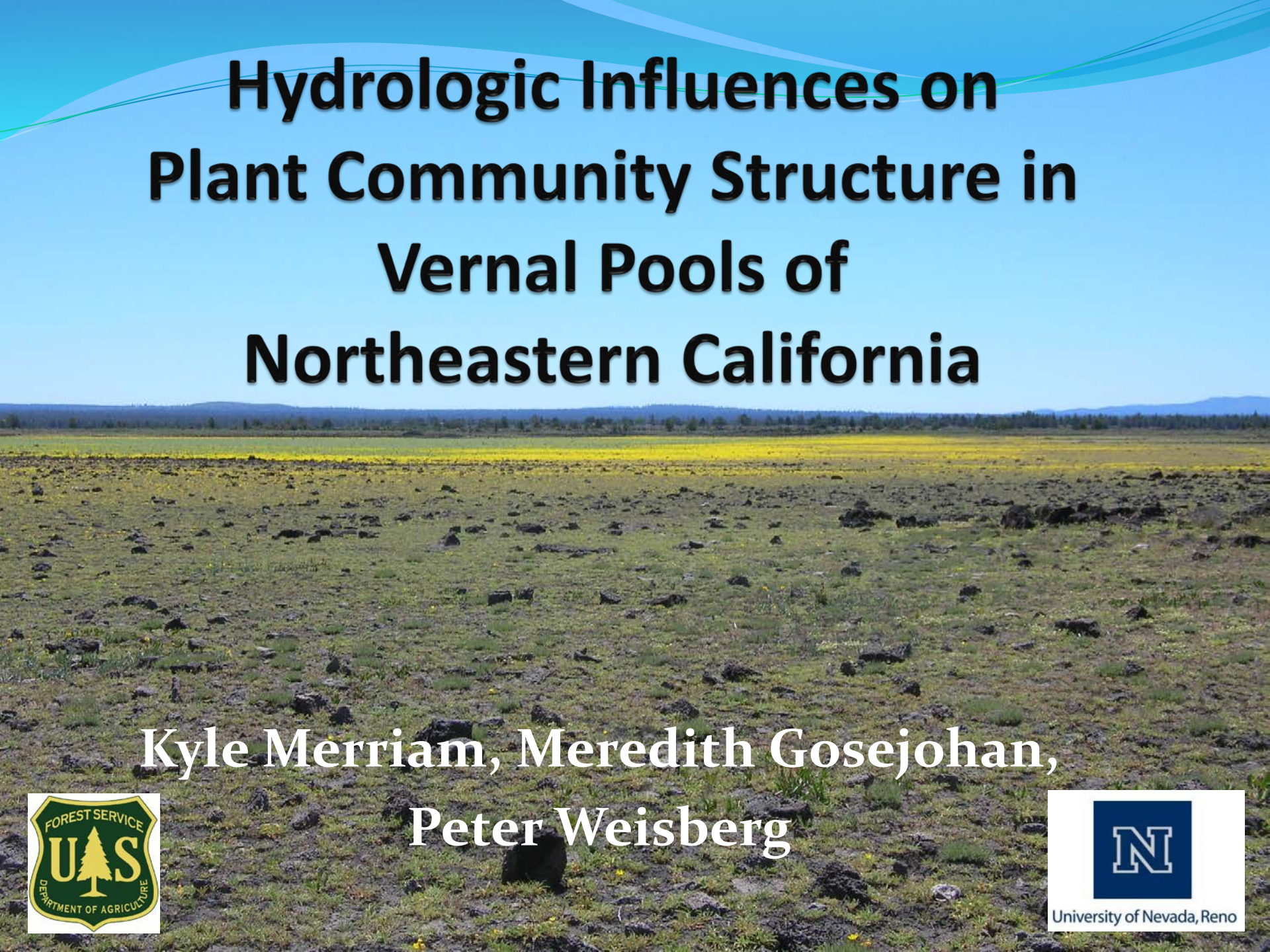
Hydrologic Influences on Plant Community Structure in Vernal Pools of Northeastern California



Kyle Merriam, Meredith Gosejohan, Peter Weisberg

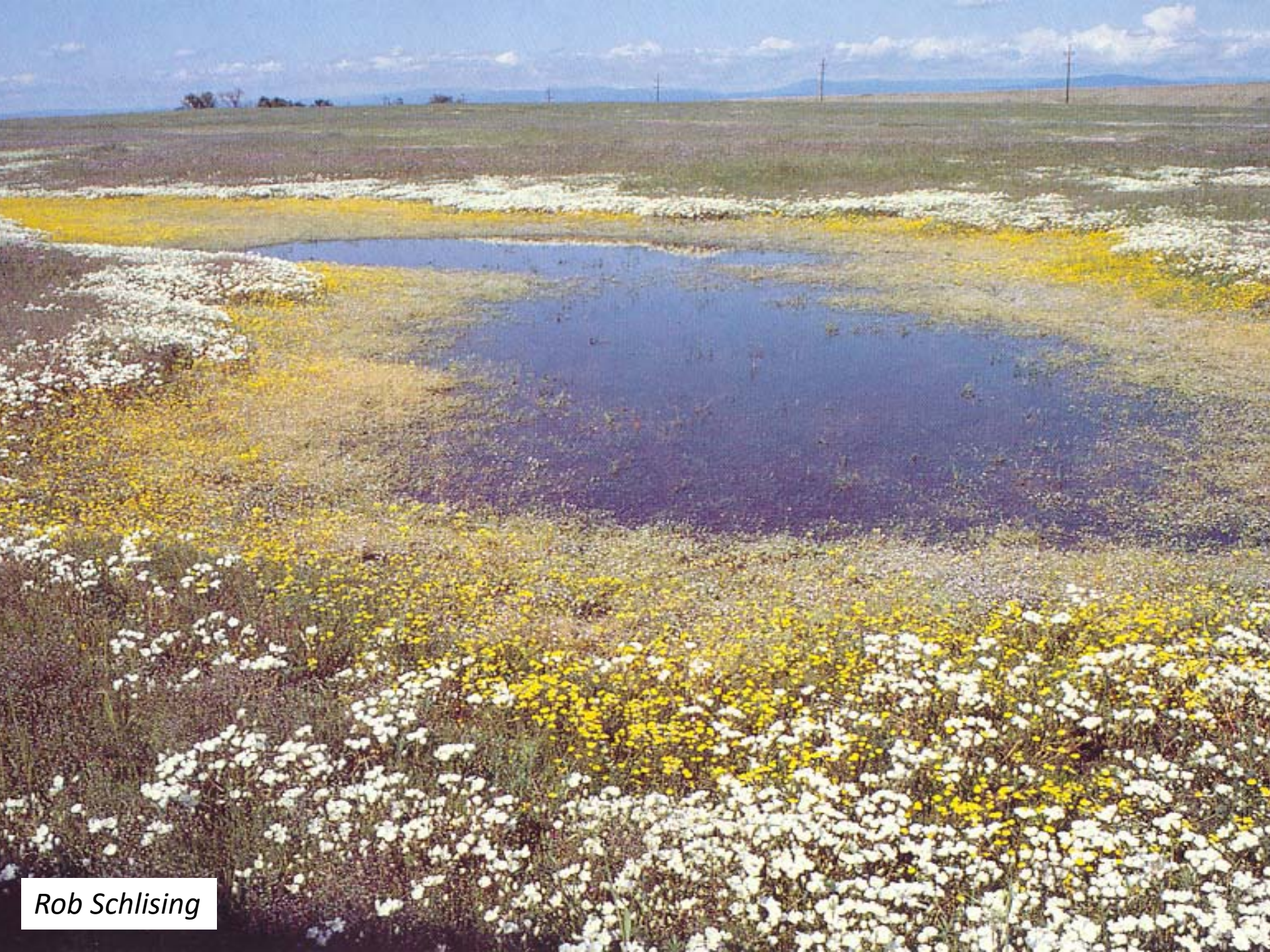
FOREST SERVICE US DEPARTMENT OF AGRICULTURE

University of Nevada, Reno

Vernal pools are challenging!

Orcuttia tenuis

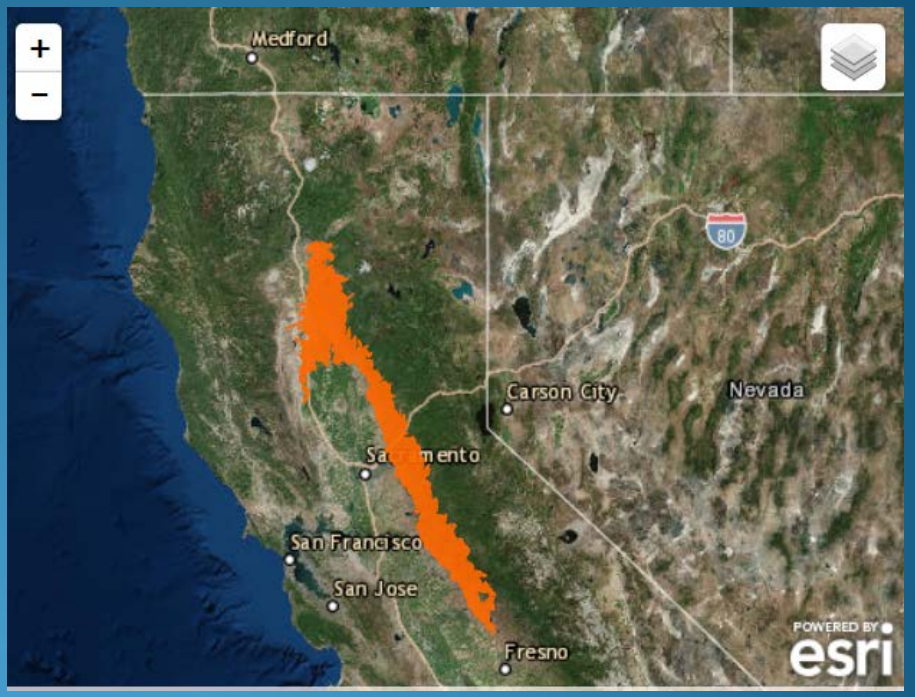
- Terrestrial & aquatic phases
- Specific inundation requirements
- Persistent seed bank


Rob Schlising

Vernal Pool Classification

short-inundated communities

Layia fremontii

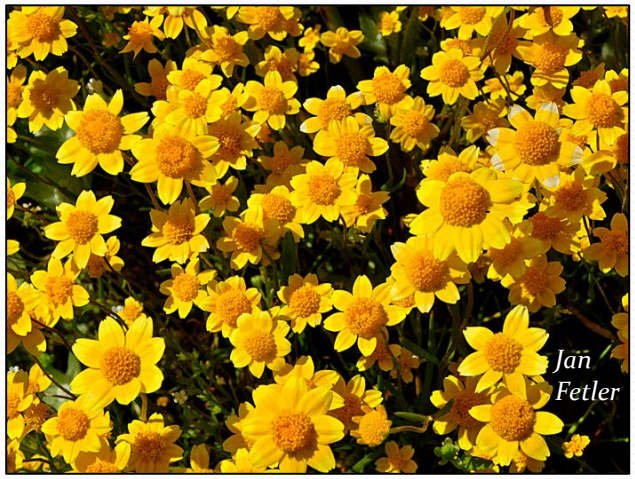


Manual of California Vegetation

Achyrachaena mollis

Vernal pool classification

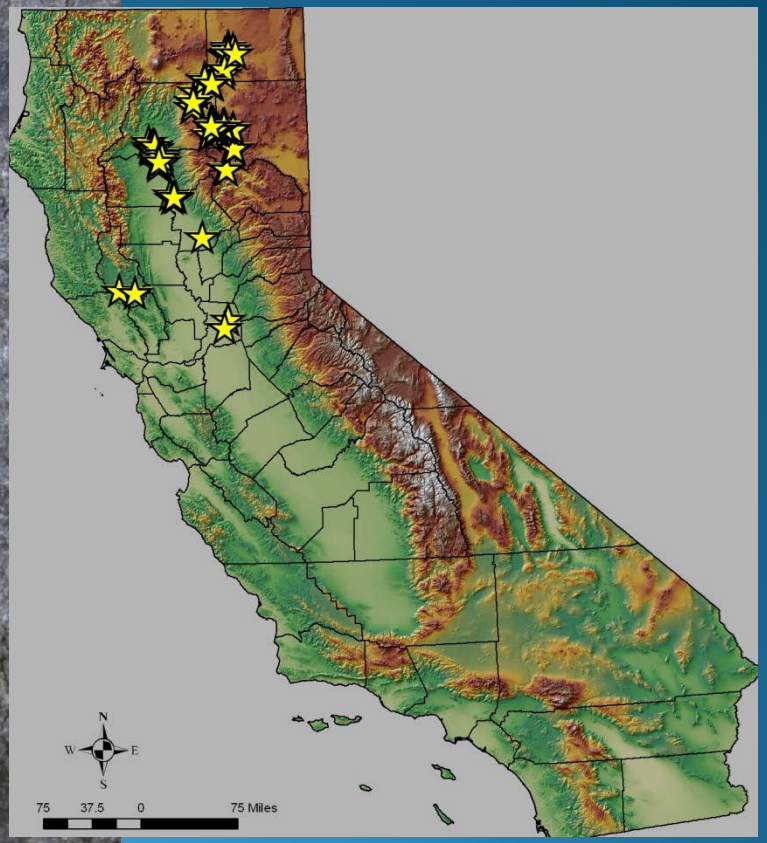
Lasthenia fremontii



Downingia bicornuta

Manual of California Vegetation

Vernal Pool Regions



Orcuttia tenuis
State & Federally Listed

Vernal Pool Habitat

Central Valley

Northeastern California





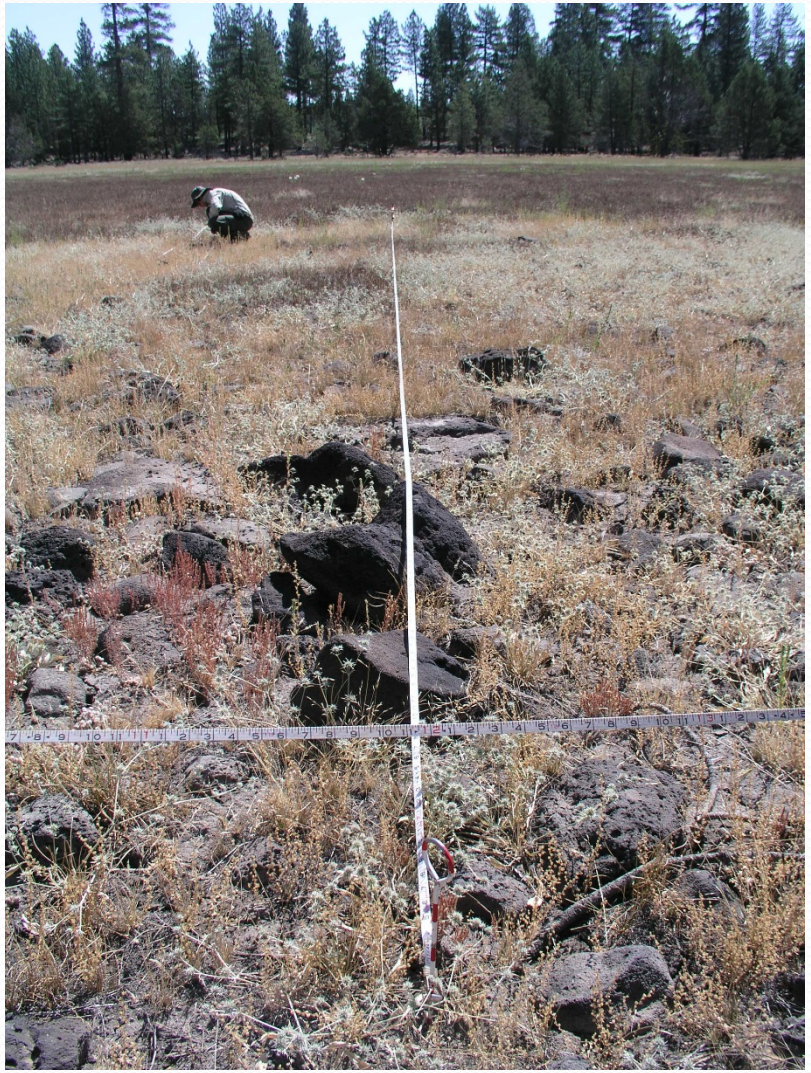




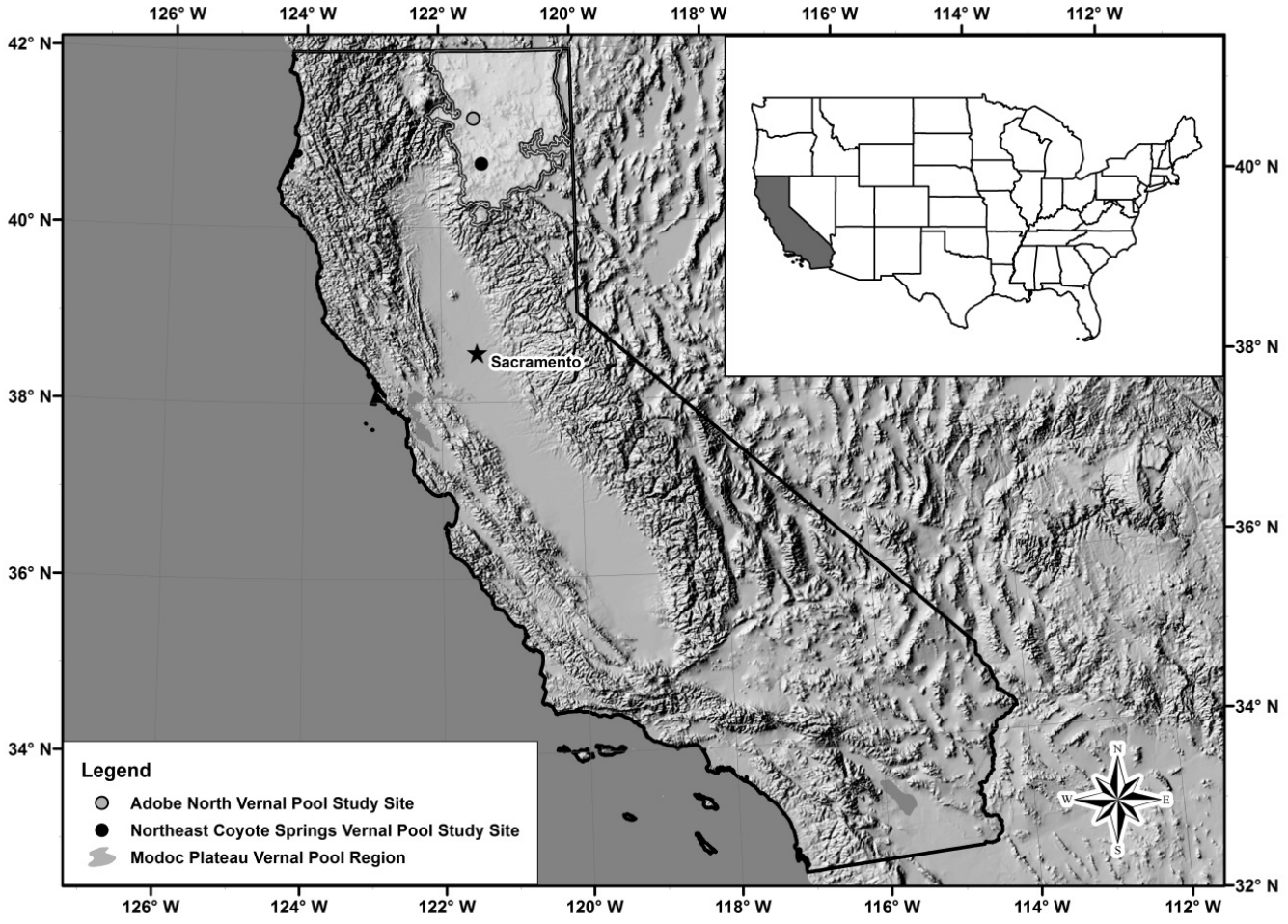


Questions

- How does hydrology affect vernal pool plants in northeastern California?
- What vernal pool plant communities occur on the Modoc Plateau?
- What are the hydrologic requirements of *Orcuttia tenuis?*

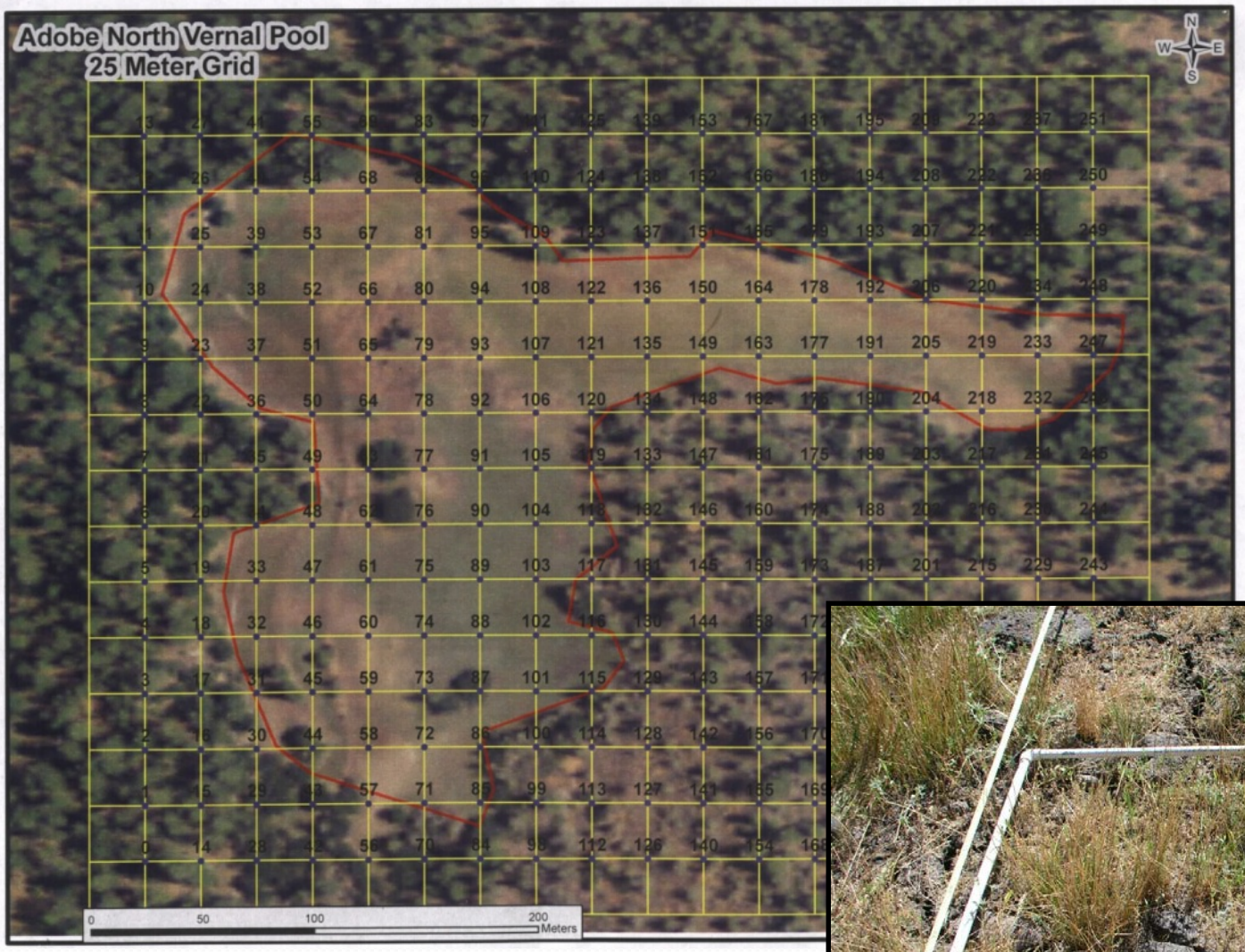


Study Sites


126° W
124° W
122° W
120° W
118° W
116° W
114° W
112° W
42° N
40° N
38° N
36° N
34° N
32° N
Sacramento
Legend
Adobe North Vernal Pool Study Site
Northeast Coyote Springs Vernal Pool Study Site
Modoc Plateau Vernal Pool Region
N
W
E
S

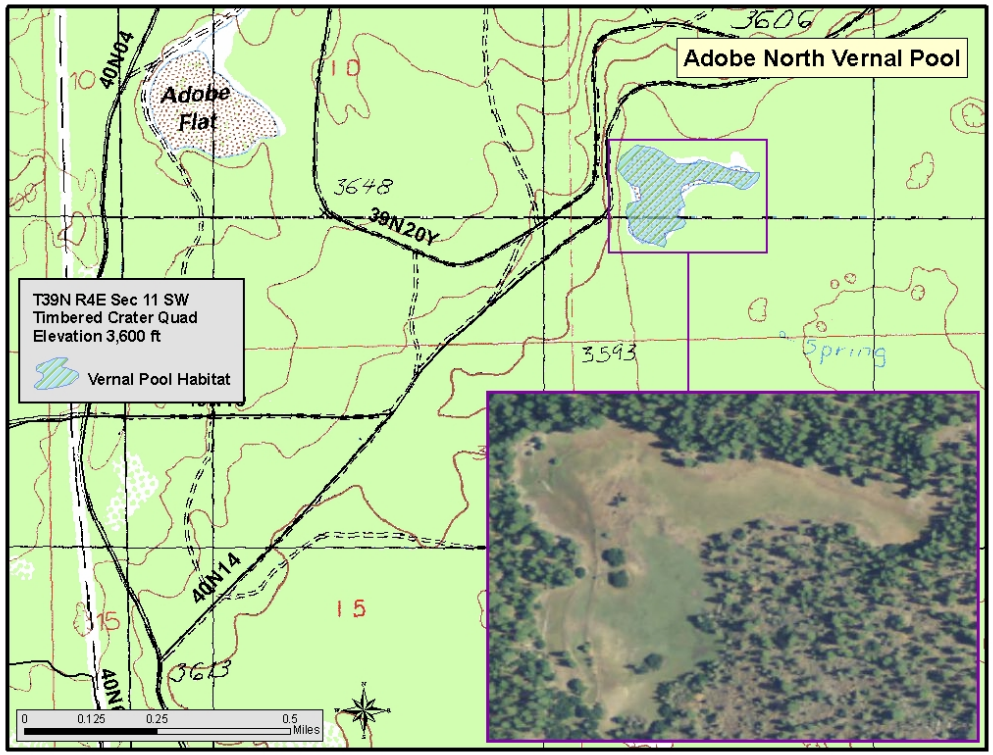
Field Methods

- Hydroperiod monitoring: stage gauges & remote cameras
- Geodetic topographic survey



- Vegetation sampling at each point

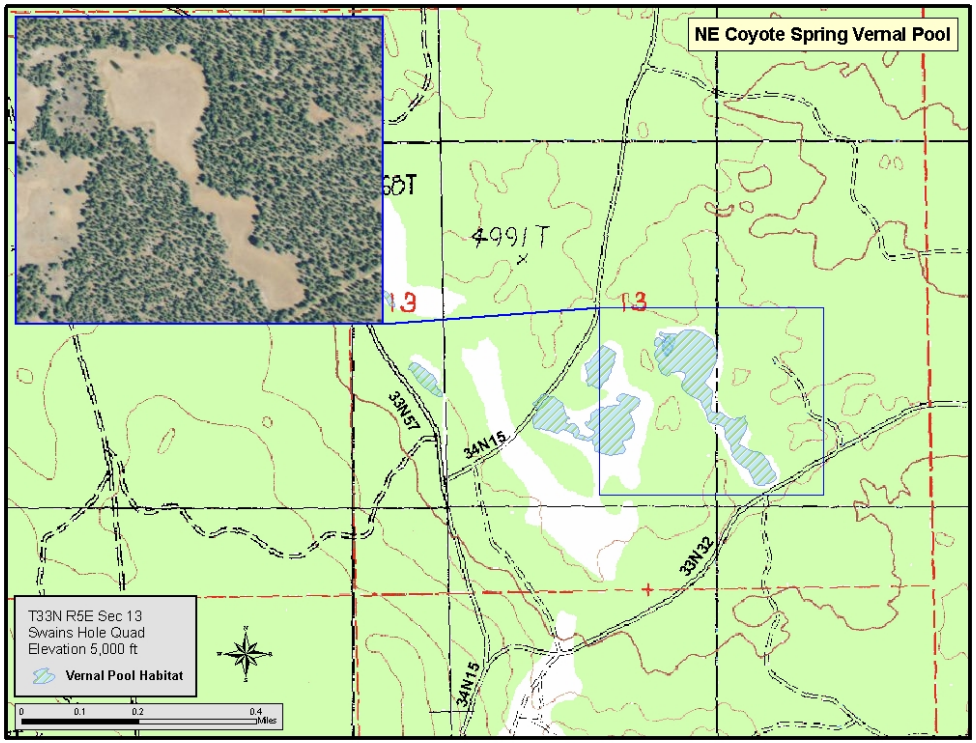
Adobe North VP



Area = 13.45 acres

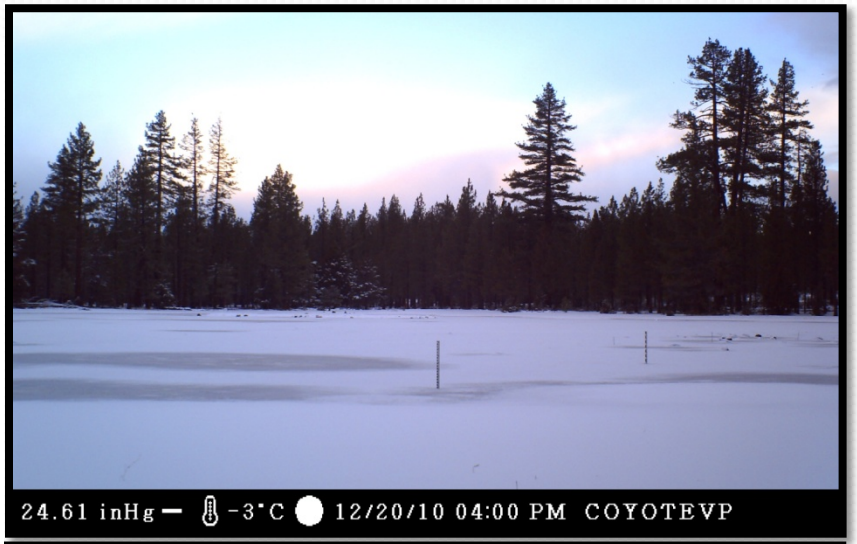
N = 192

Coyote Springs VP



Area = 8.65 acres

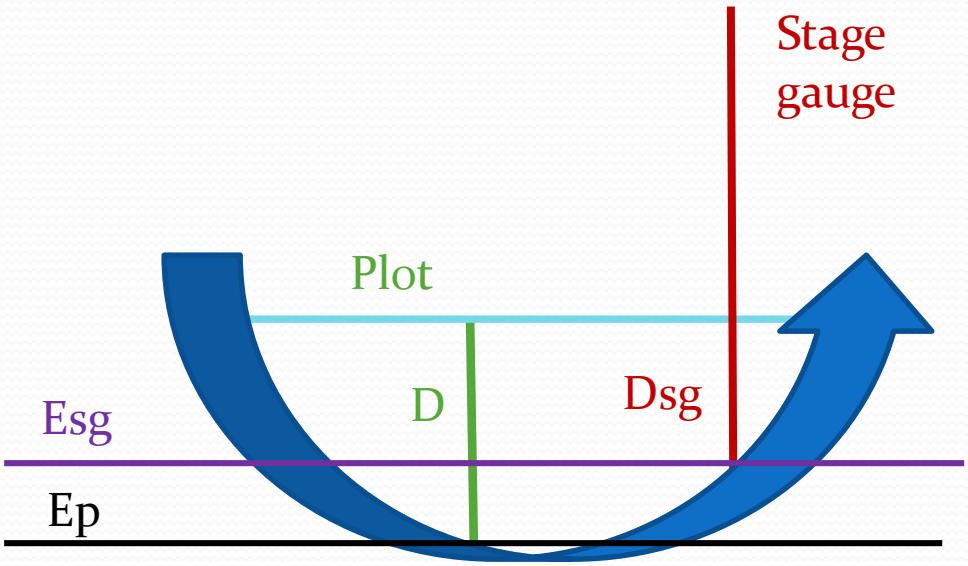
N = 142



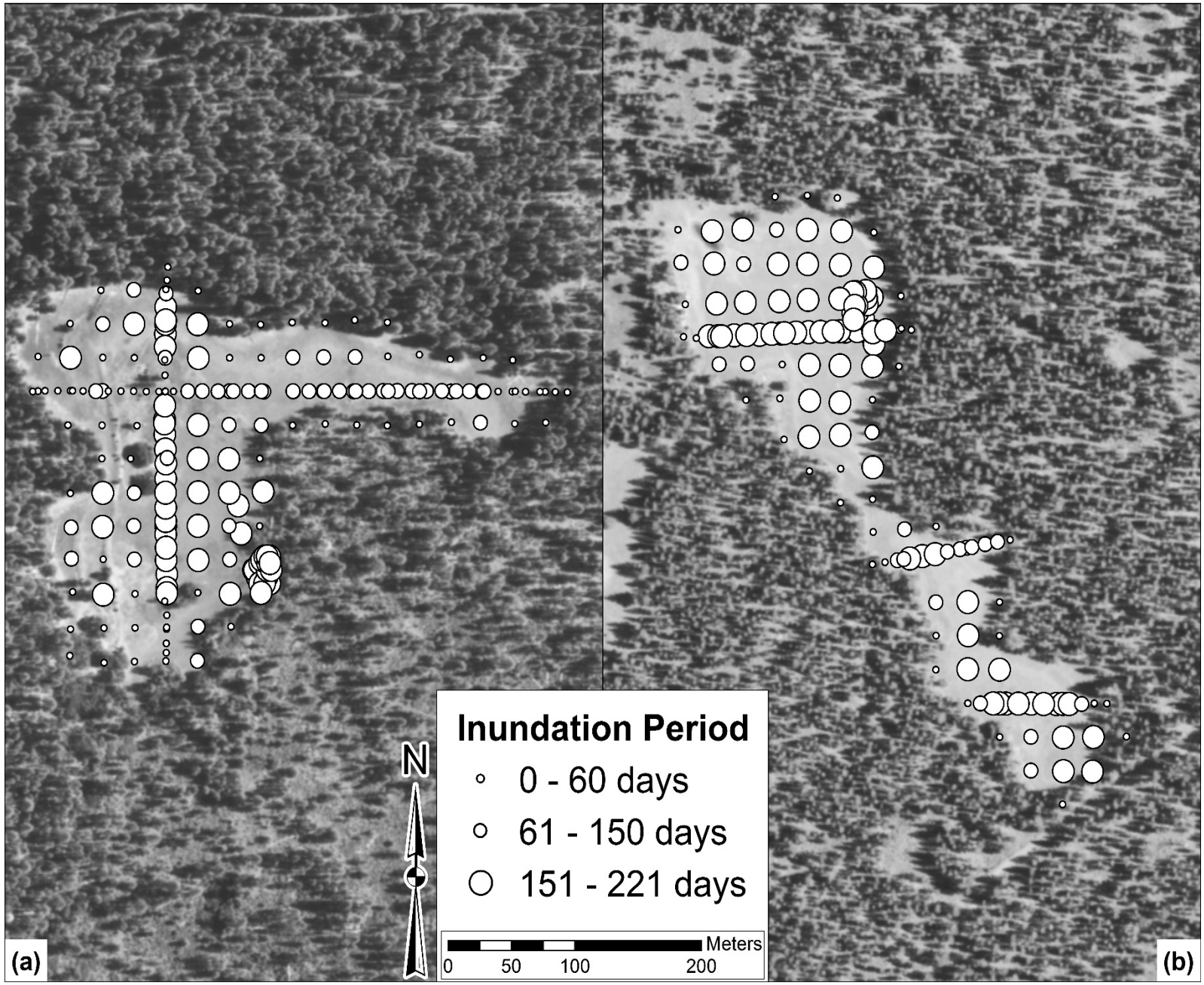
Calculating water depth

$$D = (E_{sg} - E_p) + D_{sg}$$

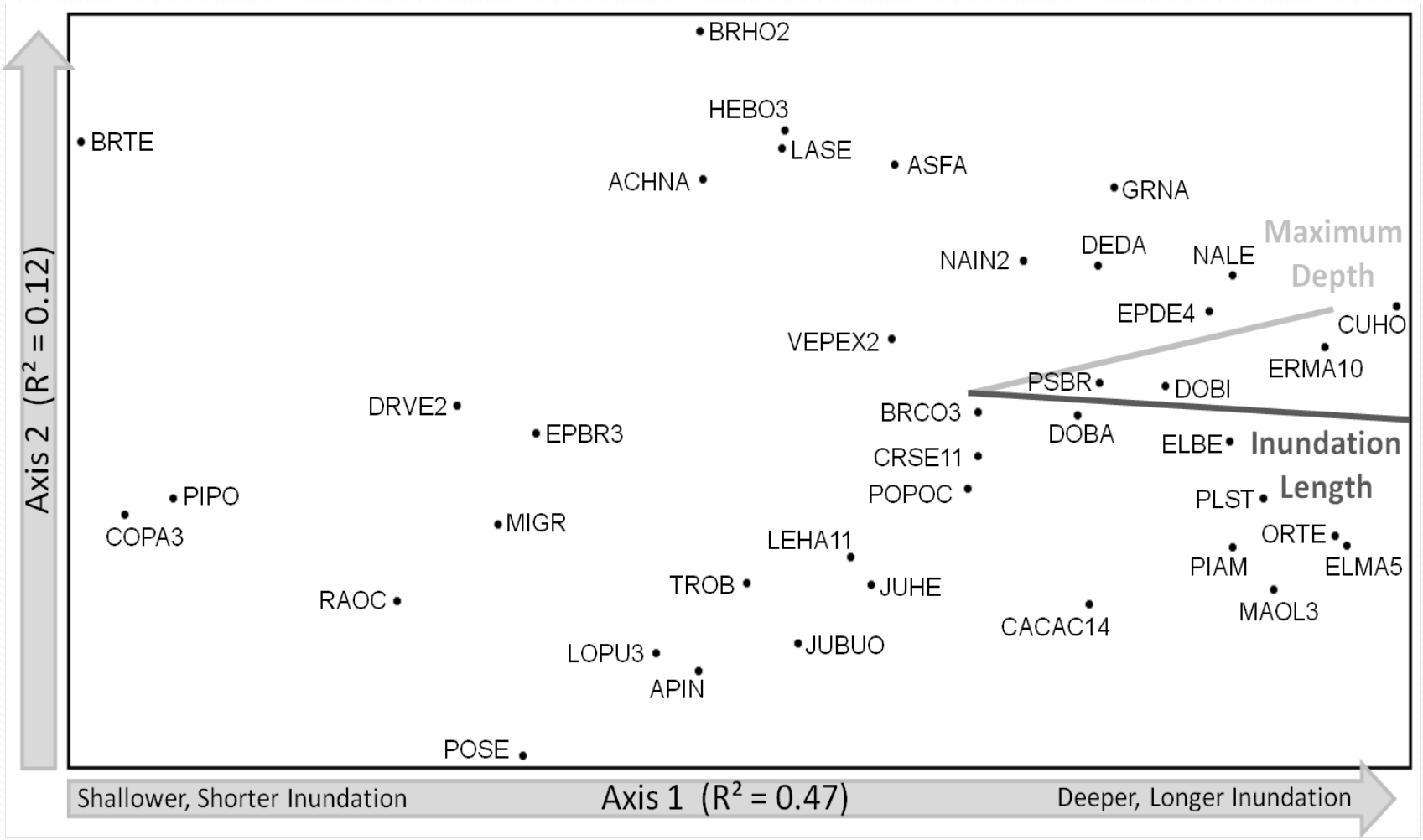
- D water depth at plot
- E_{sg} elevation at stage gauge
- E_p elevation at plot
- D_{sg} is water depth at stage gauge



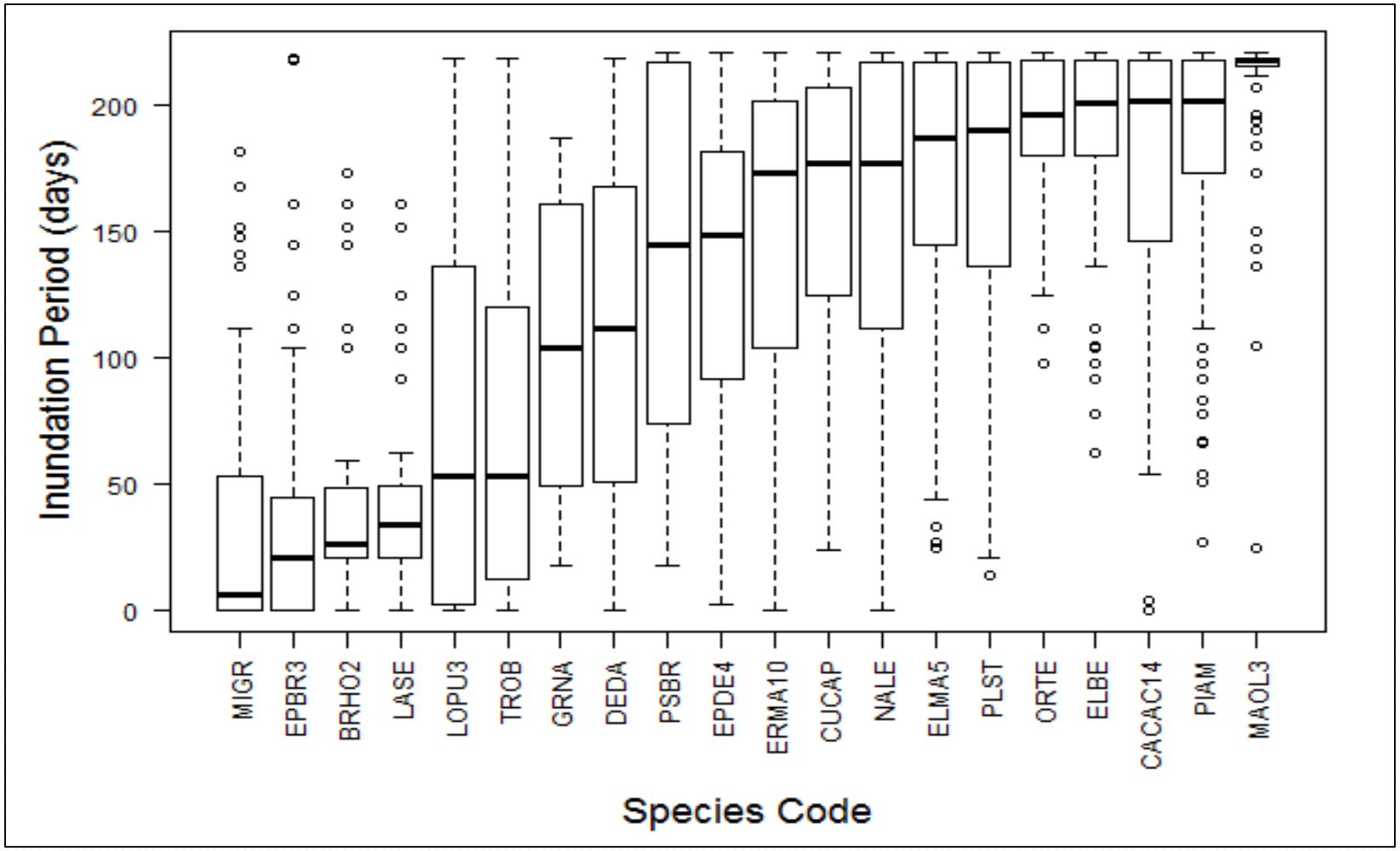
Inundation period = # days water depth > 0

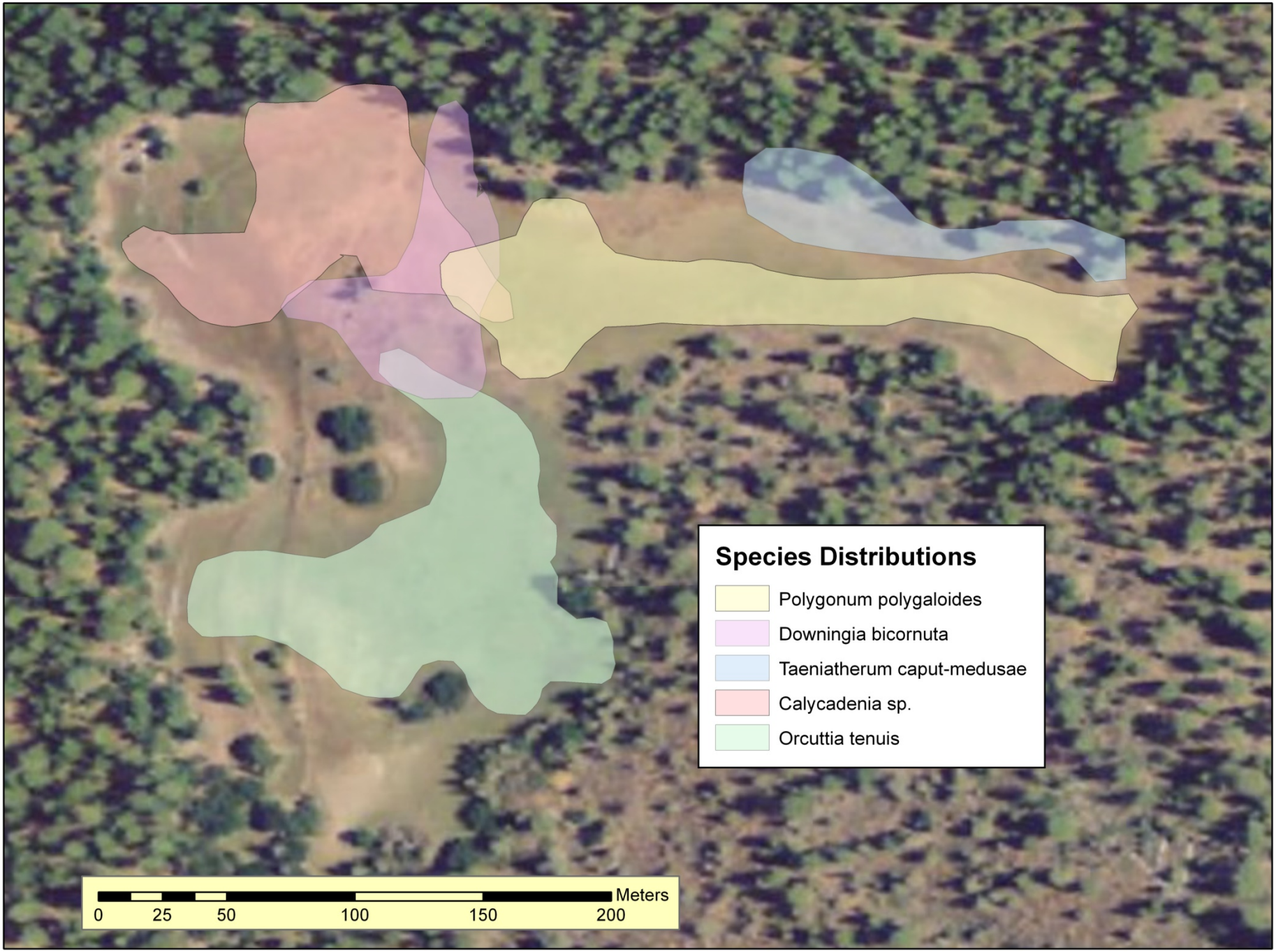

Inundation Period
0 - 60 days
61 - 150 days
151 - 221 days
N
Meters
0
50
100
200
(a)
(b)

Community Data Ordination

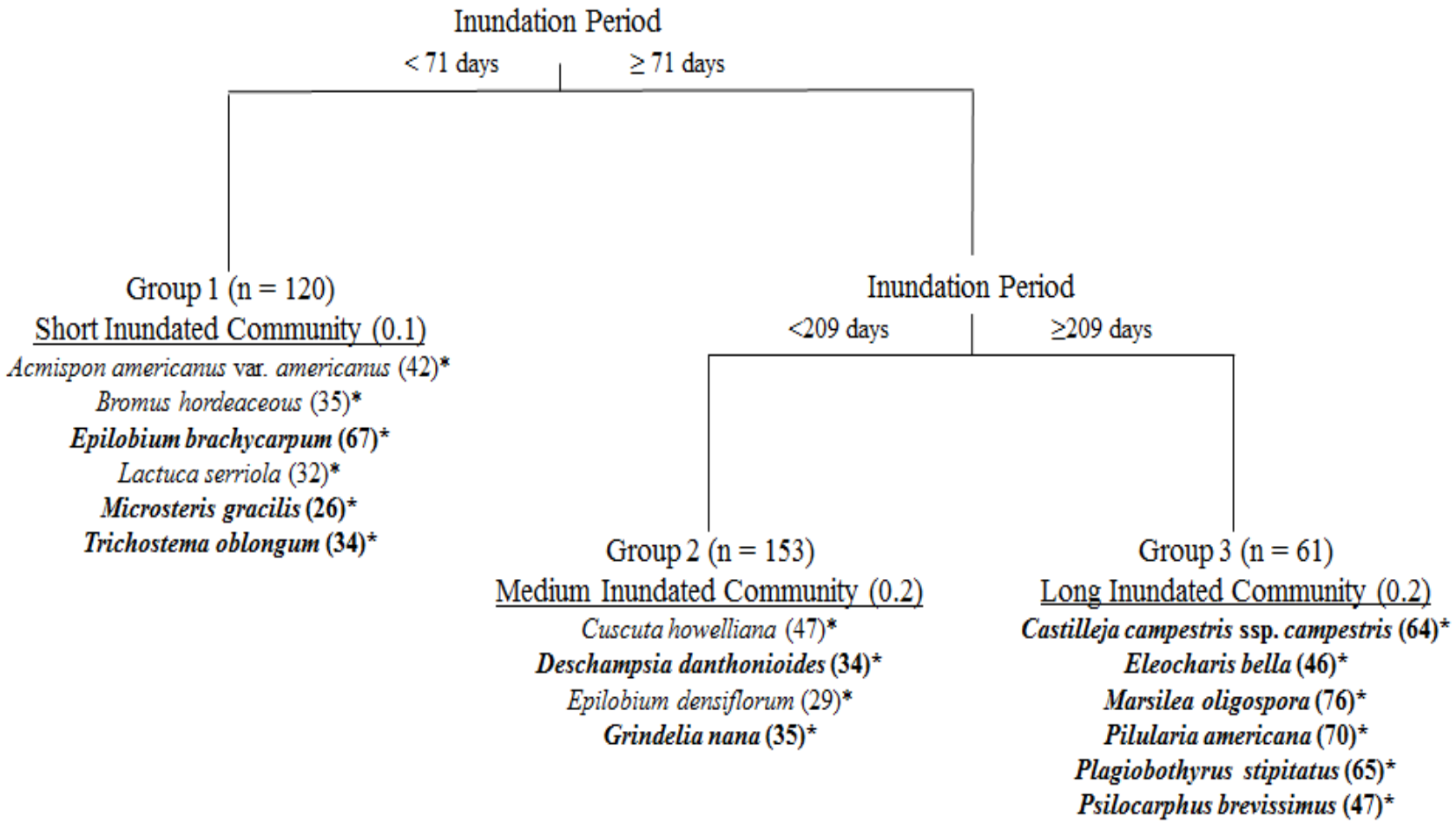


Inundation requirements




Species Distributions
Polygonum polygaloides
Downingia bicornuta
Taeniatherum caput-medusae
Calycadenia sp.
Orcuttia tenuis
Meters
0
25
50
100
150
200

Classification



Short Inundated Community

< 71 days

Trichostema oblongum

© 2003 Christopher Christie

Microsteris gracilis

© 2006 Laura Ann Eliassen

Bromus hordeaceus

© 2001 Julie Kierstead Nelson

Medium Inundated Community

≥ 71 days and < 209 days

Epilobium densiflorum

Cuscuta howelliana

Grindelia nana

Long Inundated Community

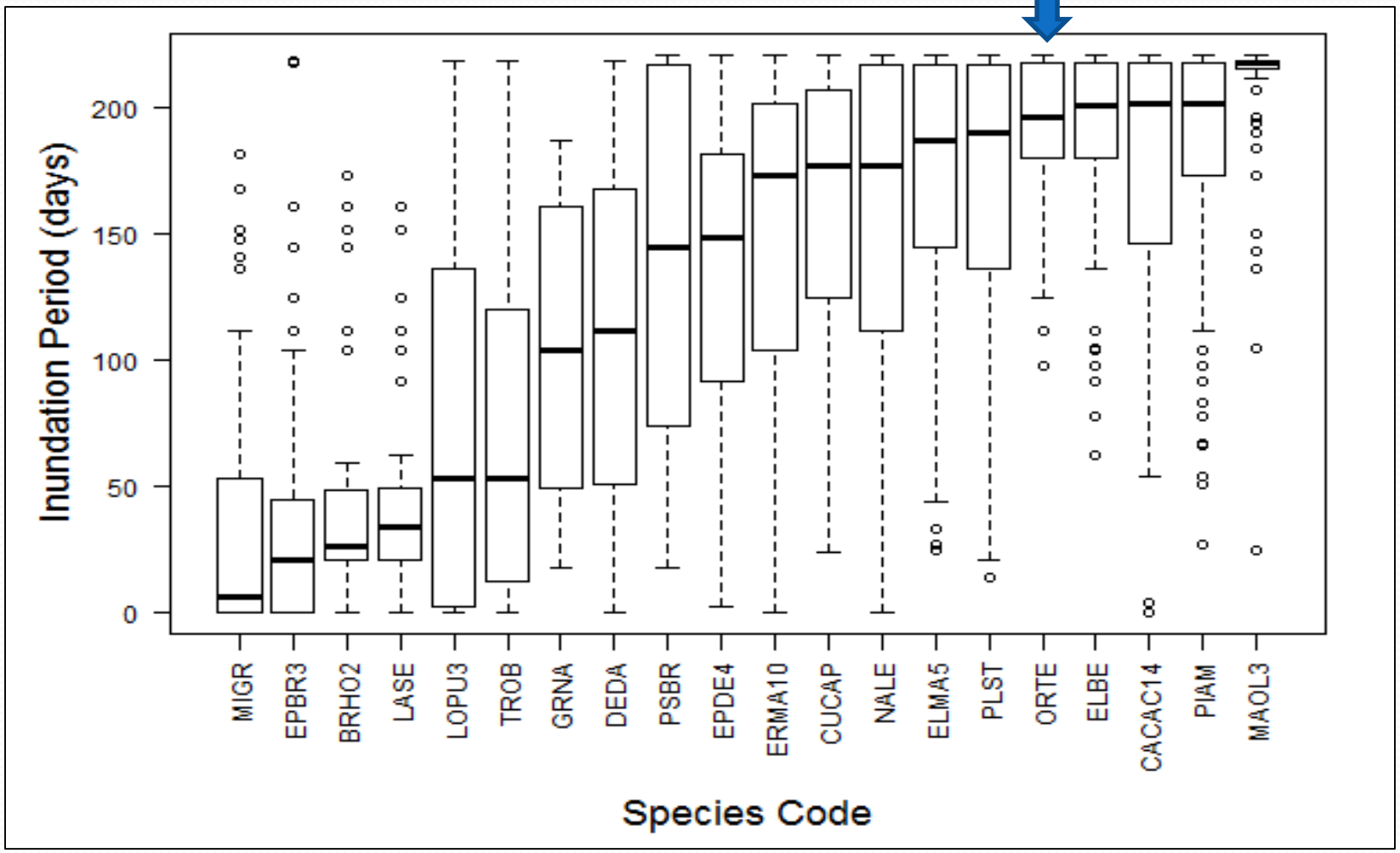
Plagiobothyrus stipitatus

Psilocarphus brevissimus

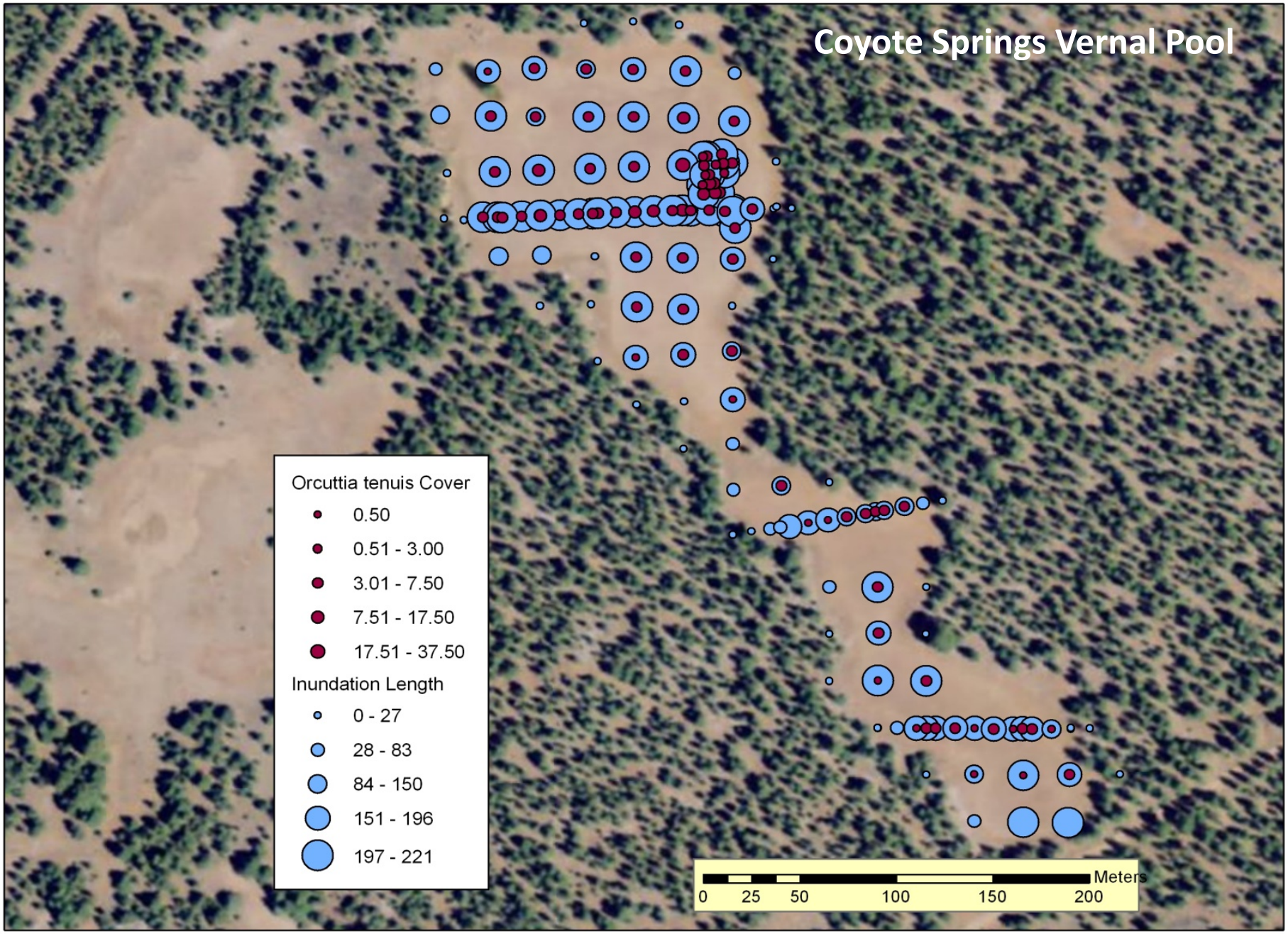
≥ 209 days

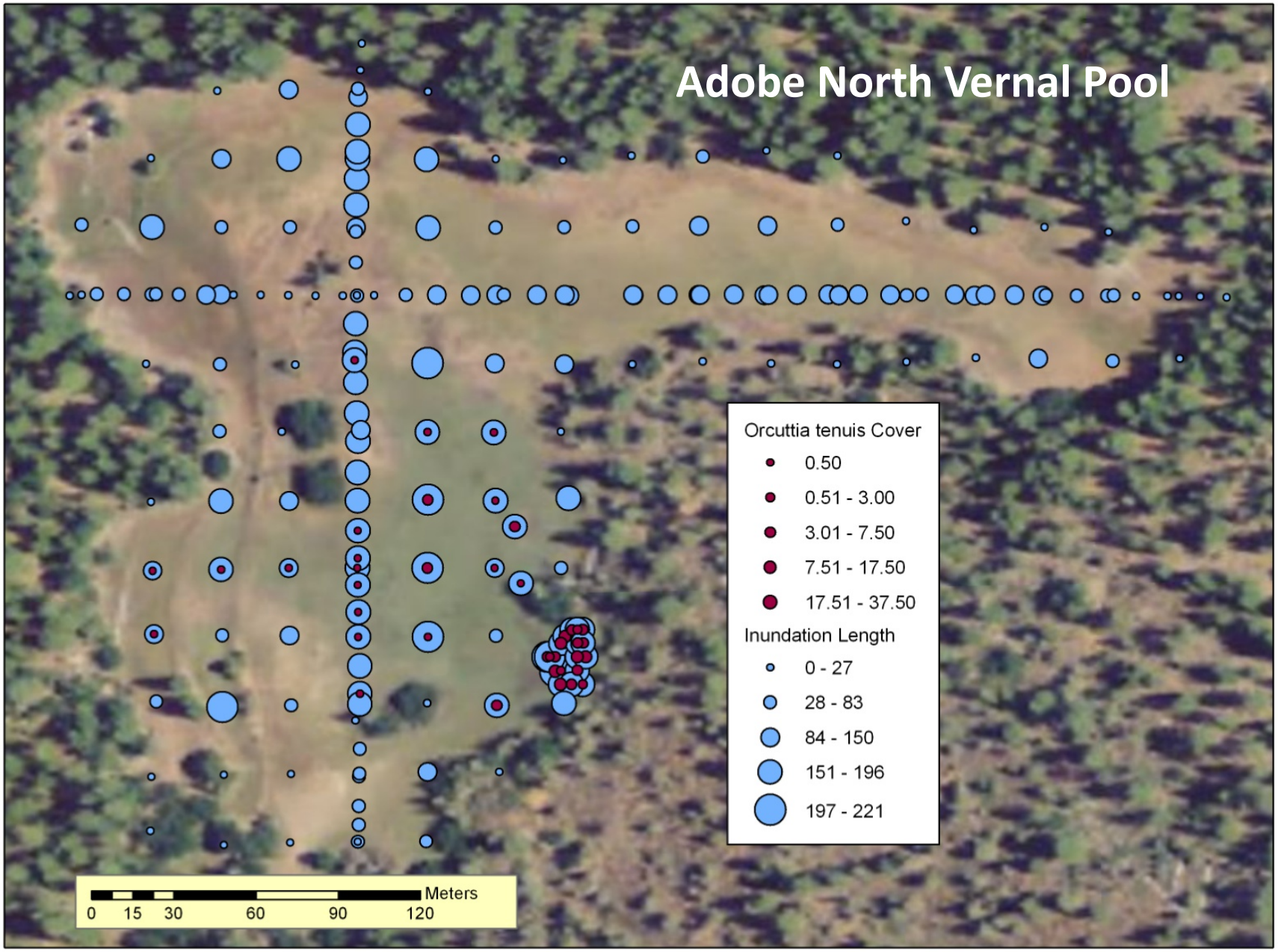
Castilleja campestris

Orcuttia tenuis



Most common at 152-161 days


Coyote Springs Vernal Pool
Orcuttia tenuis Cover
0.50
0.51 - 3.00
3.01 - 7.50
7.51 - 17.50
17.51 - 37.50
Inundation Length
0 - 27
28 - 83
84 - 150
151 - 196
197 - 221
Meters
0
25
50
100
150
200


Adobe North Vernal Pool
Orcuttia tenuis Cover
0.50
0.51 - 3.00
3.01 - 7.50
7.51 - 17.50
17.51 - 37.50
Inundation Length
0 - 27
28 - 83
84 - 150
151 - 196
197 - 221
Meters
0 15 30 60 90 120

Summary

- *Hydrology primary factor structuring plant communities*
- *Vernal pools in northeastern California are inundated for longer (~209 days) than other vernal pools (~60 days).*
- *Northeastern California supports novel plant communities*

Don Lepley

Management Implications

- Non-native species can invade vernal pools during drought years
- *Orcuttia tenuis* requires ~150 days of inundation
- Maintaining and restoring vernal pool hydrology is critical for vernal pool species

Questions?