


An Evaluation of Coastal Restoration Projects in Louisiana for Nutrient Credit Trading in the Lower Mississippi River Basin

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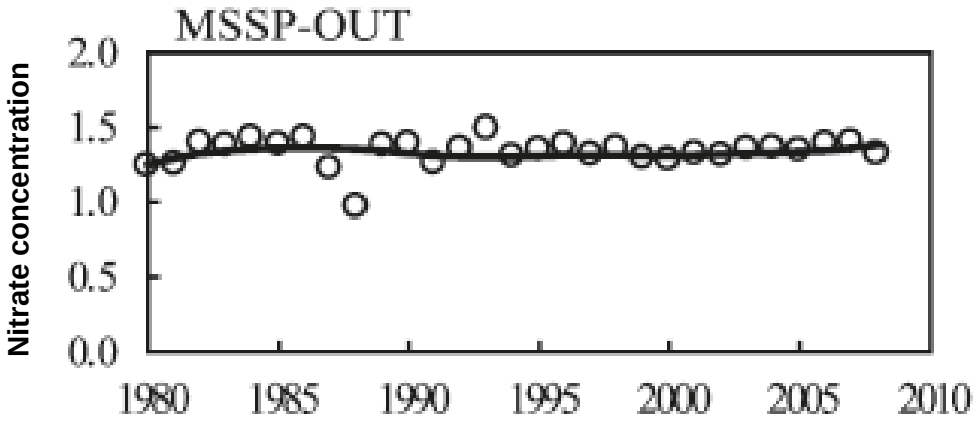
Nitrate in the Mississippi River

- 'Dead Zone' the size of New Jersey
- Nitrate loadings essentially unchanged for 2 decades
- Environmental groups are suing EPA over lack of setting nutrient criteria for the Miss. R. basin states

"…little consistent progress has been made since 1980…"



Sprague, L.A. et al. 2011. Nitrate in the Mississippi R. and Its Tributaries, 1980-2008: Are We Making Progress? Environ. Sci. Tech

Stemming Nutrient Pollution Along the Mississippi River

- Nutrient credit trading
  - Used in smaller watersheds
  - Regulatory drivers lacking along the Ms R.
- Restoration measures
  - designing wetlands for agricultural landscape
  - large floodplain projects
  - coastal river diversions

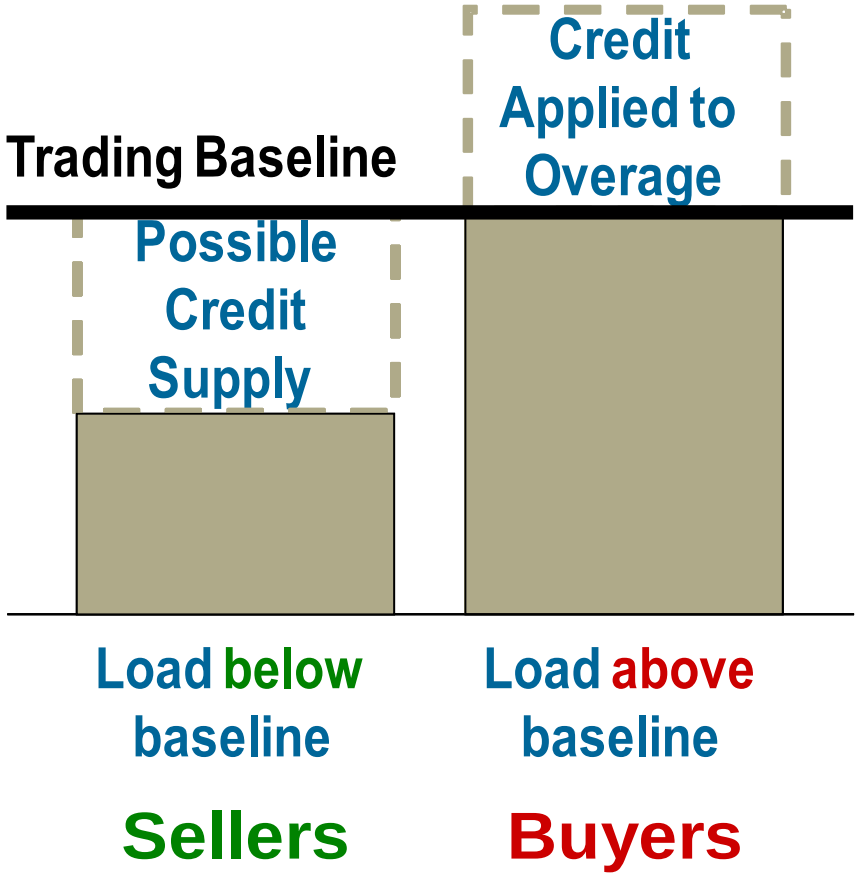
Nutrient Credit Trading

- Entity subject to a nutrient reduction requirement

  PS discharger

- Meets or exceeds its responsibilities by purchasing a cost effective, **demonstrably equivalent** treatment option

- Credit sellers can be NPS or PS



Project Components

Nutrient **removal capacity** of delta wetlands?

Credit **supply** CPRA projects can generate?

Nutrient removal **costs?**

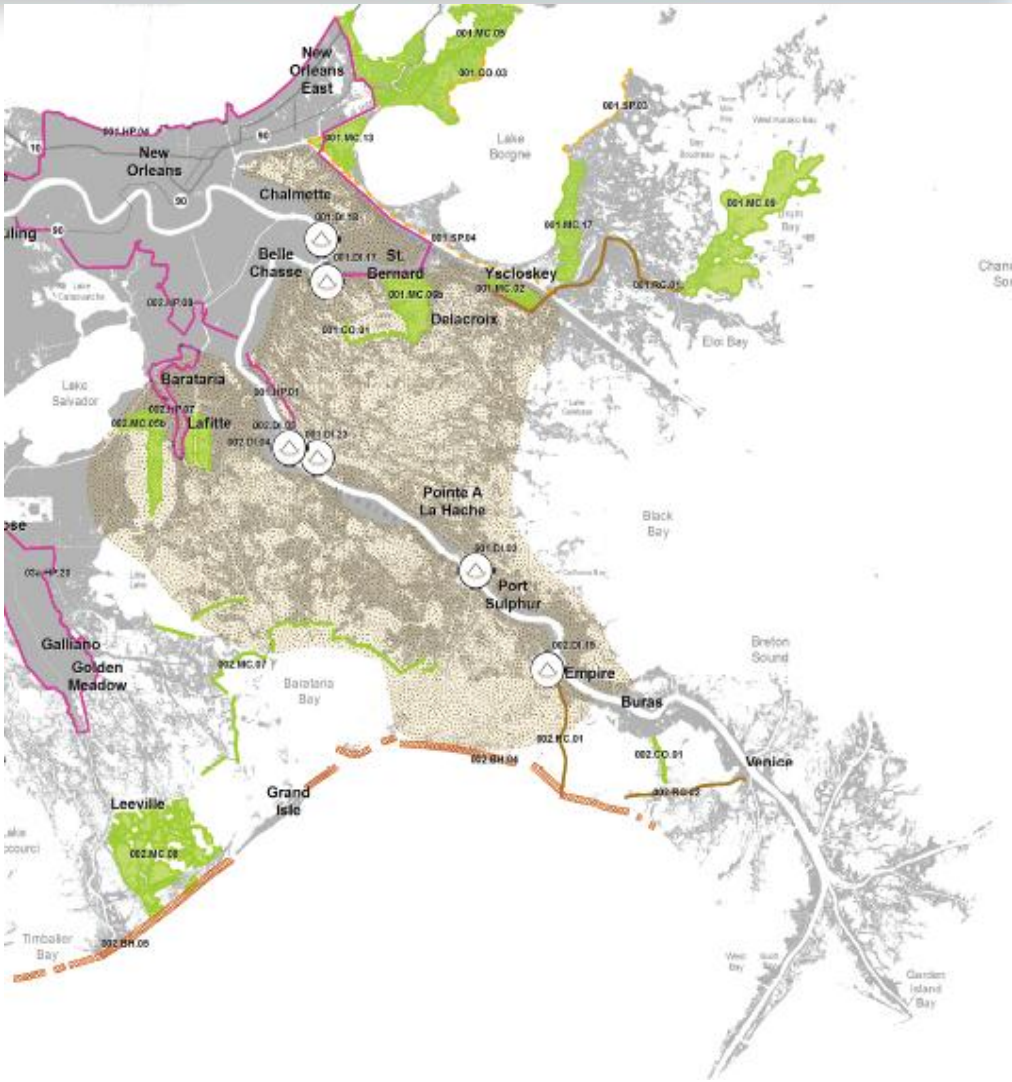
What could **demand** look like in the future?

Louisiana's Coastal Master Plan: Restoration Project Types

- **River diversions**
  - siphons
  - freshwater diversions
  - sediment diversions

$4 Billion in planned projects

Cumulative flow
400,000 cfs



Sediment Diversions >50,000 cfs

Controlled Freshwater Diversions

1998

2006

- Two diversions operating capacity > 8,000 cfs
- Potential modification to increase flows in future

Nutrient Removal Estimates: Literature and Preliminary Modeling

Scientific Basis for Nutrient Removals: Mass Balance Estimates

Study area	System	Removal Efficiency		Mass Removal	
		TN RE (%)	TP RE (%)	TN g m-2 yr-1	TP g m-2 yr-1
Fourleague Bay[1]	Fluvial	40%	20%	25	1.0
Caernarvon Diversion[2]	Small River Diversion	40%	50%	2.3	0.2
Swamp Forests[3]	Treatment wetland	70%	50%	20	2.0

1 Perez et al 2011; 2 Hyfield et al. 2008, Day et al. 2009; 3 Hunter et al 2009

Estimating Diversion Nutrient Removals: Current and Future Conditions

- Need a tool for estimating the range of conservative nutrient removals on a flow basis
- First-order area based model

CH2M Hill Treatment Wetland Toolkit

(*P-k-C* model*)†

A = Wetland area (square meters m^2)
Q = Flow (cubic meters per year, m^3/yr)
C_i = Influent concentration (mg/L)
C_e = Effluent concentration (mg/L)
C^* =Background concentration (mg/L)
k = First-order, area-based removal rate constant (m/yr)
P = Weathering factor

† *Based on work by Kadlec, Knight, and Wallace*

Model Assumptions
Comparison to Published Estimates

Assumptions:

- diversion operations
- residence time 3 and 12 days

Used similar hydraulic loading estimates from to the Caernarvon diversion (Hyfield et al. 2008)

Compared model and field removal

- TN = **2.0** g/m2/yr
- TP = **0.2 - 0.3** g/m2/yr

Caernarvon - 1998

Caernarvon - 2006

Nutrient Removal Estimates

Residence Time = 12 days 20 ac / cfs		TN	TP
Mass loading	($g/m^2/yr$)	6.1	0.54
Mass removal	($g/m^2/yr$)	2.1	0.31
Removal Efficiency	(%)	34%	58%

N = 250 – 360 lbs / cfs / yr

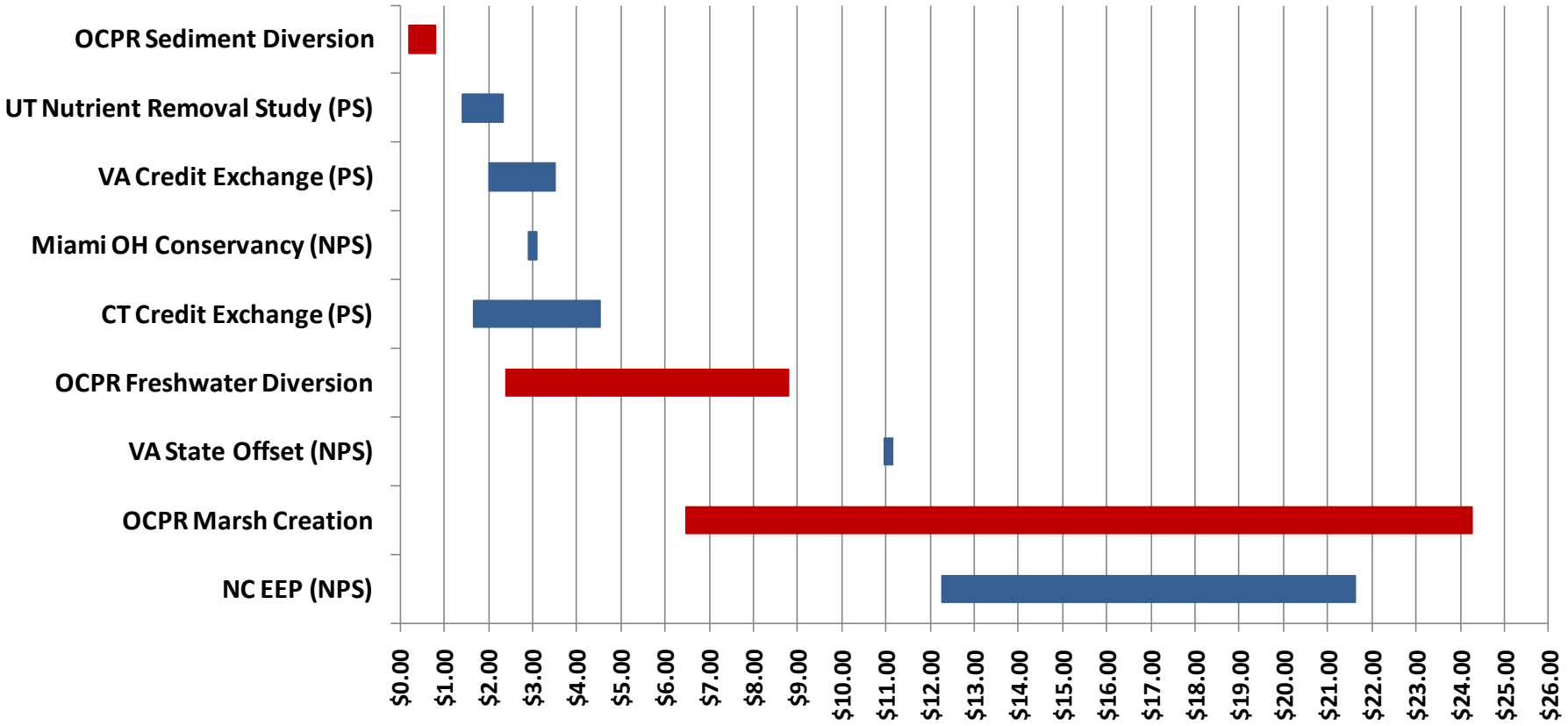
P = 20 – 55 lbs / cfs / yr

Cost Comparison of N and P Removals With Other Trading Programs

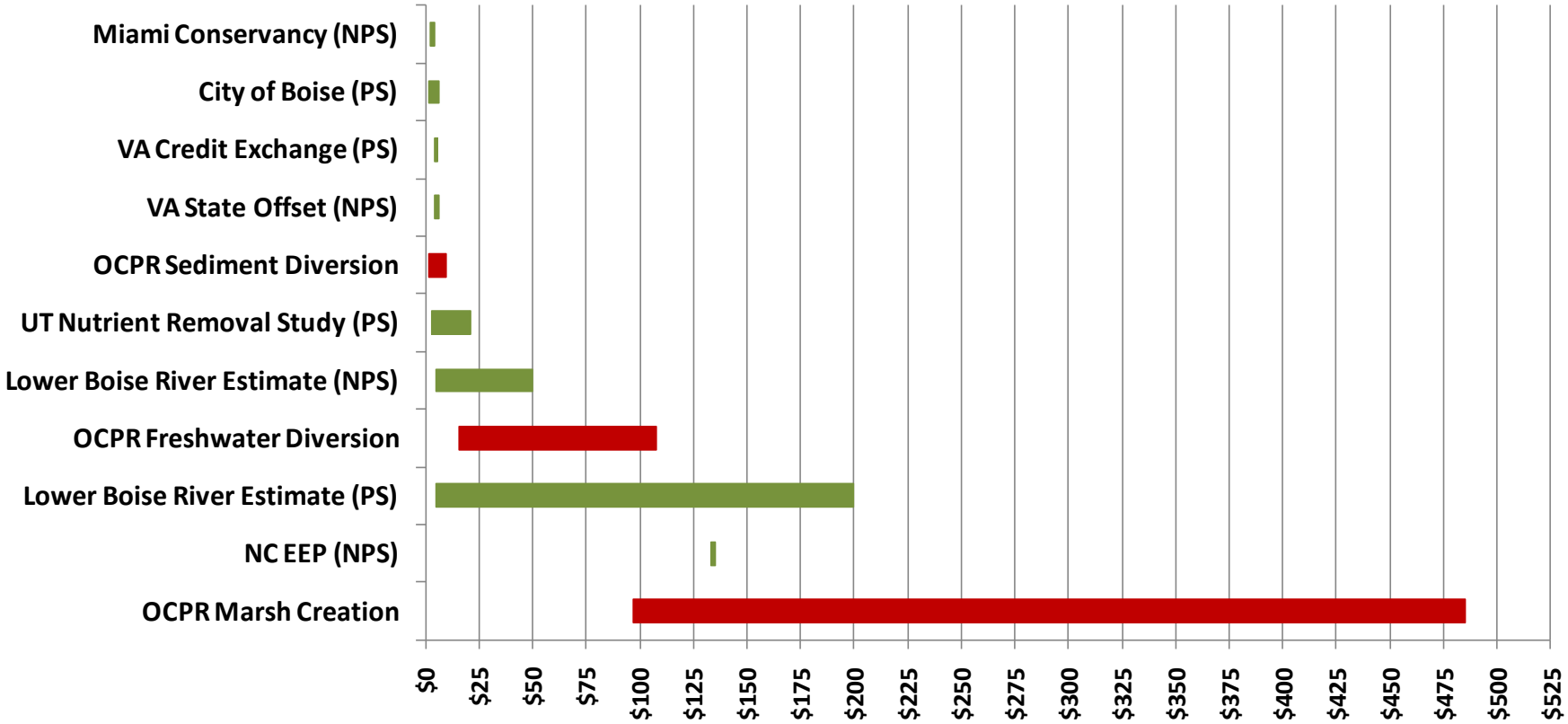
Restoration Project Cost Statistics Summary

		Area for Marsh Creation (ac) Design Flow for Diversions (cfs)			Total Project Costs Million 2011 Dollars		
	# of Projects in Data Set	*Min*	*Max*	*Average*	*Min*	*Max*	*Average*
Marsh Creation	28	133	2,800	745	$ 3.93	$ 62.60	$ 21.54
Freshwater Diversion	11	1,000	35,000	7,468	$ 6.92	$ 177.05	$ 77.24
Sediment Diversion	6	2,500	50,000	21,650	$ 1.40	$ 278.30	$ 61.99

What does it cost to create a N-credit? Comparison with other trading programs

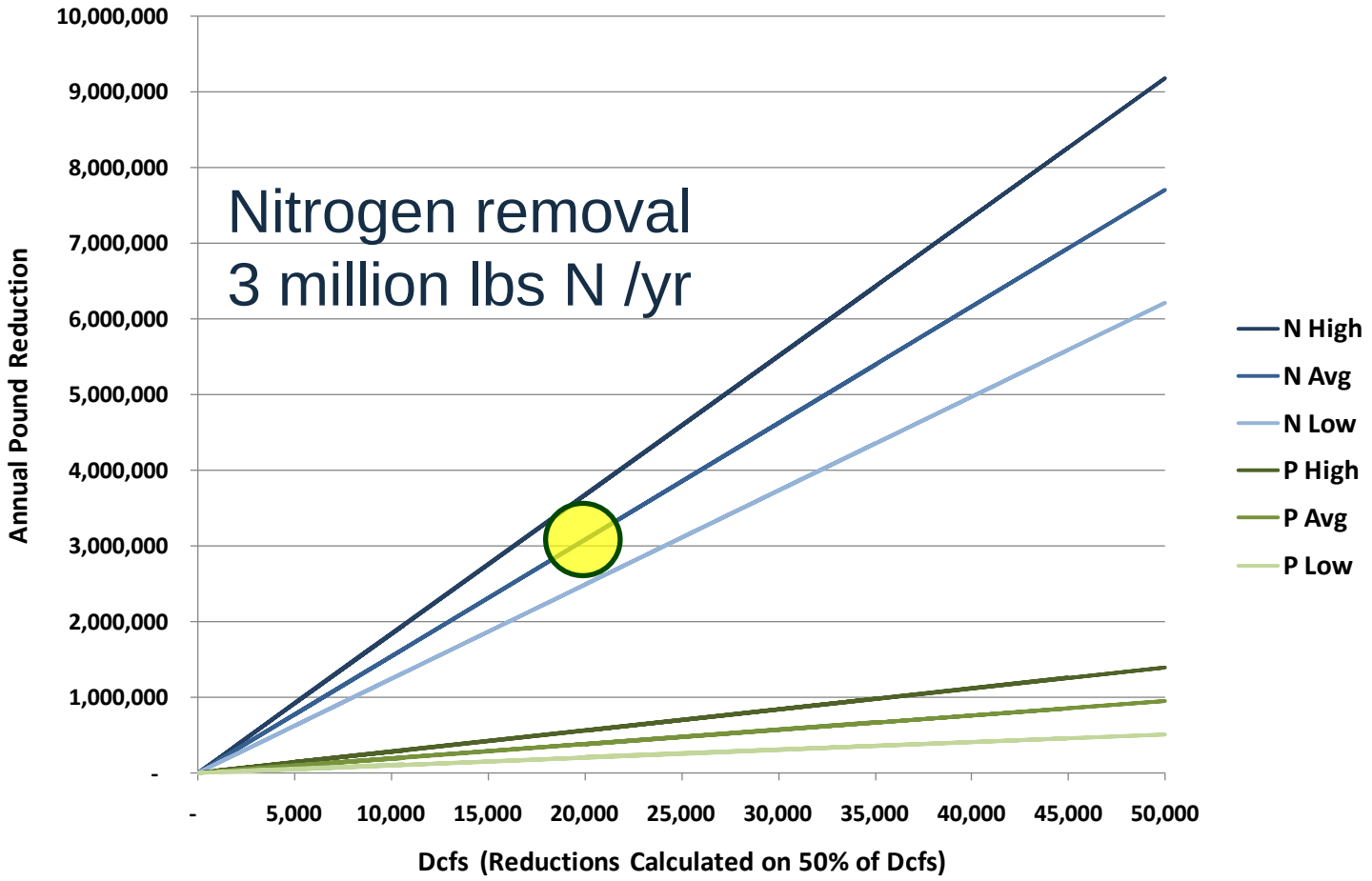


What does it cost to create a P-credit? Comparison with other trading programs



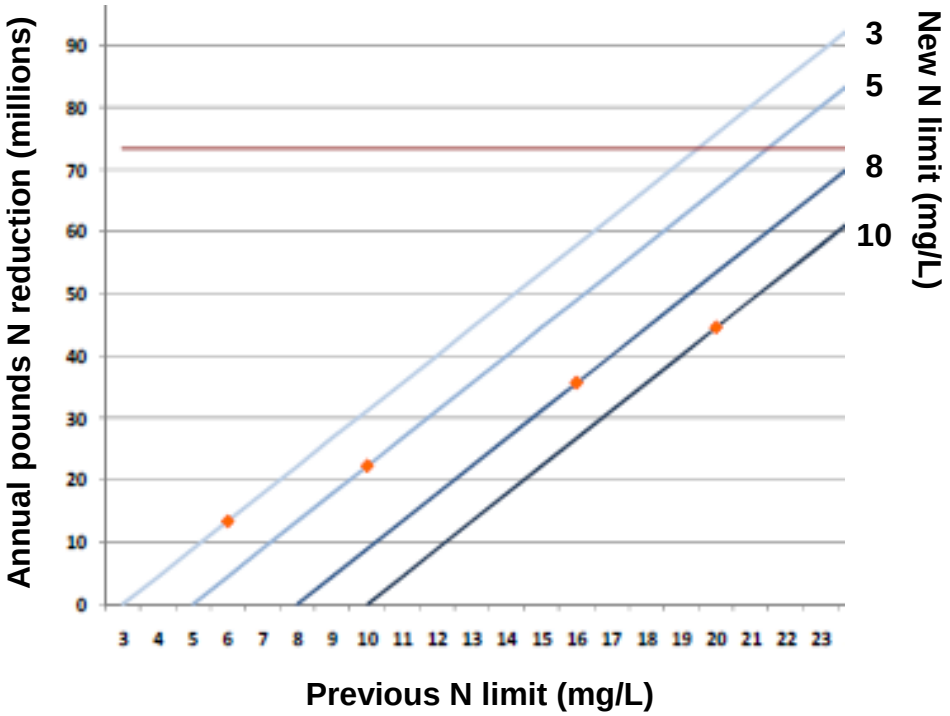
Potential Credit Supply and Demand Scenarios
Illustrations for Louisiana

Annual N and P Supply
Two Diversions, ½ Design Capacity, Op's 3 mo



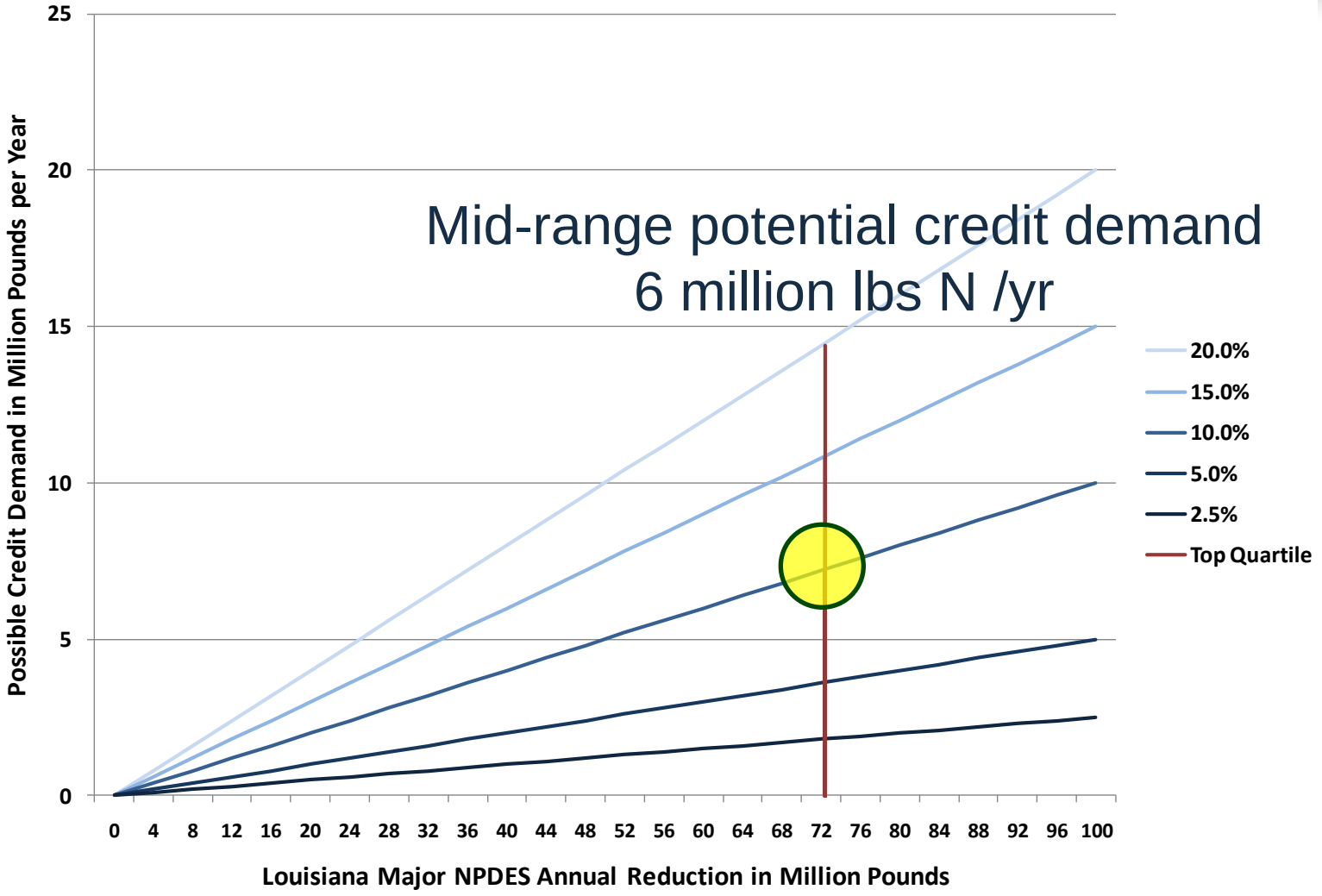
Potential Regulatory Demand
Louisiana NPDES Major Dischargers

- Regulatory demand in LA
  - NPDES major dischargers
  - 2007 discharge = 1,463 MGD *
- Assumed concentration reductions 50%
- ~70 million lbs of N reductions could be required

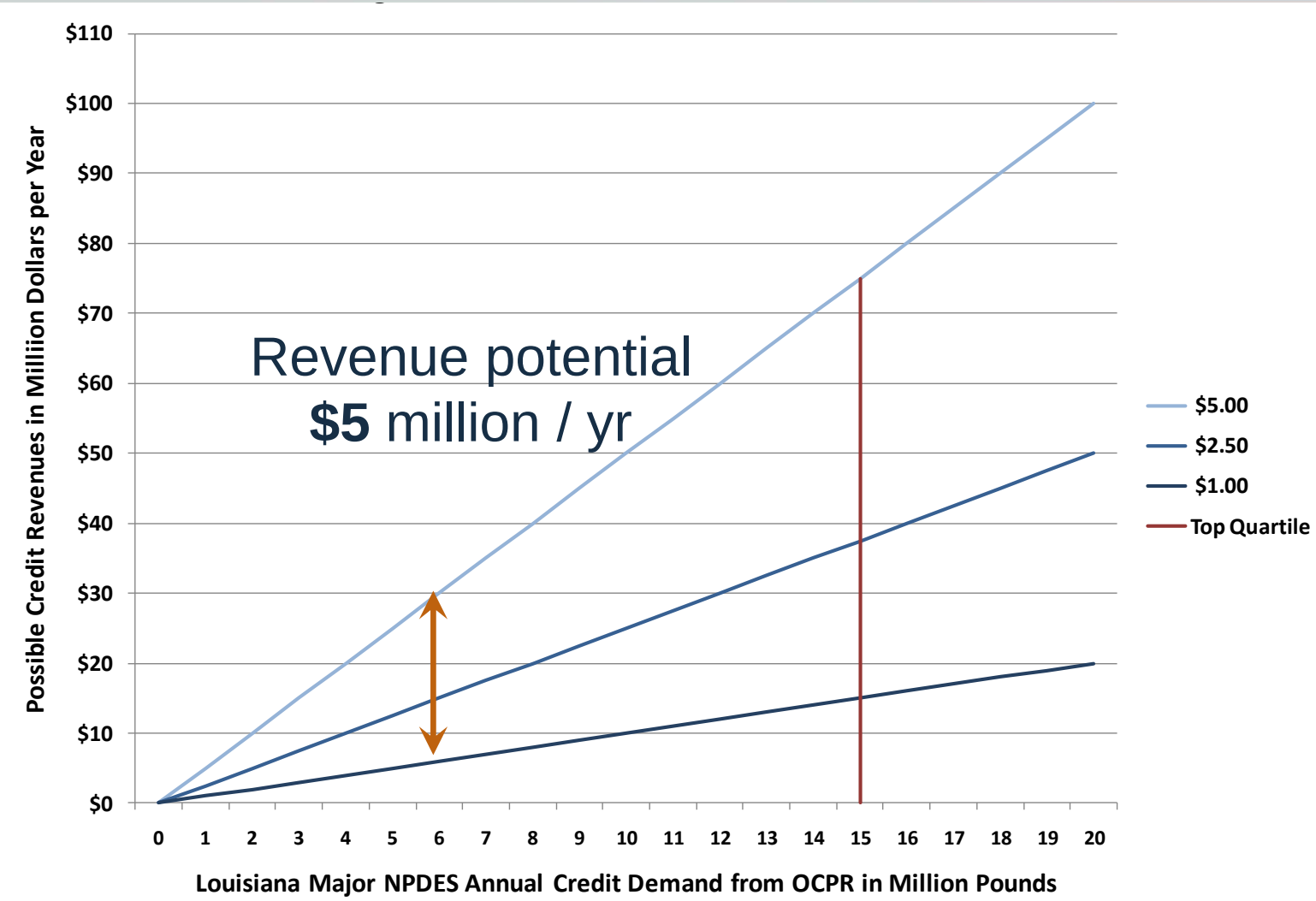


** EPA Discharge Monitoring Report Pollutant Loading Tool (EPA, 2011)*

Potential Nitrogen Credit Demand % Needed for NPDES Compliance



Potential Revenue: Credit Demand and Nitrogen Price



Summary Points

Summary

- **CPRA costs**:
  within range of other programs
- **Profit is not the goal**:
  CPRA may competitively price credits
- **Regulatory drivers:**
  are developing for Miss. R.
- Revenue may be significant enough to **enhance restoration projects**

Challenges and Opportunities

Regulatory

- LDEQ is interested in advancing a platform for nutrient trading

Science

- Project performance needs to be documented
- Need to improve monitoring and prediction tools

Opportunities

- Partner with upstream states for advancing Mississippi River interstate trading

CPRA

Questions?