Five Years of Vegetation Monitoring at Grass Lake Research Natural Area.

Shana Gross*[1], Wes Christensen[2], Stuart Osbrack[1]
email: *segross@fs.fed.us
[1]Lake Tahoe Basin Management Unit, USDA Forest Service, 35 College Drive, South Lake Tahoe, CA 96150
[2]Department of Geology, One Shields Avenue, University of California, Davis, CA 95616

Background

Grass Lake was designated as a "Research Natural Area" by the Forest Service to preserve a representative Sphagnum bog type in the Northern Sierra Nevada physiographic province of Pacific Southwest Region.

Grass Lake is the largest and best example of a Sphagnum "bog" (fen) in California.

TRPA considers Grass Lake under Vegetation Threshold V2 – Uncommon plant communities.

Hydrologic change is predicted to be the largest threat to this community, climate change may exaggerate the response.

Sphagnum spp. (Peat moss) and *Meesia triquetra* (3-ranked hump moss) are considered fen indicator species. Both of these genera are dominant components of Grass Lake.

Figure 1: Location of Grass Lake Research Natural Area, CA

Methods

Long term vegetation monitoring (2004/2005 & 2009)

1) 3 Trend transect R5 range monitoring plots.
2) 5 photo point areas each with 5-6 photographs
3) *Sphagnum* spp. and *Meesia triquetra* cover monitoring –Data presented here:

- Surveyed transects throughout Grass Lake
- GPS points and cover were recorded every 13 meters when species were present
- Braun-Blanquet cover classes were used for analysis

Geostatistical Analysis (preserves spatial trends):

- ArcMap 9.3 Geostatistical Analyst
- Ordinary Kriging using spherical variogram models
- Anisotropy angle 90-100 degrees (approximately E-W)
- E-W range ~200 m (major) N-S range ~90 m (minor)
- Lag size 10 meters
- Number of lags 12

Sawed off snowshoes during monitoring protects resources and improves safety

Meesia triquetra

Sphagnum sp.

Results: *Meesia triquetra* (3-ranked hump moss)

Figure 2 (right): Cover of *Meesia triquetra* in 2004/2005 (points). Polygons are geostatistical interpolation of cover.

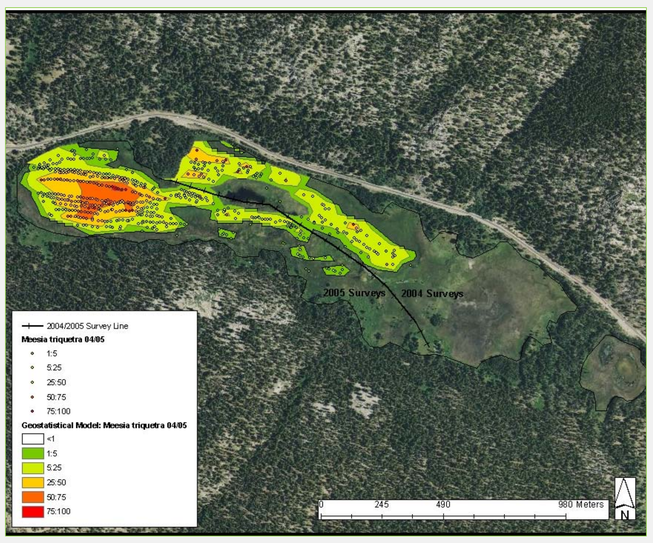


Figure 3 (right): Cover of *Meesia triquetra* in 2009 (points). Polygons are geostatistical interpolation of cover.

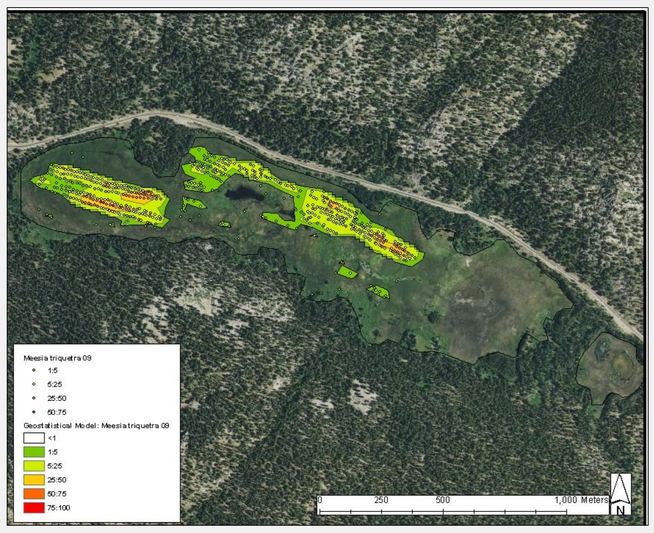
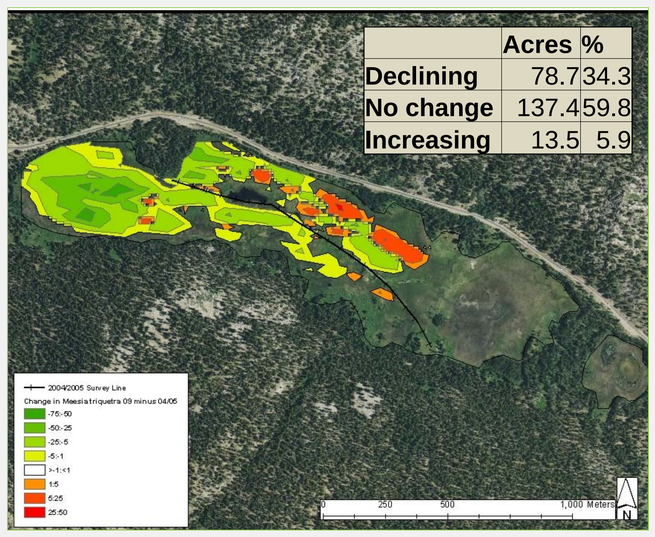


Figure 4 (right): Change in geostatistical interpolations of *Meesia triquetra* cover from 2004/2005 to 2009 (2004/2005 subtracted from 2009)

	Acres	%
Declining	78.7	34.3
No change	137.4	59.8
Increasing	13.5	5.9



Results: *Sphagnum* spp. (Peat moss) – *S. lescurii*, *Sphagnum* sp.

Figure 5 (right): Cover of *Sphagnum* spp. in 2004/2005 (points). Polygons are geostatistical interpolation of cover.

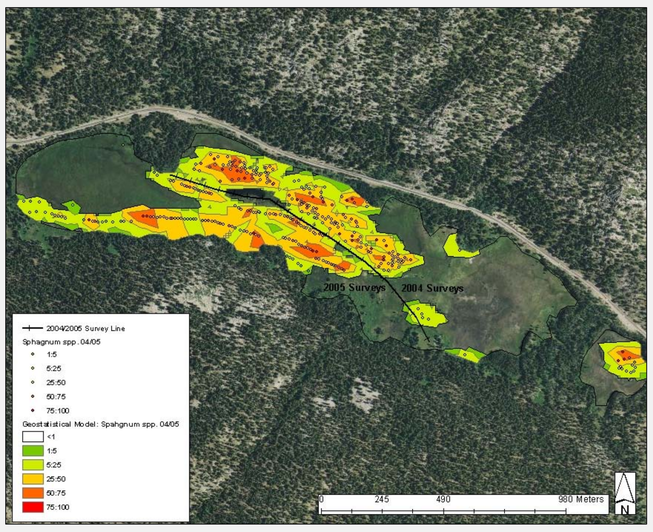


Figure 6 (right): Cover of *Sphagnum* spp. in 2009 (points). Polygons are geostatistical interpolation of cover.

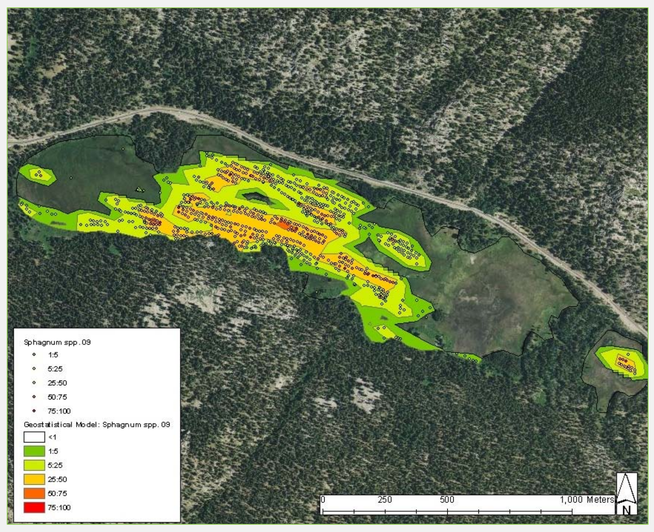
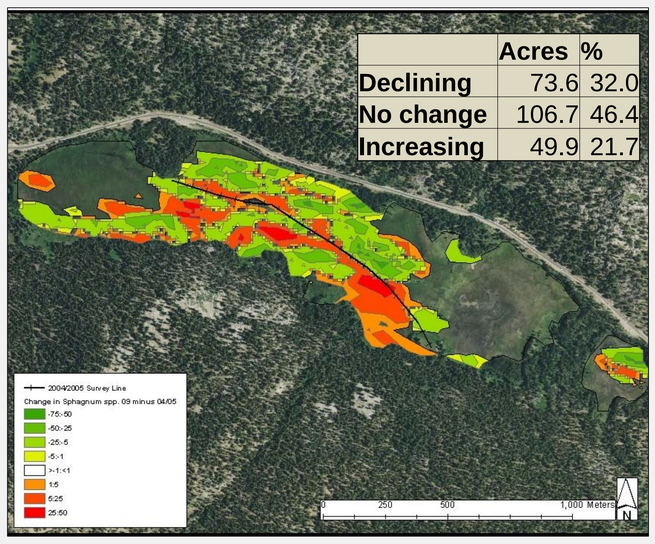


Figure7 (right): Change in geostatistical interpolations of *Sphagnum* spp. cover from 2004/2005 to 2009 (2004/2005 subtracted from 2009)

	Acres	%
Declining	73.6	32.0
No change	106.7	46.4
Increasing	49.9	21.7



Hydrological Variability

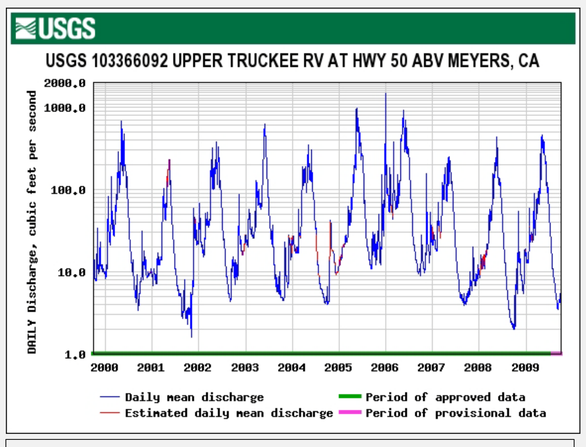


Figure 8: USGS Hydrograph from Upper Truckee River, 2000:2009

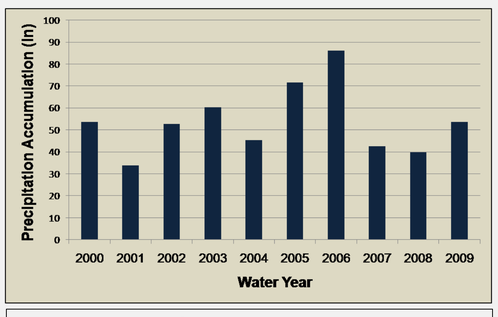


Figure 9:Snotel Site 463 – Echo Peak, Accumulated precipitation 2000:2009 water year

Discussion

Meesia triquetra

- Total area decline of 34% at Grass Lake
- Majority of decline was between 1-25% cover
- Observed increase occurred in area monitored in 2004

Sphagnum spp.

- Total area decline of 32% at Grass Lake
- Majority of decline was between 5-25% cover

Hydrological variability

- 2004 and 2009 were dry years, 2005 was a wet year
- 2009 late season rain event
- Peak discharge/base flow comparable in 2004 & 2009
- 2005 peak discharge and base flow higher in 2005

- Decline in cover and area of Meesia and Sphagnum may be hydrologically influenced.
- The high storage capacity of the west end, may explain the increase of *Meesia* cover in wetter years.
- The response rate is unknown. Based on these data, change was observed in 5 years.
- Monitoring in 2010 may address response rate. It is hypothesized that cover will increase in 2010 based on current above average snow pack.

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