Stormwater Retrofitting: What's the Real Cost?

(and why is it so hard to figure out?)

2022 Waukesha County Stormwater Workshop

April 14, 2022

Presented by:
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Outline

1. Importance of the presentation
2. How source data was selected
3. Key strengths of data sources
4. Results & Discussion

Why Important?

Wisconsin's MS4 Permits require "retrofit" stormwater pollution reductions

NR 151.13 (2) (b): *". . A 20 percent reduction in total suspended solids, or to the maximum extent practicable, as compared to no controls, for runoff from existing development that enters waters of the state..."*

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Why Important?

TMDL Requirements for MS4s

- Wisconsin's numeric load reductions for individual MS4s
- Meeting WLAs requires pollution reduction from existing urban lands

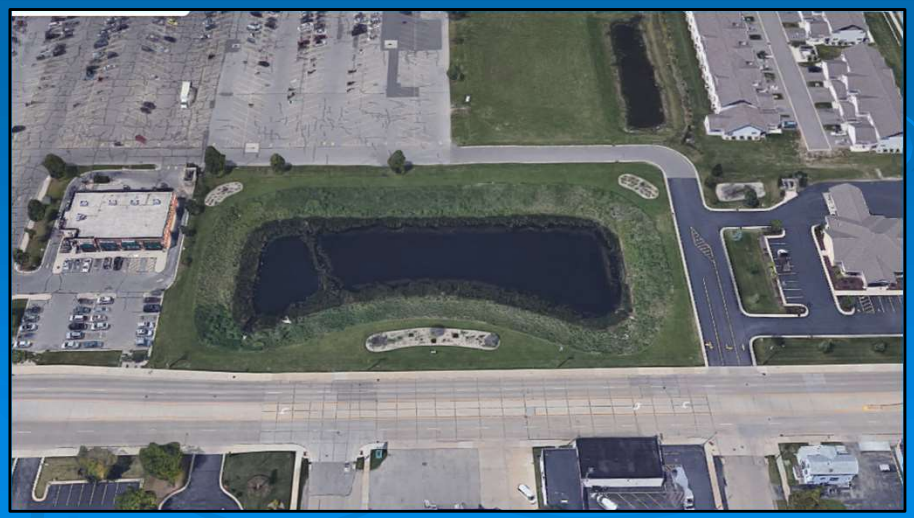
Everybody wants to know:

"How much will it cost to meet MS4 permit requirements??"

Definition

My working definition:

1) "Retrofitting" is constructing a structural stormwater management practice within in an already built environment – usually focused on pollution control.
2) Does not include practices with new or re-development
3) Usually practice treats multiple parcels



Data Sources and Vetting

- Data for retrofit cost came from:
  - Wisconsin MS4s (population 50 – 100 k)
  - Practices treat existing developed urban lands
  - Practices installed between 2003 – 2012
  - Only regional ponds built to WI Tech Stnd. 1001
  - Costs were from awarded contractor bids only
- Consistent TSS reduction modeling

Data Sources and Vetting

- Why only look at Stormwater Ponds?:
  - Practice with the most history and experience
  - Very specific design requirements – consistency
  - Often built as a “stand alone” in retrofit conditions (not part of a larger project) – easier to ID costs
  - Should have most consistent unit costs because of contractor experience
  - Consistent TSS modeling

Results and Discussion

	City	BMP	Construction Costs *	Land Costs	Watershed Treated (acres)	TSS Reduction (tns/yr)
1	Appleton, WI	SW Pond	$607,053		220.0	21.0
2	Appleton, WI	SW Pond & channel	$1,235,282		524.0	67.1
3	Appleton, WI	SW Pond	$552,383		103.0	13.0
23	Green Bay, WI	SW Pond	$223,267	$83,500	66.0	4.9
24	Green Bay, WI	SW Pond	$125,117	$35,000	68.0	2.8
25	Green Bay, WI	SW Pond	$108,612	$74,000	54.6	5.0
26	Green Bay, WI	SW Pond	$151,197		54.3	3.5
27	SE Wis	SW Pond Conv.	$185,405		133.0	19.6
28	SE Wis	SW Pond	$313,873		190.0	18.2

	Construction Costs *	Land Costs	Total Costs
Count:	28	18	28
Average:	$470,032	$193,760	$594,592
Minimum:	$74,909	$35,000	$75,399
Maximum:	$1,304,817	$621,000	$1,856,436

* Does not include design, legal, or construction services

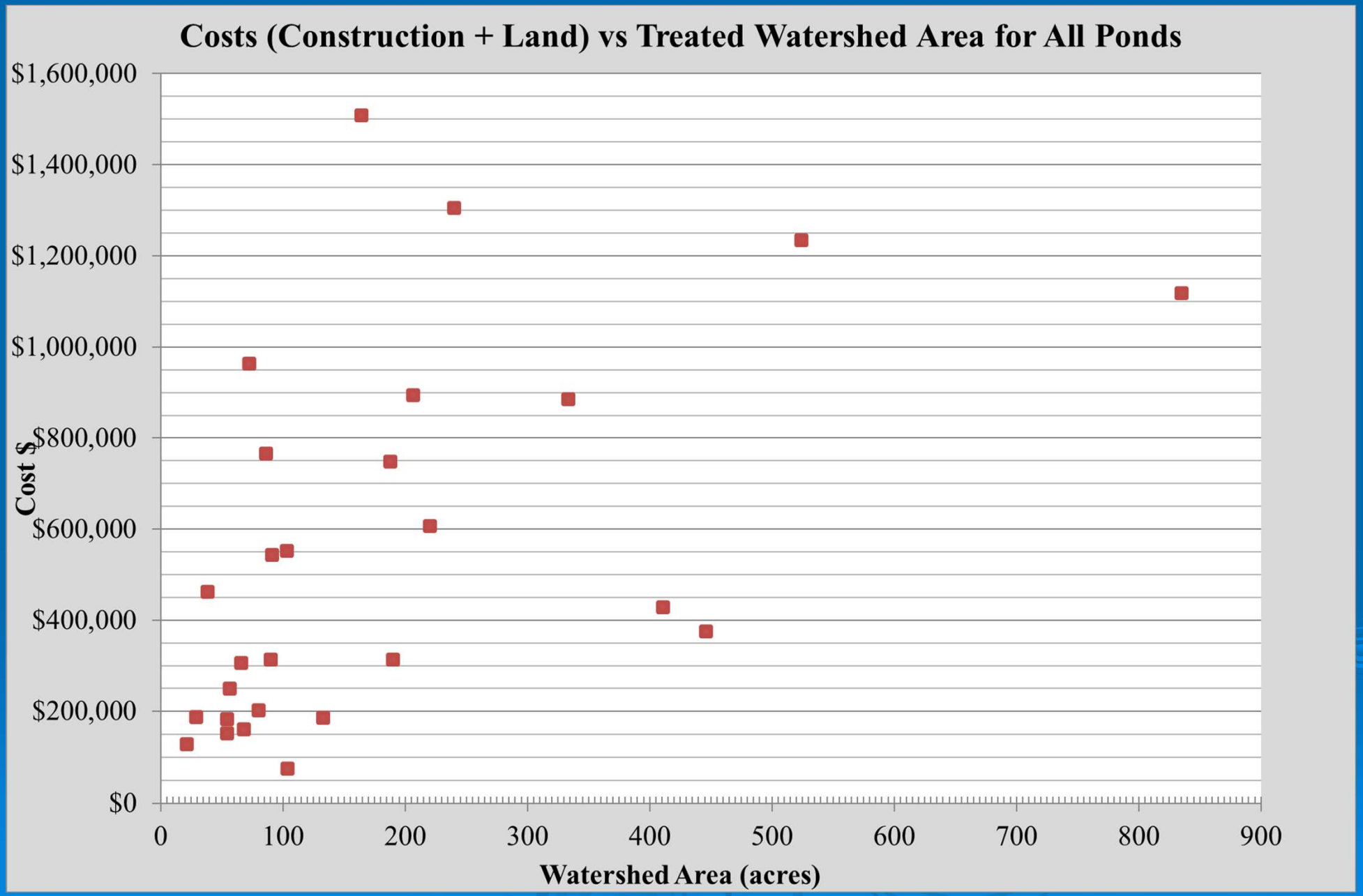
Results and Discussion

Planning level analyses often use 2 approaches:

- What does it cost to treat “X” acres of land?
- What does it cost to treat “X” pounds of pollution?

Let’s start with: “cost / acre of urban land?”

Results and Discussion ($/Ac.)



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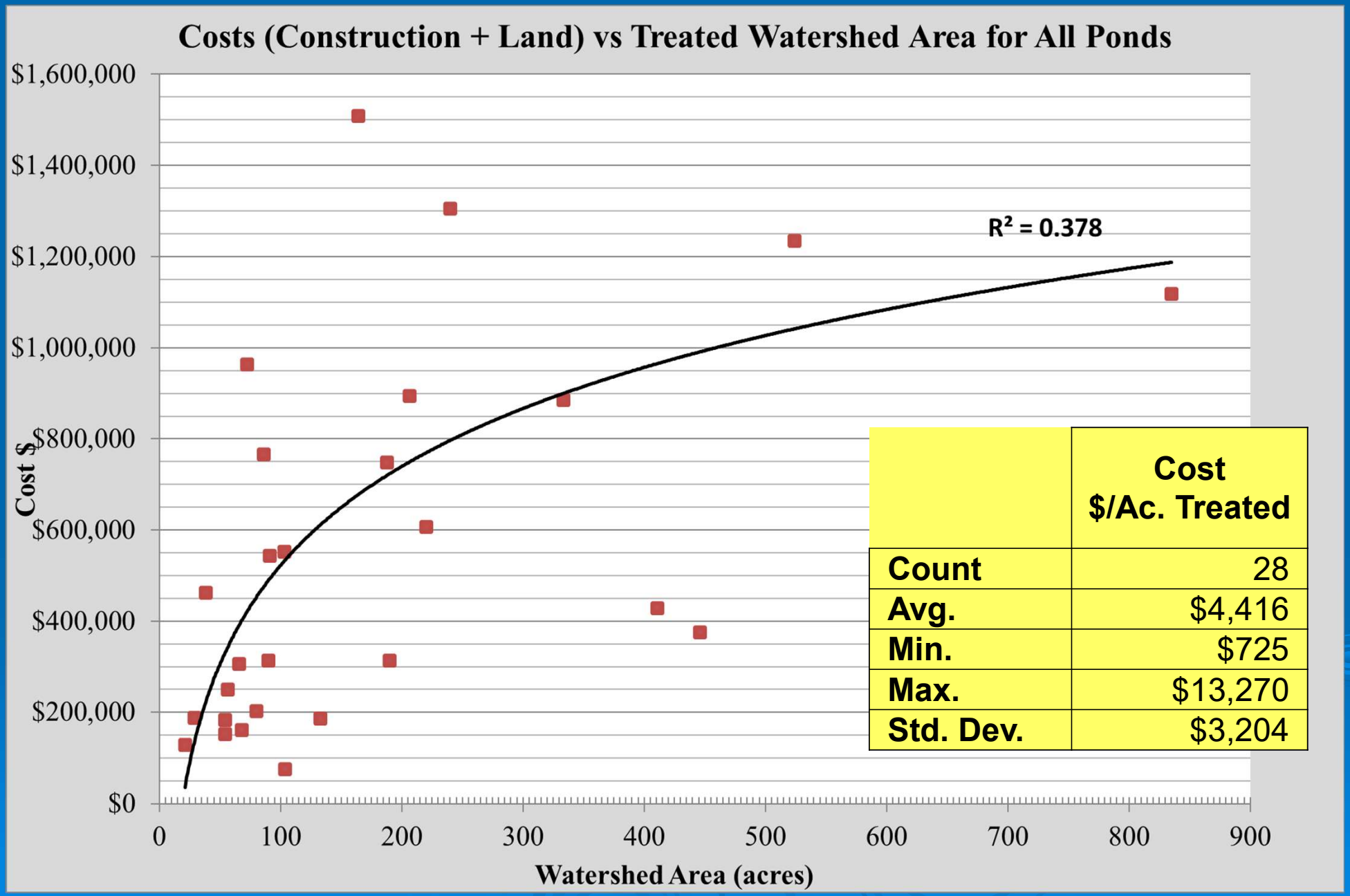
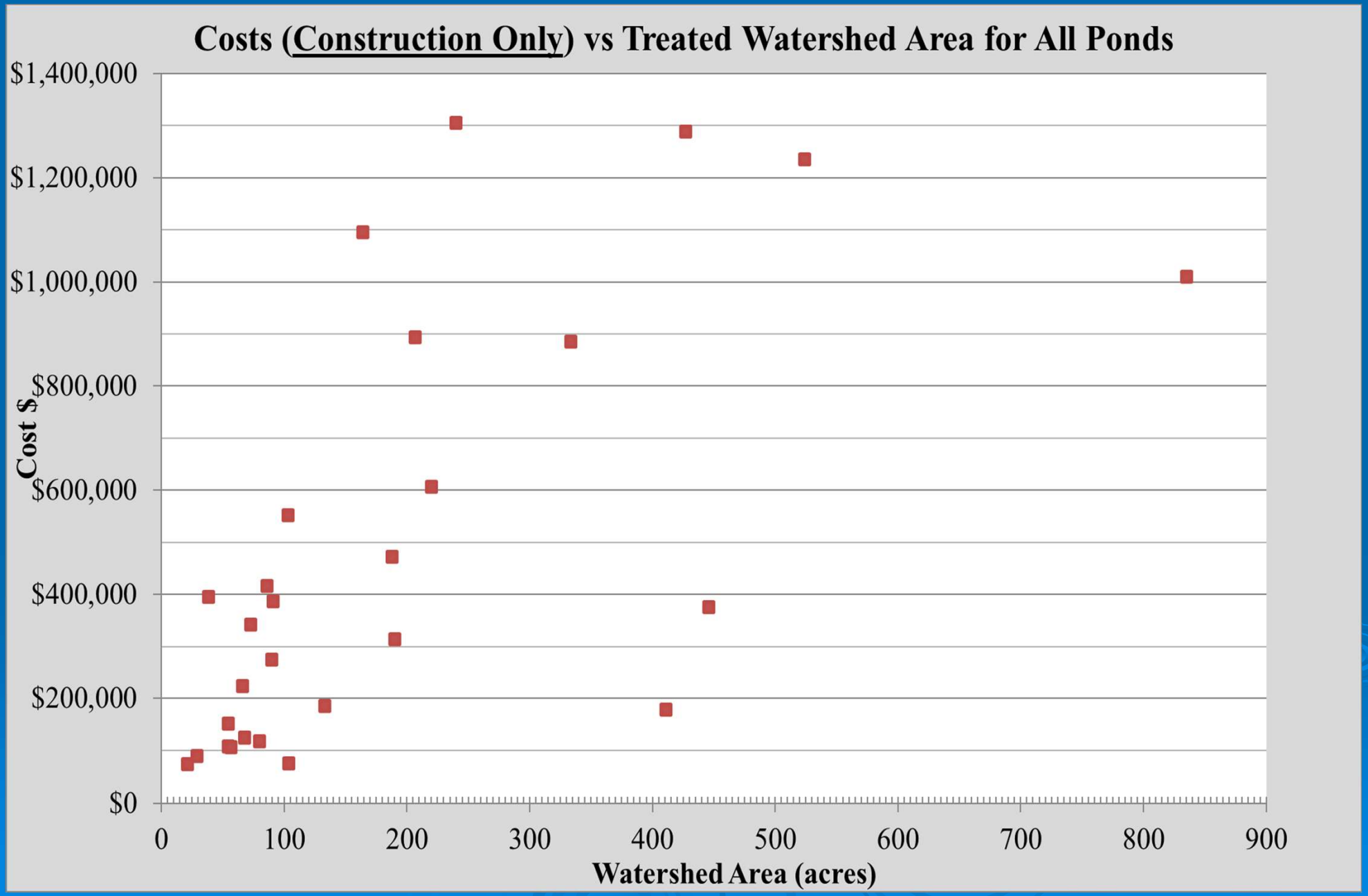


	Cost $/Ac. Treated
Count	28
Avg.	$4,416
Min.	$725
Max.	$13,270
Std. Dev.	$3,204

Results and Discussion ($/AC.)



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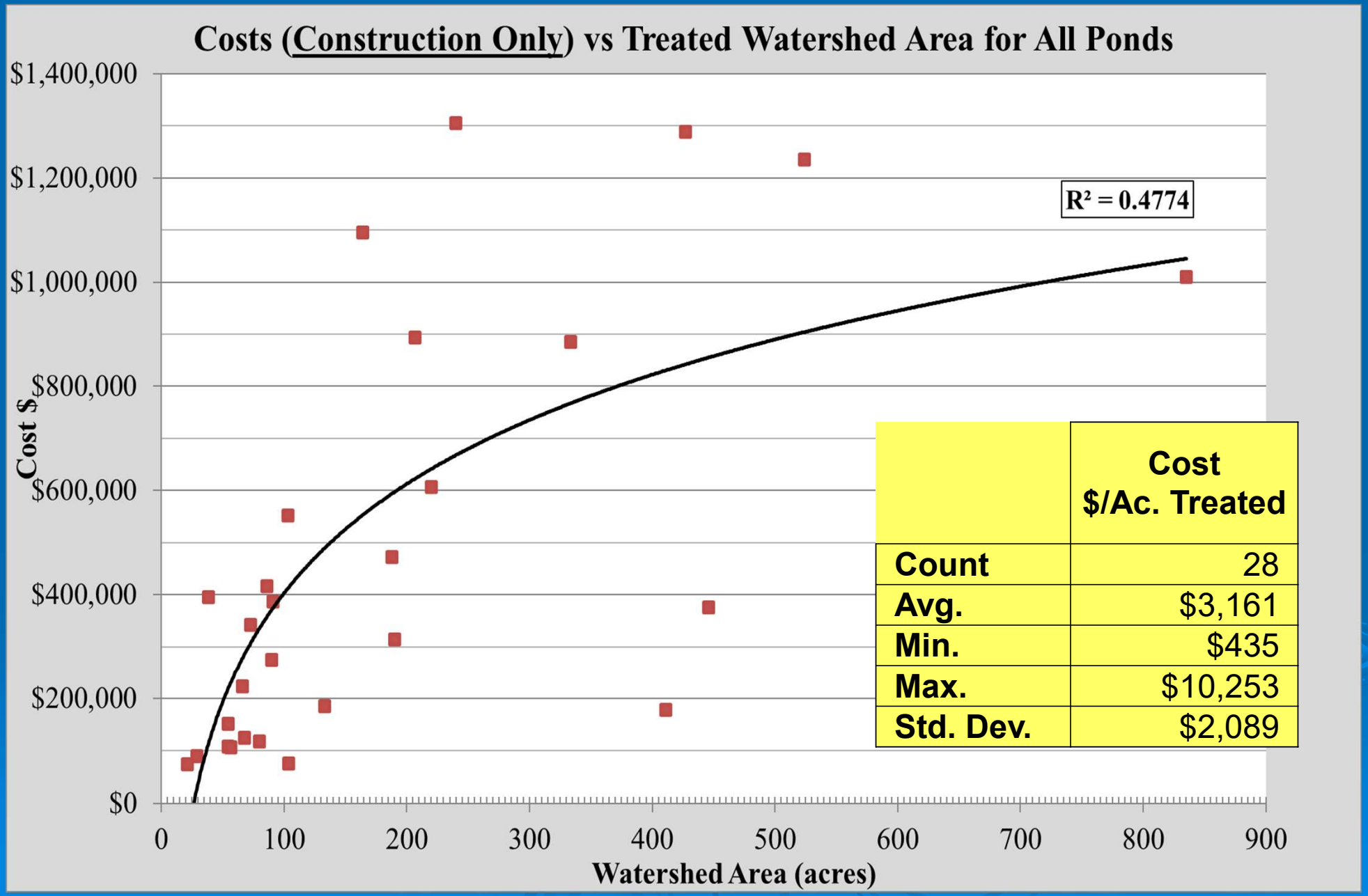
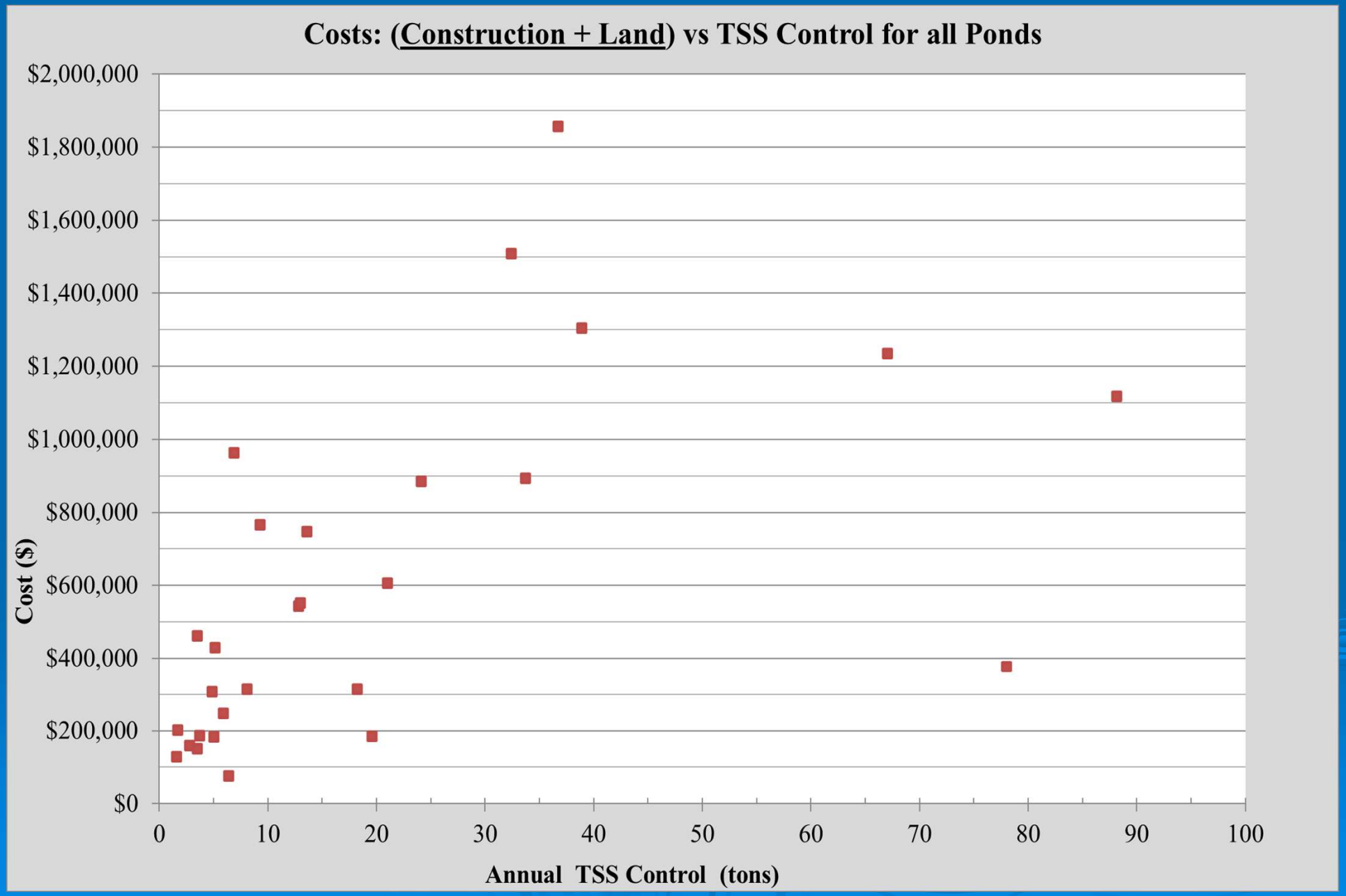


	Cost $/Ac. Treated
Count	28
Avg.	$3,161
Min.	$435
Max.	$10,253
Std. Dev.	$2,089

Results and Discussion

Question: How much does it cost / ton TSS reduction through “retrofitting”?

Results and Discussion ($/Tn)



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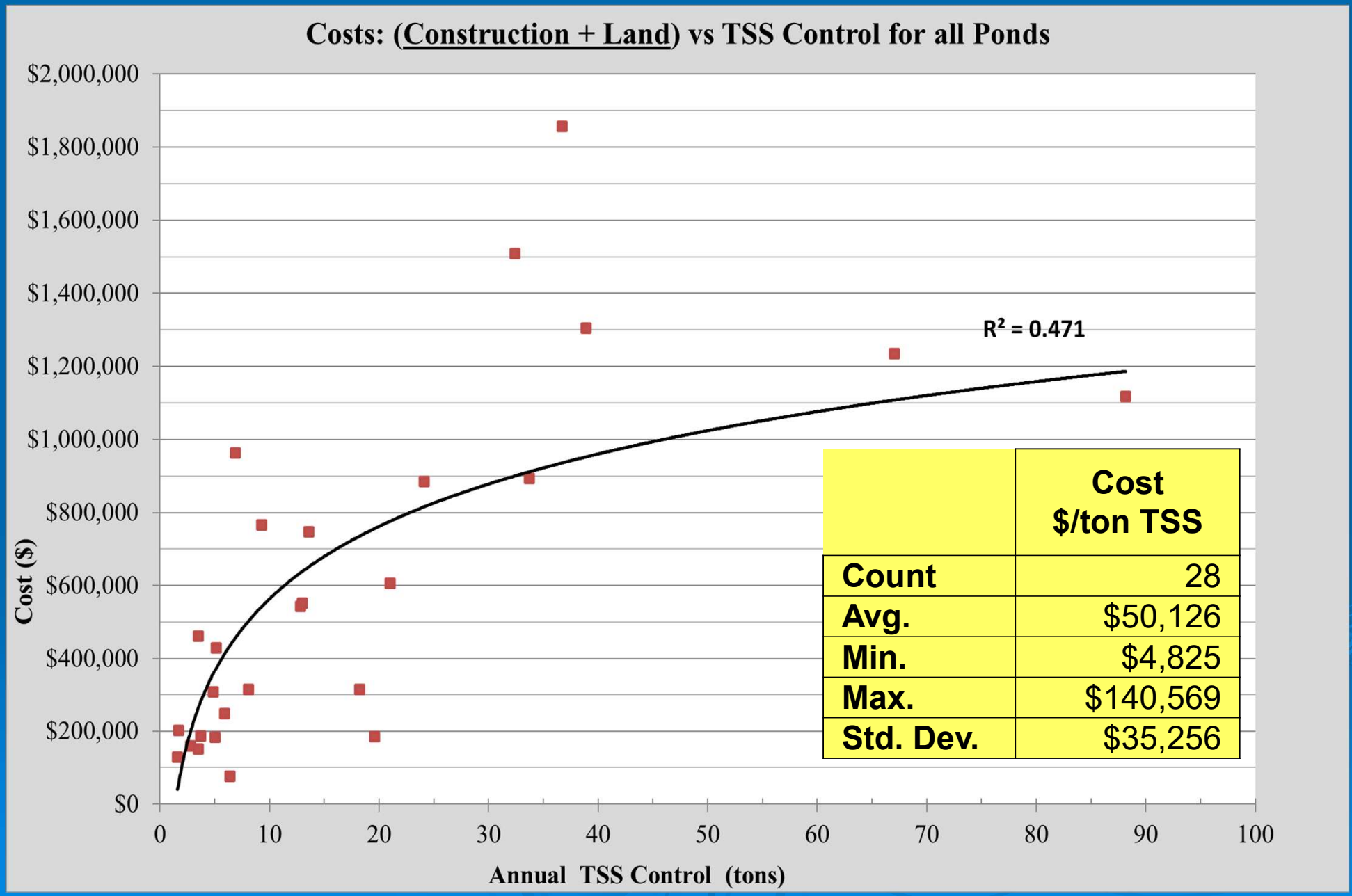

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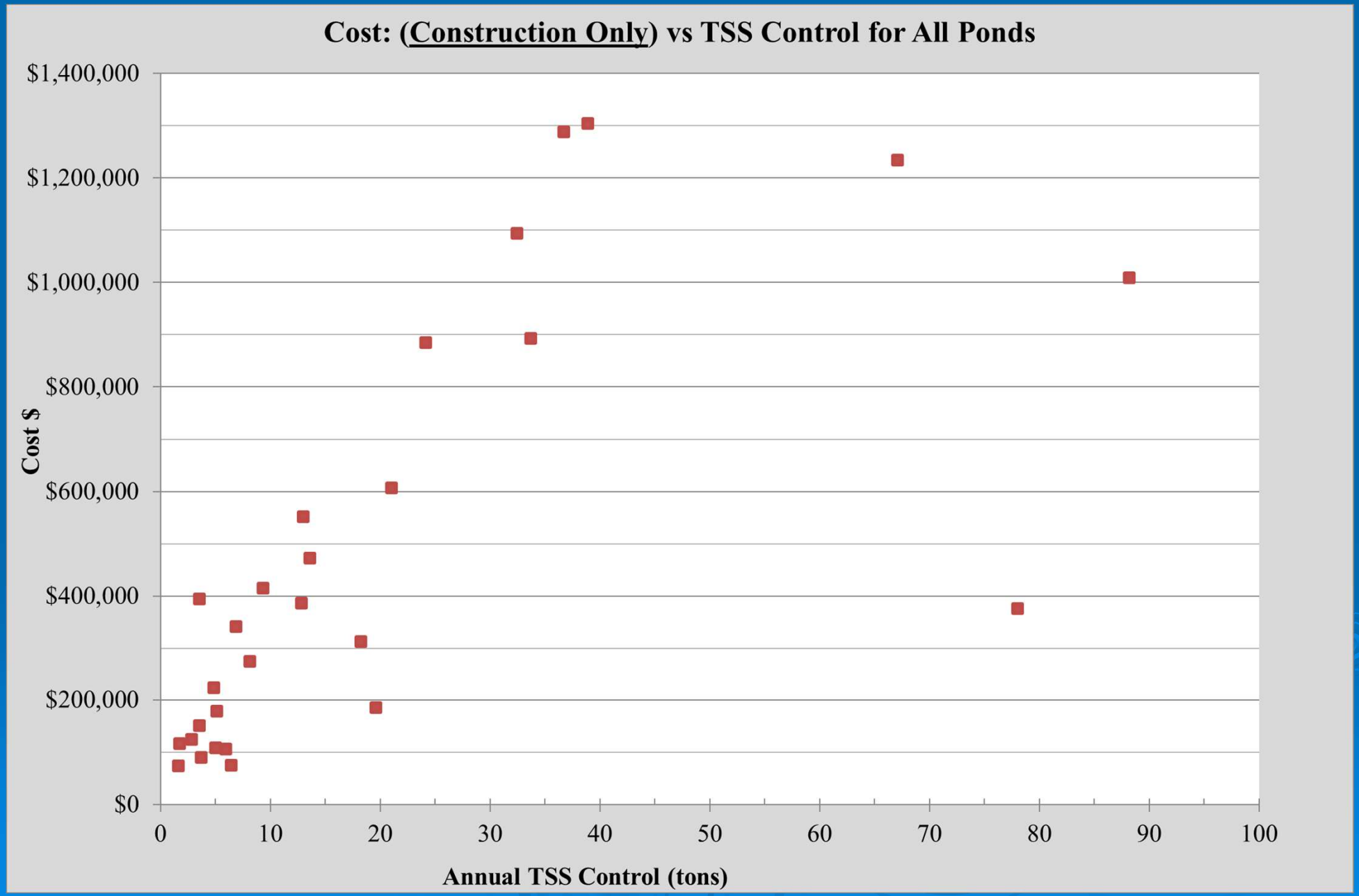

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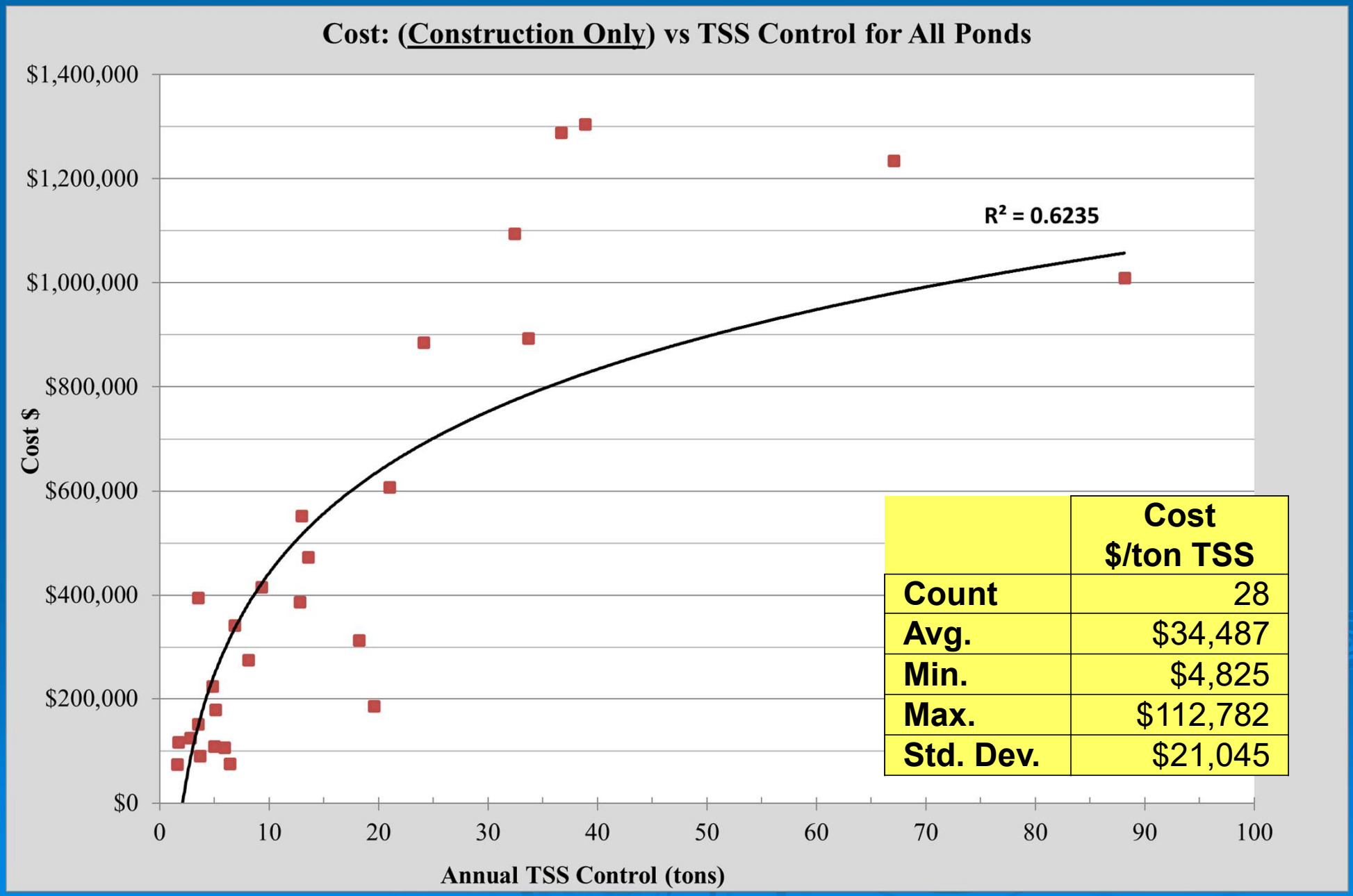

	Cost $/ton TSS
Count	28
Avg.	$34,487
Min.	$4,825
Max.	$112,782
Std. Dev.	$21,045

Results and Discussion

- Reasons for high degree of variability:
  - Site conditions
    - Environmental conditions
    - Bedrock / groundwater issues
    - Regulatory challenges
  - Contractor market
    - Seasonal timing of contracting
    - Synergy of nearby projects
    - Material / energy costs
  - Land Costs

Conclusions

- Predicting BMP costs of “simple” practices is highly variable.
- Predicting real costs of more dispersed, smaller scale (i.e. GI practices) is even more variable.
- Be aware of the variability when using cost figures.
- Explain range of variability to users

Discussion / Q & A

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