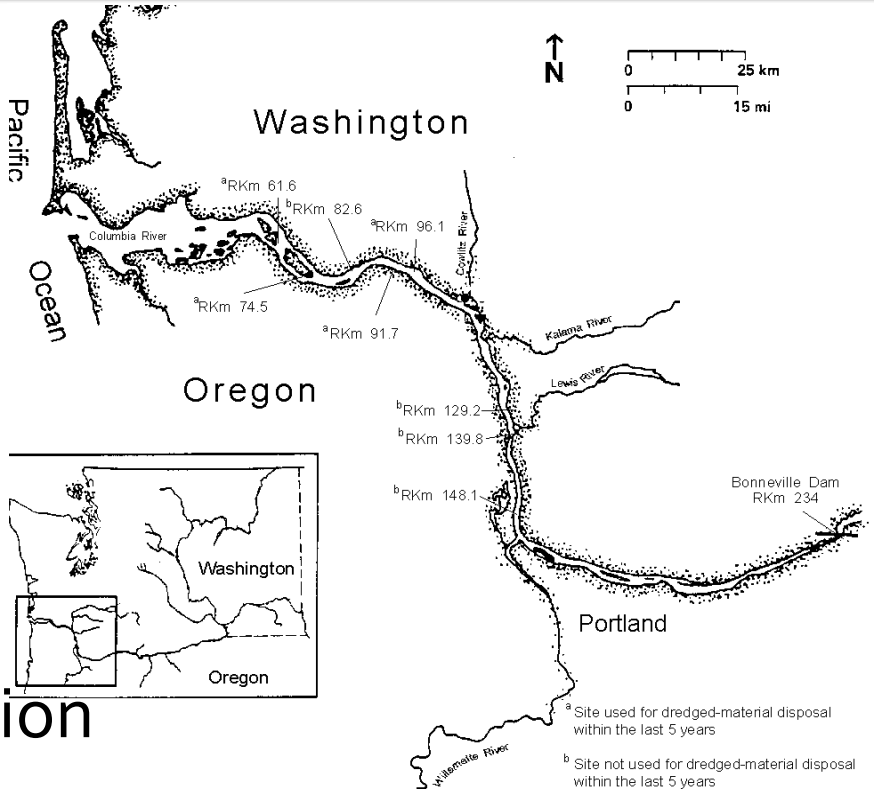
Riparian Wetland Response to Livestock Exclusion in the Lower Columbia River Basin (LCRB)

Sarah Holmen-Shewell, Alan Yeakley
Portland State University

Background

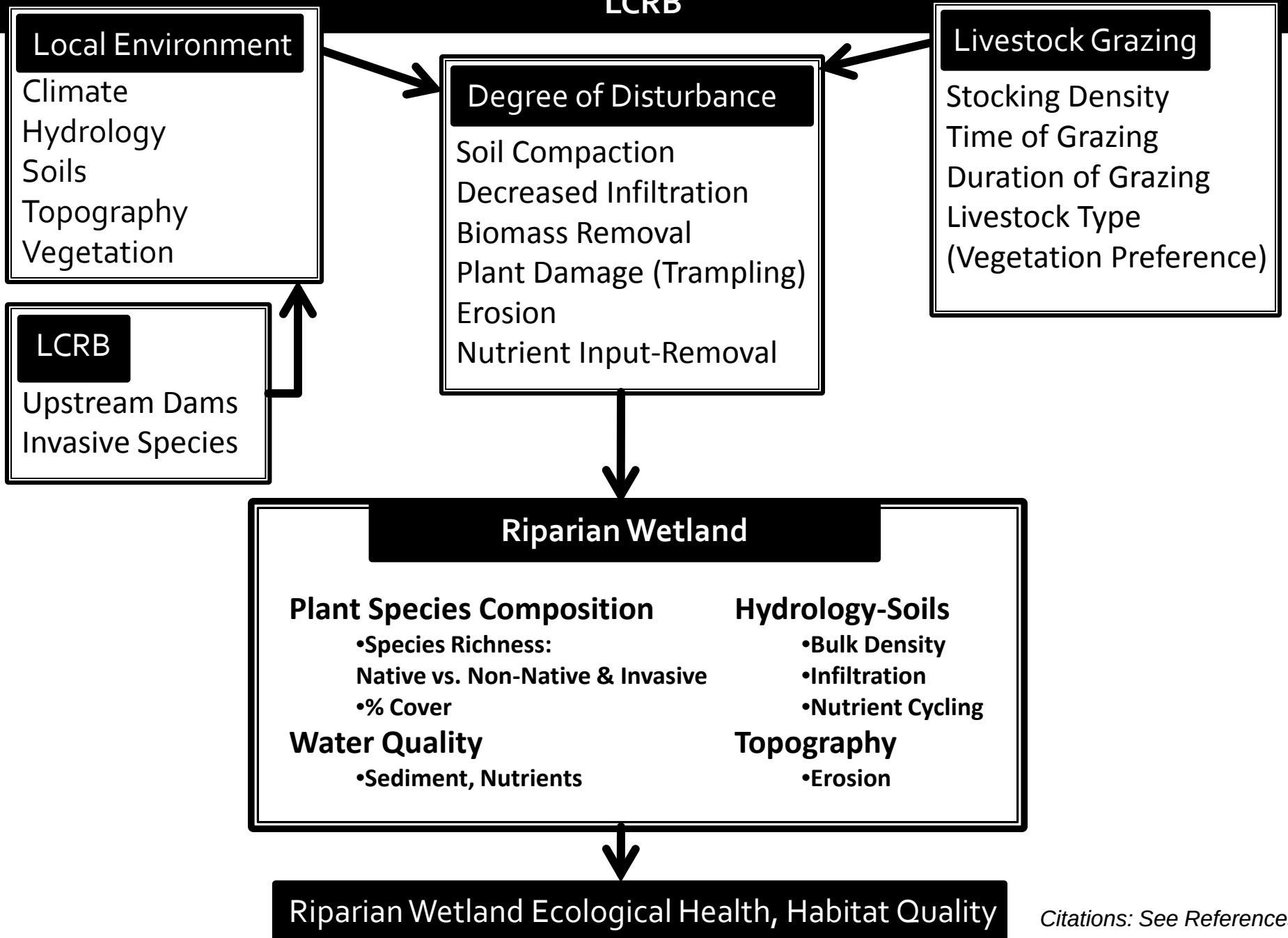
OREGON WILD CAUGHT SALMON:
A tasty way to support local fishermen.

- **Lower Columbia River Basin**
  - Riparian Restoration
  - Endangered Salmon
  - Land Use and Restoration
- **Livestock Grazing**
  - Intensive Riparian Use
  - Exclusion = Passive Restoration
- **Invasive Plants**
  - Reed Canarygrass (RCG) *Phalaris arundinacea* L.



(Christy and Putera 1992 ,PACFISH 1994, Kershner et al. 2004, Lev et al. 2004, Fullerton et al. 2006)

Factors Involved In Determining Livestock Grazing Impacts on Riparian Wetlands In the LCRB



Citations: See References

RCG - Livestock Forage

- RCG has been planted for livestock forage production

- Livestock successfully feed on RCG throughout the growing season and prefer young RCG stands and re-growth (Decker et al. 1969).

Objectives

Evaluate Grazing vs Excluded Riparian Wetlands

- Examine riparian plant communities and soil characteristics along a succession gradient of livestock exclusion.
- Determine plant species richness and dominance

Hypotheses

- Grazed riparian wetlands will have higher native and non-native species richness than excluded wetlands.
  - RCG will be the dominant non-native species within the excluded wetlands.

Study Sites

Site Locations

Lower Columbia River Basin
Oregon, USA

Current Grazing (CG)
State Land, Historic and Current Grazing

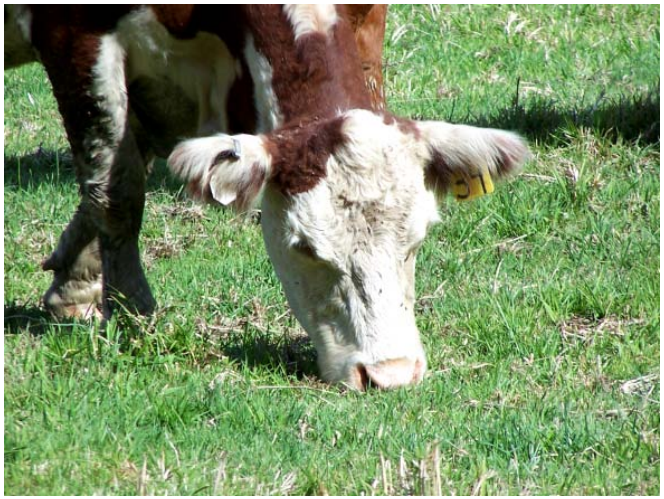
Short-term Exclusion (STE)
Hogan Ranch, 3 Years Exclusion

Long-term Exclusion (LTE)
Metro Multnomah Wetland, 13 Years Exclusion

N

Study Sites: Grazed Site

- Currently and Historically Grazed
- Heavy Grazing Utilization > 1200 AMU May- October

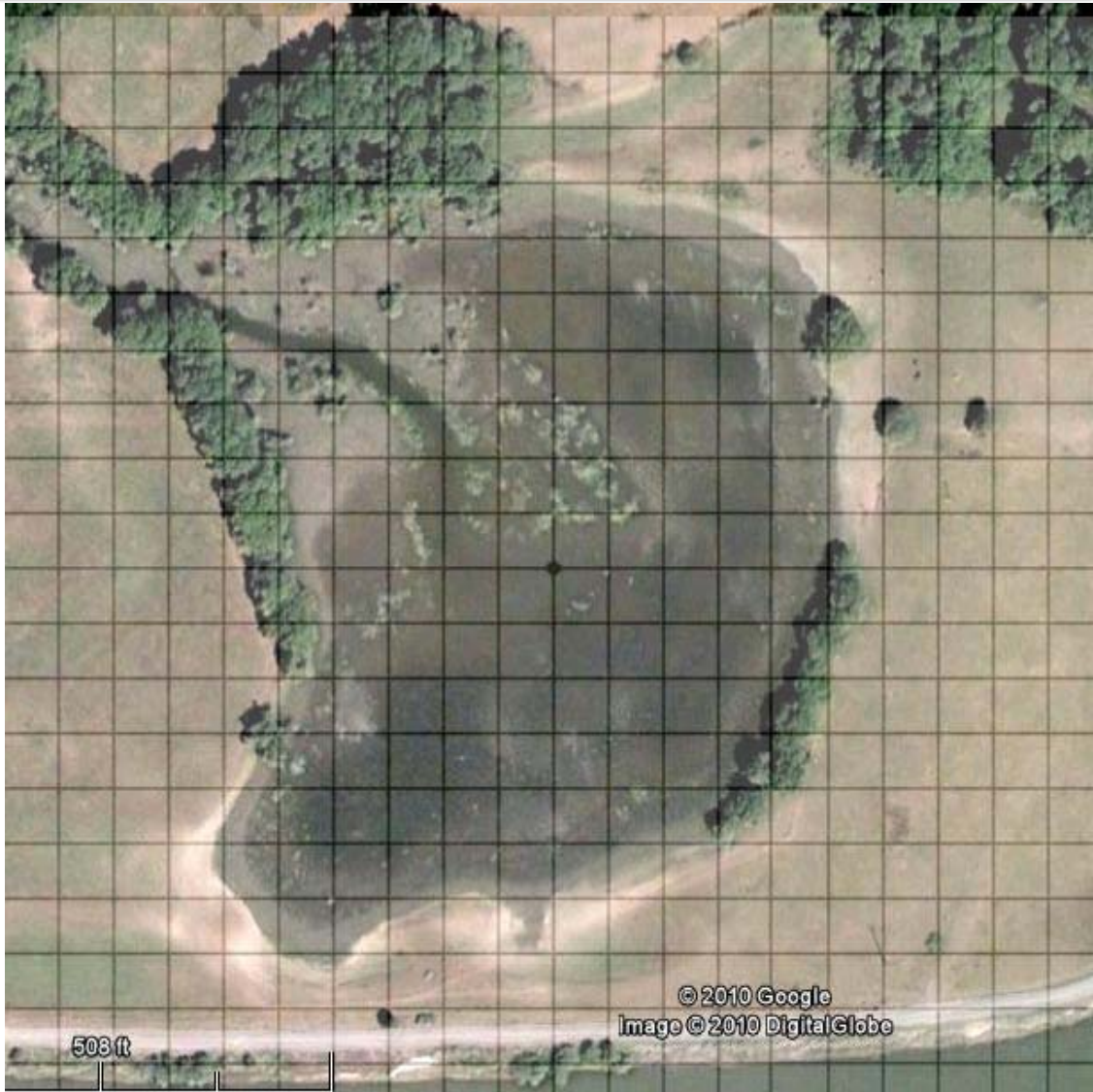


Current Grazing Site
Oregon Park and Recreation State Lands

September 2009

Study Sites: Short-term Exclusion (STE)

- Historically Grazed
- 3 Years of Livestock Exclusion



Short-term Exclusion Site, 3 Years
Hogan Ranch Boundary Wetland

August 2009

Study Sites: Long-term Exclusion (LTE)

- Historically Grazed
- 13 Years of Livestock Exclusion


Long-term Exclusion Site, 13 years
Metro's Multnomah Channel Wetlands
September 2009

Methods

Sample Site Selection

- 6 (60-45 meter) transects placed randomly with in each site

Parameters Measured

- *Soil Survey*
- *LiDAR Elevation Data*
- *Vegetation Survey*

Soil Survey

- ***Soil Surface Bulk Density (g/cm3)***
  - **Using a soil corer of known volume, calculated as soil dry weight (g) divided by total core volume (cm^3)**
- **Soil Texture Analysis**
  - **Dry Sieving and Hydrometer to determine % Gravel, Sand, Silt and Clay**
- **Soil % Organic Matter**
  - **Loss-on-ignition**

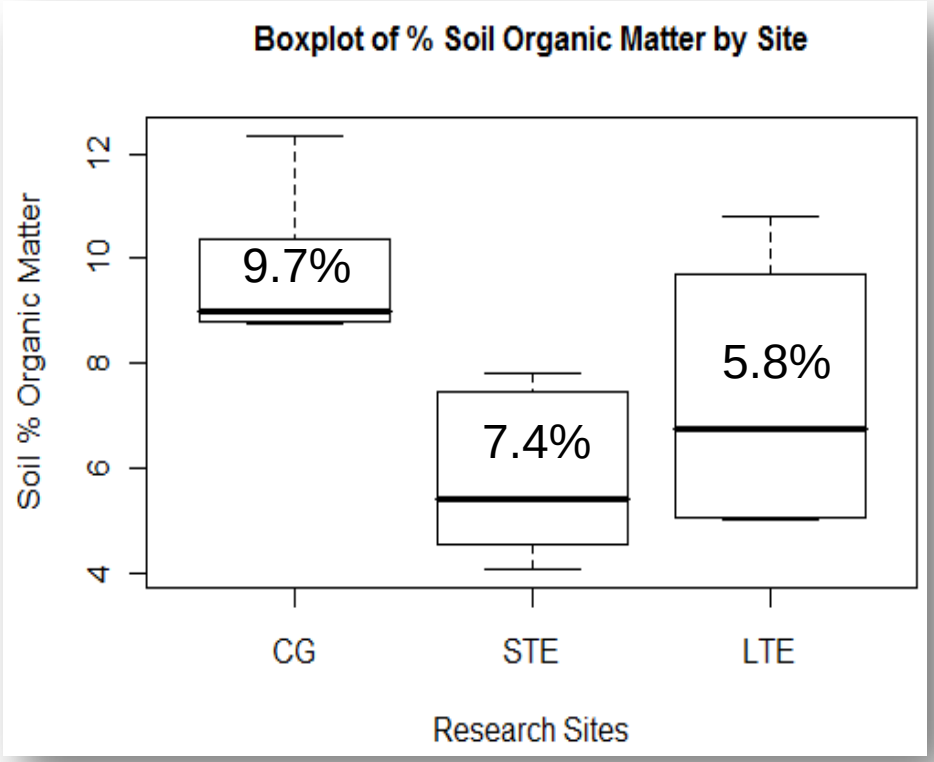
(Kalra and Maynard 1991)

Vegetation Survey

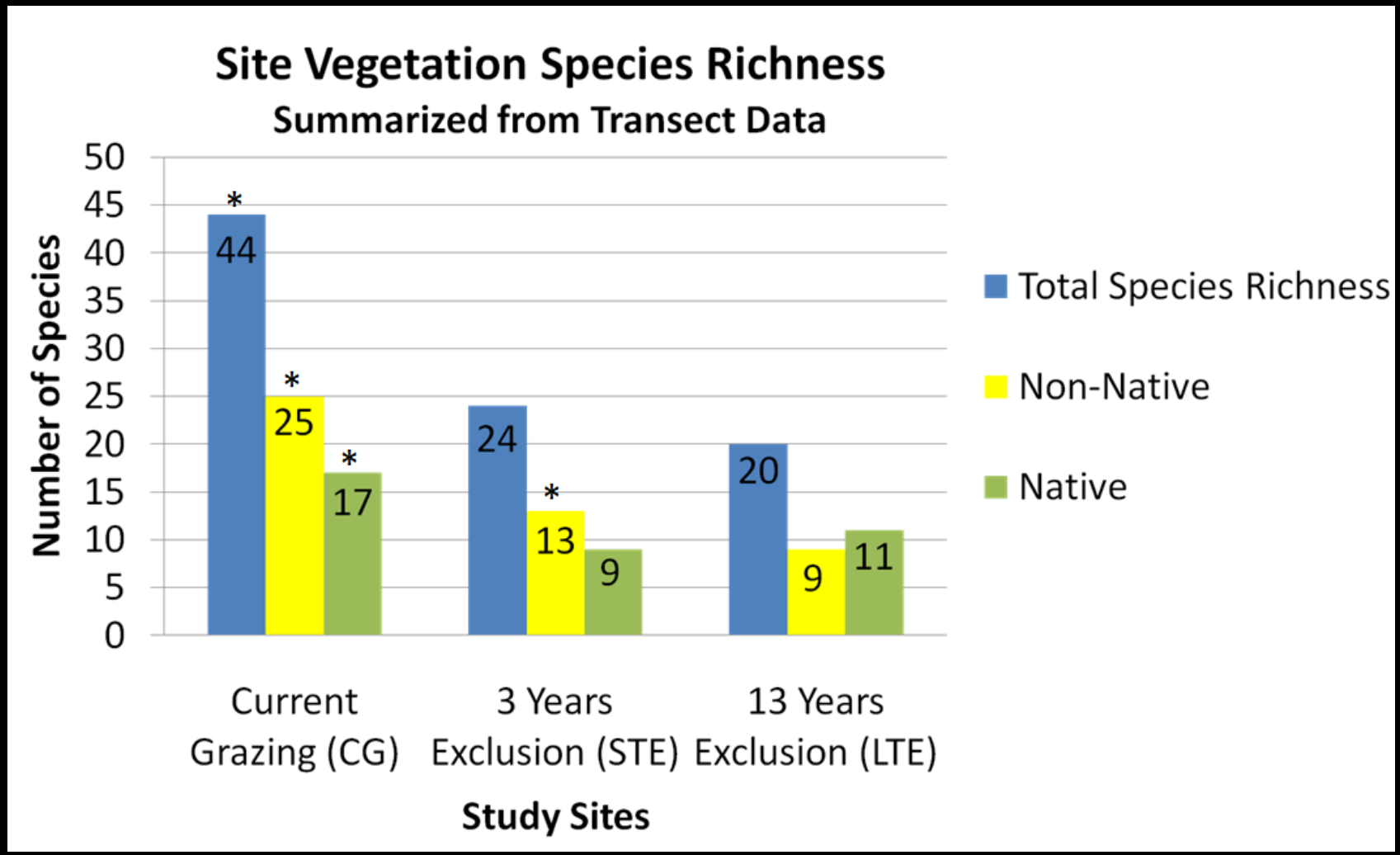
- *Line Intercept Method* (Brower et al. 1997, Jerkins et al. 2008)
  - Plant Cover for Each Species
  - Every 10cm (1dm)
- Native, Non-Native Veg. Data:
  - Species richness (Ludwig and Renolds 1988, Chaneton and Facelli 1991)
  - Relative cover
  - Diversity: Shannon's Index (H') (Pielou 1975)

Preliminary Results: Soil Survey

- ***Bulk Density*** *(g/cm3)*
  - ***Similar Between all Sites***
- ***Soil Texture Analysis***
  - ***Clay Loam for all sites***
- ***% Organic Matter (OM)***
  - ***Grazed site had a higher OM content than the exclusion sites***

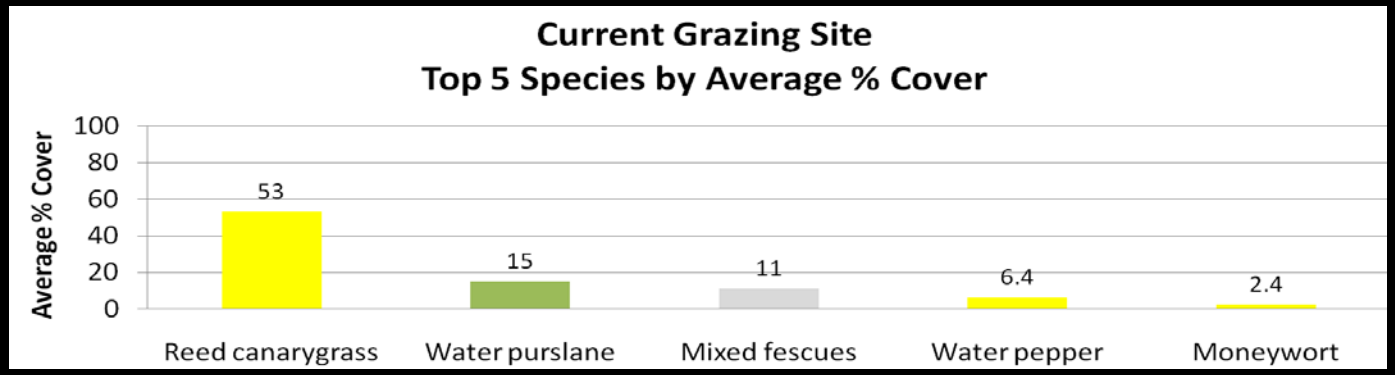


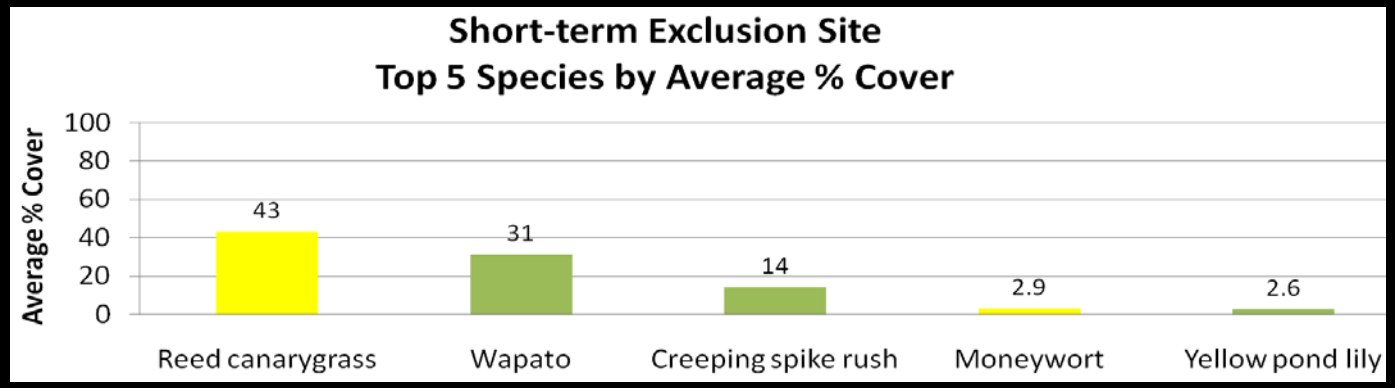
Preliminary Results
Vegetation Survey: Species Richness

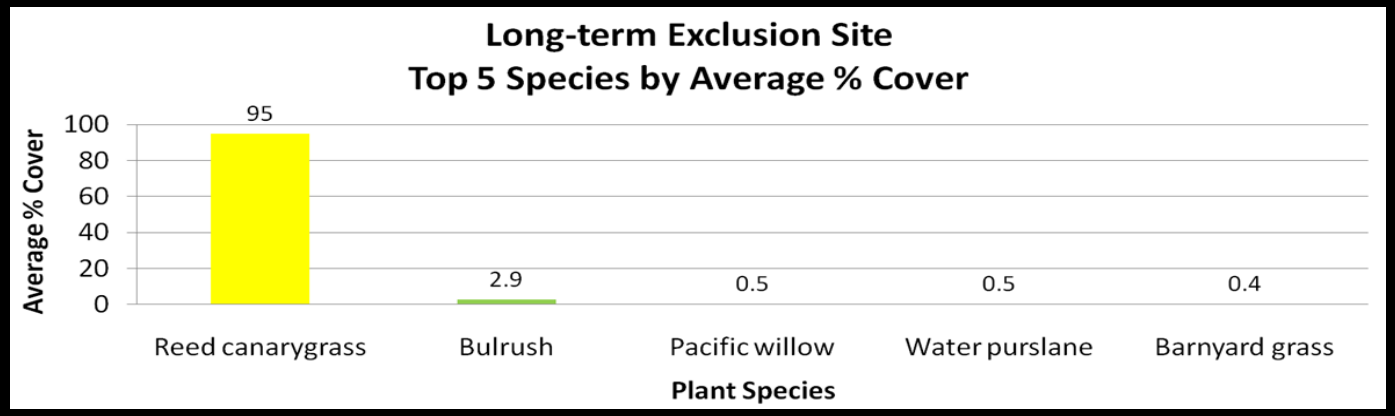


* Indicates significant difference (p-value<0.05) between sites, Kruskal-Wallis and Wilcoxon Rank Sum Test

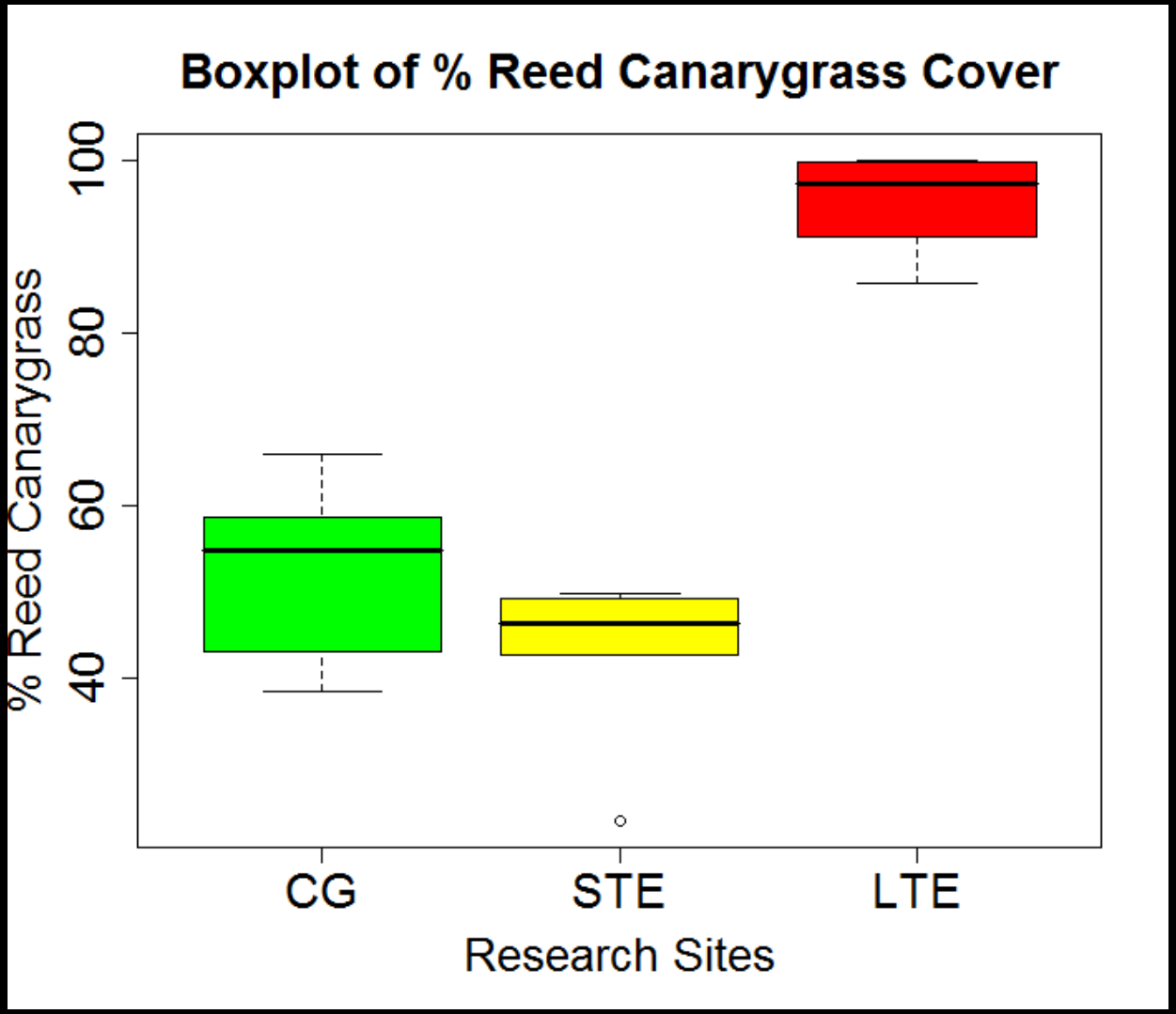
Preliminary Results
Vegetation Survey: Relative Cover



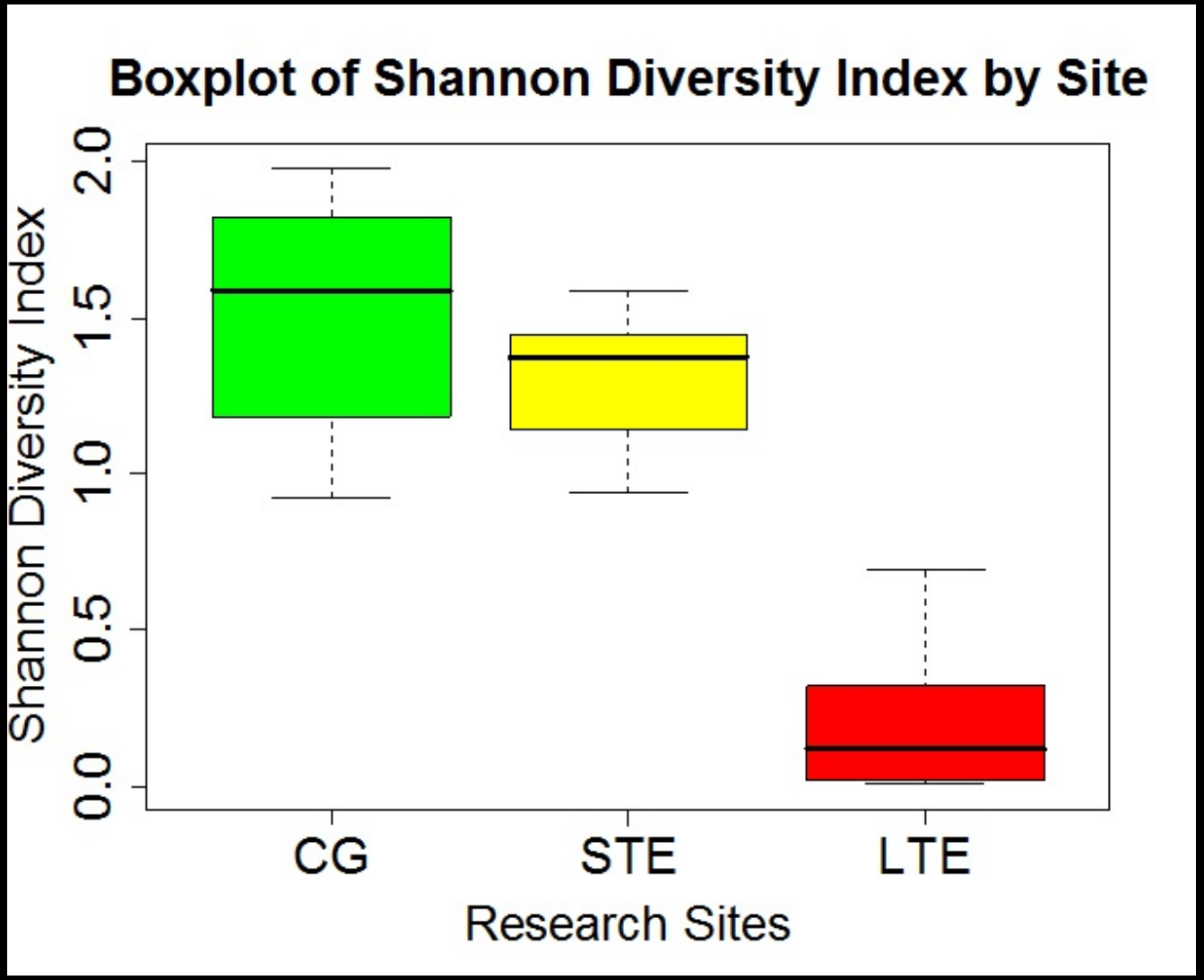




Preliminary Results
Vegetation Survey: Relative Cover



Preliminary Results
Vegetation Survey: Diversity



Conclusions

- More native and non-native species were found in the grazed site than the excluded sites
- Reed canarygrass was the dominant species for all of the wetland sites
- The grazed and short-term exclusion wetlands had similar Diversity and RCG cover

Why is this important?

Why is this important?

- Future Restoration Projects

It is possible that the impacts of cattle grazing in the riparian wetlands of the LCRB may decrease the abundance of RCG and increase riparian vegetation diversity and habitat quality (Zedler 2000, Tesauro 2001).

Thank you! Questions?

Sarah Holmen Shewell

M.S. Environmental Science and Managment Candidate 2010
Portland State University
Phone: 541-217-8184
Email: sarahholmen@gmail.com
shewell@pdx.edu

References

Conceptual Figure: Factors Involved in Determining Livestock Grazing Impacts on Riparian Wetlands in the Lower Columbia River Basin (LCRB) (Kauffman and Krueger 1984, Wissmar and Beschta 1998, Christy and Putera 1992, Menke and Bradford 1992, Milchunas and Lauenroth 1993, Vavra et al. 1994, Green and Kauffman 1995, Belsky et al. 1999, van Oene et al. 1999, Reeves and Champion 2004, Clary and Kinney 2002, Austin et al. 2007, Osmond et al. 2007, Bartuszevige and Endress 2008, Zedler 2009).

Austin, JE, JP Keough, and WH Pyle. 2007. Effects of habitat management treatments on plant community composition and biomass in a montane wetland. *Wetlands (Wilmington, N.C.)* 27(3): 570-87.

Bartuszevige A and Endress B. 2008. Do ungulates facilitate native and exotic plant spread? seed dispersal by cattle, elk and deer in northeastern Oregon. *J Arid Environ* 72(6):904-13.

Belsky AJ,Matzke A,Uselman S. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* 54: 419–431.

Brower, JE, JH Zar and CN von Ende. 1997. Field and Laboratory Methods for General Ecology, 4th edition. WCB/McGraw-Hill, Boston, MA, USA.

Chaneton, EJ and Facelli, JM. 1991. Disturbance effects on plant community diversity: spatial scales and dominance hierarchies. Vegetatio 93: 143-155.

Christy and Putera. 1992. Lower Columbia River natural area inventory, 1992. Report to The Nature Conservancy, Washington Field Office, Seattle. Oregon Natural Heritage Program, Portland. 74 pp.

Clary WP and Kinney JW. 2002. Streambank and vegetation response to simulated cattle grazing. *Wetlands (Wilmington, N C) Wetlands 22*(1):139-48.

Decker, AM, GA Jung, JB Washko, DD Wolf, and MJ Wright. 1969. Management and productivity of perennial grasses in the Northeast: I. Reed Canarygrass. West Virginia Univ. Agric Exp. Sn. Bull. 550T.

Fullerton AH, Beechie TJ, Baker SE, Hall JE, Barnas KA. 2006. Regional patterns of riparian characteristics in the interior Columbia River Basin, Northwestern USA: Applications for restoration planning. L*andscape Ecol* 21(8):1347-60.

Green, DM. and JB Kauffman. 1995. Succession and livestock grazing in a northeastern Oregon riparian ecosystem. *J. Range Manage*. 48:307-313.

Jenkins, NJ, Yeakley, JA, and Stewart, EM. 2008. Responses of *Phalaris Arundinacea* L. to managed flooding of wetlands in the Columbia Slough in Portland, Oregon, USA. *Wetlands* 28:1018-1027.

Kalra, YP, and DG Maynard. 1991. Methods manual for forest soil and plant analysis. Forestry Canada, Northwest Region, Northern forest Centre, Edmonton, Alberta.

Kauffman JB,Krueger WC. 1984. Livestock impacts on riparian ecosystems and streamside management implications...a review. *Journal of Range Management* 37: 430–438.

Kershner JL, Roper BB, Bouwes N, Henderson R and Archer E. 2004. An Analysis of Stream Habitat Conditions in Reference and Managed Watersheds on Some Federal Lands within the Columbia River Basin. North American Journal of Fisheries Management 24(4):1363–1375.

Lev, E, Schaaf, DV, Christy, J, and P Adamus. 2004. The Scappoose Bay Bottom Lands Conservation and Restoration Plan. The Wetlands Conservancy, Tualatin, OR.

Ludwig, J.A. & Reynolds, J.F. 1988 Statistical ecology: a primer on methods and computing. New York: John Wiley and Sons.

Menke, J., and GE Bradford. 1992. Rangelands. Agriculture, Ecosystems & Environment 42(1-2): 141-63.

Milchunas, D.G. and Lauenroth, W.K. 1993. Quantitative effects of grazing on vegetation and soils over a global range of environments. Ecological Monographs 63 (4): 327-366.

Milchunas DG, Sala OE, Lauenroth WK. 1988. A generalized model of the effects of grazing by large herbivores on grassland structure. American Naturalist 132: 87–106.

Osmond, D.L., D.M. Butler, N.N. Ranells, M.H. Poore, A. Wossink, J. T. Green. 2007. Grazing Practices: A Review of the Literature. North Carolina Agricultural Research Service, Technical Bulletin 325-W. North Carolina State University. Raleigh, NC.

PACFISH (Pacific Anadromous Fisheries Habitat), USDA Forest Service, USDI Bureau of Land Management, 1994. Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon, Washington, Idaho, and Portions of California. USDA Forest Service, Washington, D.C.

Pielou, EC. 1975. Ecological Diversity. John Wiley & Sons, New York.

Reeves and Champion. 2004. Effects of livestock grazing on wetlands: Literature review. National Institute of Water & Atmospheric Research Ltd, New Zealand. NIWA: HAM2004-059

Tesauro J. 2001. Restoring wetland habitats with cows and other livestock: A prescribed grazing program to conserve bog turtle habitat in New Jersey. Conservation In Practice 2:2.

van Oene, H, van Deursen, EJM and Berendse, F. 1999. Plant-herbivore interaction and its consequences for succession in wetland ecosystems: A modeling approach. *Ecosystems* 2(2): 122-138.

Vavra M, Laycock WA, Pieper RD, eds. 1994. Ecological Implications of Livestock Herbivory in the West. Denver (CO): *Society for Range Management*.

Wissmar, RC and RL Beschta. 1998. Restoration and management of riparian ecosystems: A catchment perspective. *Freshwater Biology* 40, (3): 571-85.

Zedler, J. 2000. Progress in wetland restoration ecology. *Trends in Ecology & Evolution* (Amsterdam) 15, (10): 402-7.