

Seedling recruitment in variable hydrologic regimes

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Vegetation establishment in a mitigation wetland

- The Gold Standard: rapid establishment of a desirable plant community
 - What factors are most critical?
 - Soil quality
 - Hydrologic regime
 - Seed bank
 - Planted Stock
 - Competition, predation



Source: Ohio Department of Transportation

The Dutch Fork Wetlands, 2006





The Dutch Fork Wetlands, April 2006

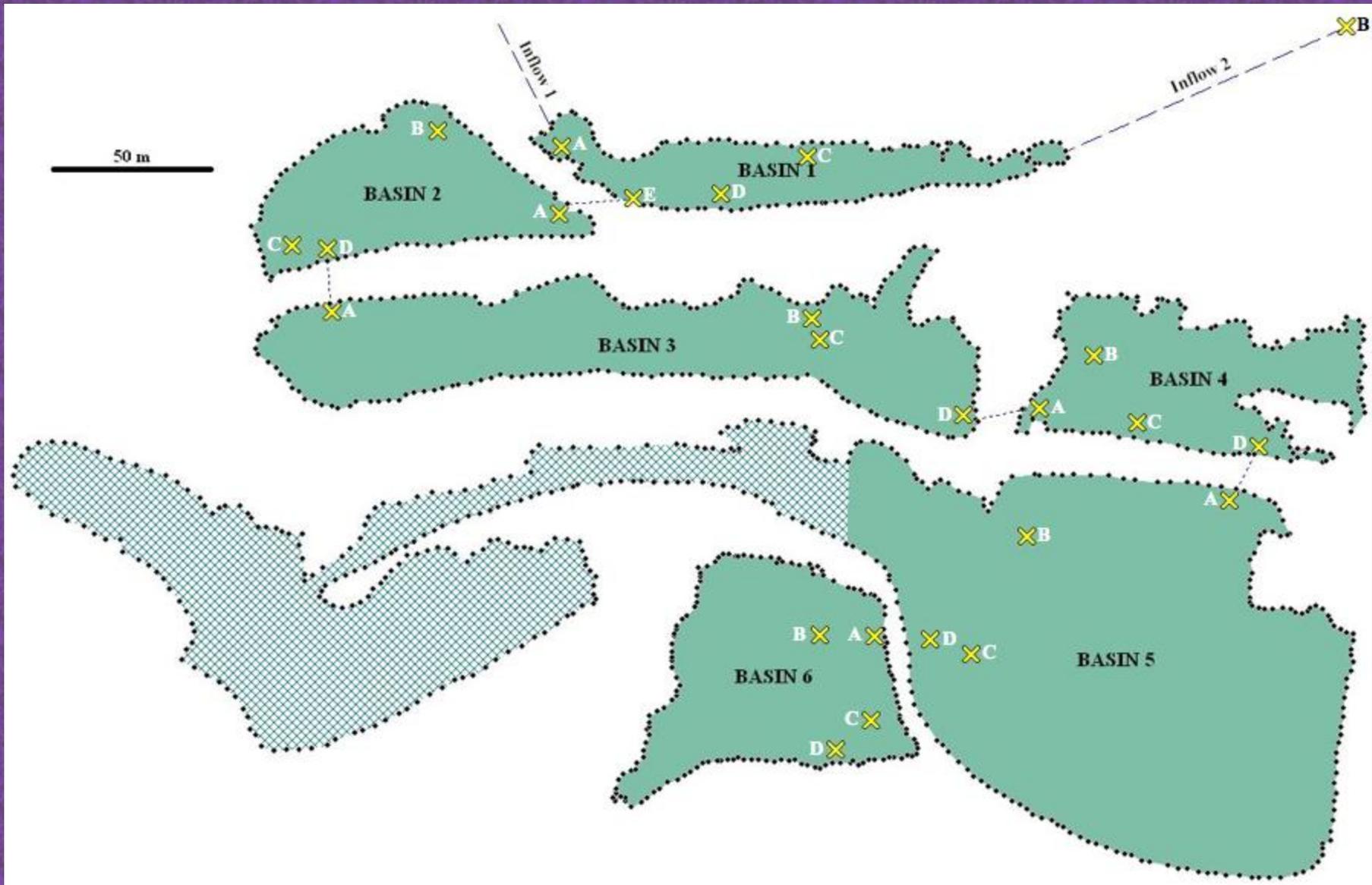


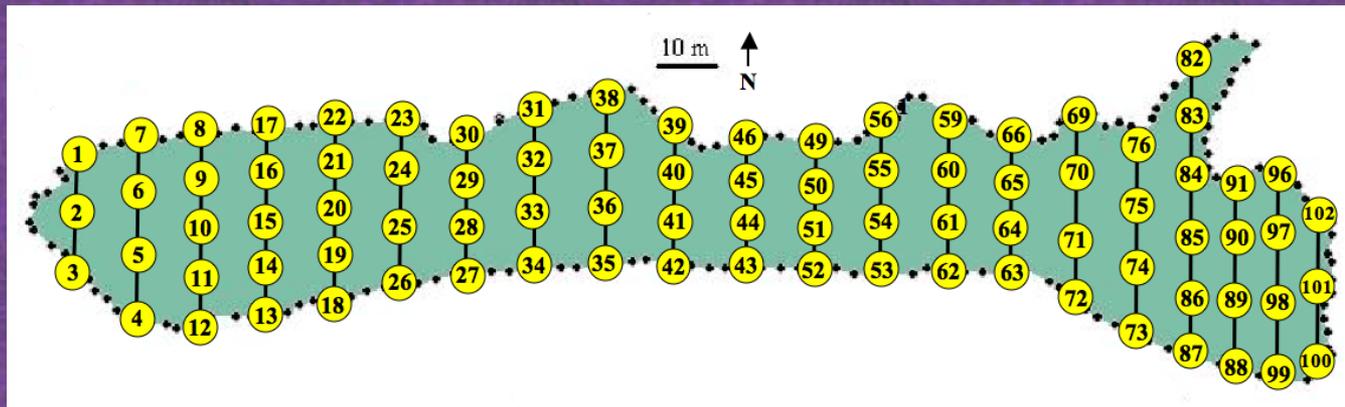
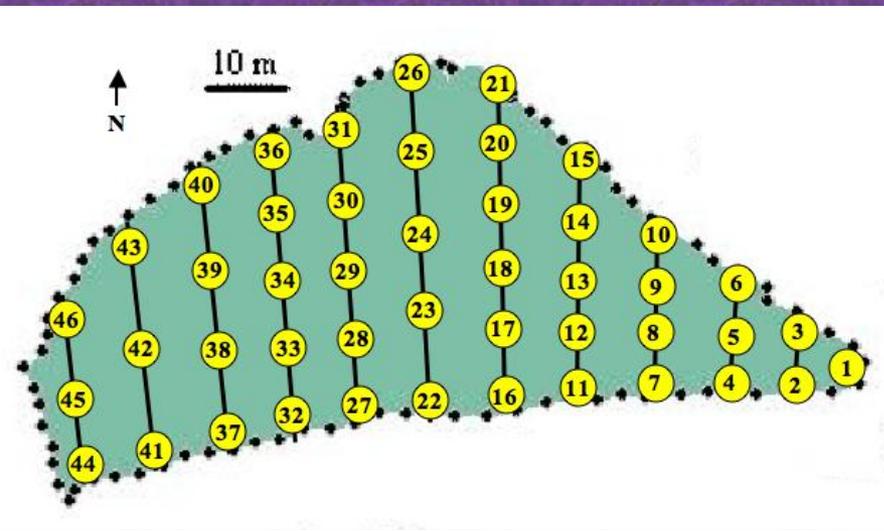
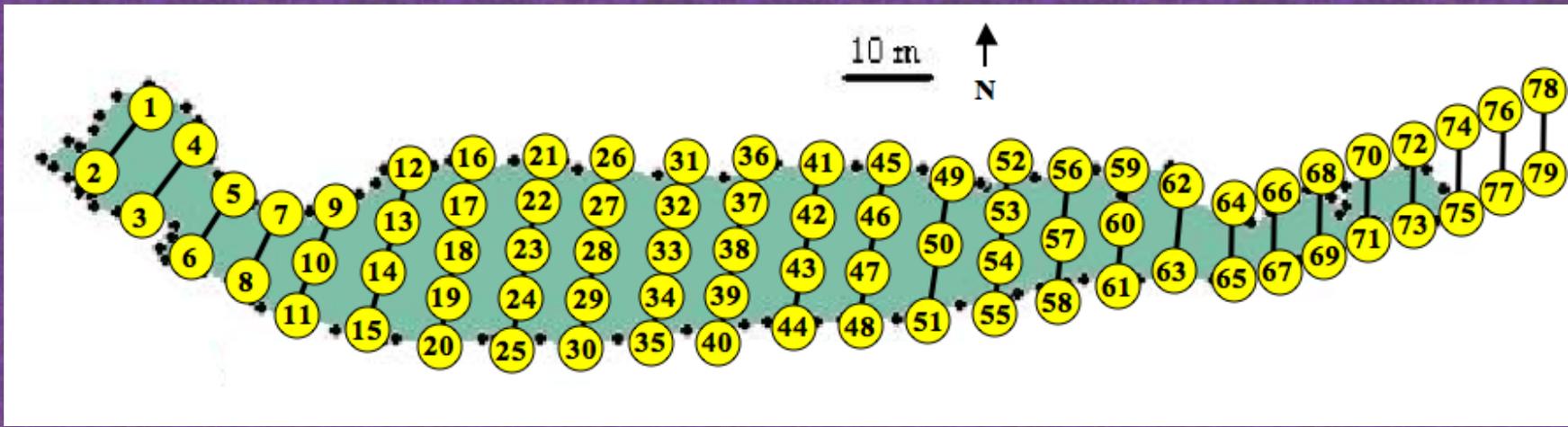


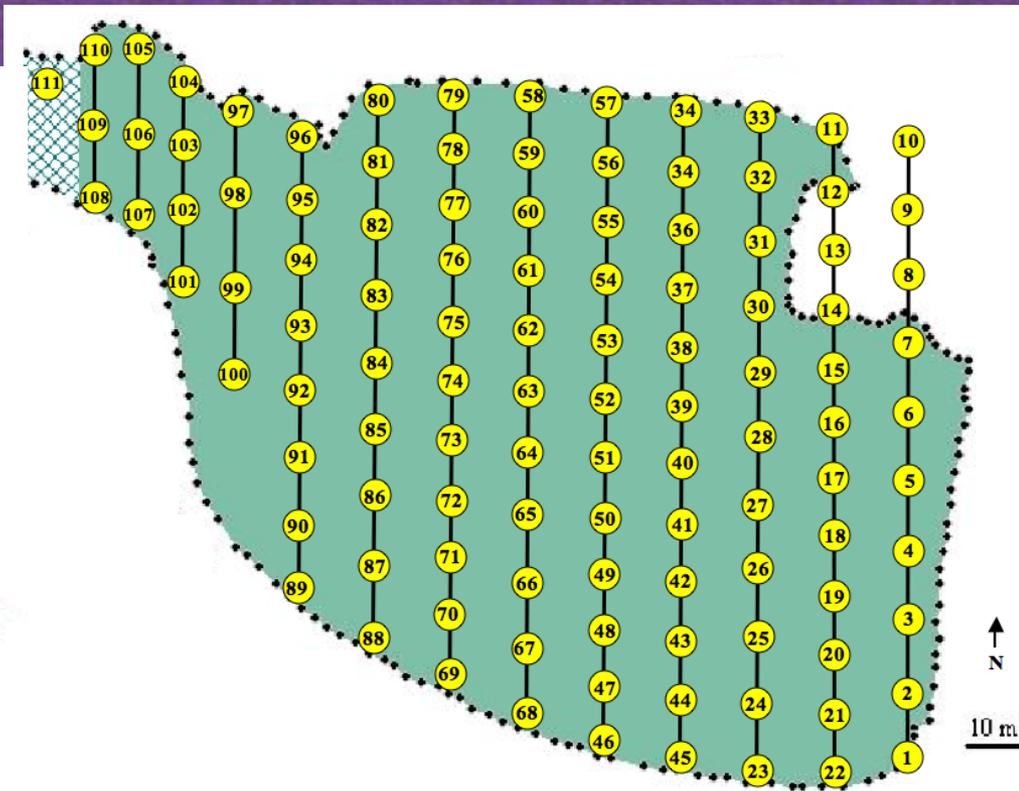
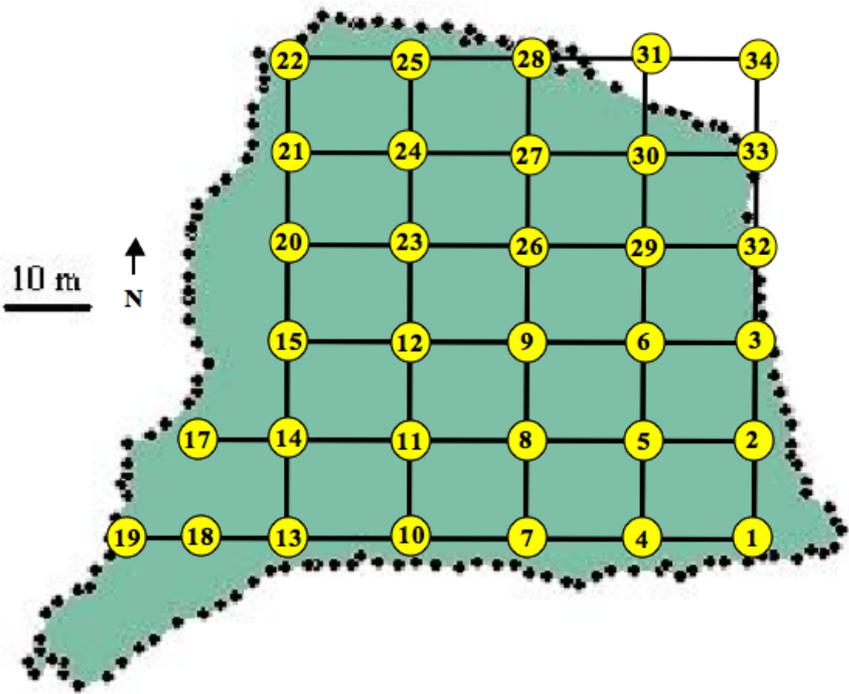
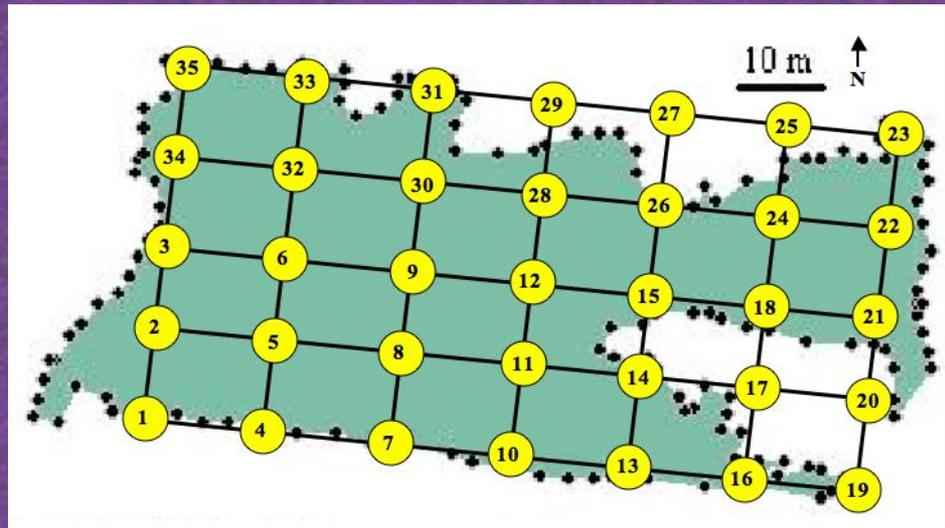
Success and Succession

- How does the plant community develop spatially in the first three years?
- What biotic and abiotic factors are particularly conducive to successful establishment of the desired plant community?







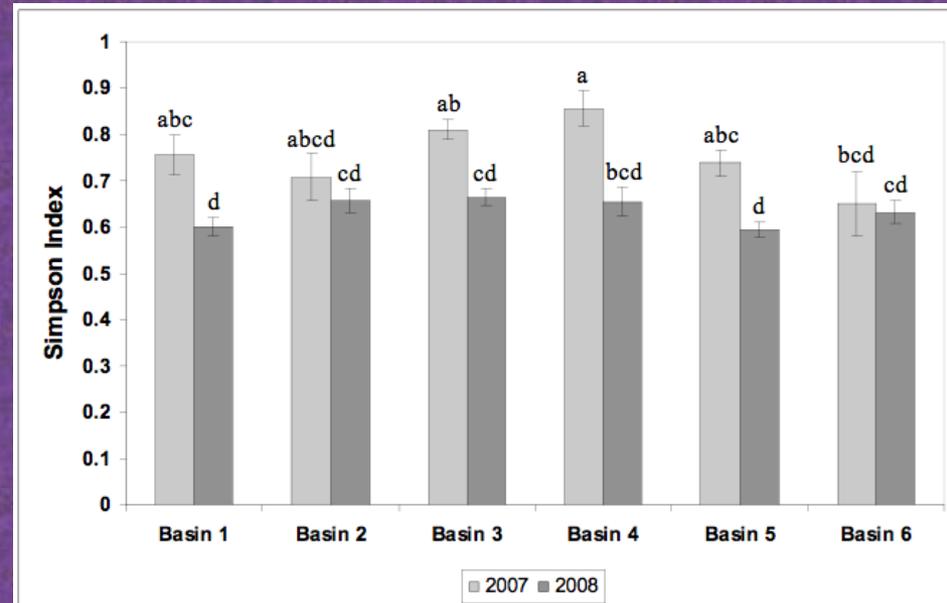
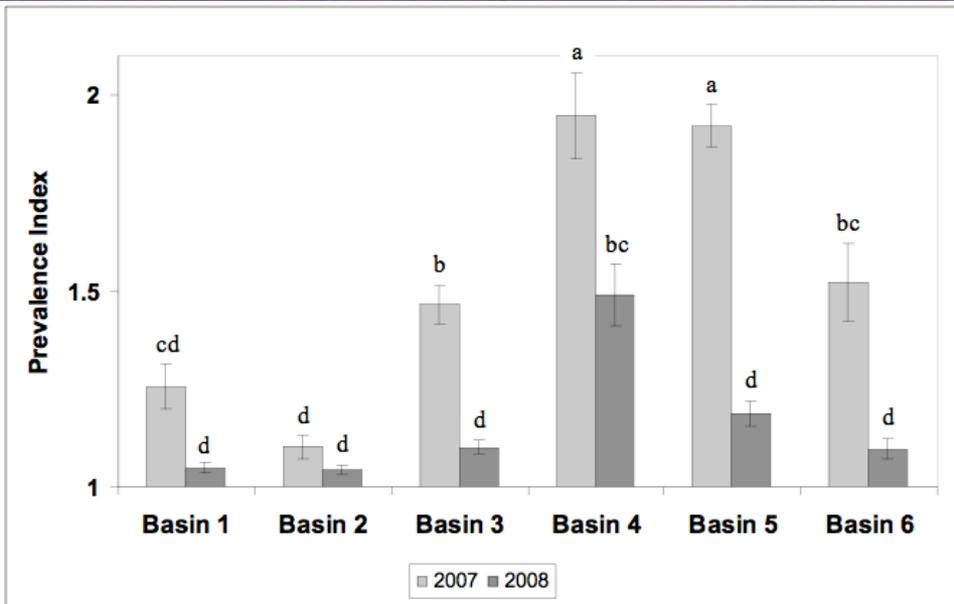


Grid point data collection

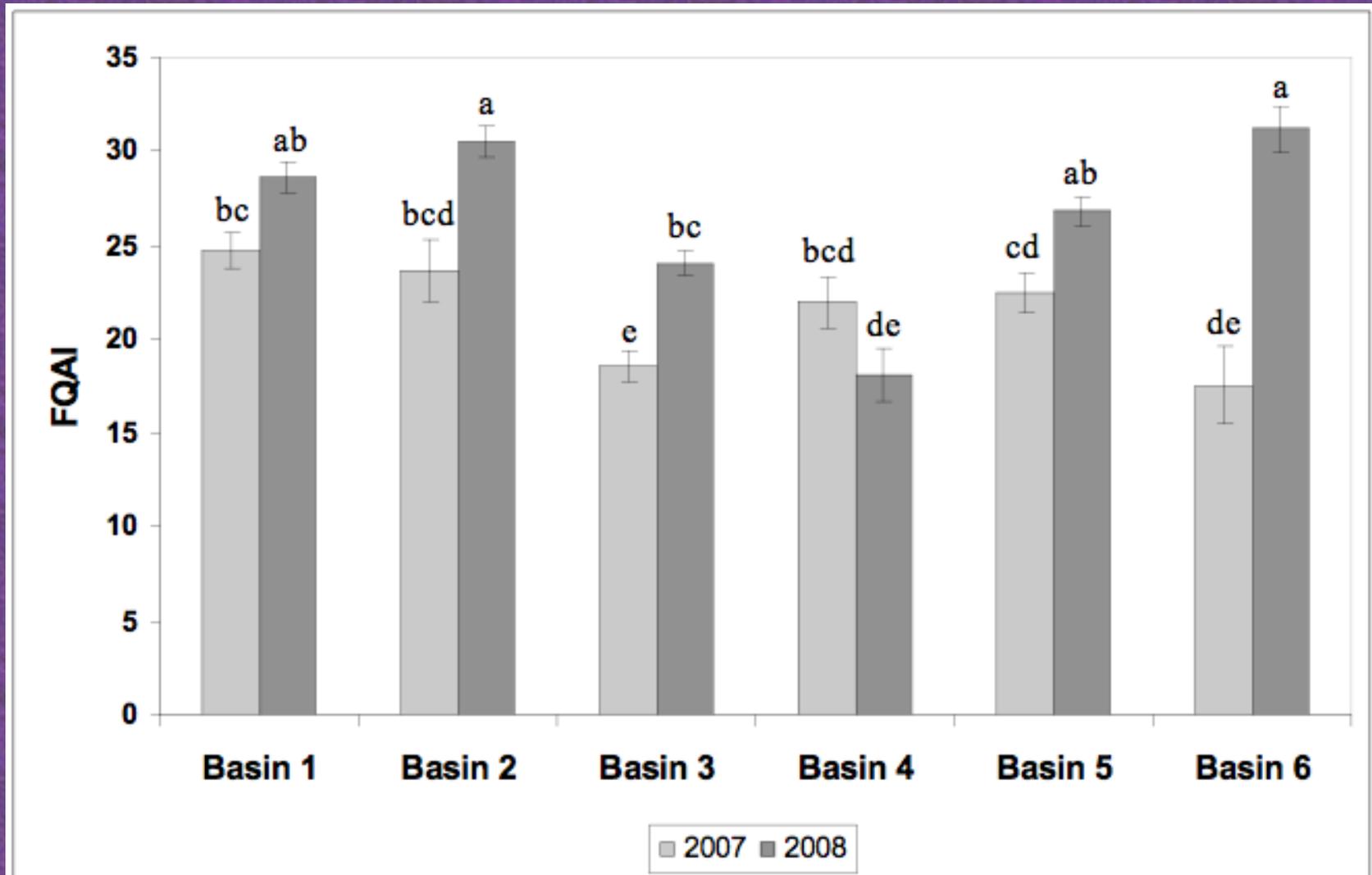
- Soil Bulk Density, Organic Matter, pH (2006, 2008, 2009)
- Depth (Hourly, 2006-2009)
- Macrophyte richness, cover, diversity, quality; 5m² (2007-2009)
- Seed bank richness, diversity, quality (2008, 2009; select locations)



Dutch Fork Wetland Macrophytes, 2007-2008



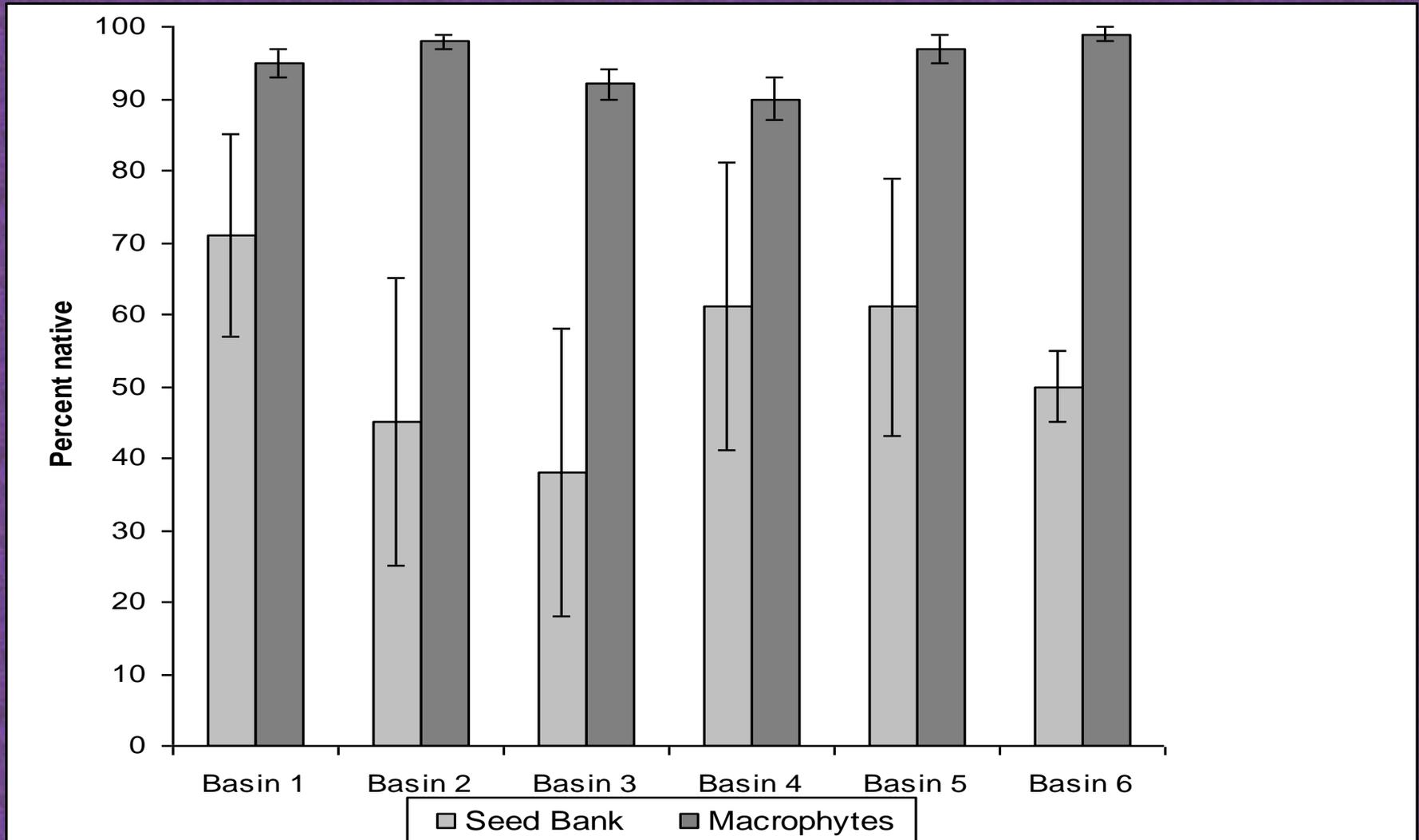
Dutch Fork Wetland Macrophytes, 2007-2008



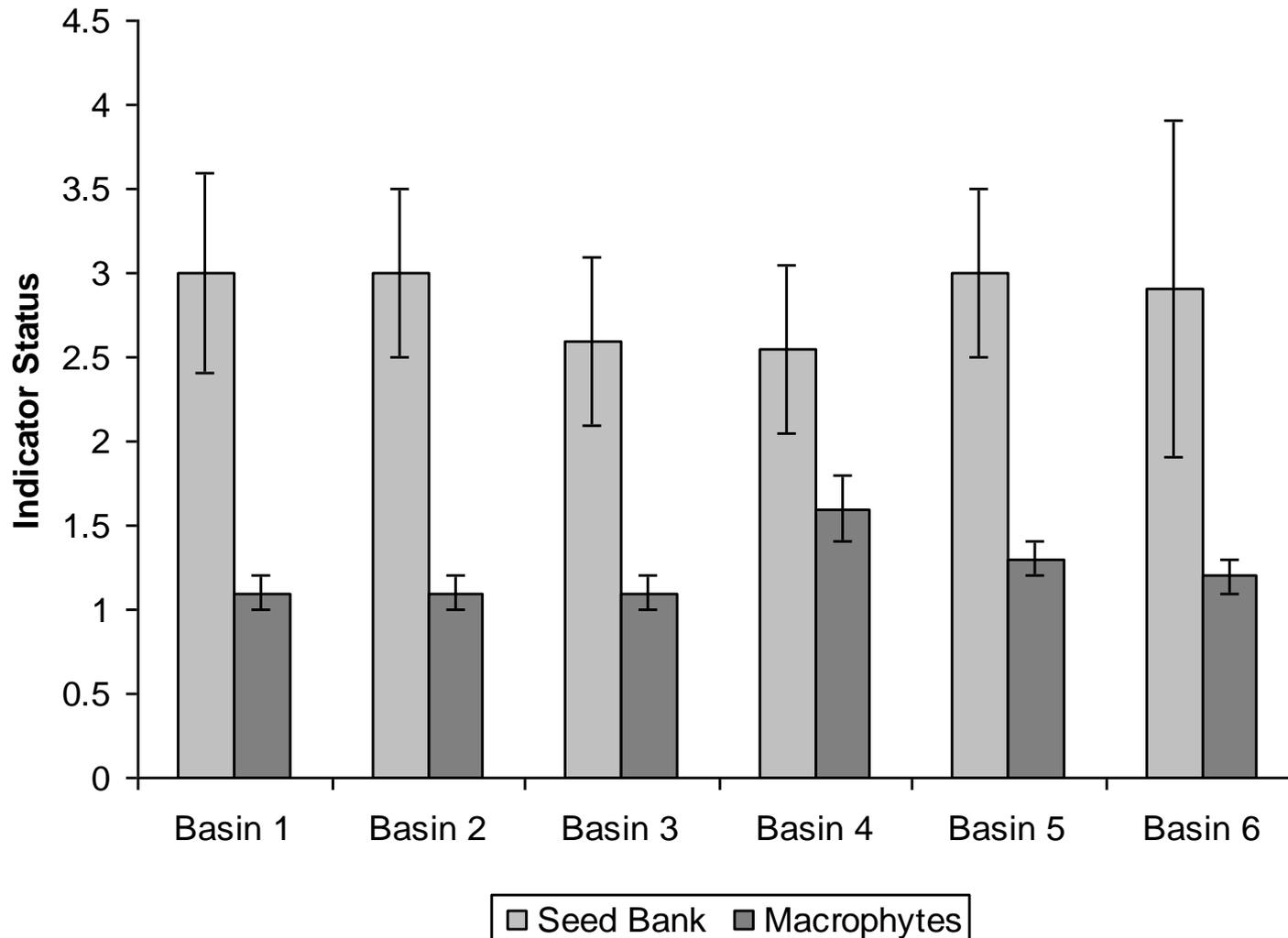
Factors Influencing Establishment of Desired Community

- Seed Bank
- Soil Quality
- Hydrologic Regime

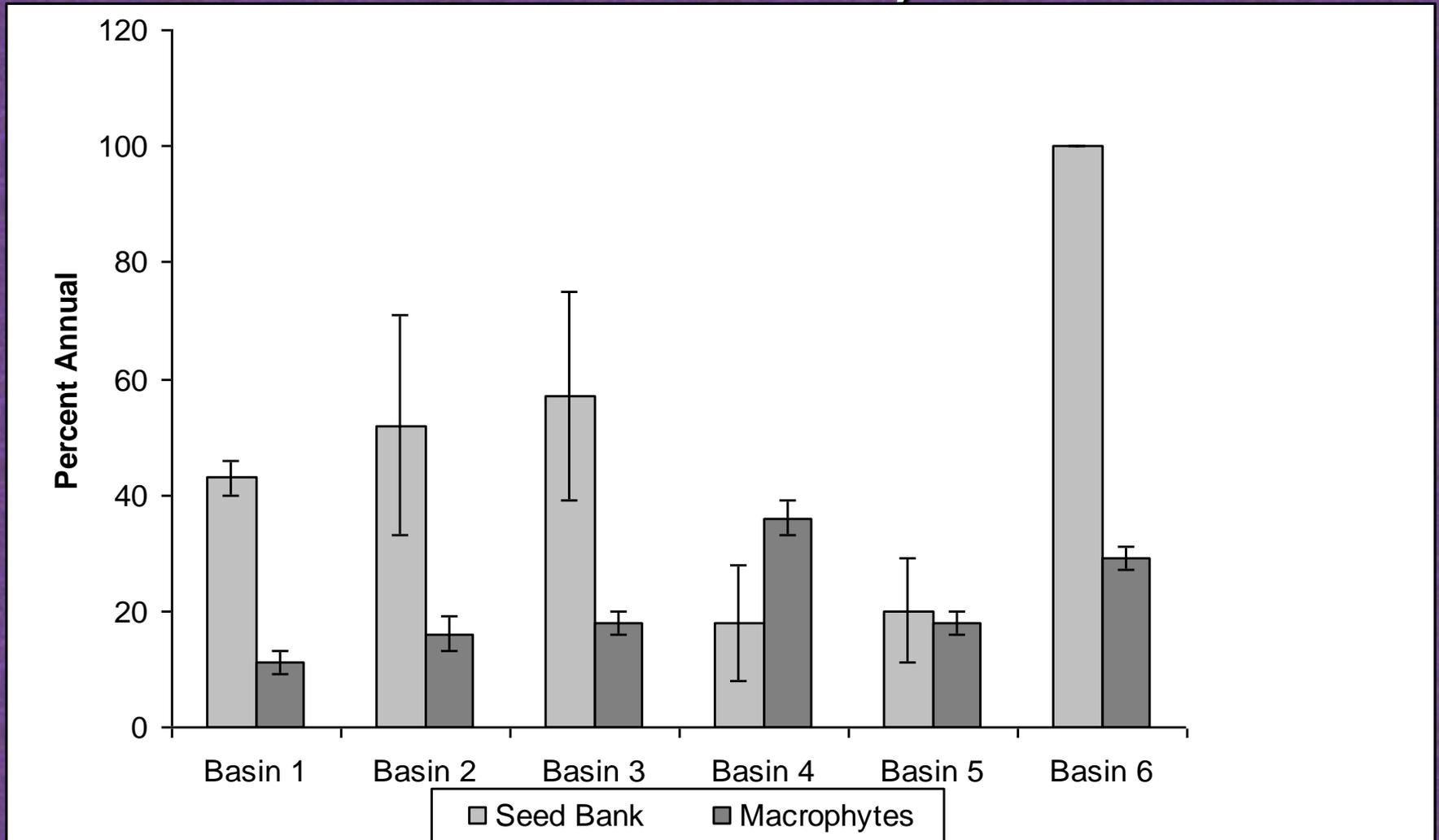
Dutch Fork Wetland Macrophytes and Seed Bank, 2008



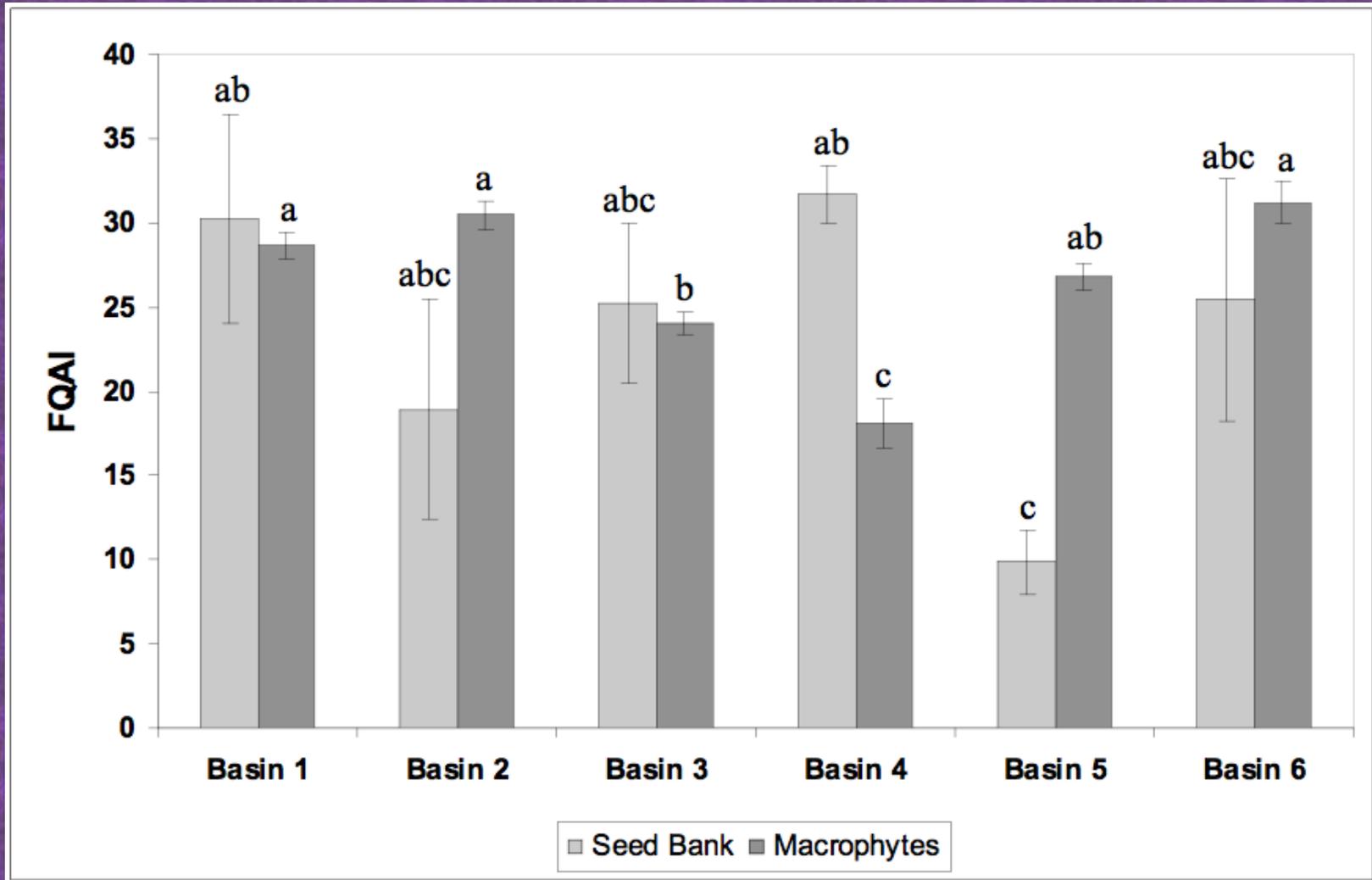
Dutch Fork Wetland Macrophytes and Seed Bank, 2008



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Dutch Fork Wetland Macrophytes and Seed Bank, 2008



Sorensen Similarity Index, 2008

	Macrophyte community					
	B1	B2	B3	B4	B5	B6
B1	100	50.7	47.2	42.3	41.7	29.2
B2	50.7	100	50.8	34.9	45.5	14
B3	47.2	50.8	100	48.4	48.1	23.6
B4	42.3	34.9	48.4	100	41.9	44.7
B5	41.7	45.5	48.1	41.9	100	32.8
B6	29.2	14	23.6	44.7	32.8	100

Sorensen Similarity Index, 2008

	Macrophyte Community					
Seed Bank	B1	B2	B3	B4	B5	B6
B1	1.6	1.9	1.8	2.2	1.5	3.3
B2	3.3	1.9	3.6	2.2	3	3.3
B3	3.2	1.9	3.6	2.1	3	3.2
B4	3.2	1.9	3.6	2.1	3	3.2
B5	1.6	1.9	1.8	2.2	1.5	3.5
B6	1.7	2	1.9	2.3	1.6	3.7

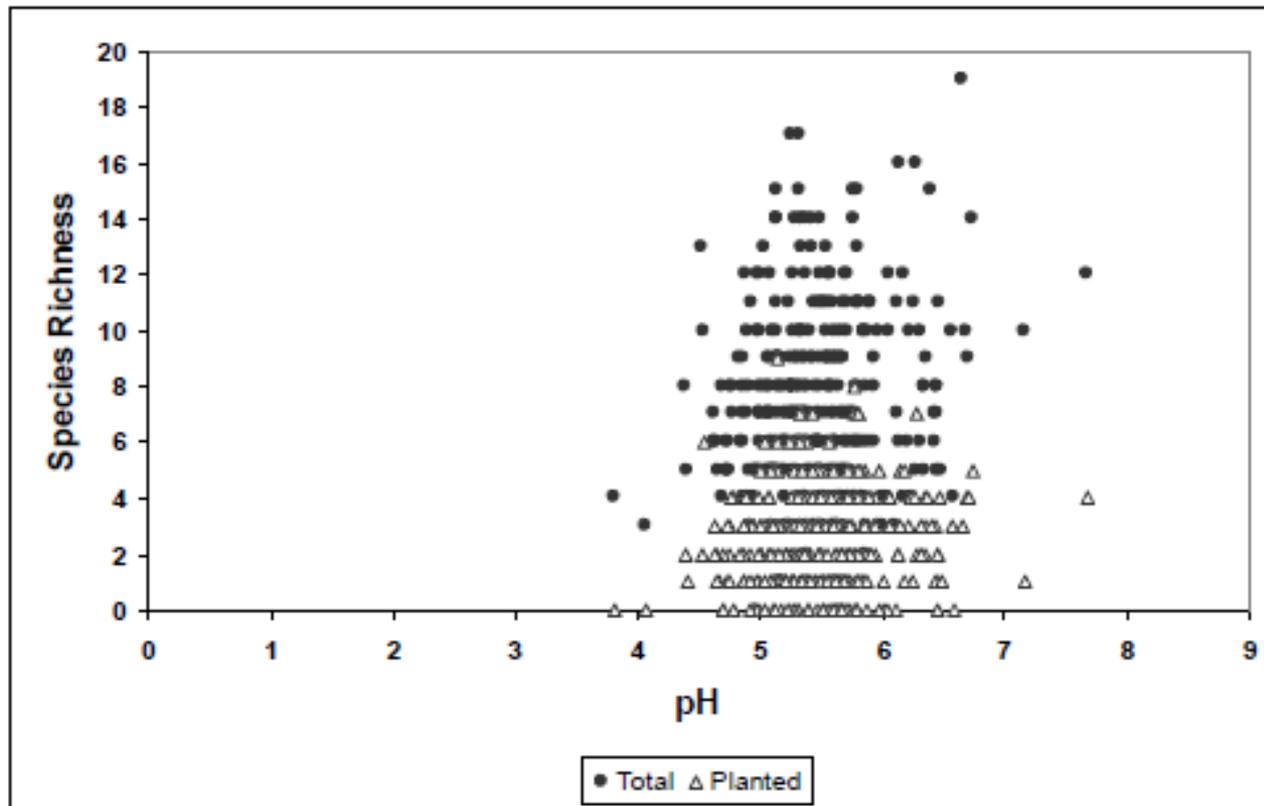
Observations

- Seed bank is significantly more nonnative, facultative, and annual than macrophyte community
- Seed bank has not made a large contribution to macrophyte community

Factors Influencing Establishment of Desired Community

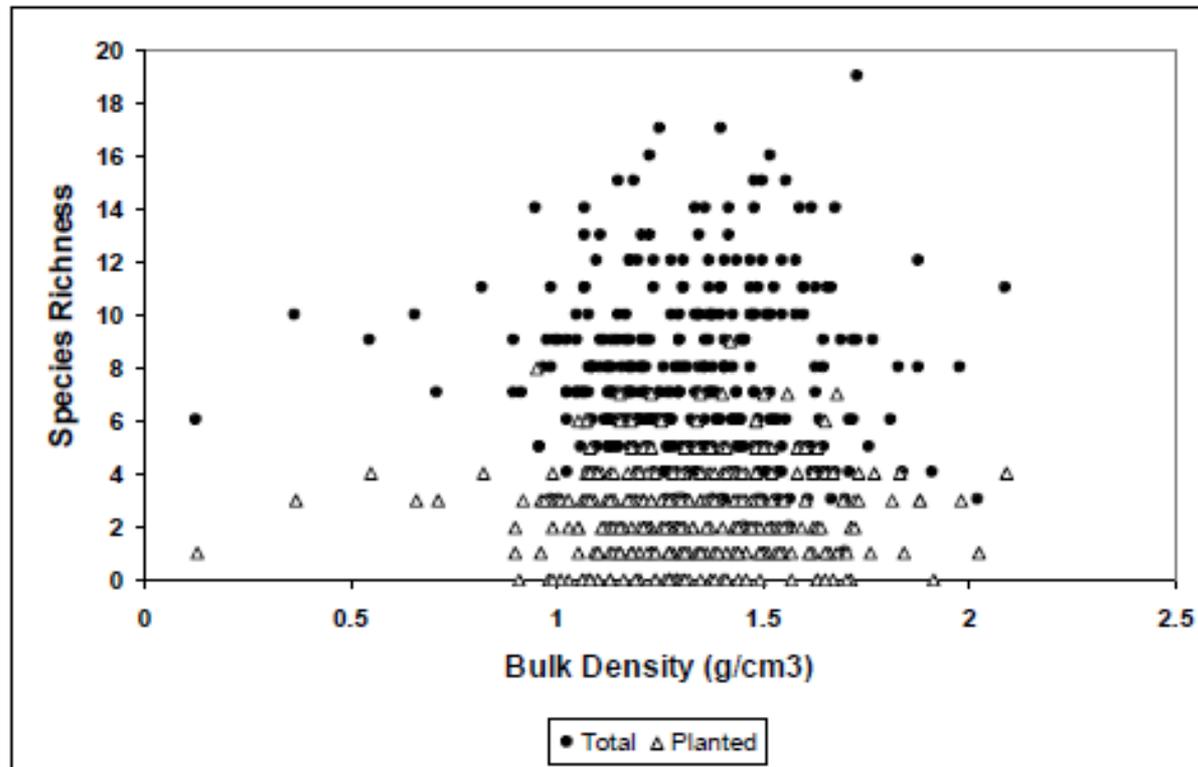
- Seed Bank
- Soil Quality
- Hydrologic Regime

Soil Quality



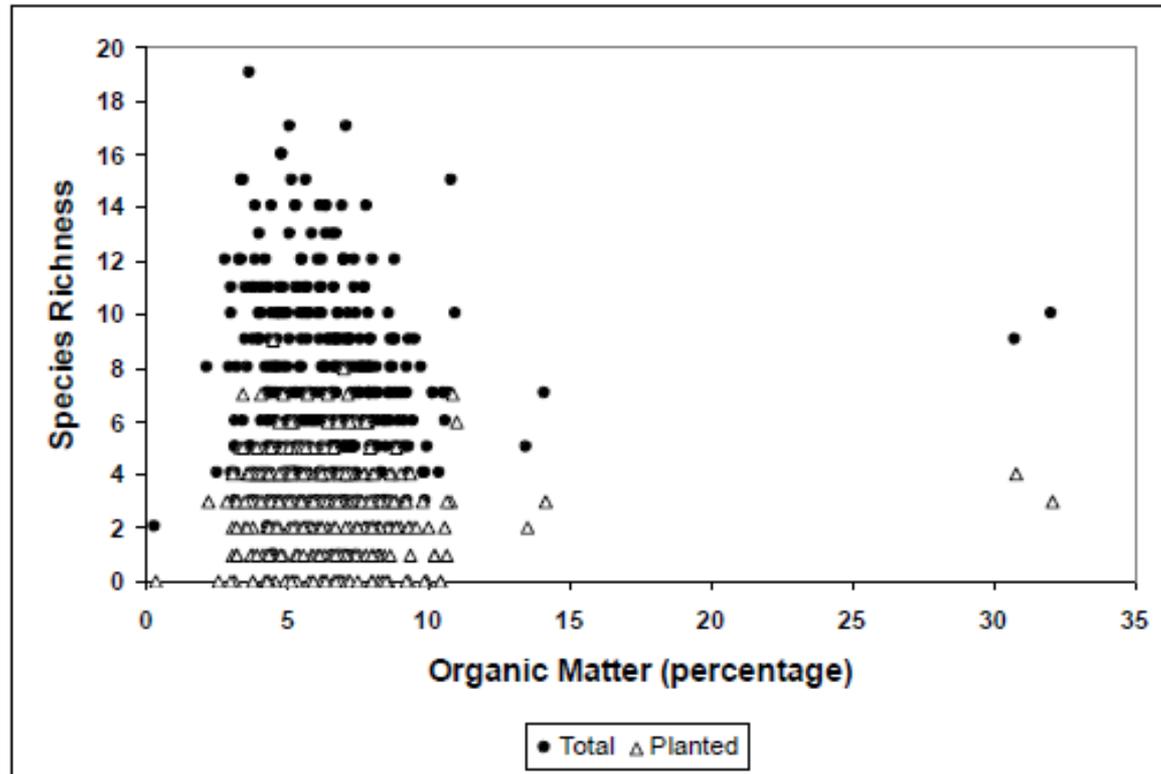
Species Richness versus pH. Each point represents a 5m² area. The two plots denote the total amount of species and the planted species. Correlations with number of species ($r=0.1330$) and planted species ($r=0.0849$) were not significant (2008).

Soil Quality

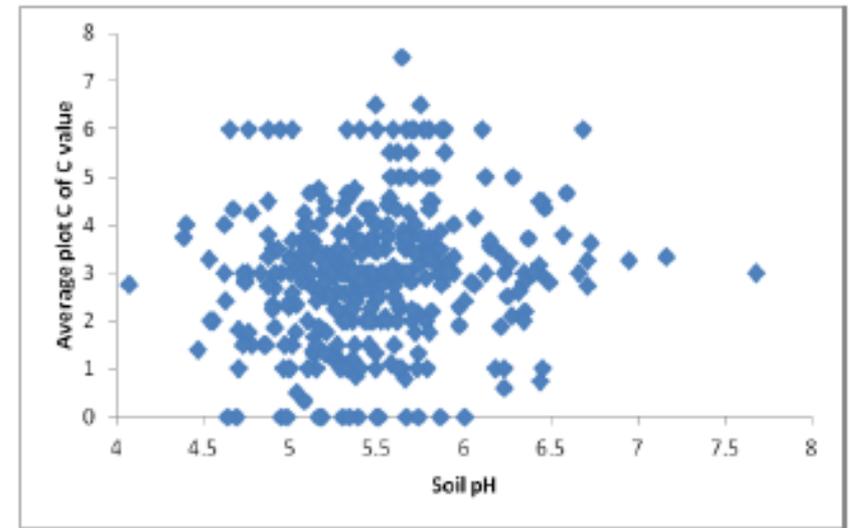
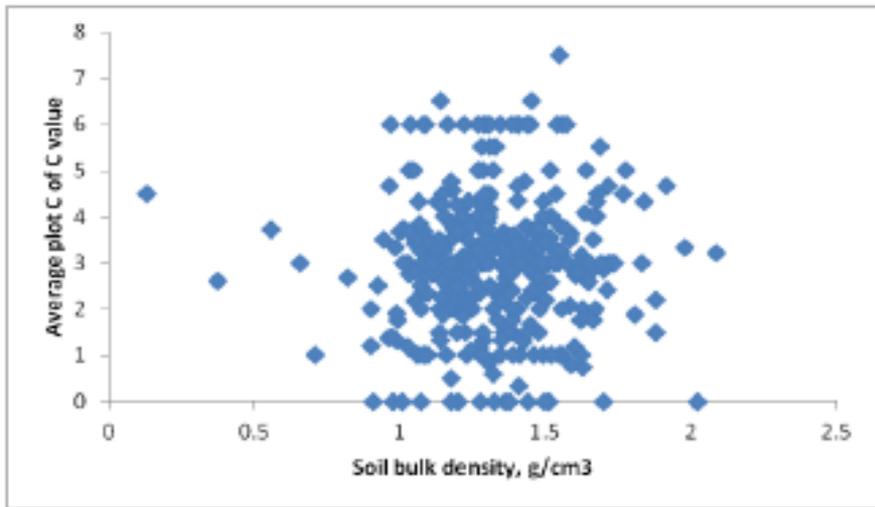


Species Richness versus bulk density. Each point represents a 5m² area. The two plots denote the total amount of species and the planted species. Correlations with number of species ($r = -0.0238$) and planted species ($r = 0.0075$) were not significant (2008).

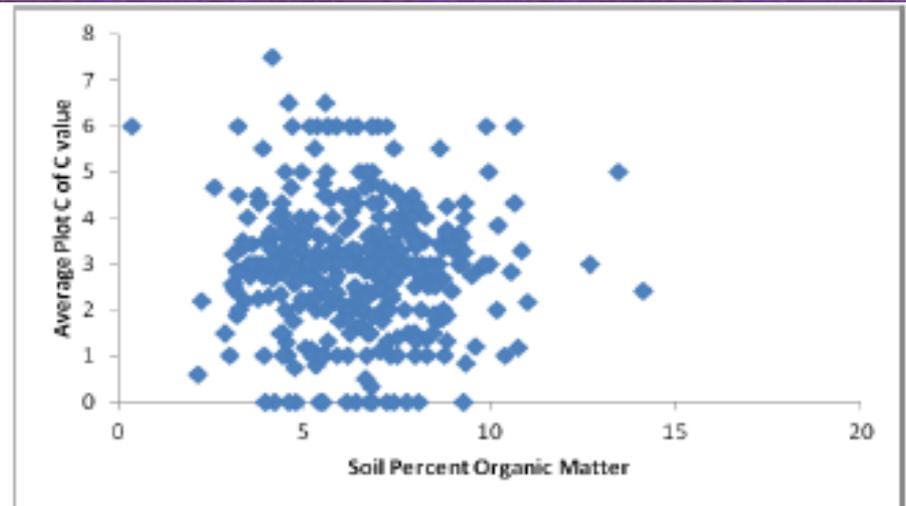
Soil Quality



Species Richness versus organic matter. Each point represents a 5m² area. The two plots denote the total amount of species and the planted species. Correlations with number of species ($r = -0.0474$) and planted species ($r = -0.0236$) were not significant (2008).



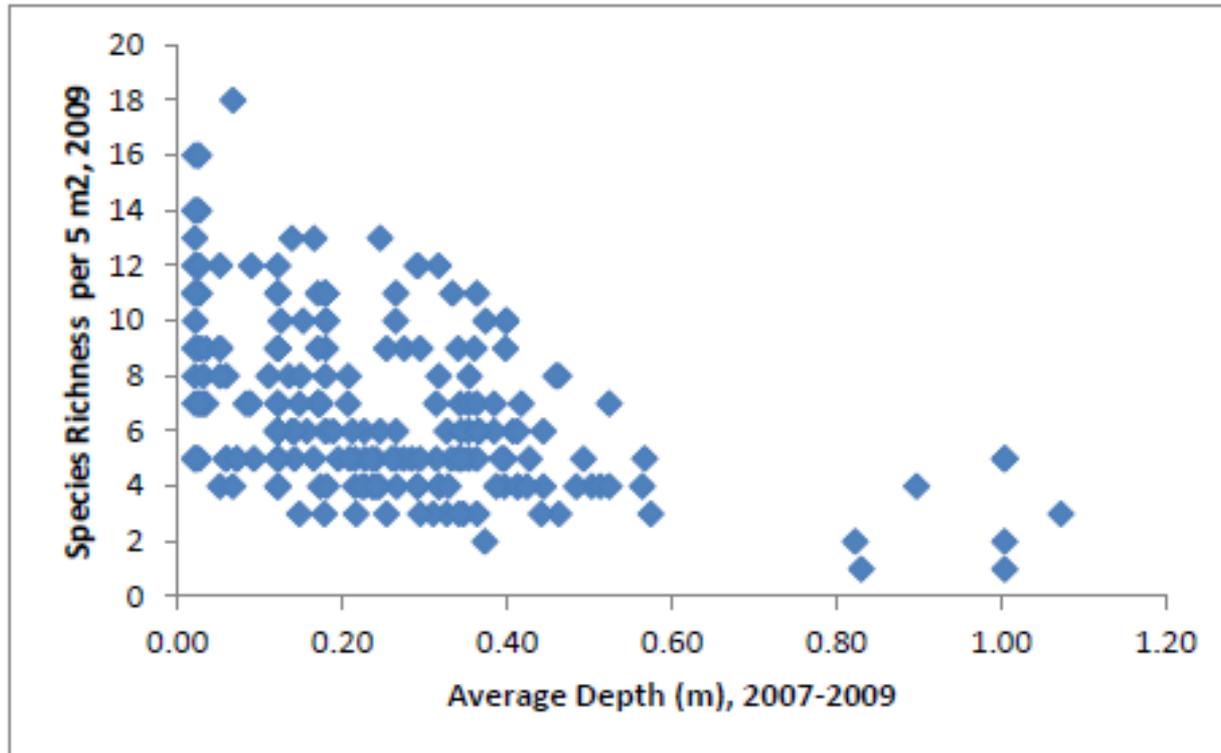
- The desirable plant community is not distributed by soil condition in the first 3 years



Factors Influencing Establishment of Desired Community

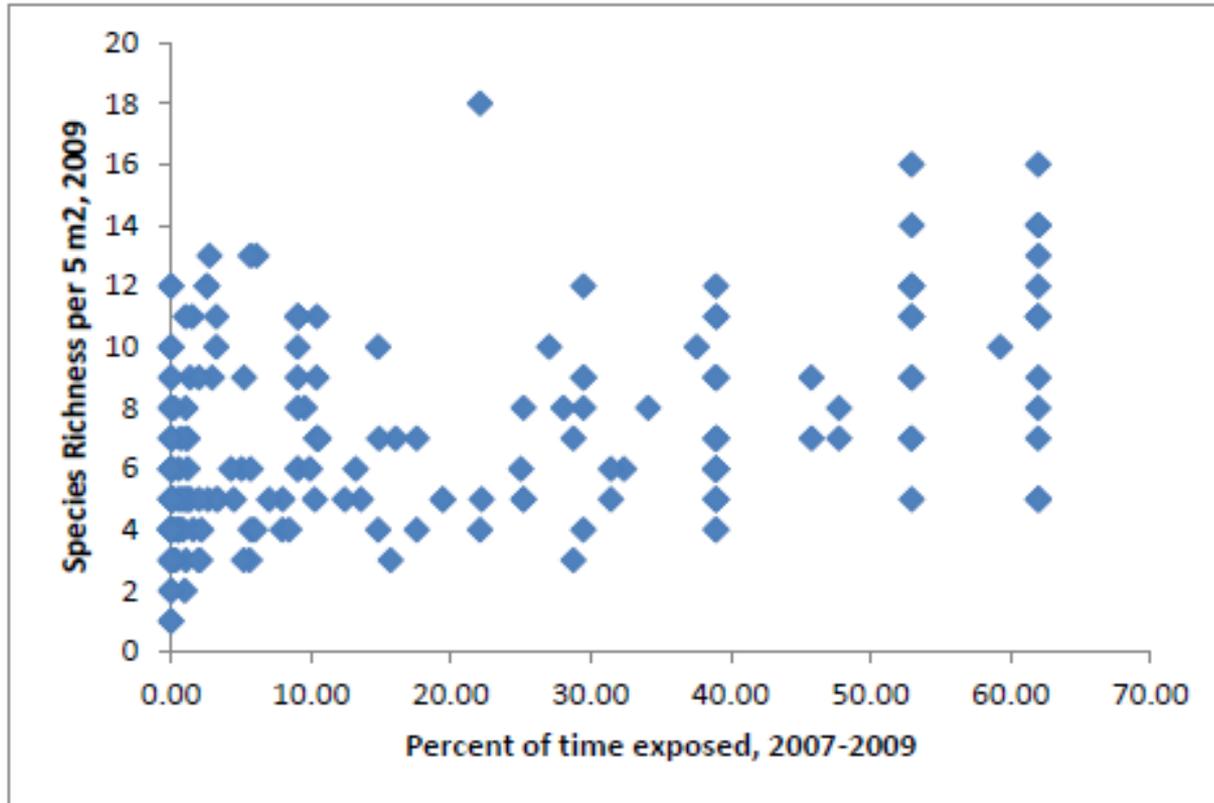
- Seed Bank
- Soil Quality
- Hydrologic Regime

Hydrologic Regime

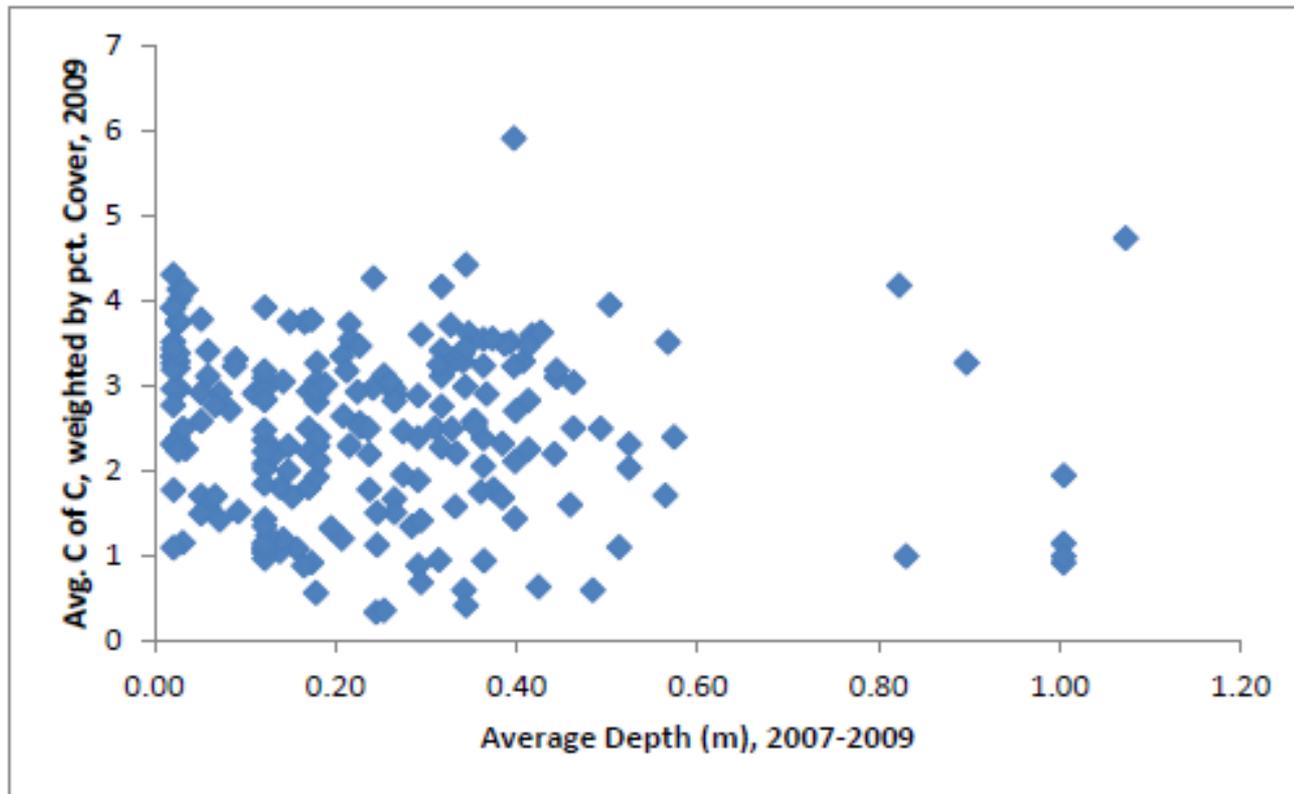


Vascular plant species per 5m² plot in 2009 by average depth per plot, 2007-2009.

Hydrologic Regime

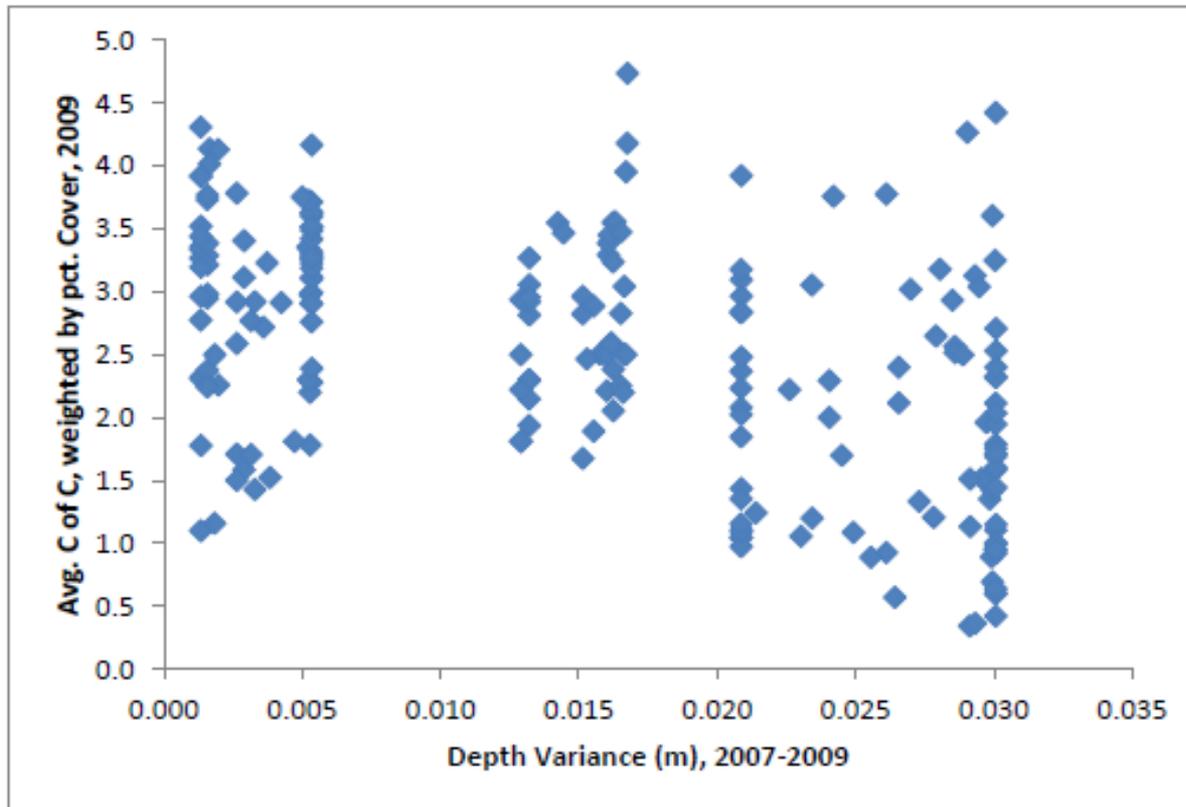


Hydrologic Regime



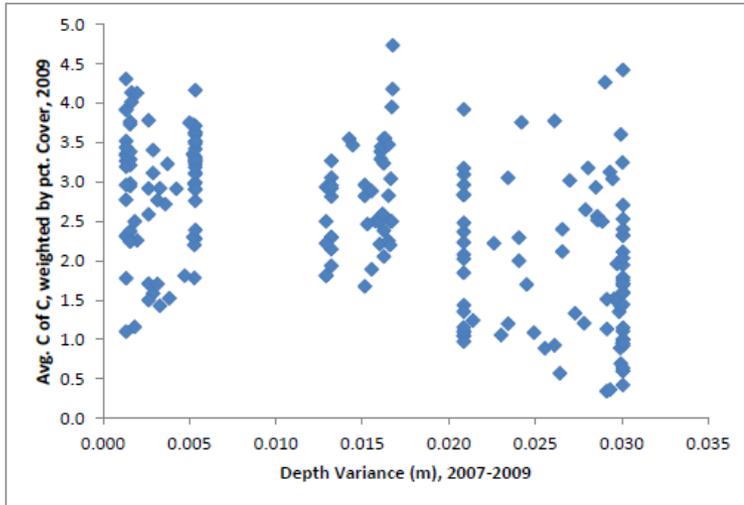
Mean Coefficient of Conservatism per 5 m² plot in 2009 by average plot depth, 2007-2009.

Hydrologic Regime

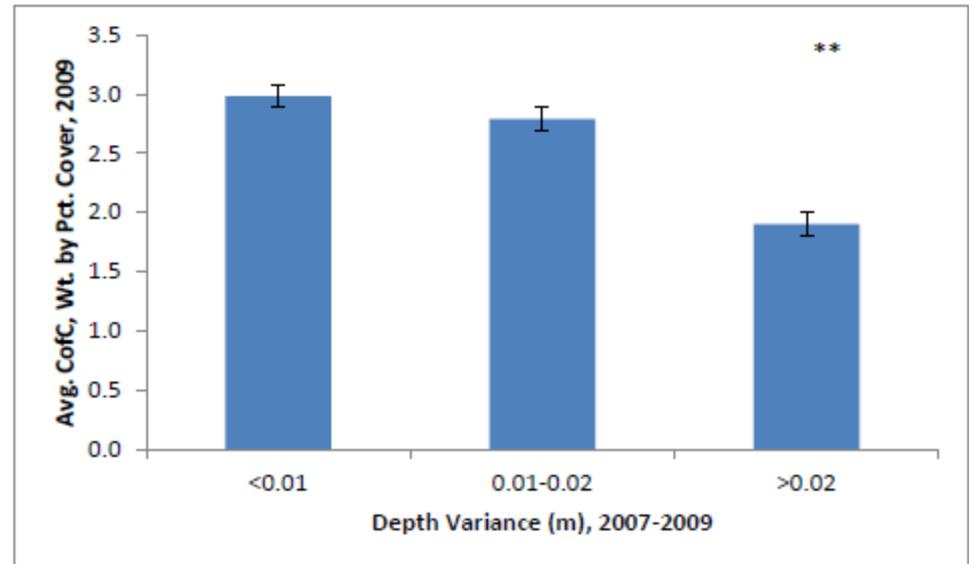


Mean Coefficient of Conservatism per 5 m² plot in 2009 by plot depth variance, 2007-2009.

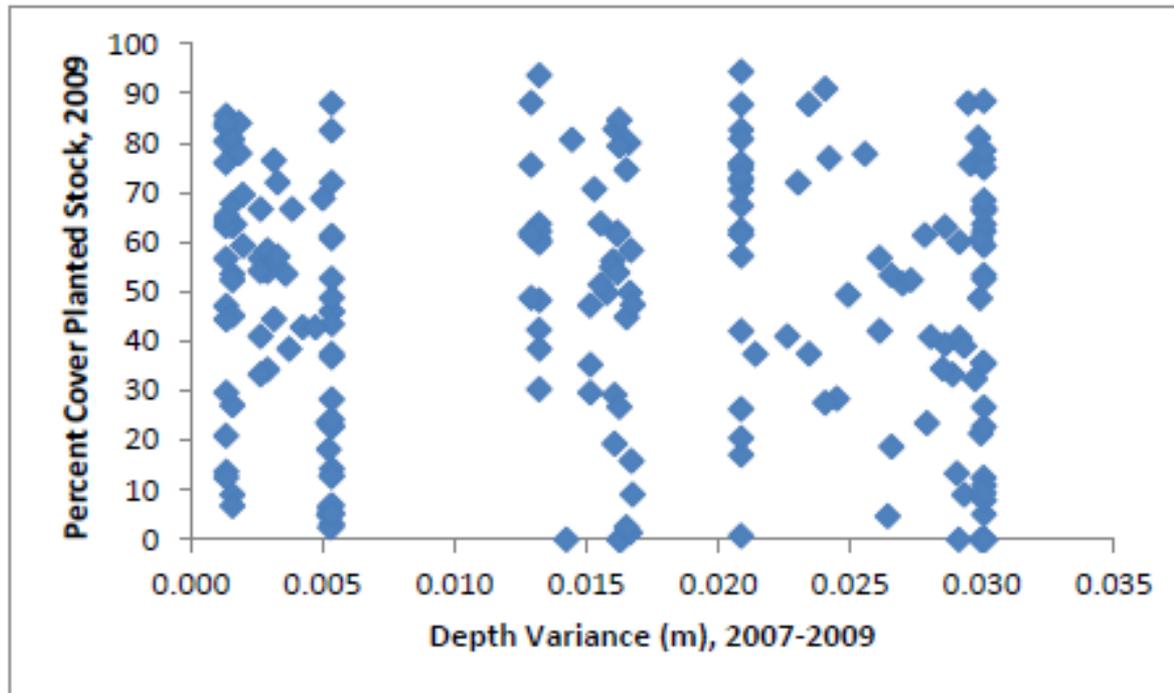
Hydrologic Regime



Mean Coefficient of Conservatism per 5 m² plot in 2009 by plot depth variance, 2007-2

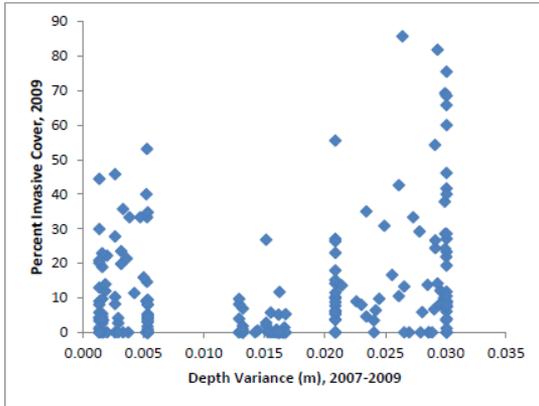


Hydrologic Regime

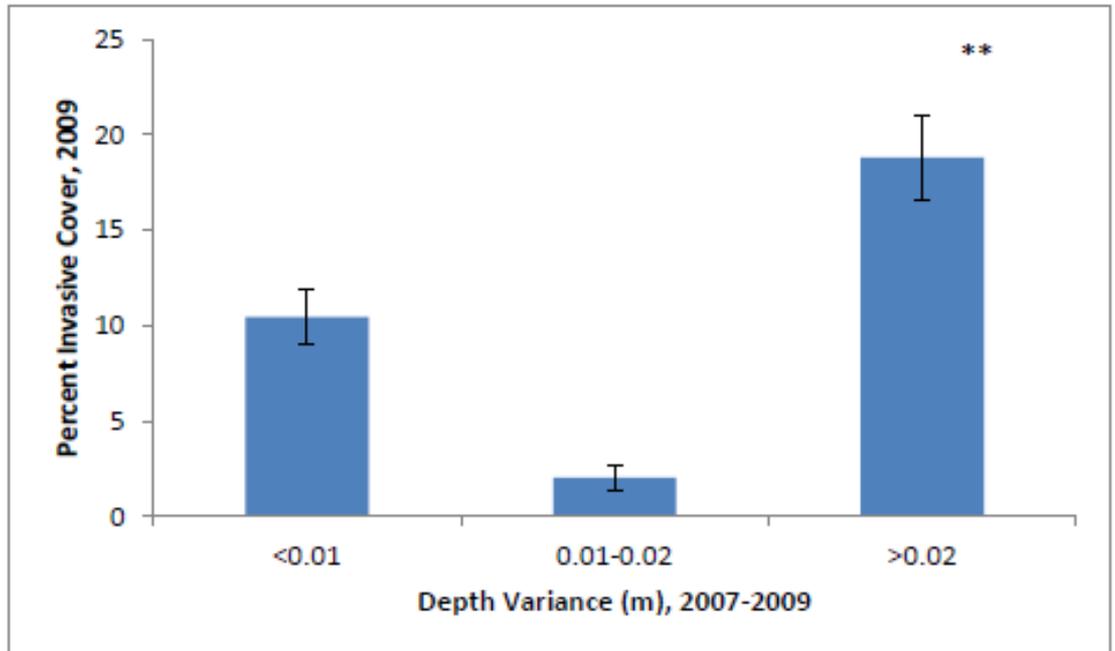


Percent cover planted stock per 5m² plot in 2009 by depth variance per plot, 2007-2009.

Hydrologic Regime



Percent cover invasive vascular plants per 5m² plot in 2009 by depth variance per plot, 2007-2009.



Observations

- Greater diversity is associated with shallow depths with frequent exposure
- Greater floristic quality and lower invasive cover are seen in plots with lower depth variance

Implications

- Constructing and managing for low depth variance in the first three years may be conducive to floristic quality
- Surveys for monitoring and evaluation should be spatially explicit

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