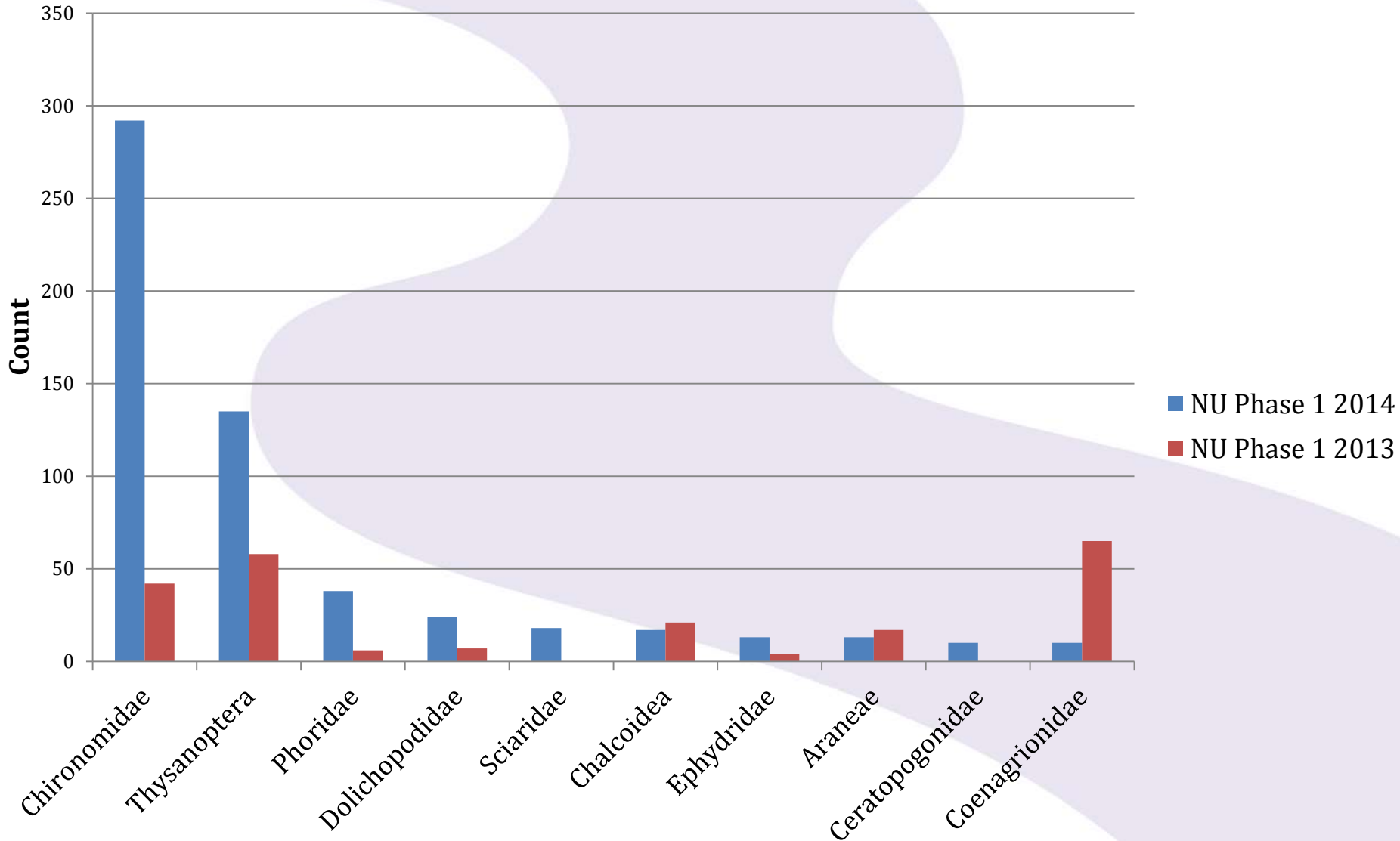
NU Phase 1 North

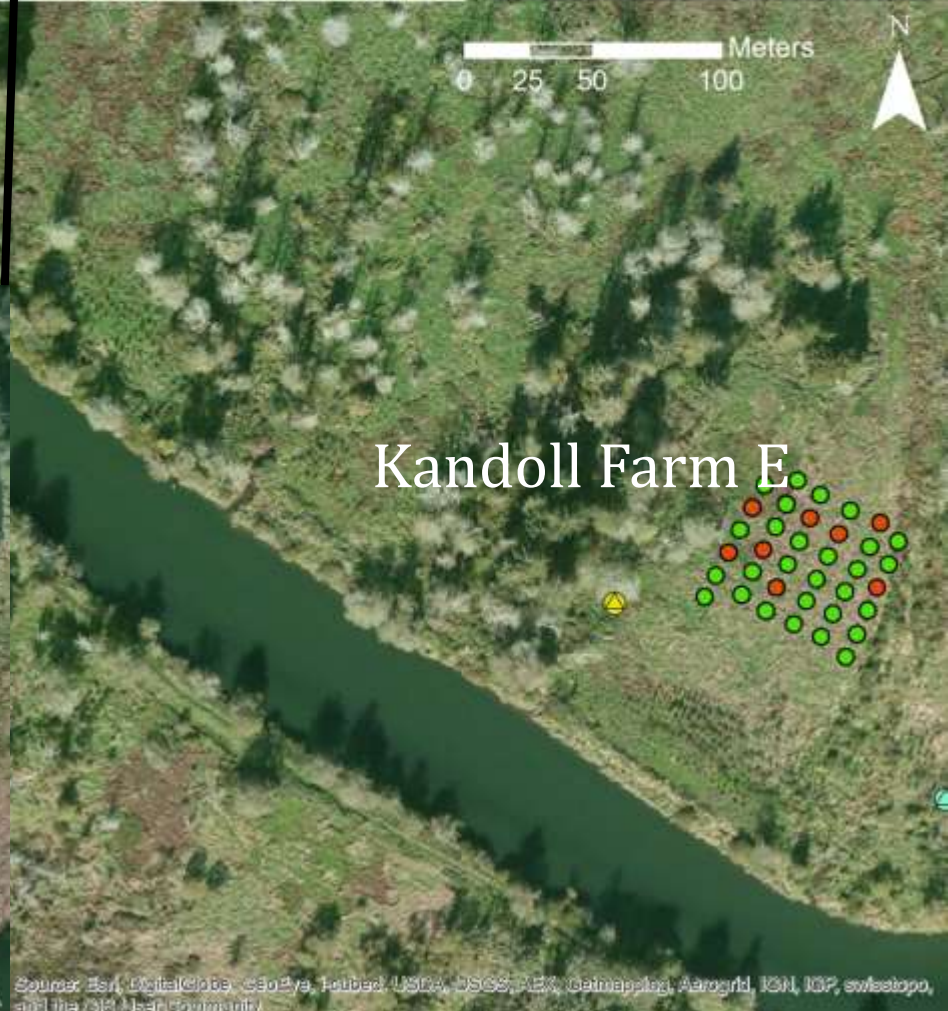
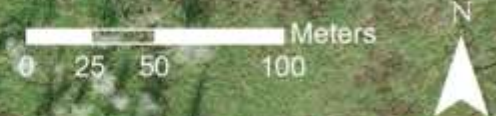
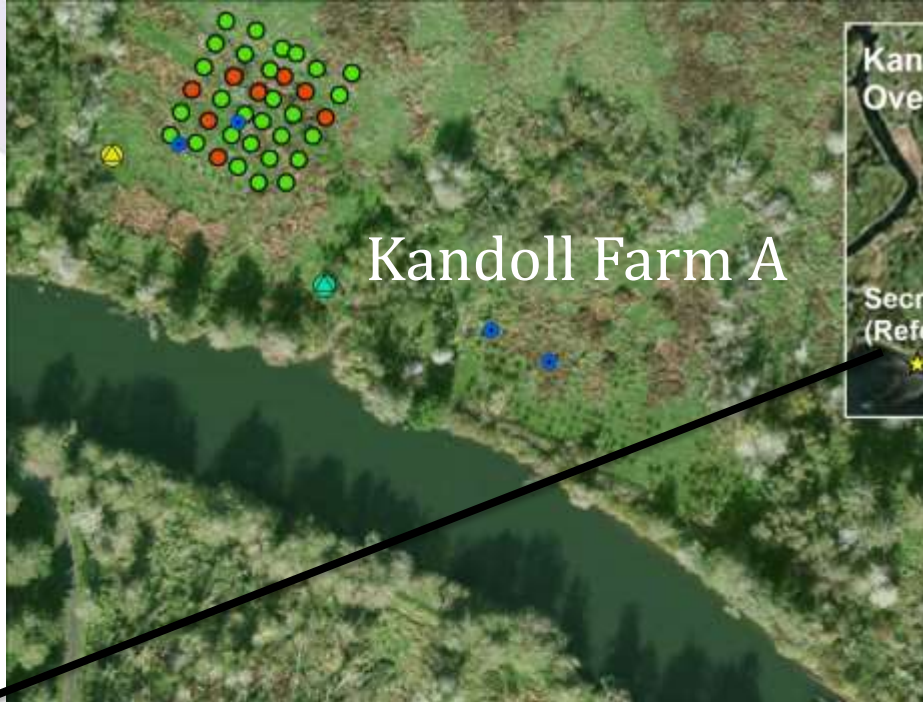


NU Phase 1 South



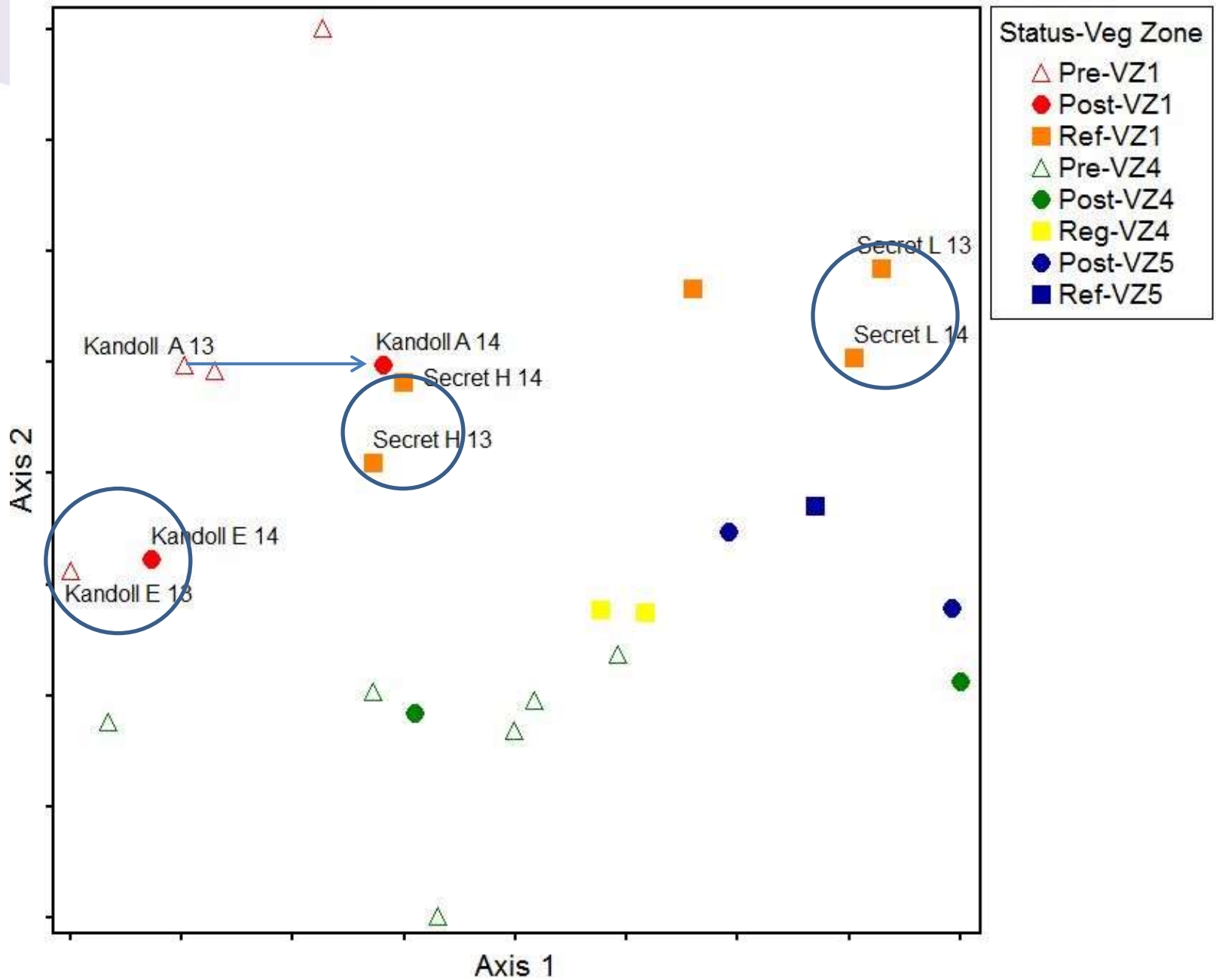
NU Phase 1 Terrestrial Macroinvertebrates



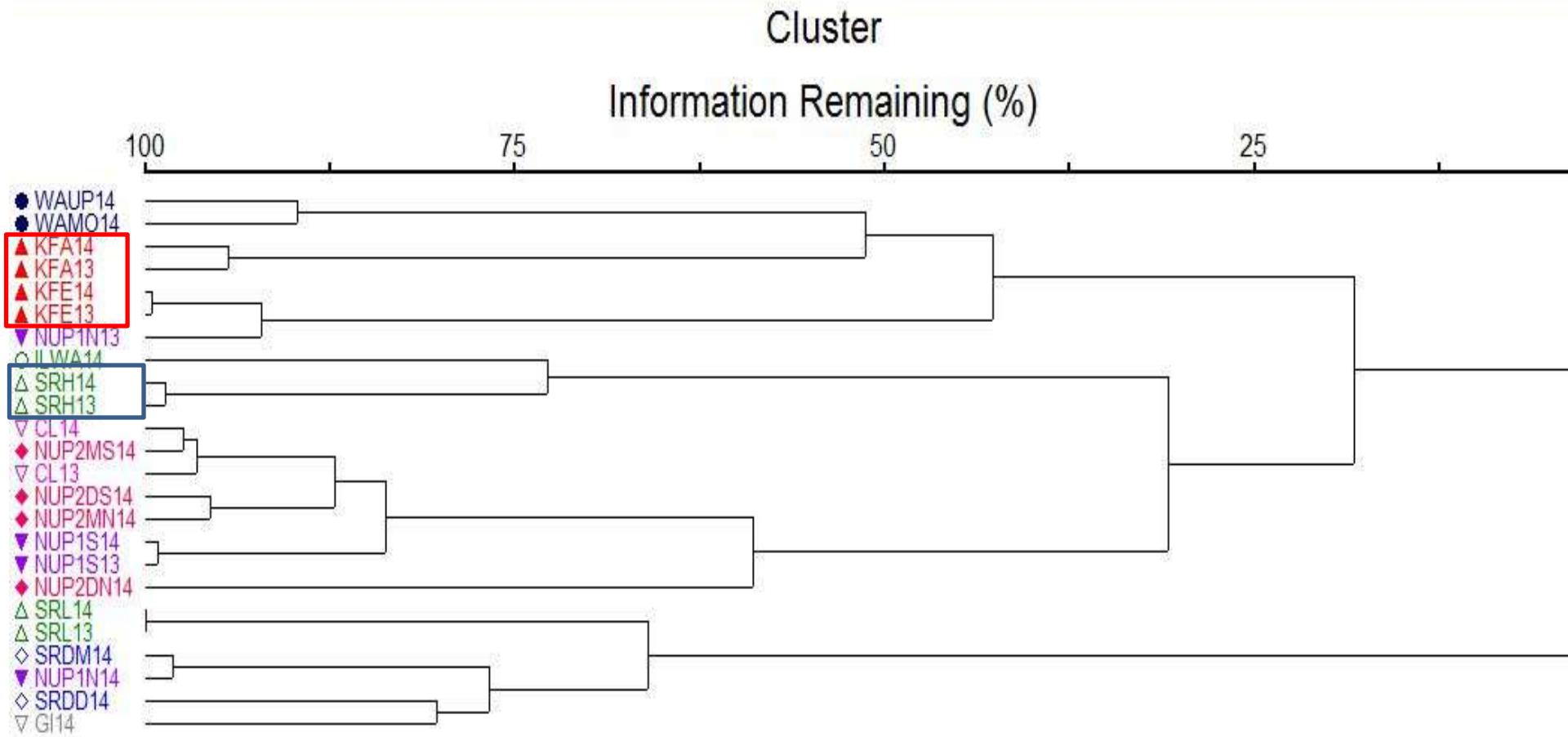


Source: Esri, DigitalGlobe, GeoEye, IGN, USDA, USGS, AeroVig, GeoMapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Kandoll Farm and Secret River



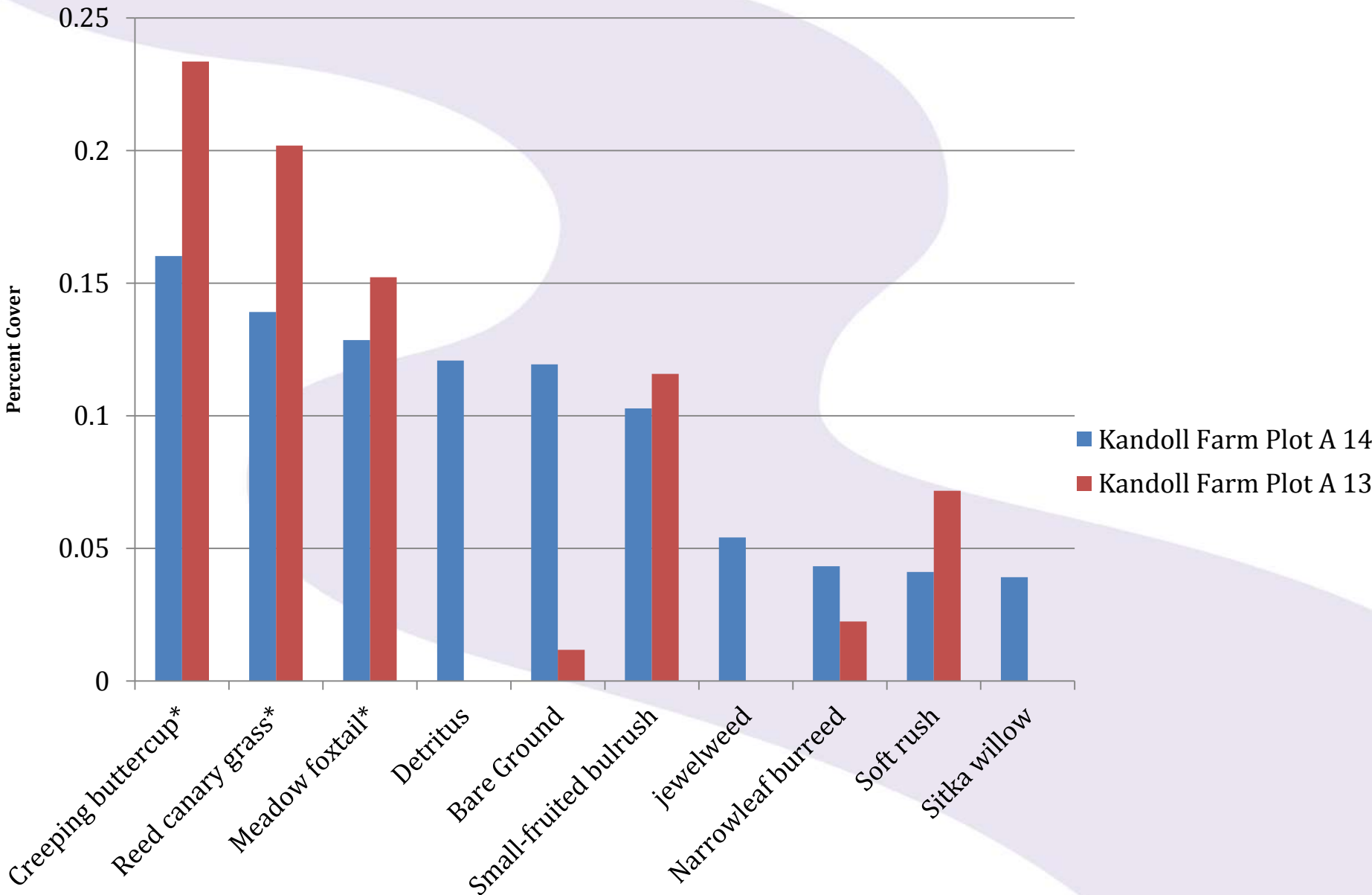
NU Phase 1



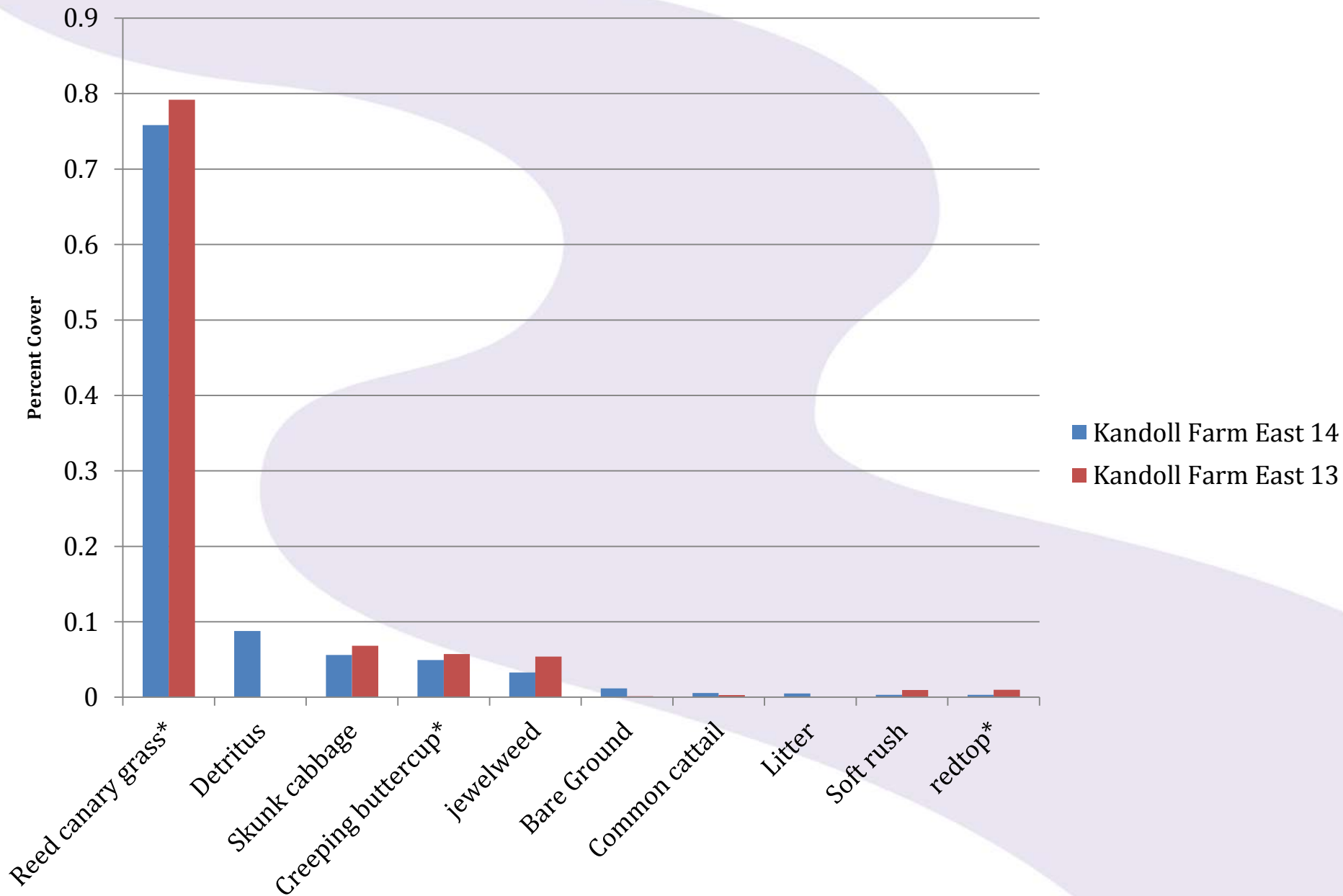
Site

▲ Kandoll Farm △ Secret River ▼ North Unit Phase 1 ▼ Cunningham Lake ● Wallacut ○ Illwaco ◆ North Unit Phase 2 ◇ Sandy River Delta ▼ Gary Island

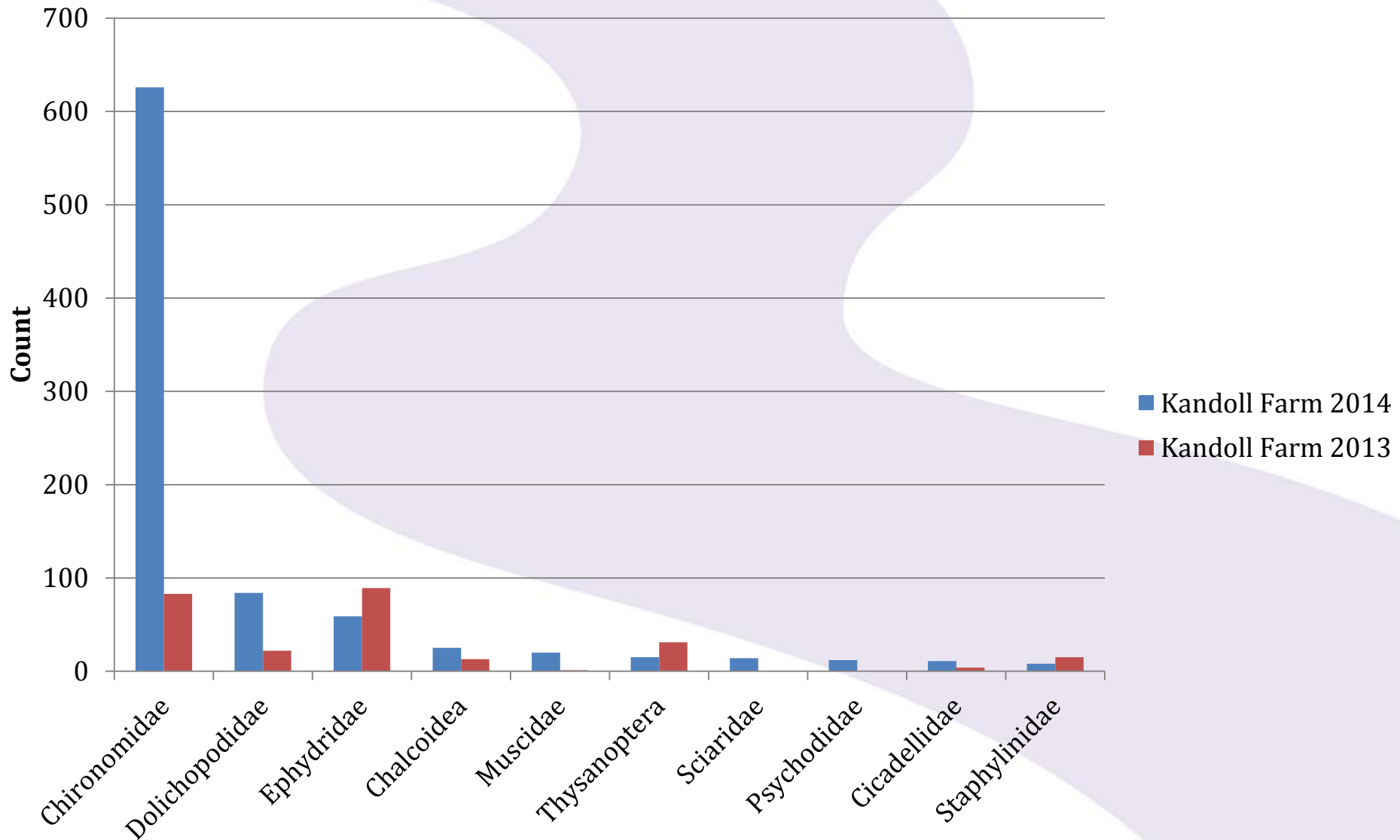
Kandoll Farm Plot A



Kandoll Farm Plot E



Kandoll Farm Terrestrial Macroinvertebrates



Kandoll Farm Plot A

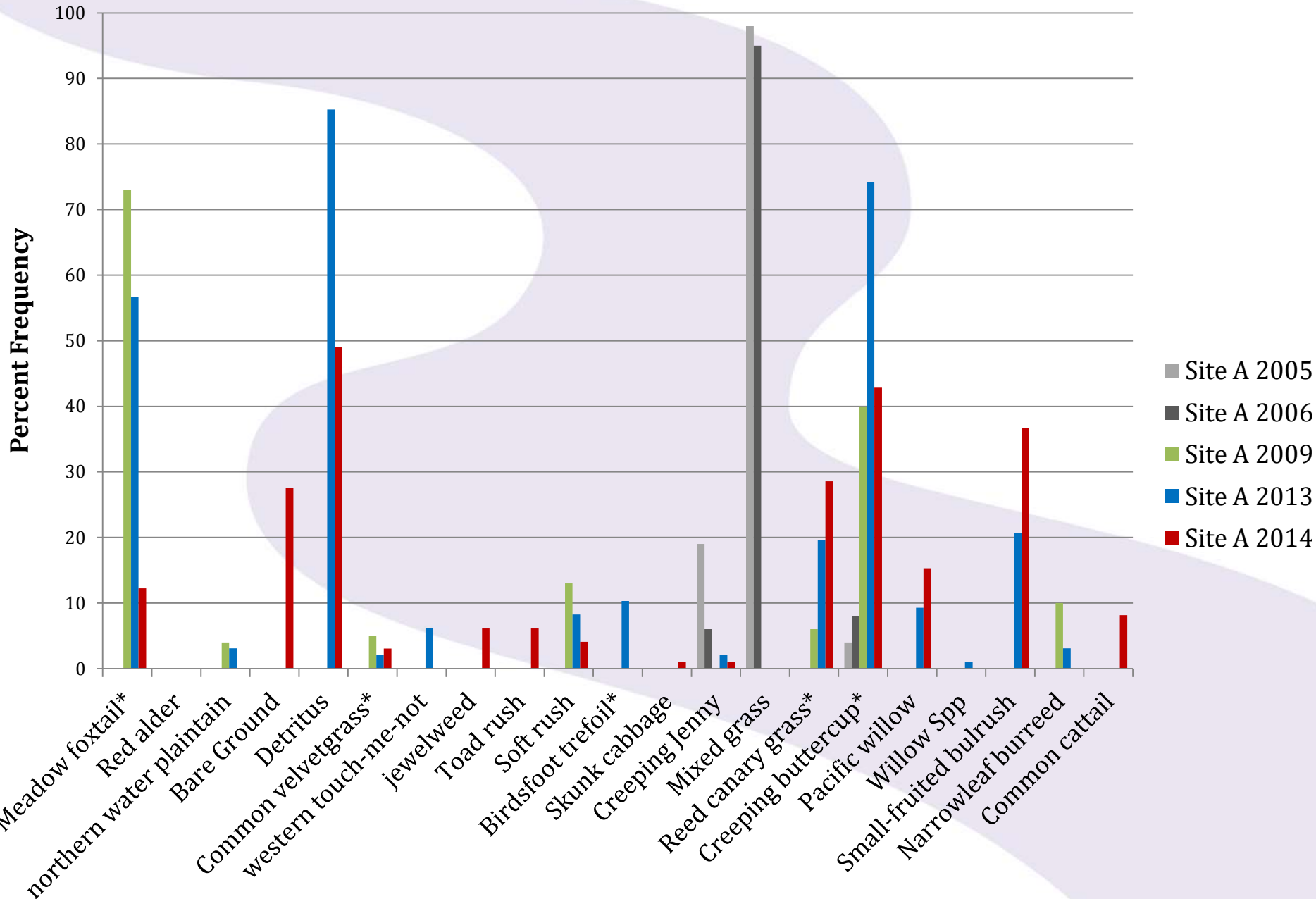
LPI

Legend

- Veg. Plot, Permanent
- Veg. Plot, Status
- Fall Out Trap
- ▲ Mega Transect Start
- Mega Transect End



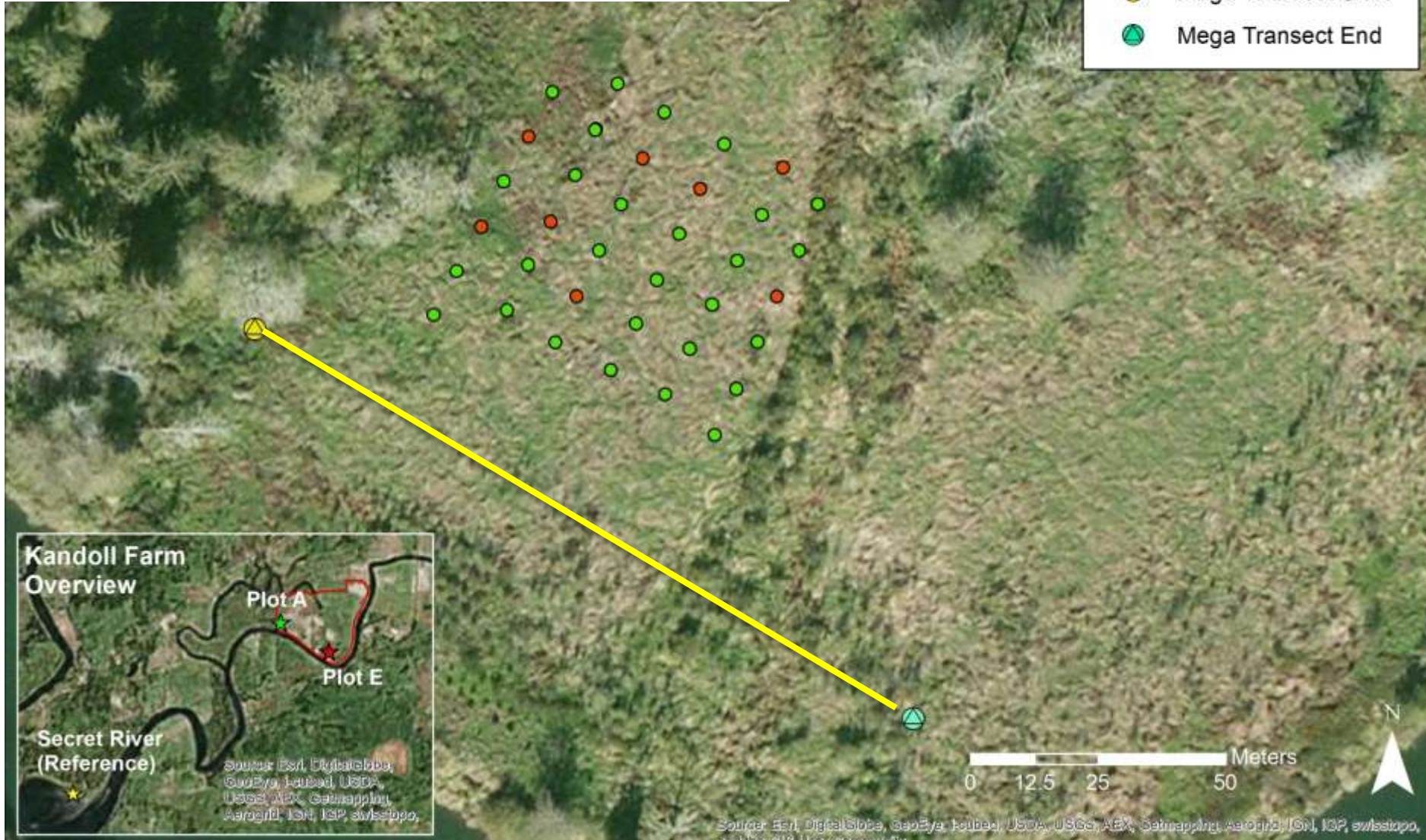
Kandoll Farm Plot A LPI



Kandoll Farm Plot E LPI

Legend

- Veg. Plot, Permanent
- Veg. Plot, Status
- Fall Out Trap
- ▲ Mega Transect Start
- ▲ Mega Transect End



Kandoll Farm
Overview

Plot A

Plot E

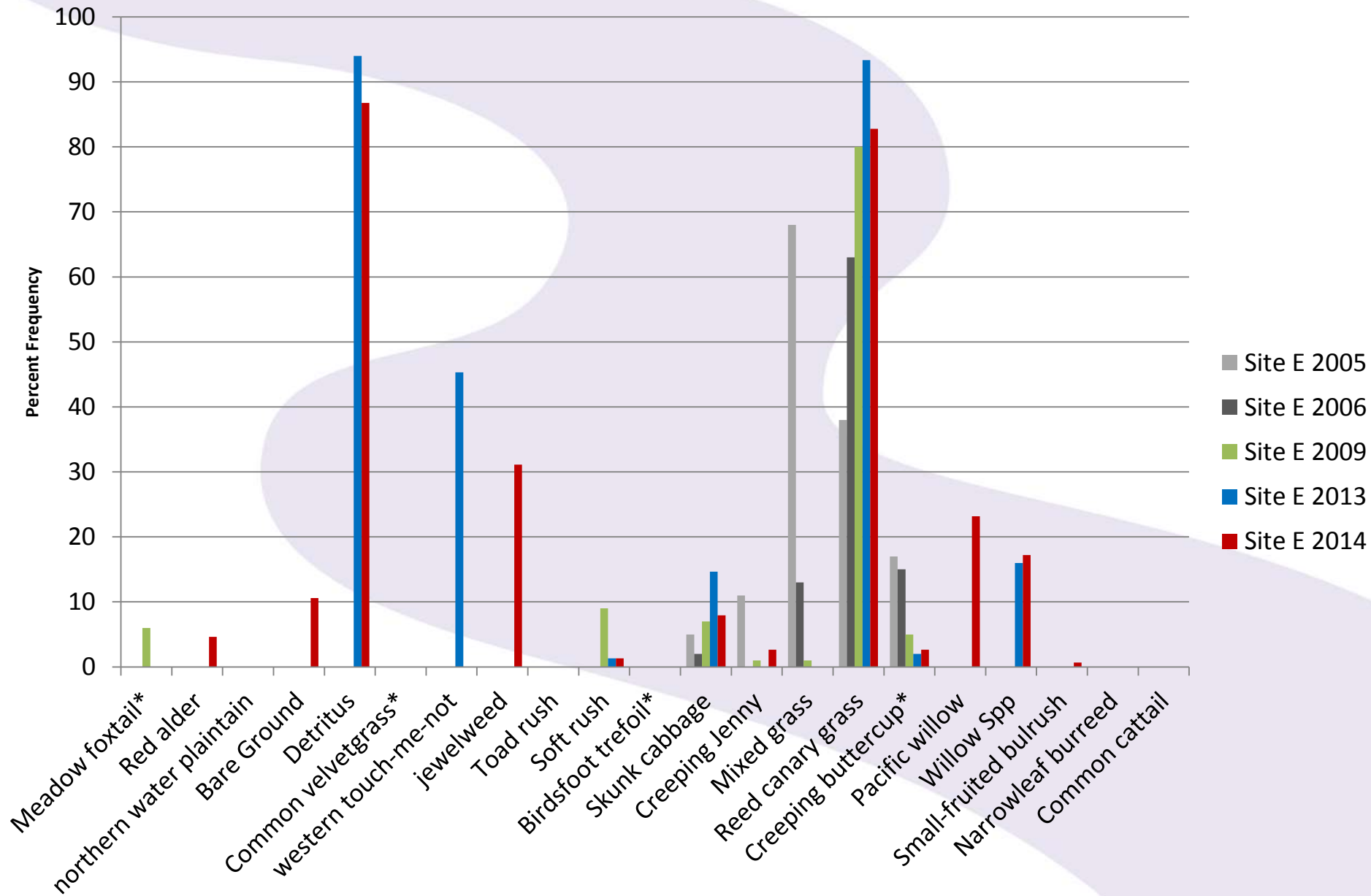
Secret River
(Reference)

Source: Esri, DigitalGlobe,
GeoEye, IGN, USDA,
USGS, AeroGRID, IGN, IGP, swisstopo,

0 12.5 25 50 Meters

Source: Esri, DigitalGlobe, GeoEye, IGN, USDA, USGS, AEX, GeoMapping, AeroGRID, IGN, IGP, swisstopo,
and the GIS User Community

Kandoll Farm Plot E LPI



Horsetail Creek PIT tag Array

- Operating Pre and Post Restoration
- Identify fish/life stage
- Determine if fish transit culvert



Horsetail Creek PIT tag Array

- Hatchery and Wild Stocks Detected
 - Hatchery fish from the Snake and Salmon Rivers
- In 2014 summer run steelhead had residence time ranging from 1-11 days
 - Juvenile fish transited culvert
 - One summer run steelhead from the Snake River was detected in spring and fall



Questions



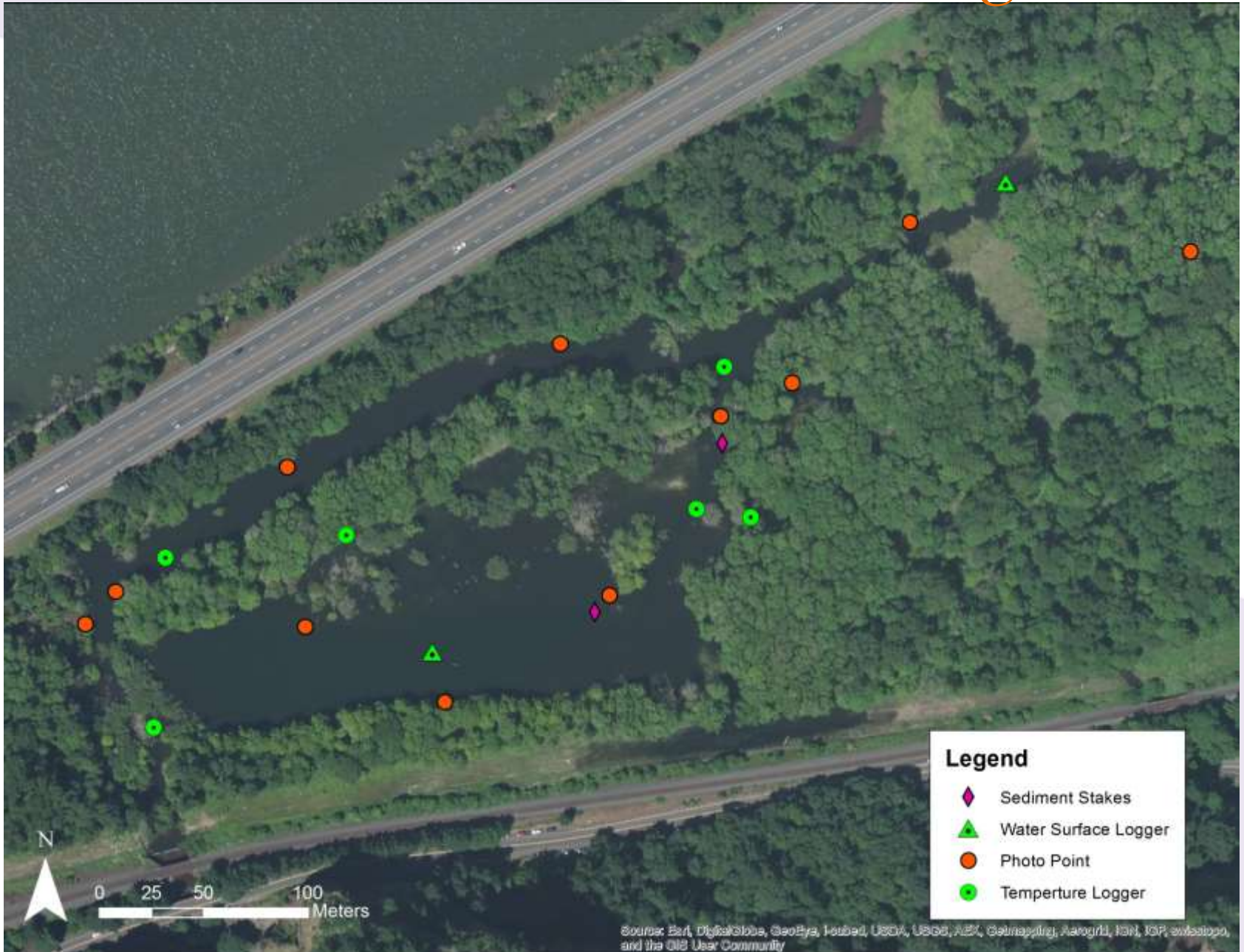
Level 3 AEM Discussion



Level 3 AEM Discussion

- Brief Level 3 site report for Horsetail
- Group Discussion
 - How's it going with AEM?
 - What can be improved?
 - Time and resource constraints
 - Data management

Horsetail Monitoring



Level 3 Photo points

Pre-restoration



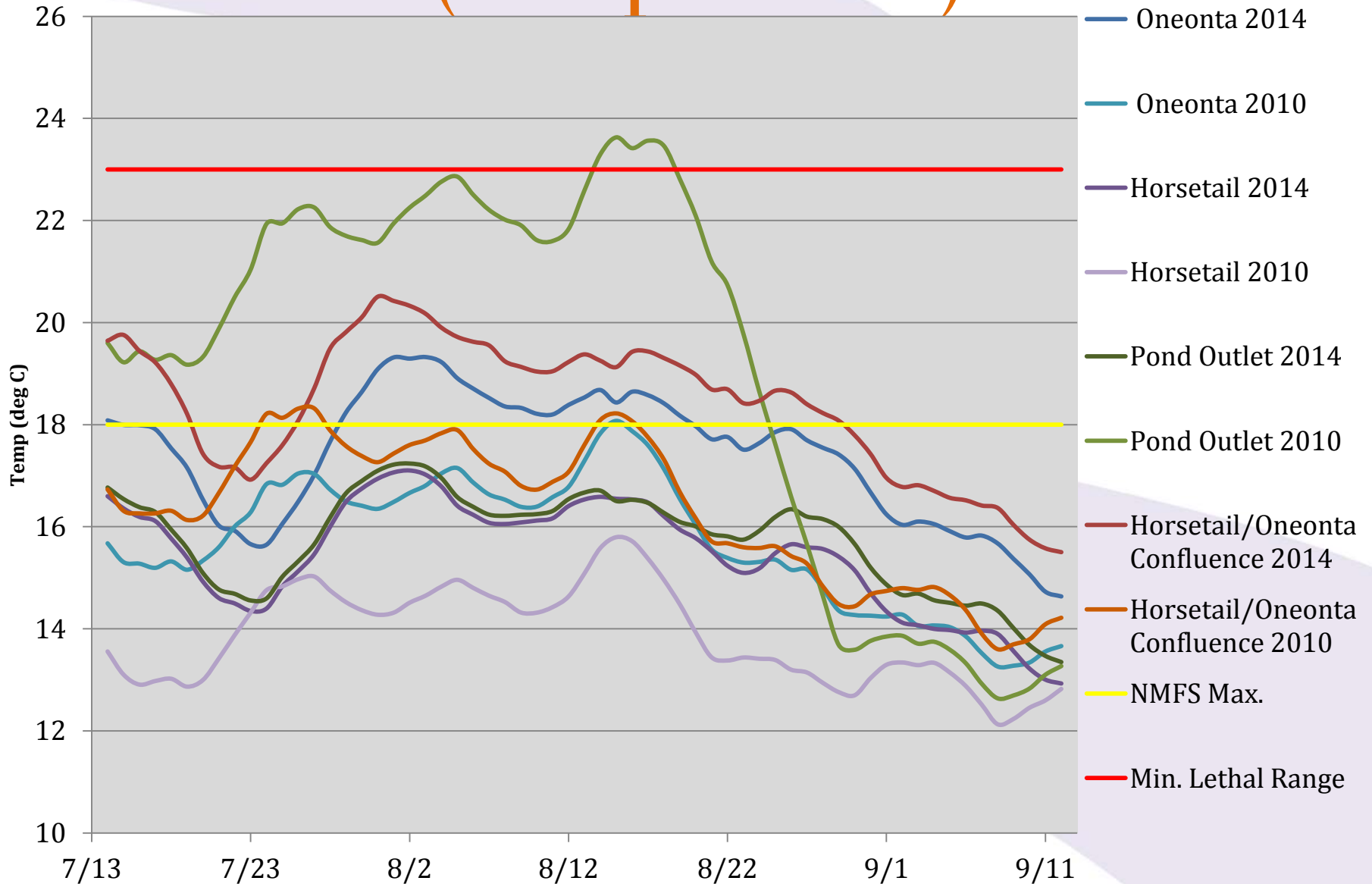
Post restoration



**Post restoration
(winter)**

Date: 3/7/2014
Time: 10:00
Project: HT
Point #: 5-1
Direction: NE
Azimuth: 70

Horsetail Monitoring (Temperature)



Horsetail Monitoring



Horsetail Monitoring (Temperature)

- Lowest mean 7-day moving average maximum daily temperature at control locations on Horsetail and Oneonta Creek was $\sim 2^{\circ}\text{C}$ warmer in 2014 than 2010
- Warmer and drier conditions masking improvements related to restoration
 - 2010 was cooler and wetter than 2014, but the observed difference in temperature from the upstream to downstream on the Horsetail Creek were similar

Horsetail Monitoring

- Increased discharge on Oneonta Creek
- Sediment accretion – TBD
- WSE – TBD
- LWD Channel Cross Sections – TBD



Level 3 AEM Questions and Discussion

How's it going with AEM?

What can be improved?

Time and resource constraints

Data management