Status of Meadows in the Lake Tahoe Basin 2000 through 2010

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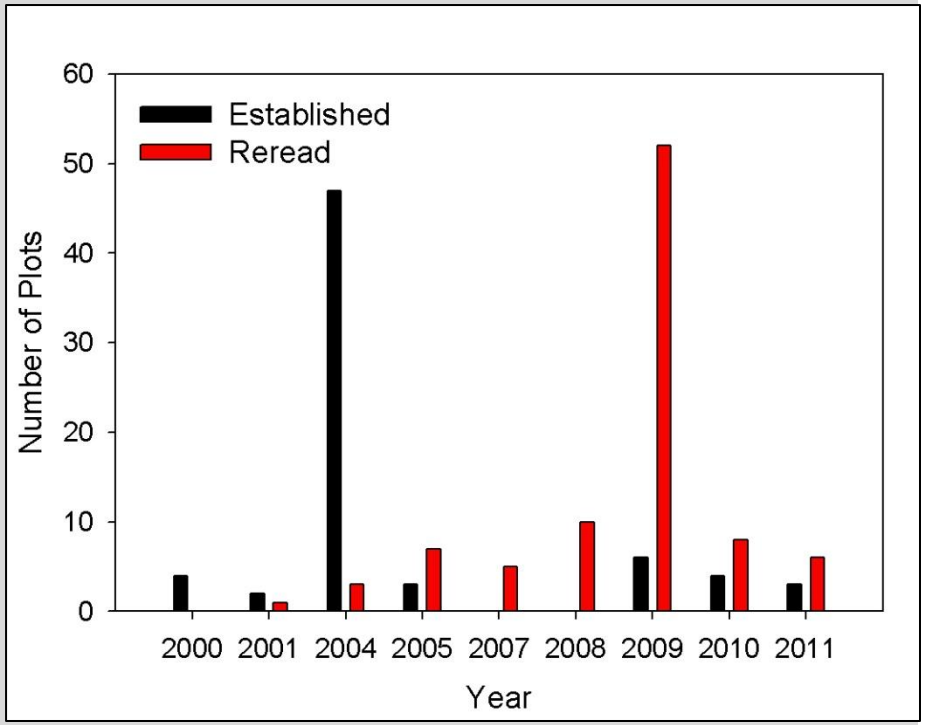
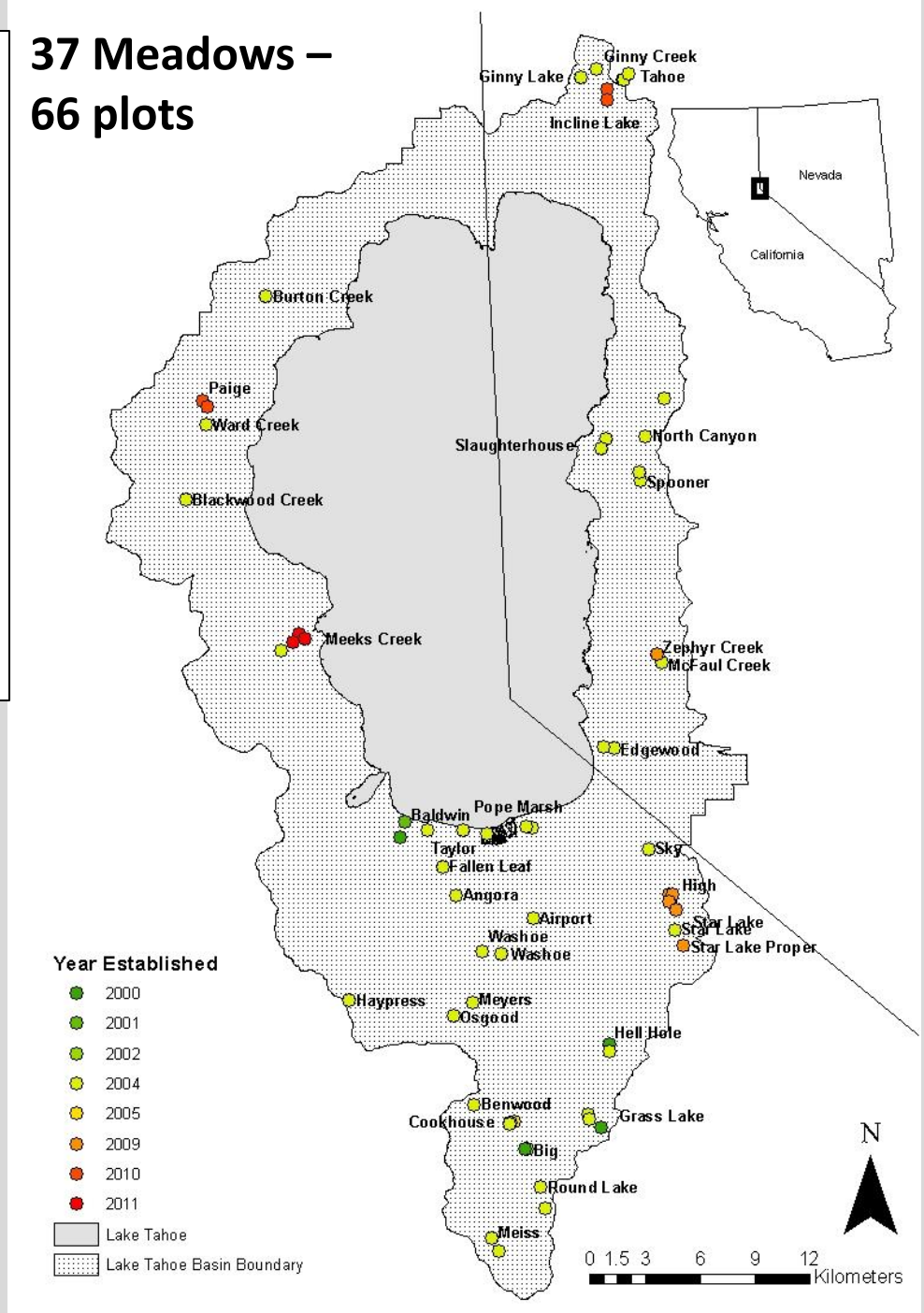
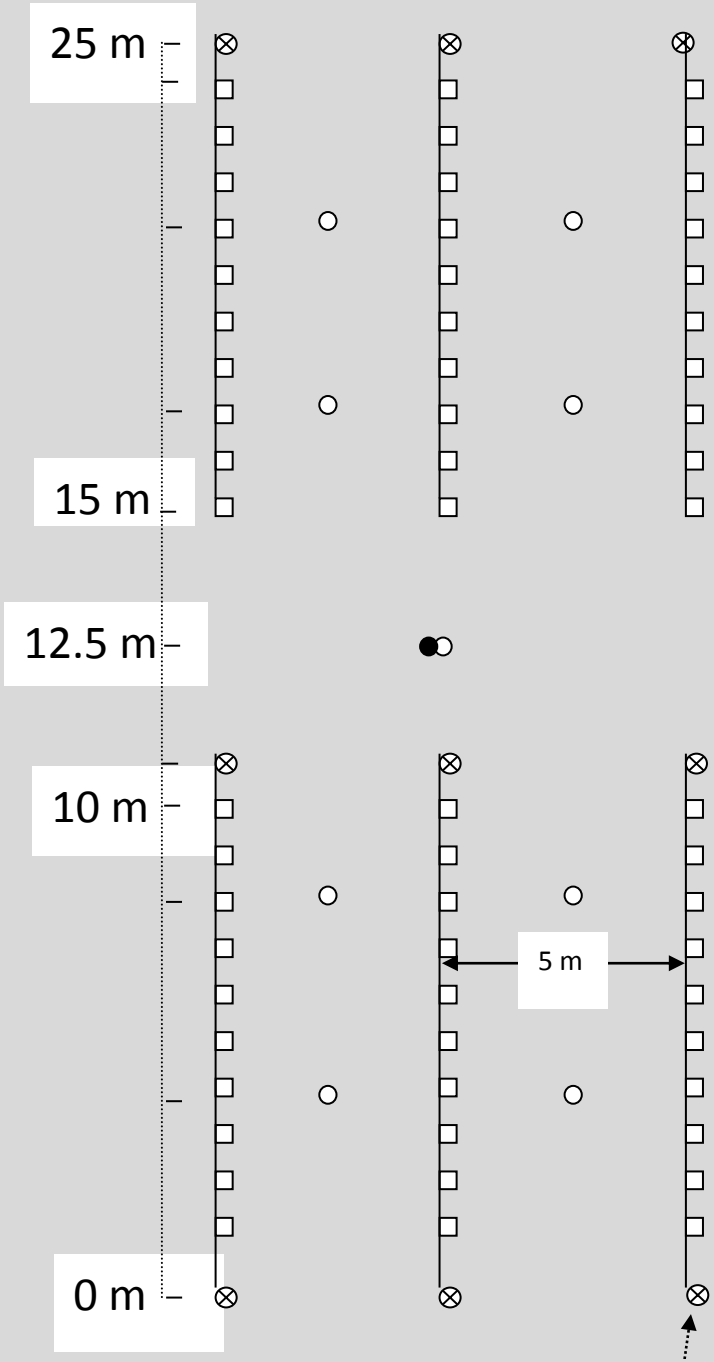
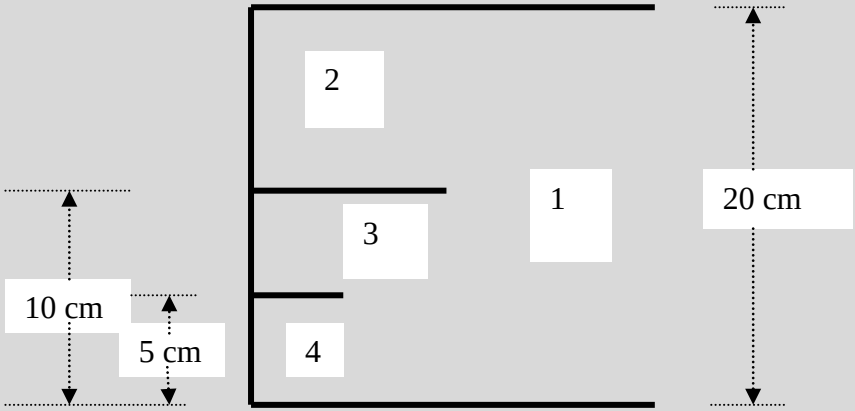


37 Meadows – 66 plots




LTB0429
T2
8/6/08


25 m
15 m
12.5 m
10 m
5 m
0 m



Frequency

% of plots occupied by a species

- Comparable with identical size/shape plots
- Sensitive to changes in spatial arrangement
- Monitor invasion of undesirable species
- Measures stable throughout growing season
- Nondestructive
- Can be evaluated quickly
- Repeatable – no/low observer bias

What did we analyze?

- Community Data correlated with Environmental Data
- Diversity
- Plant functional group scorecards
  - Vegetation Wetland Score
  - Ecosystem Function Score

Field Data	
Percent Ground Cover	Basal Vegetation
	Litter
	Bare Soil
	Gravel
	Rock
	Cryptogram
Hydrologic Indicators	Depth to Mottles
	Depth to Saturation
	Rooting Depth
	Number of Invasive Species
Office Data	
Meadow Scorecard Scores	Vegetation Wetland Score
	Ecosystem Functional Score
PRISM Climate Group, OSU 166.5.119.253	Annual Precipitation
	Average Annual Maximum Temperature
	Average Annual Minimum Temperature
	Elevation

Functional Groups

Groupings of plant species which perform similarly in an ecosystem based on a set of common functional traits related to plant species response to disturbance and stressors in meadow.

WHY

- Consistent for all species, including new species
- Objective
- Based on ecology of each species
- Consistent with scientific literature
- Model species and community response

WE USED

- Vegetation Wetland Score
  - FWS Wetland Ratings
  - Obligate, Facultative, Upland
- Ecosystem Function Score
  - Height of species
  - Rhizomatous/non-rhizomatous
  - Nitrogen Fixing
  - Annual/Perennial

Ecosystem Function Score	CSR
All Annuals	R
Forbs, <1 m, non rhizomatous	R
Forbs, <1 m, rhizomatous	S
Forbs, >1 m, non rhizomatous	S
Forbs, >1 m, rhizomatous	C
All N-fix herbaceous	S
Grasslikes, rhizomatous, all heights	C
Grasslikes, non rhizomatous, <50 cm	S
Grasslikes, non rhizomatous, >50 cm	C
Grasses, <70 cm	S
Grasses, >70 cm	C
Shrubs and trees	C
Nonvascular perennial	S

R: Forbs, <1m, non rhizomatous

Christopher Chrisite - CalPhotos

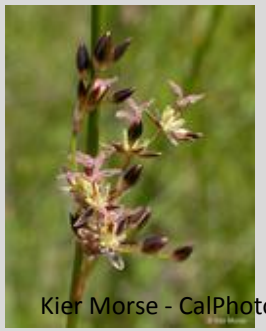
Castilleja miniata

S: Forbs, <1m, rhizomatous

Christopher Christie - Calphotos

*Aster occidentalis**

C: Grasslikes, rhizomatous, all heights

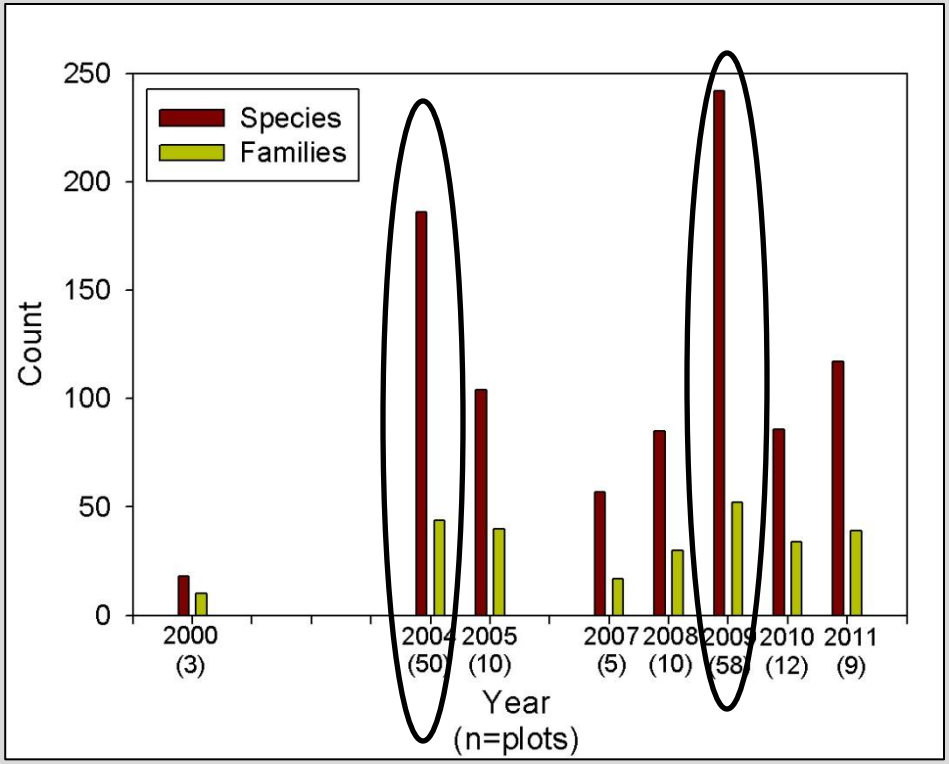


Kier Morse - CalPhotos

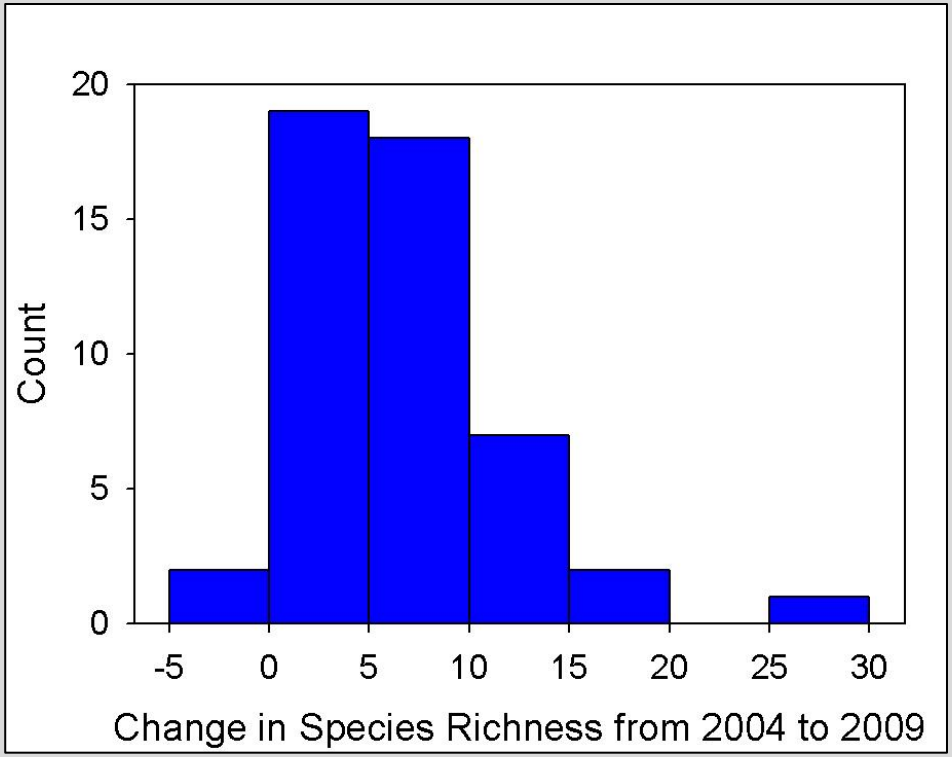
*Juncus arcticus**

Species Richness

Number of Species and Families By Year: 2000 to 2011



Change in Species Richness 2004 to 2009

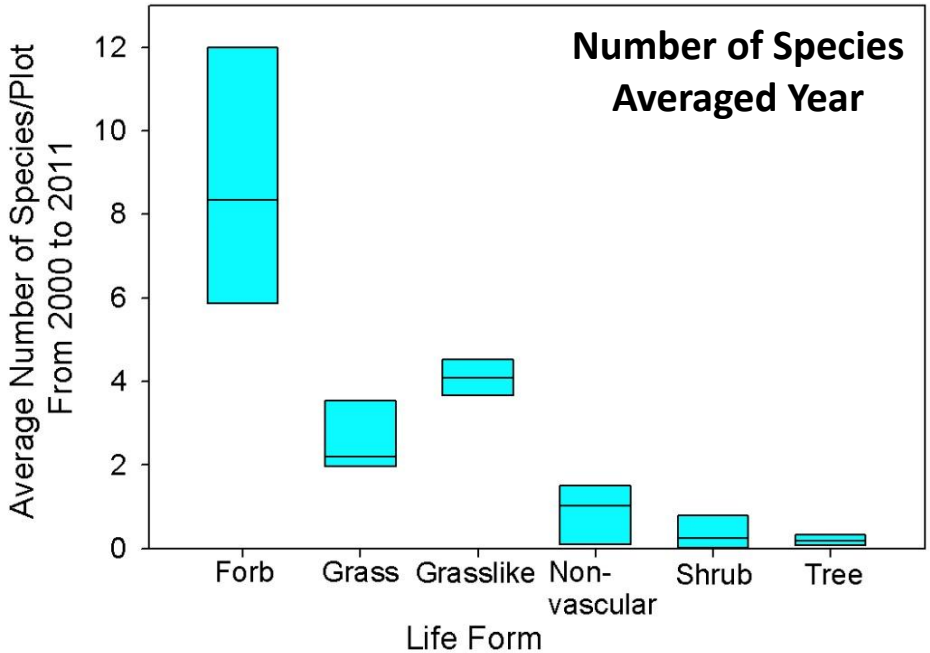


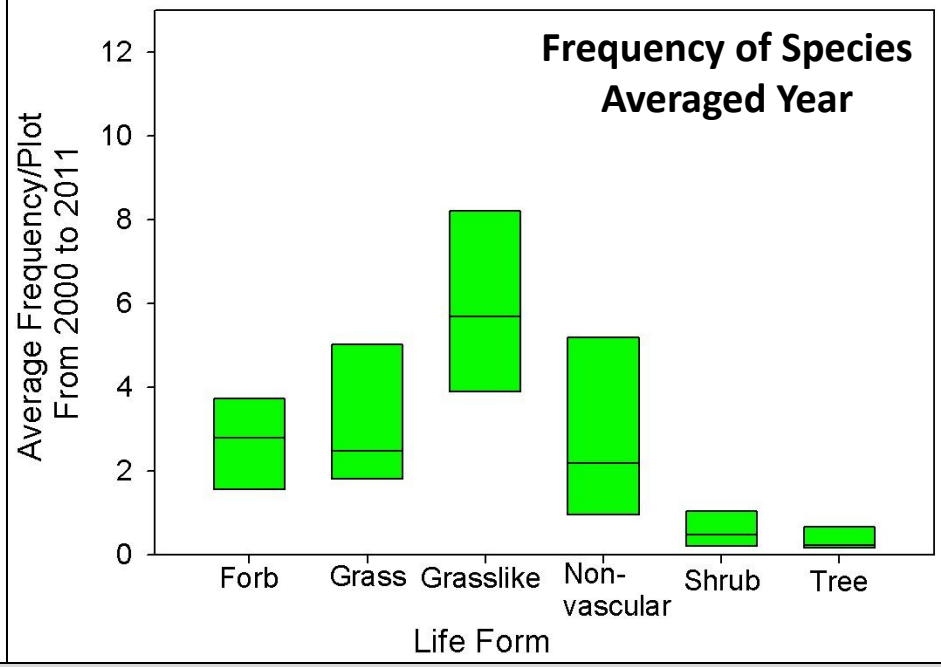
30 species were unique to 2004

79 species were unique to 2009

- **54% R (n=43)**
- **19% S (n=15)**
- **27% C (n=21)**

What do our meadows look like?





Forb

Christopher Christie - Calphotos

*Aster occidentalis**

Grass

Julie Nelson - CalPhotos

*Deschampsia cespitosa**

Grasslike

Kier Morse - CalPhotos

*Juncus arcticus**

Nonvascular

LTBMU FS

Sphagnum sp.*

Shrub

Steve Matson – CalPhotos

*Salix geyeriana**

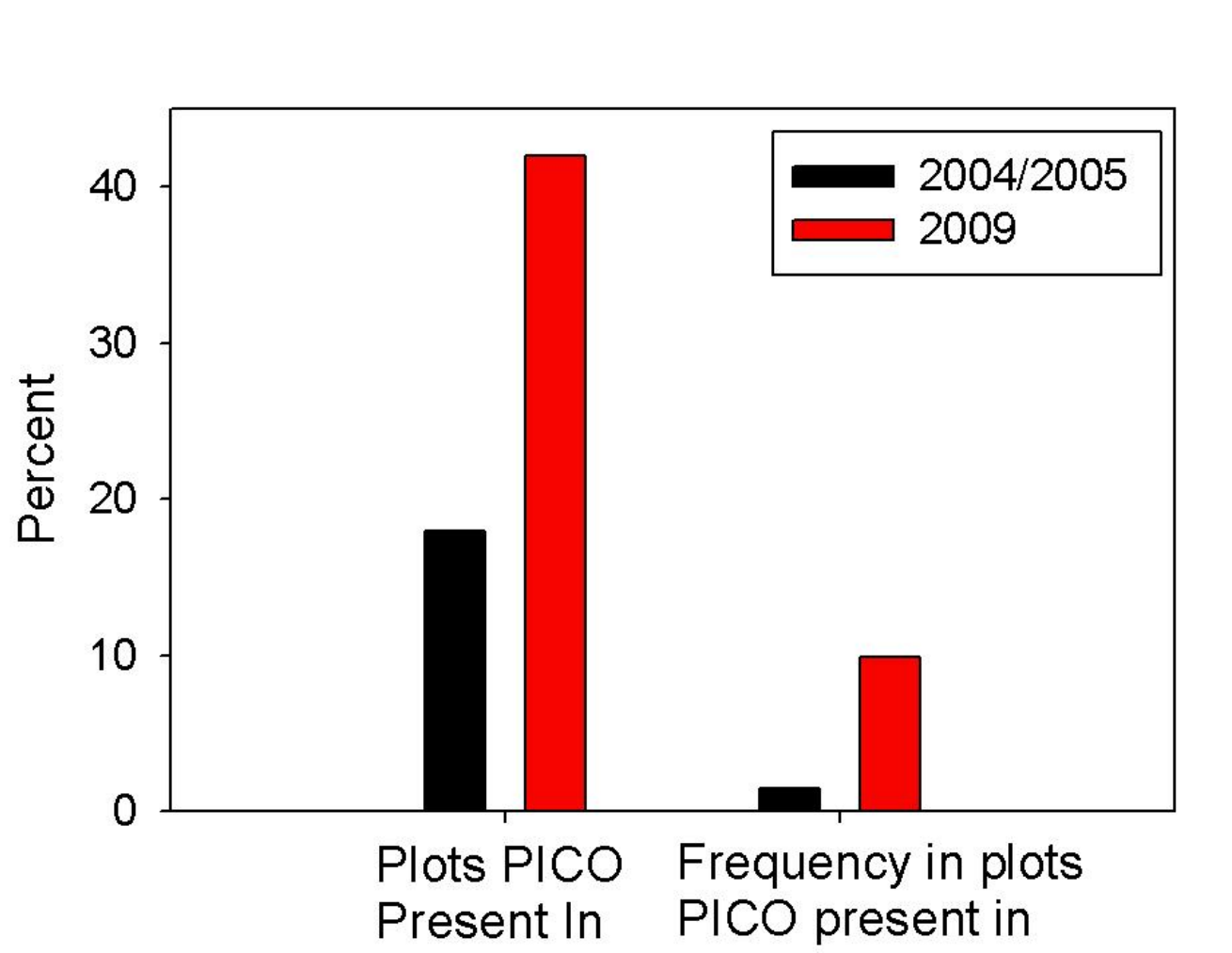
Tree

LTBMU FS

*Pinus contorta**

Encroachment of *Pinus contorta*?

Meadow	04/05	09
Airport		x
Big 1		x
Blackwood Creek		x
Cookhouse 3	x	x
Cookhouse 4		x
Cookhouse 5		x
Ginny Lake	x	x
Grass Lake 1	x	x
Grass Lake 3		x
Haypress	x	x
Hell Hole 1	x	x
Hell Hole 2		x
McFaul Creek		x
Meiss 1		x
Osgood 1	x	
Round Lake 1	x	x
Round Lake 2		x
Sky		x
Star Lake		x
Tahoe 1	x	x
Tahoe 2	x	x
Ward Creek		x

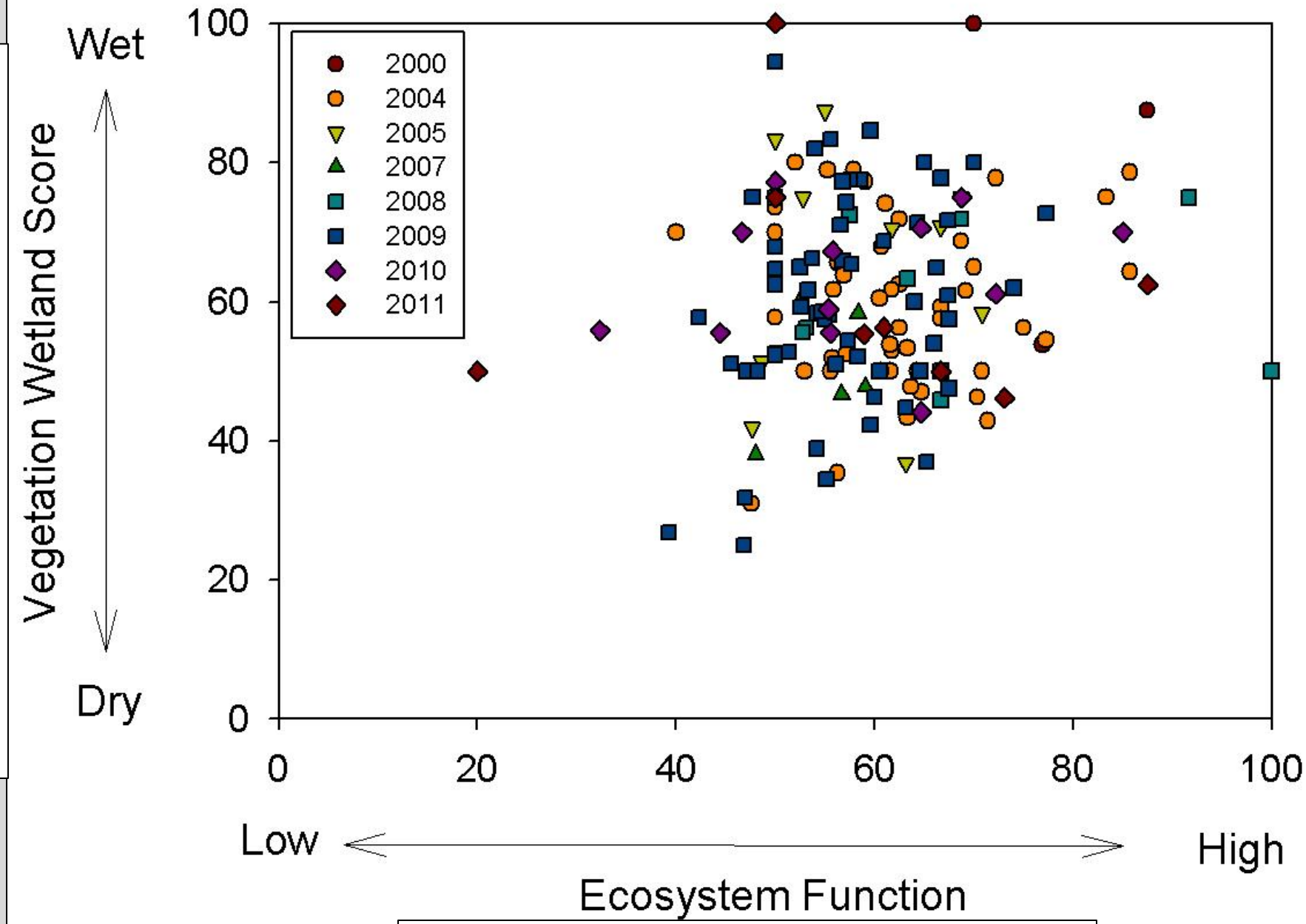


McNemar's Test: 2004 to 2009 p = 0.03

What Environmental Variables Influence Community Composition?

- **Vegetation wetland score**
- Elevation
- Depth to Saturation
- Precipitation
- Maximum temperature
- Litter cover
- Soil cover
- Cryptogram cover

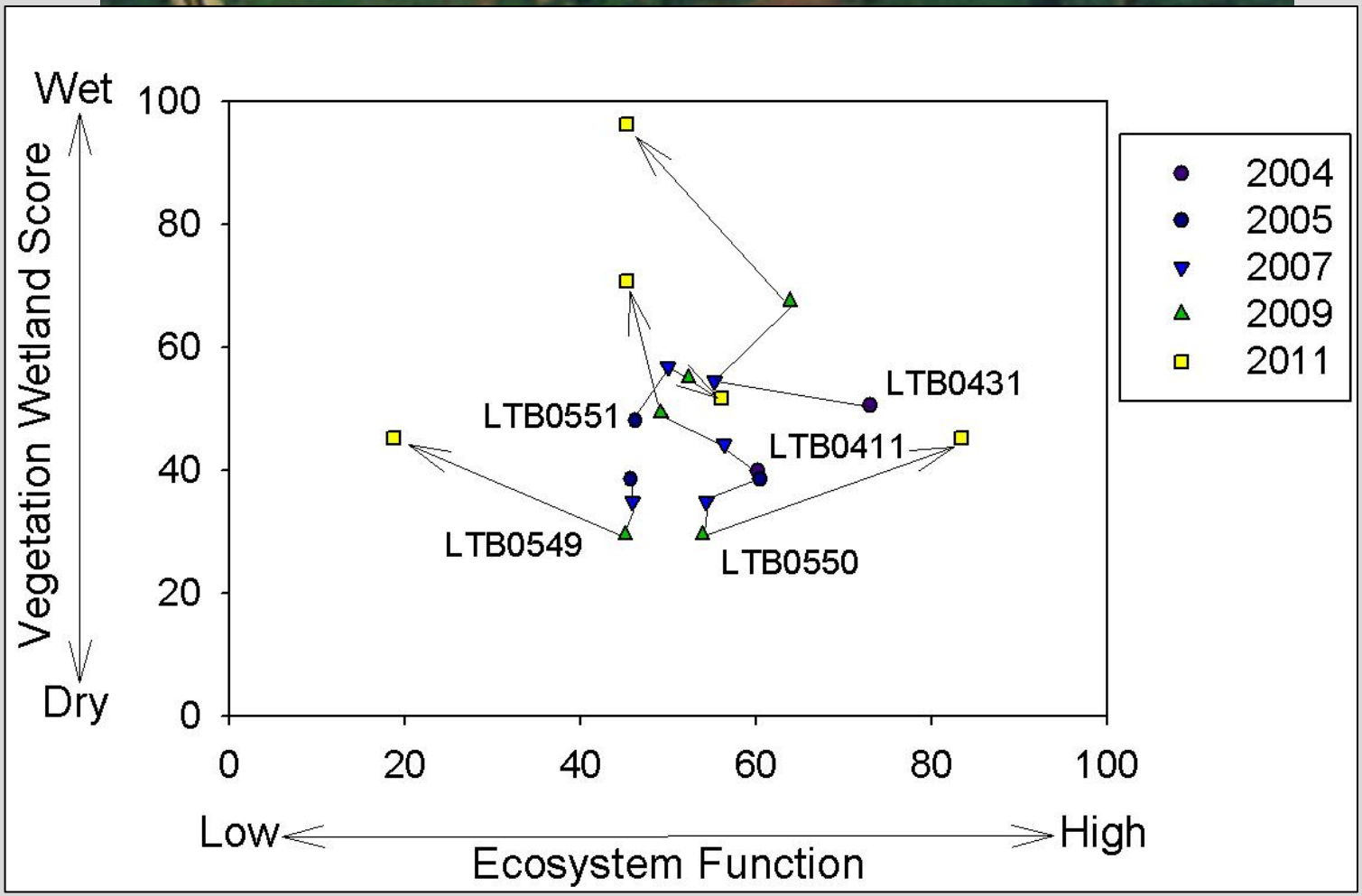
wetland rating = 50 + .5 *(OBL) - .5 * (FACU+UPL)



condition score = 50 + .5 *(C) - .5 * (R)

Cookhouse


LTB0551
LTB0411
LTB0549
LTB0550
LTB0431

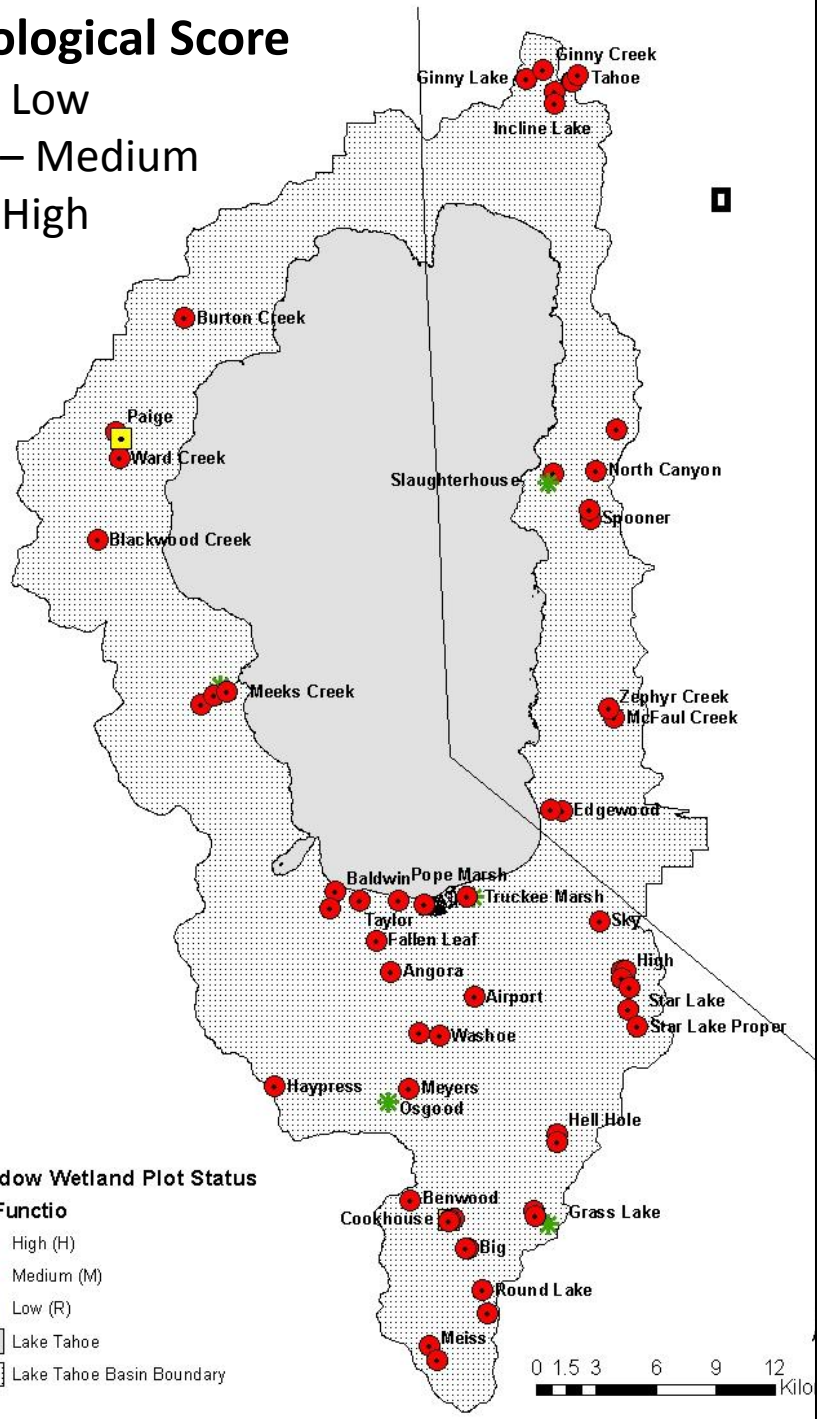

Wet
Dry
Vegetation Wetland Score
100
80
60
40
20
0
0
20
40
60
80
100
Low
High
Ecosystem Function
LTB0431
LTB0551
LTB0411
LTB0549
LTB0550
2004
2005
2007
2009
2011

Ecological Score

2 – Low

58 – Medium

6 - High

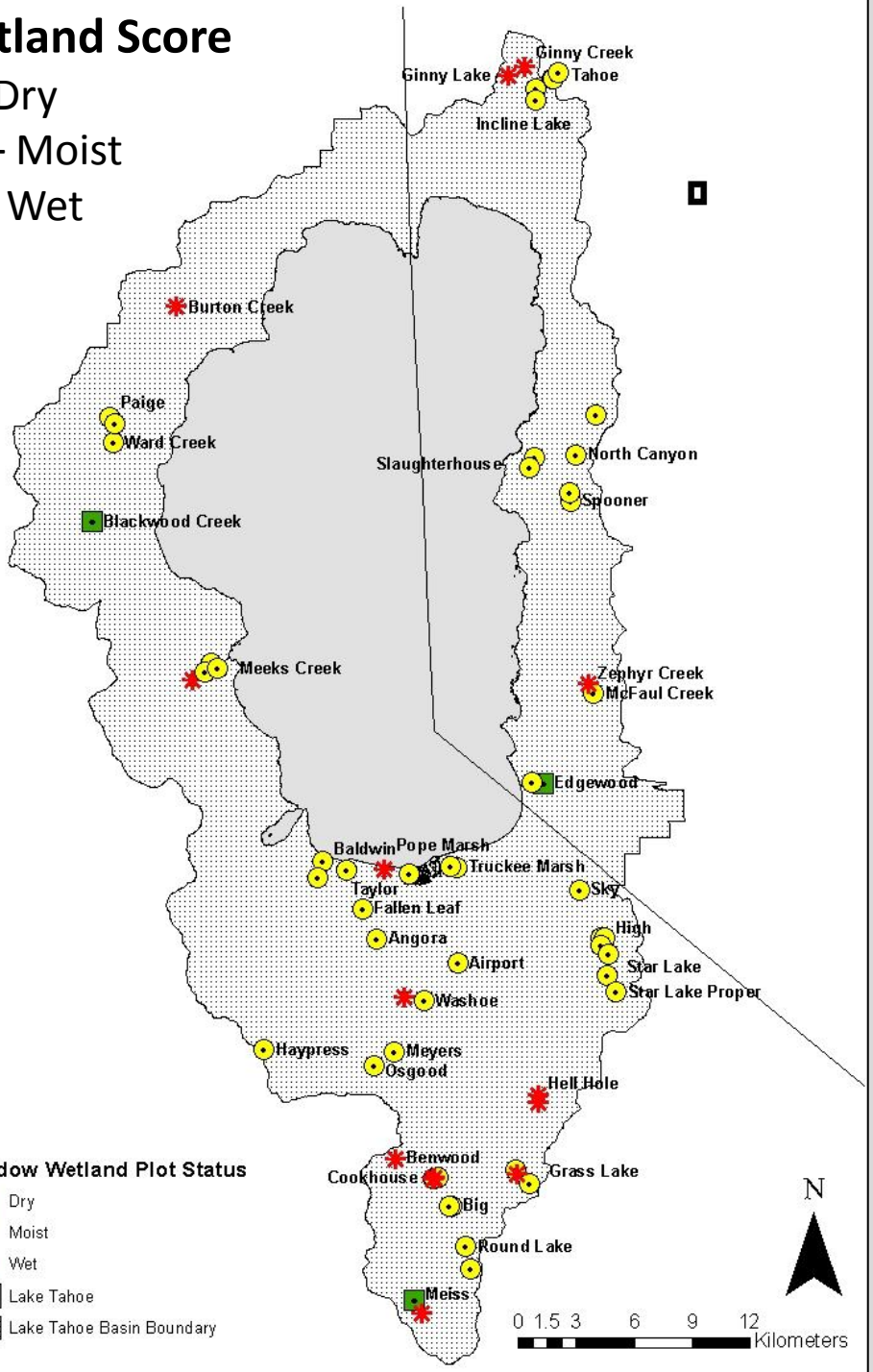


Wetland Score

3 – Dry

49 – Moist

14 - Wet



In Summary……..Future Plans

- Increased diversity 2004 to 2009
- Highest diversity - forbs
- Highest frequency - grasslikes
- LTBMU Meadows
  - Medium function
  - Moist
- Increased conifers 2004 to 2009
- Re-measure 2014
- Identify meadows for restoration –
  - Conifer removal
  - Introduction of fire
- Monitor meadows with channel restoration
  - High Meadow
  - Upper Truckee

Acknowledgements

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