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Development of an Everglades Slough Vegetation Performance Measure

Greater Everglades Ecosystem Restoration Conference
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Methods

- *Conducted extensive review of scientific studies*
- *Performed mesocosm studies*
- *Developed metrics and targets*
- *Based Performance Measure (PM) targets on the best available scientific data*
- *Incorporated meteorological variability into scientific PM target*
- *Selected current ridge and slough indicator regions (IRs) for PM application*
- *Performed Combined Structural and Operating Plan (CSOP) and Draft Tamiami Trail Limited Reevaluation Report (LRR) analysis*

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Hydrology for white water lily/slim spikerush

~365 hydroperiod

~2.0-3.28 ft depth

Conti and Gunther 1984

Welch et al. 2004

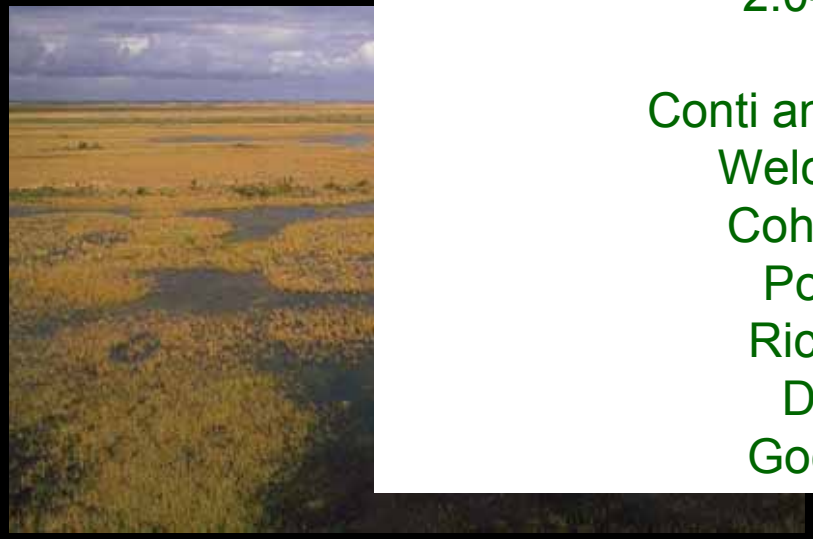
Cohn et al. 2004

Powers 2005

Richards 2007

David 1996

Goodrick 1974



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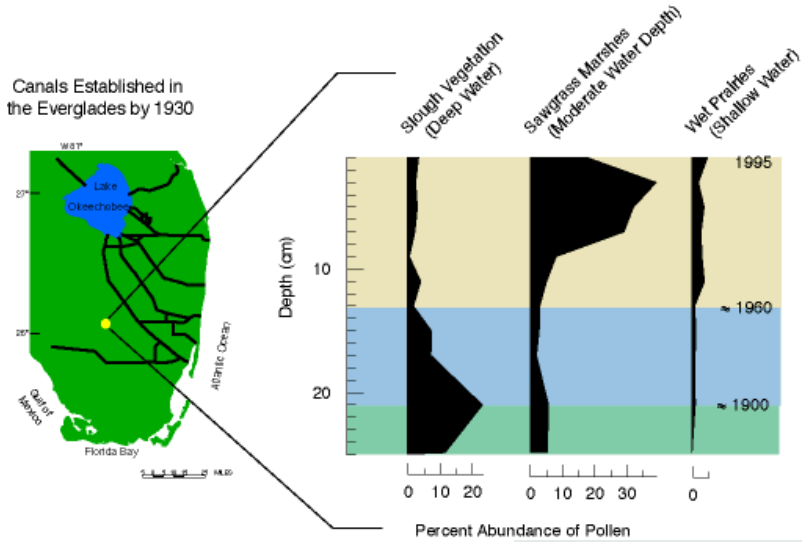
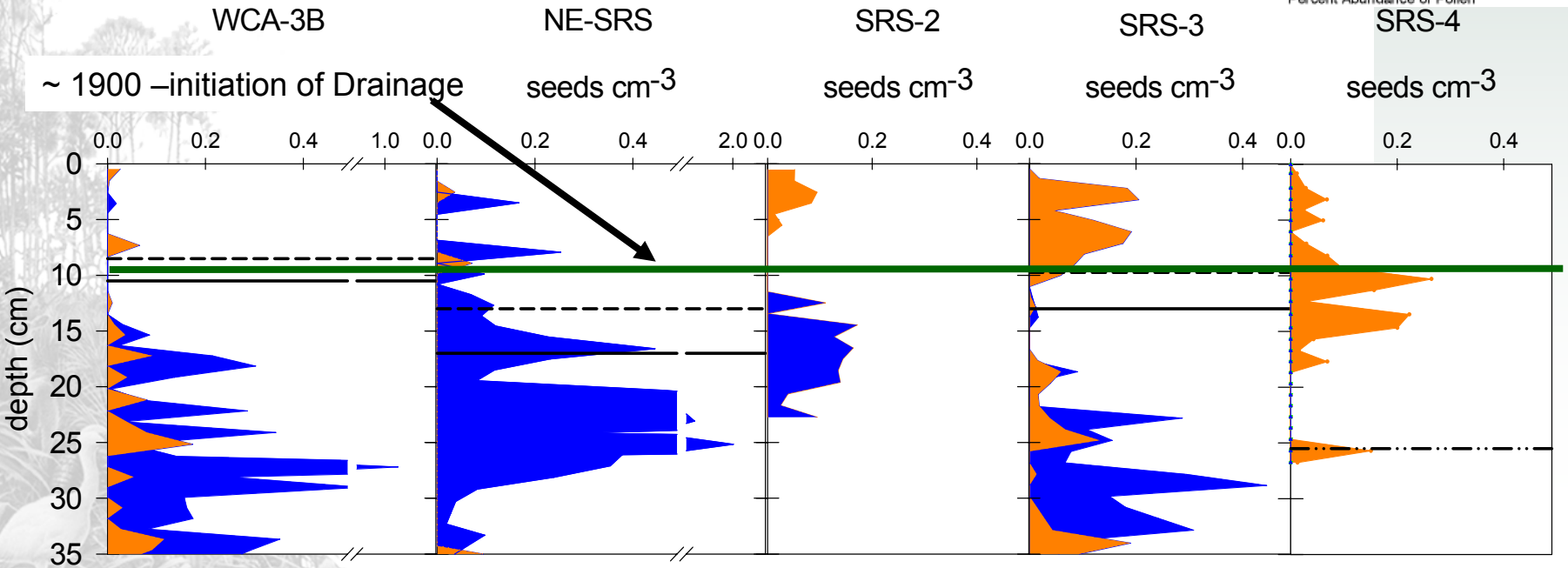
Why is white water lily suitability a good indicator?

Debra Willard (USGS)
South Florida Information Access
http://sofia.usgs.gov/sfrsf/rooms/historical/soils/past.html)





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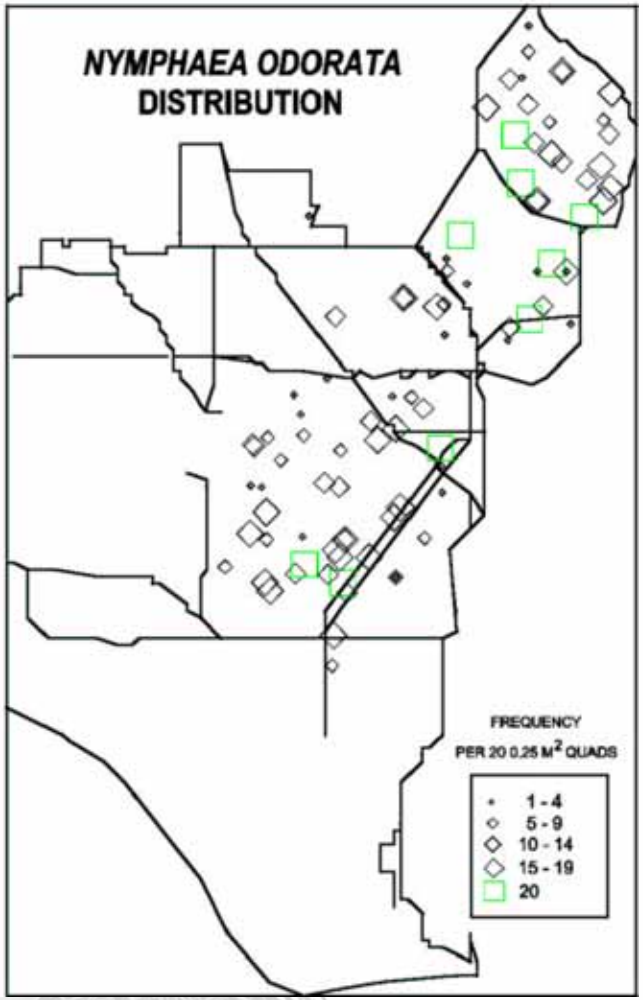
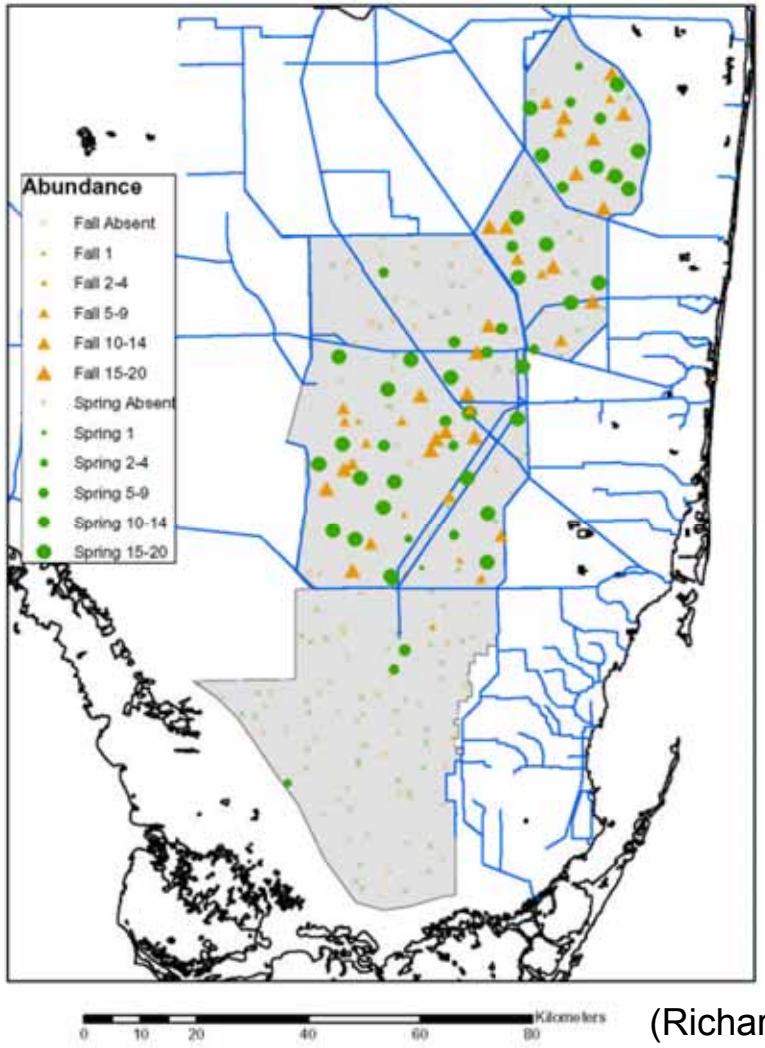
REMAP Data: Current Water Lily Distribution and Abundance

1999



(Stober et al, 2001)

2005



(Richards et al, in press)

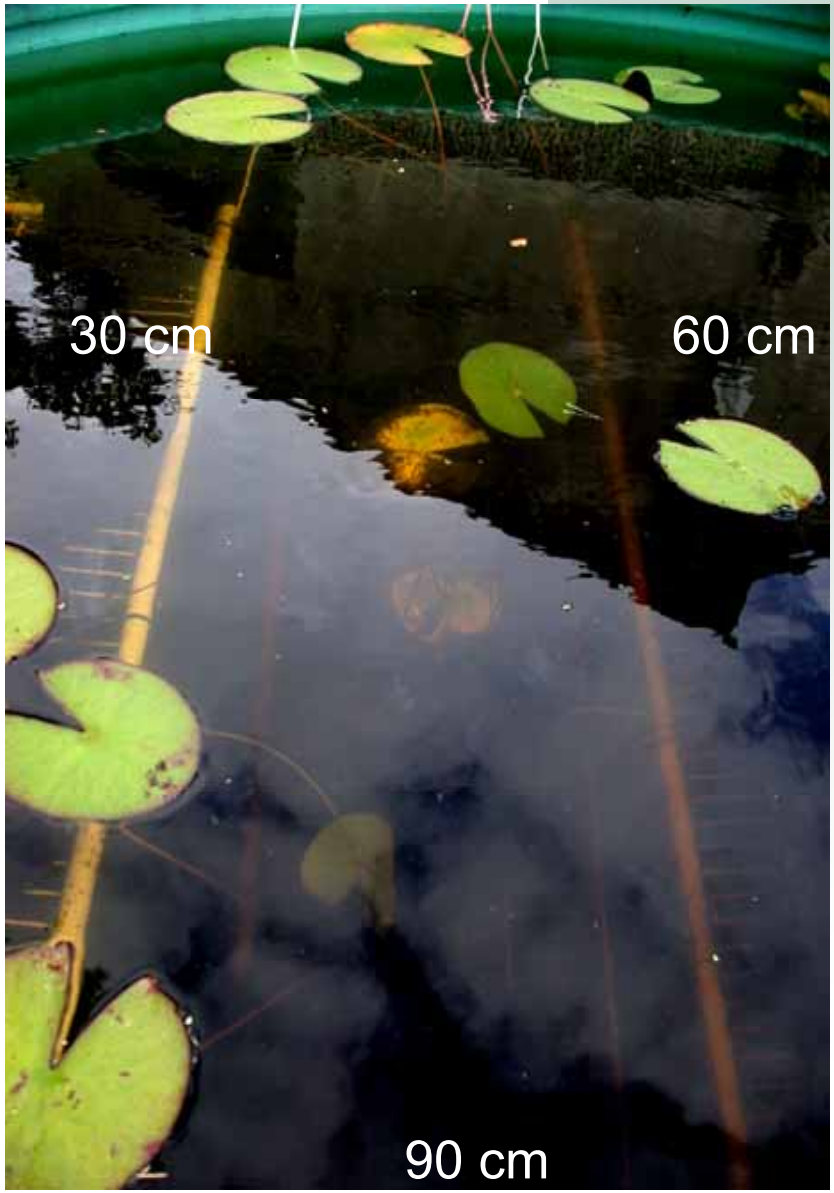
Experimental Tank Design

3 water levels:

- *Shallow - 30 cm (~1 ft) depth*
- *Medium - 60 cm (~2 ft) depth*
- *Deep - 90 cm (~3 ft) depth*

3 replicate plants per depth

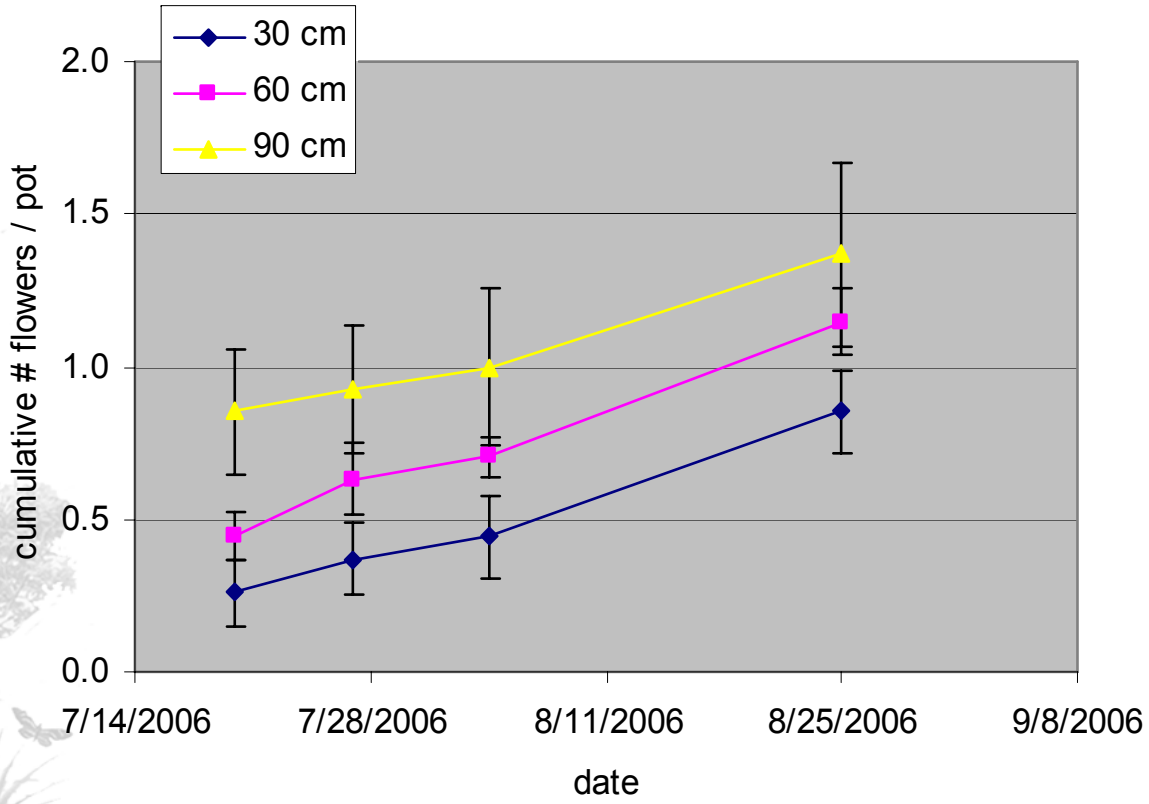
9 tanks



Root Productivity, Water Level Experiment

		Harvested Cores				***Root In-growth Bags***			
		Initial Biomass		Change in Biomass		Final Biomass		Root Productivity Rate	
Treatment	Water Level cm	mg	se	mg cm^{-3}	se	mg cm^{-3}	se	mg cm^{-3} d^{-1}	se
Water Level	30	10.25	1.98	0.228	0.042	0.330	0.056	0.011	0.002
	60	20.12	1.88	0.424	0.041	0.407	0.051	0.014	0.002
	90	18.36	2.22	0.395	0.053	0.736	0.089	0.025	0.003

White water lily flowers counted in three water depth treatments.
Values represent means per pot ± 1 SE (*n* = 9).



(Saunders et al, 2008)

Summary of white water lily mesocosm studies

- *Root biomass and seed production is significantly higher at 60 cm and 90 cm than 30 cm.*
- *Flower production is significantly higher at 90 cm than 60 cm and 30 cm respectively.*
- *Physiologic impacts are significantly higher with drydown events of duration below 21.3 cm.*

Estimated hydrologic optima for slough vegetation

Experimental/Field Study Targets:

- *Continuous hydroperiod ~365 days/year*
- *Wet season maximum depth ~3.0 ft*
- *Continuous dry down events ~ ≤ 0.7 ft – minimal events*
- *Dry season minimum depth ~ 1.0 ft*

PM Metric Targets:

- *Continuous hydroperiod ~365 days/year*
- *Continuous dry down events ~0.7 ft – minimal events*
- *Wet season average depth and dry season average depth were used since the SFWMM 2X2 best simulates seasonal averages.*
  - *"Normal" wet season average depth ~2.25+ ft; no penalty for higher depths*
  - *"Normal" dry season average ~2.0 ft*

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How was the Slough Vegetation PM Target Obtained?

- *Based on the hydrologic optima for white water lily and slim spikerush.*
- *Used Natural System Model (NSM) 4.6.2 to simulate temporal variability.*
- *Generated frequency distributions for hydrologic metrics in the NSM 4.6.2 ridge and slough IR cells.*
- *Selected the IR cell with the hydrologic conditions that most closely matched the slough vegetation hydrologic optima to generate the PM target.*
- *Result: The PM target is the empirical frequency curves from NSM that most closely match our slough vegetation hydrologic optima.*
- *These frequency curves are then evaluated at cells in defined ridge and slough IRs (IRs 110-133).*

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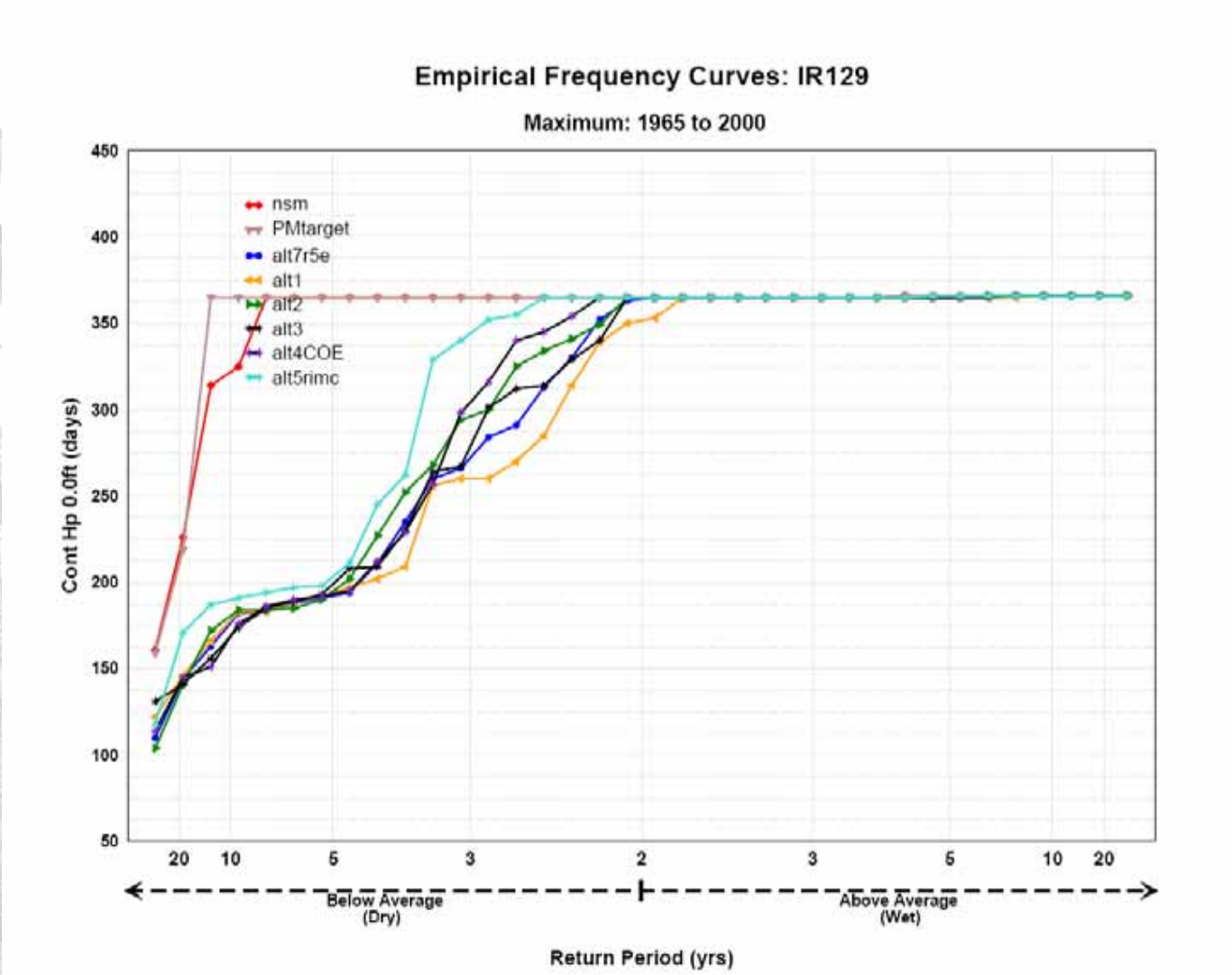
Continuous Hydroperiods for CSOP Alternatives at IR129



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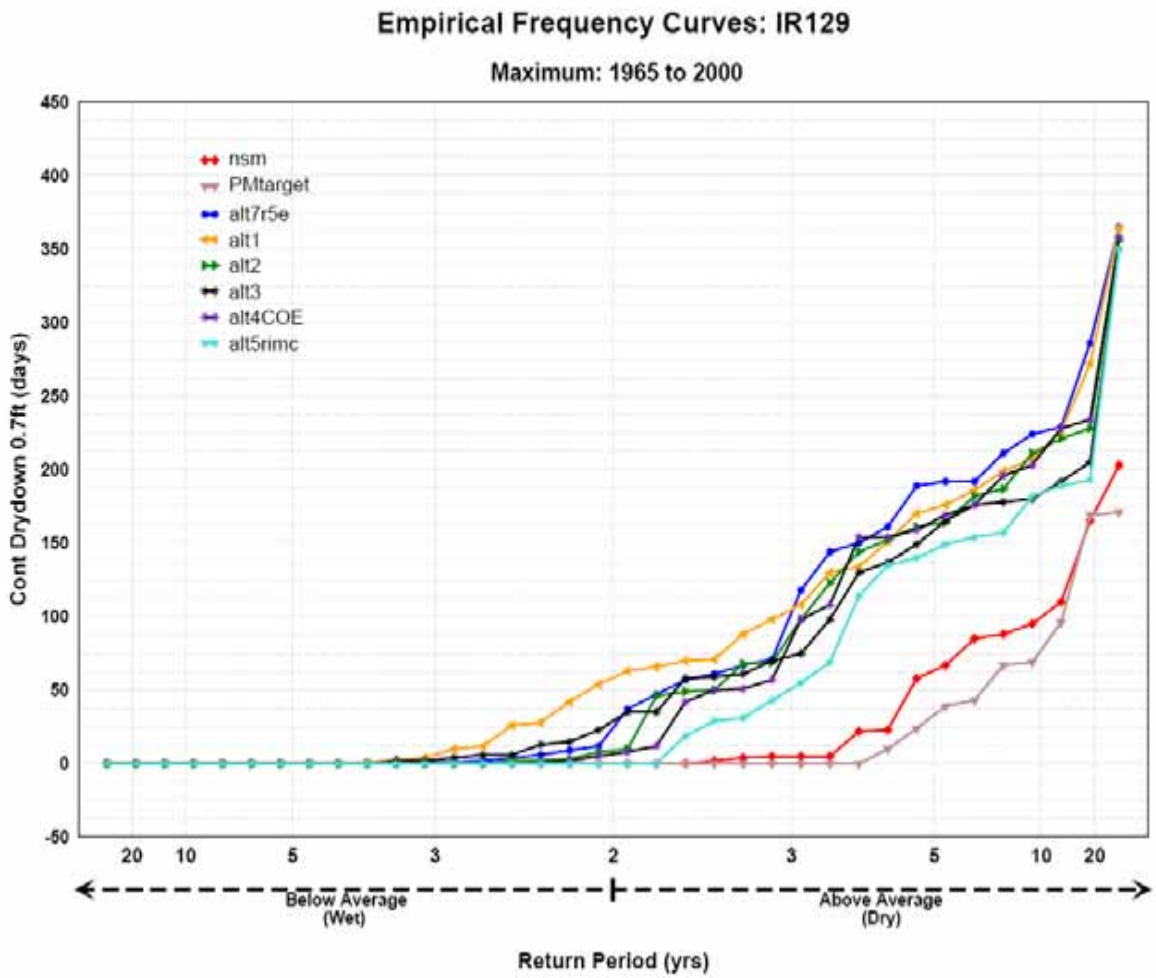
Continuous Drydowns below 0.7 feet for CSOP Alternatives at IR129



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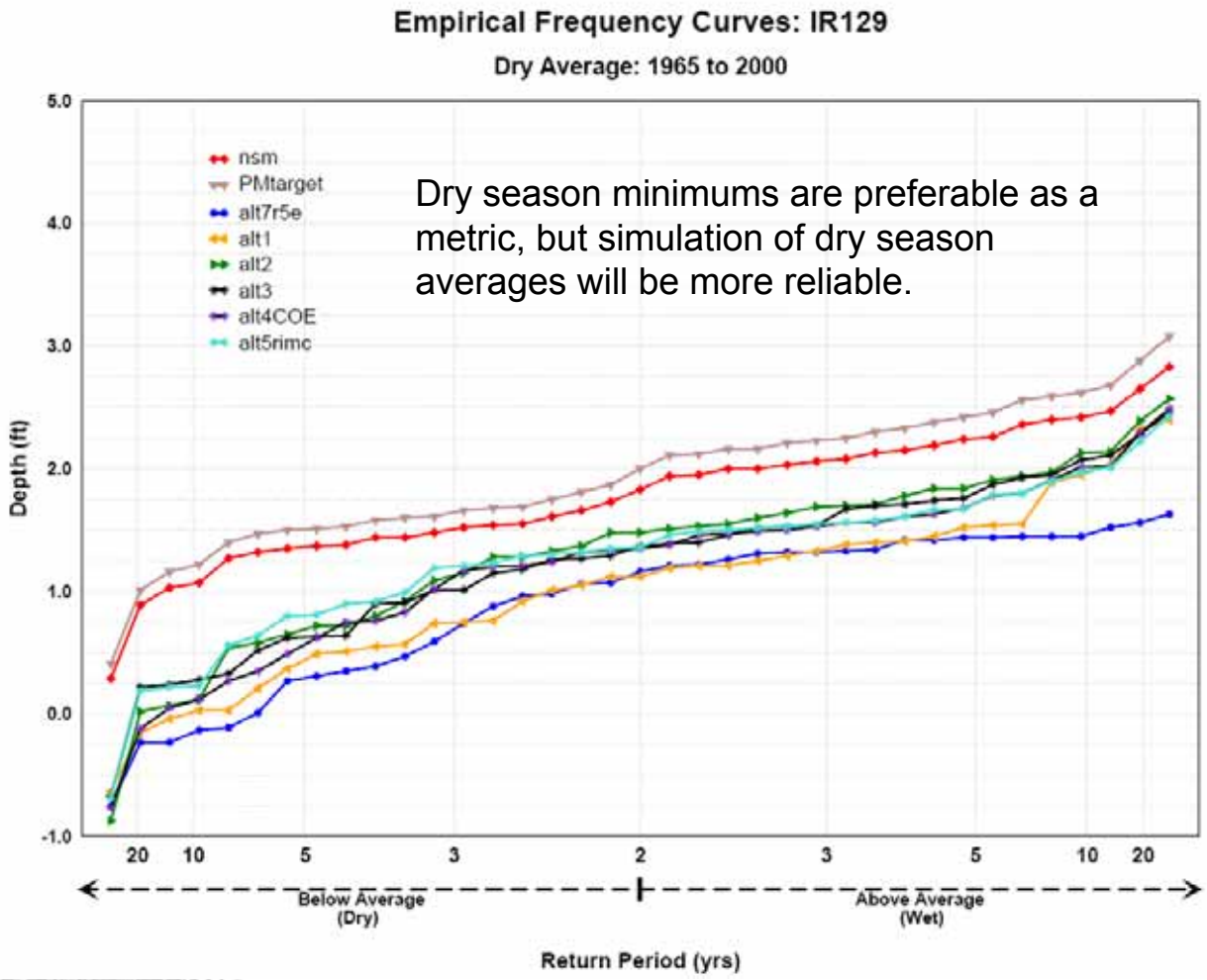
Dry Season Average depths for CSOP Alternatives at IR129



Dry season minimums are preferable as a metric, but simulation of dry season averages will be more reliable.

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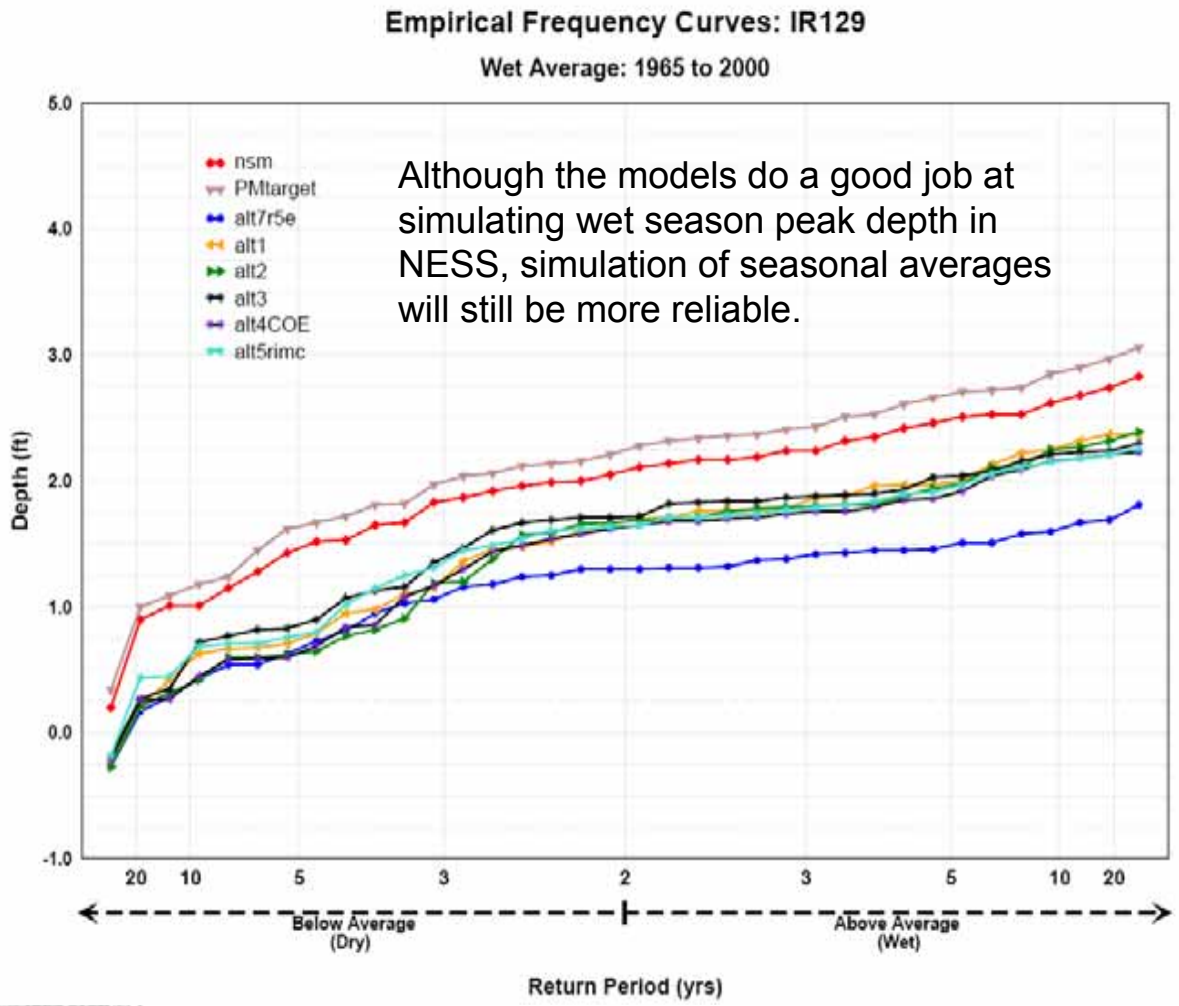
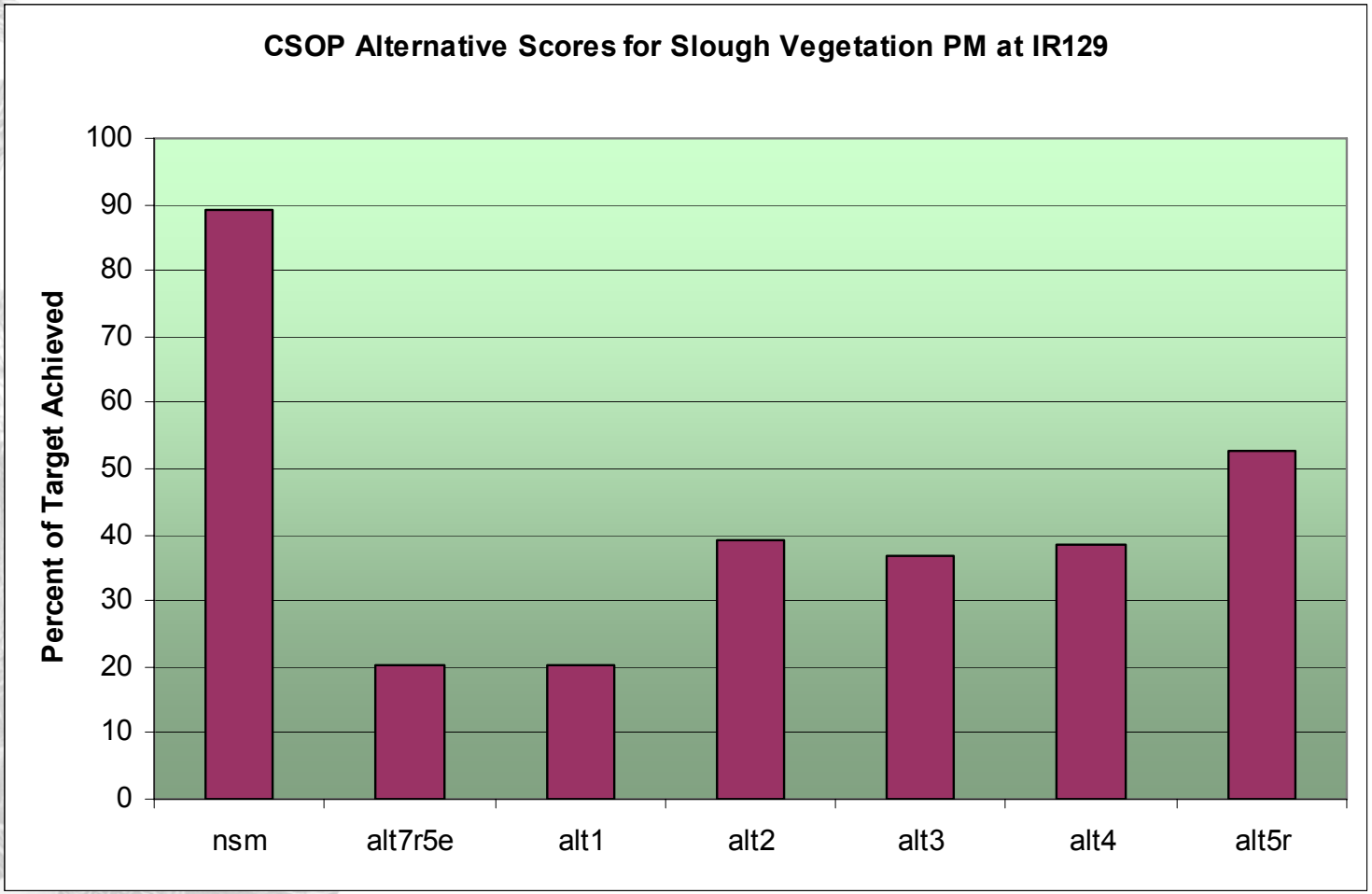
Wet Season Average Depths for CSOP Alternatives at IR129



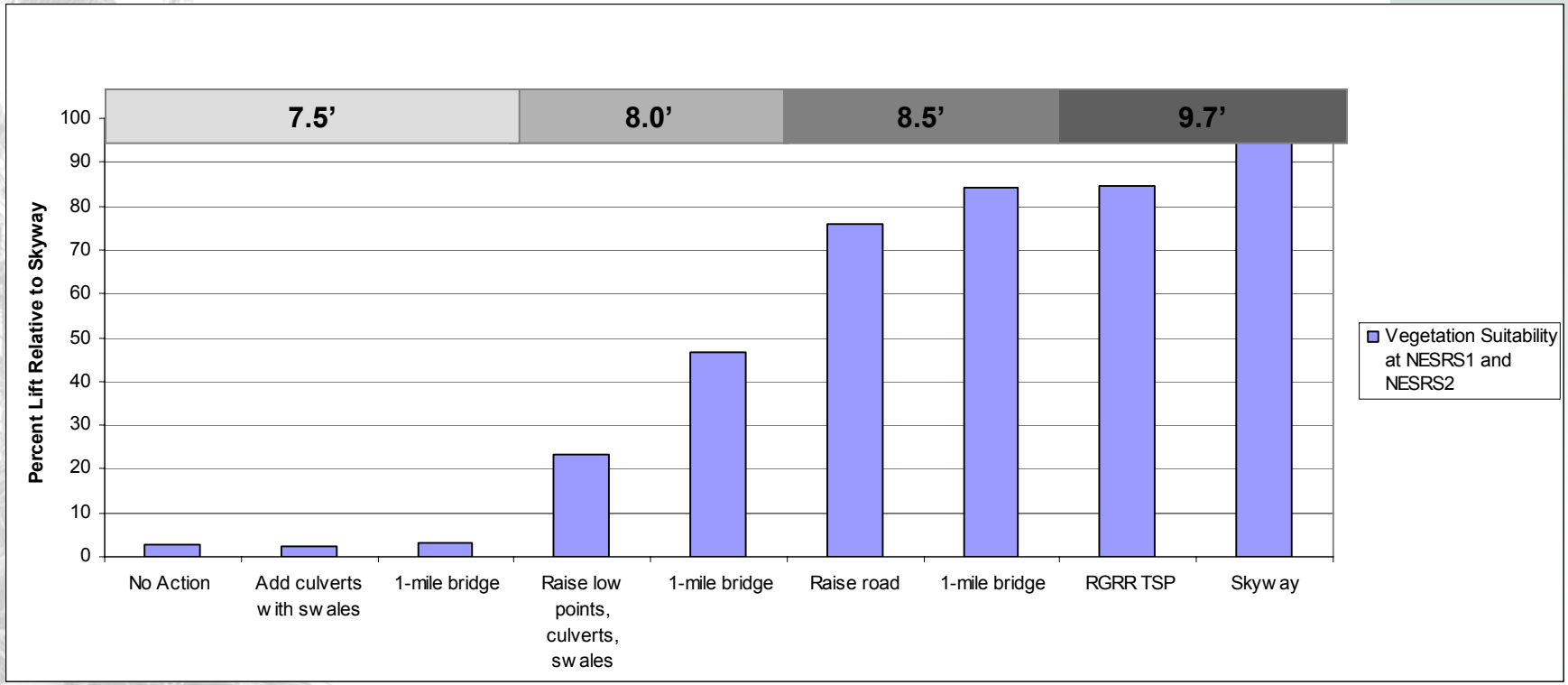
Although the models do a good job at simulating wet season peak depth in NESS, simulation of seasonal averages will still be more reliable.

CSOP Alternative Scores for Slough Vegetation at IR129



Slough Vegetation Suitability PM Results for Potential Tamiami Trail Restoration Projects

Slough vegetation benefits accrue as L-29 canal stage and conveyance capacity increases



Conclusions

- *Slough vegetation hydrologic optima were identified from a comprehensive review of best available scientific studies.*
- *The estimated hydrologic optima requirements were used to build a Slough Vegetation PM.*
- *PM targets are based on the best available scientific data and frequency curves were used to provide temporal variability to targets.*
- *This PM could be applied to evaluate local project effects as well as at the GE regional level.*
- *The CSOP and LRR applications provide support that this is a viable PM that could potentially be used to evaluate ecologic benefits of other pre-CERP and CERP restoration projects.*

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