Item 7a

UPDATES TO TRENDS IN DISSOLVED OXYGEN IN BARTON SPRINGS

Abel Porras, PE

SIGNIFICANT ASPECTS REGARDING THIS REPORT

- Technical Aspects
  - Dissolved Oxygen (DO)
  - Austin Blind and Barton Springs Salamanders are endangered
- Regulatory Aspects
  - COA Habitat Conservation Plan – In order to operate the Barton Springs Pool, COA must maintain and monitor habitat and well-being of the Austin Blind and Barton Spring Salamander
  - Barton Springs / Edwards Aquifer Conservation District – Must balance between meeting the future needs of their permittees with all users and uses, including use for habitat of the Austin Blind and Barton Springs Salamander.

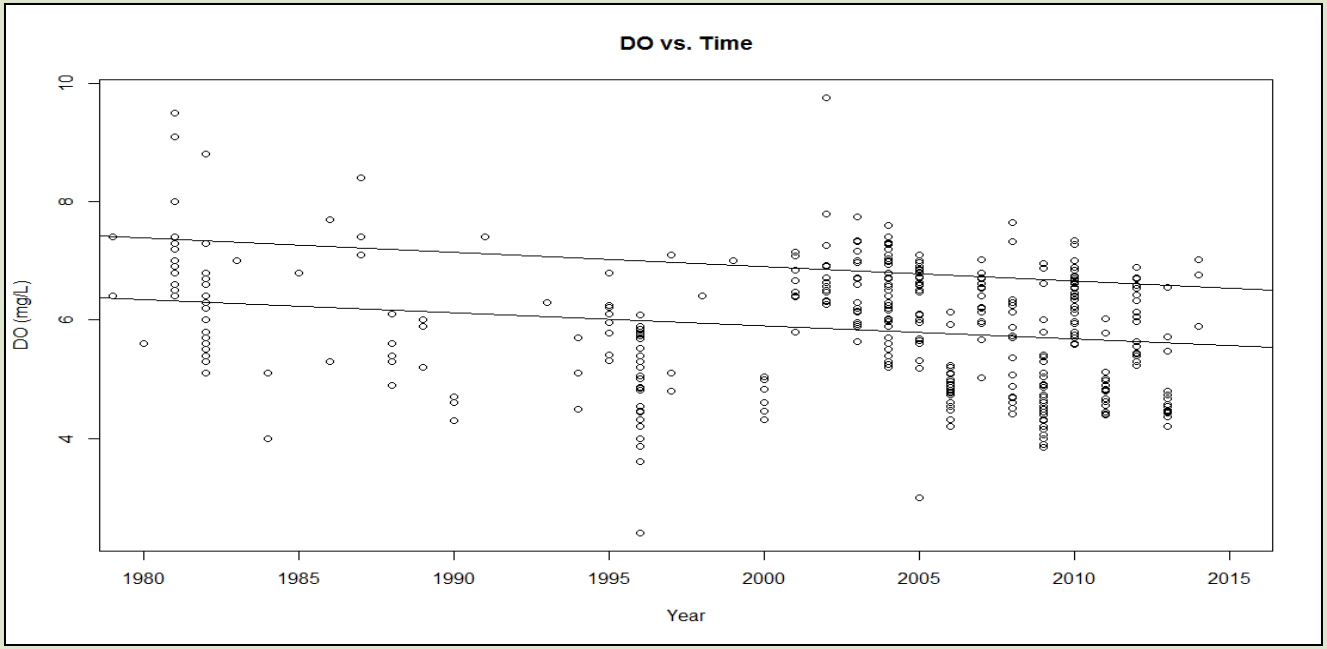
HISTORY

- Turner (2000)
  - 1st COA report which provided evidence of a significant decreasing trend in Dissolved Oxygen (DO)
- Herrington (2005)
  - Confirmed a decreasing trend
  - Correctly predicted that DO levels would go below 5 mg/L if discharge from BS went below 40 cfs
- Johns (2006)
  - Identified impacts on salamander counts from low flow and decreasing DO
- Turner (2007)
  - Calculated the relationship between flow and DO
- Herrington, Hiers (2010)
  - Reaffirmed declining temporal trends at Old Mill Springs and Eliza Springs

CURRENT TREND IN BARTON SPRINGS DO

- $DO_{\text{WITHOUT Upstream Flow}} = 4.514 - 0.000032 \cdot Date + 0.031 \cdot BSFlow$
- $DO_{\text{WITH Upstream Flow}} = 7.12 - 0.0054 \cdot BSFlow$

- Looking at Without Recharge Equation, DO decreases by about 0.012 mg/L every year.

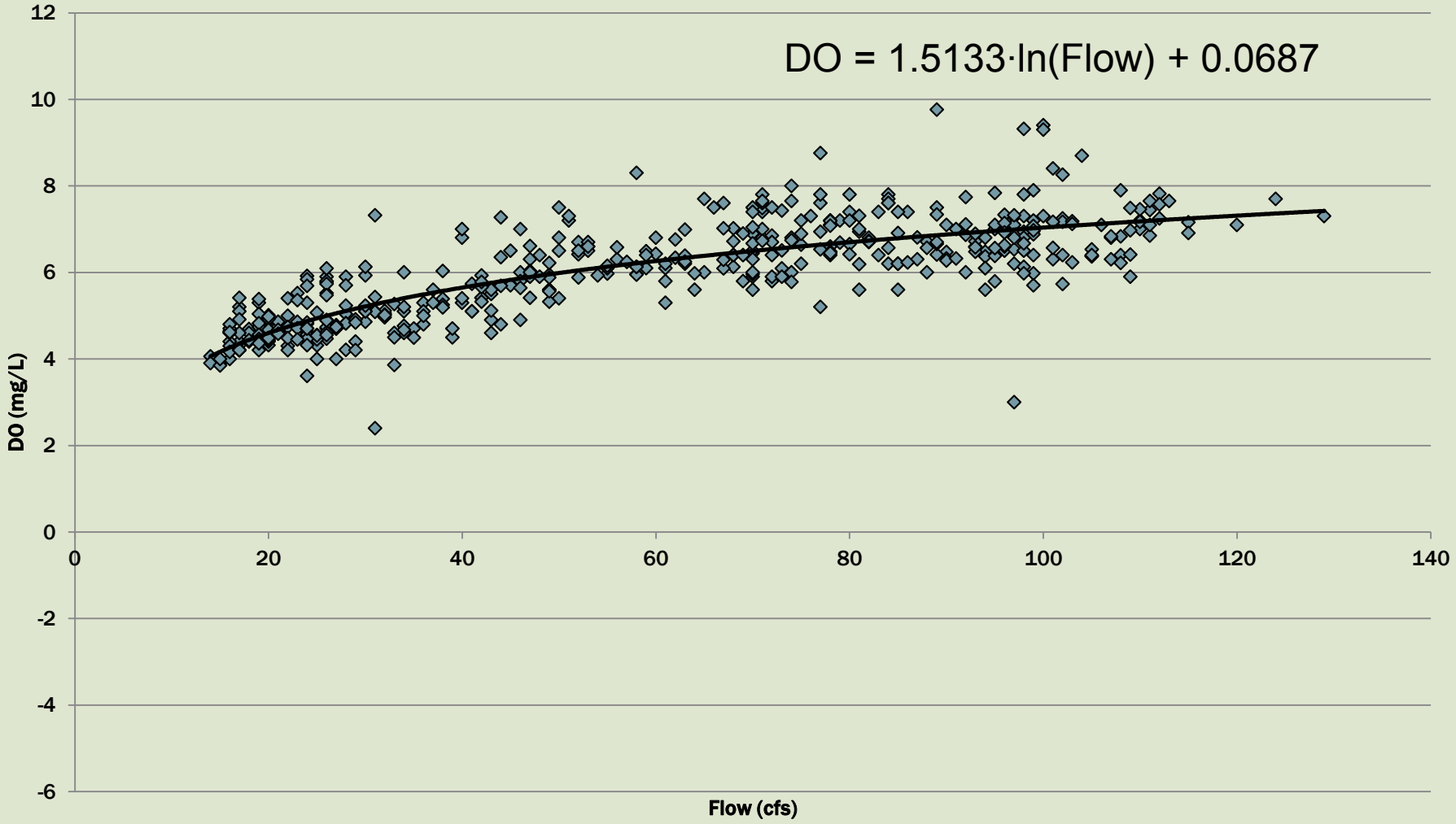


RELATIONSHIP BETWEEN FLOW AND DO

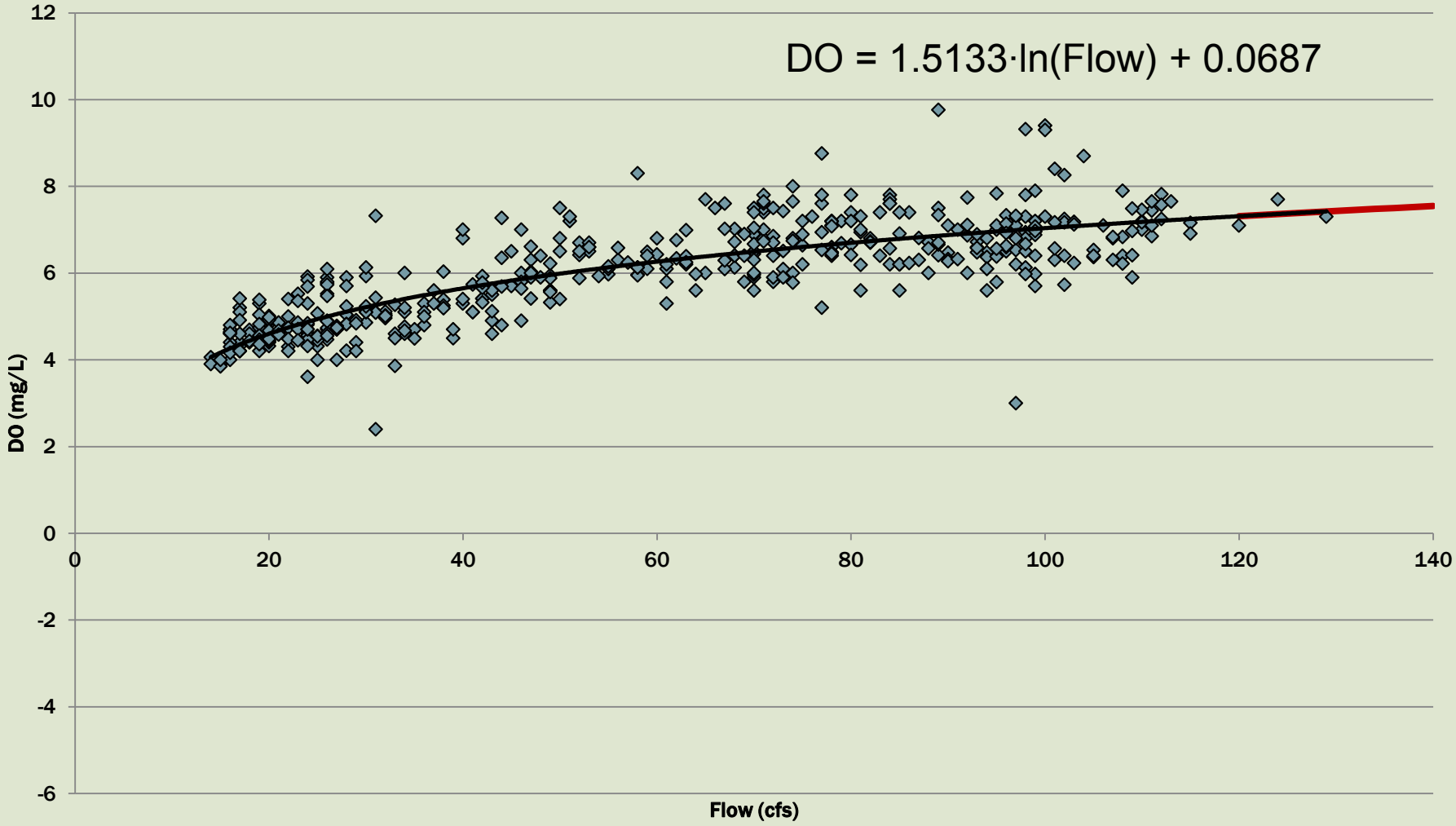
- Looked at relationship between flow and DO at the three main spring complex:
  - Parthenia Springs
  - Eliza Springs
  - Old Mill Springs

- Two nonlinear relationships were examined:
  - DO = ln(Flow) + Intercept
  - $DO = a(b-e^{-c*Flow})$

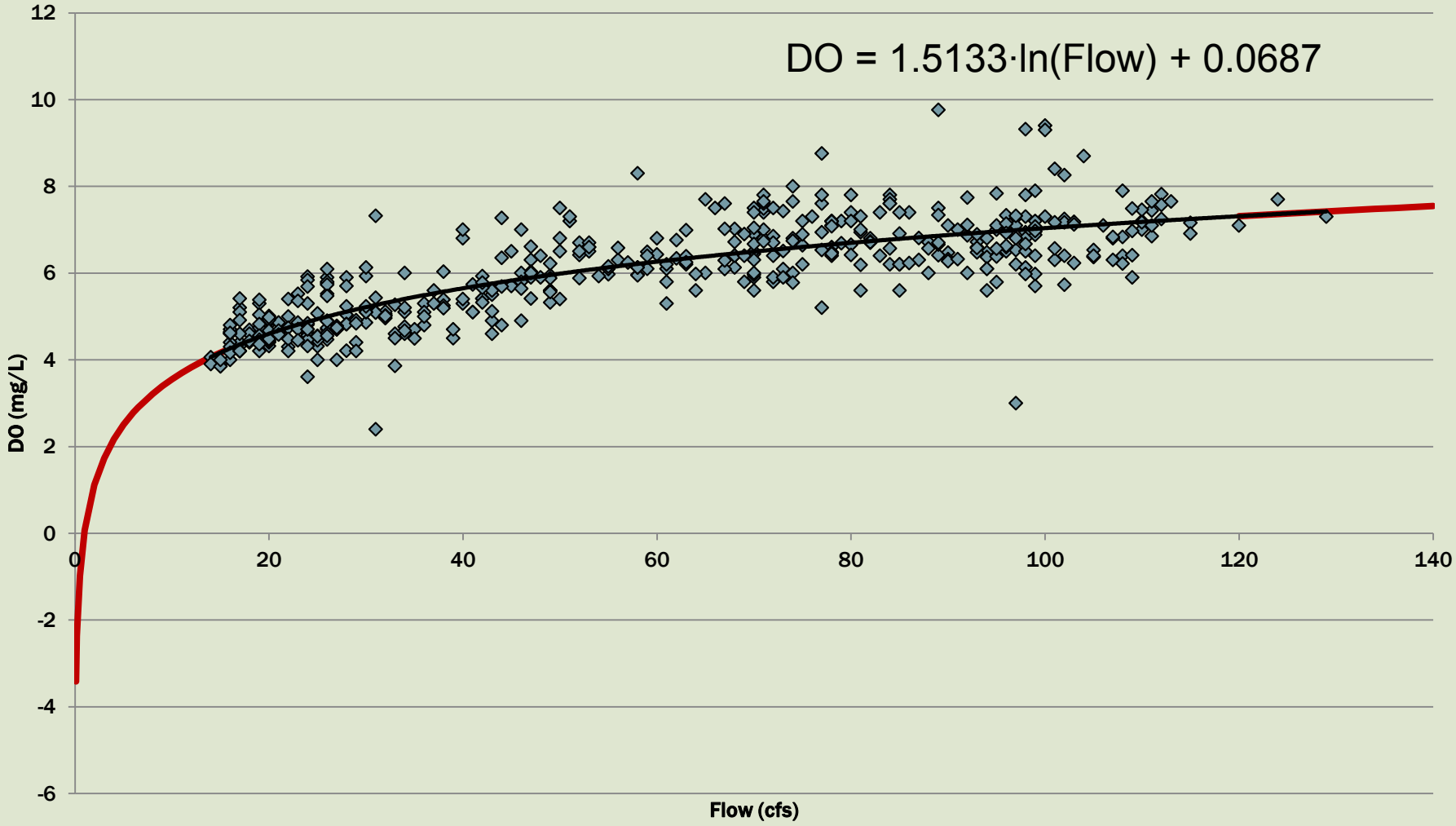
Parthenia Springs Regression Expression



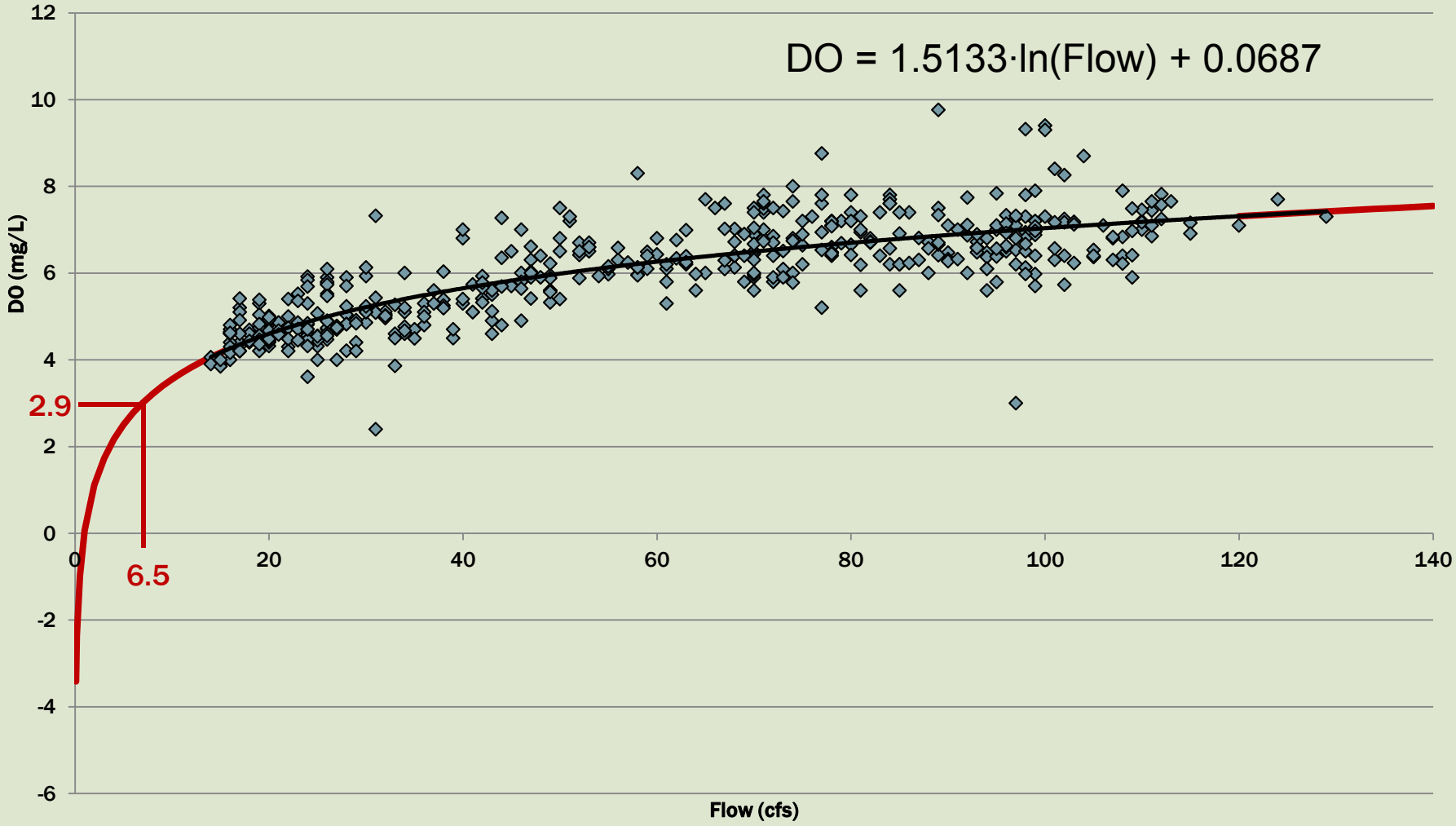
Parthenia Springs Regression Expression



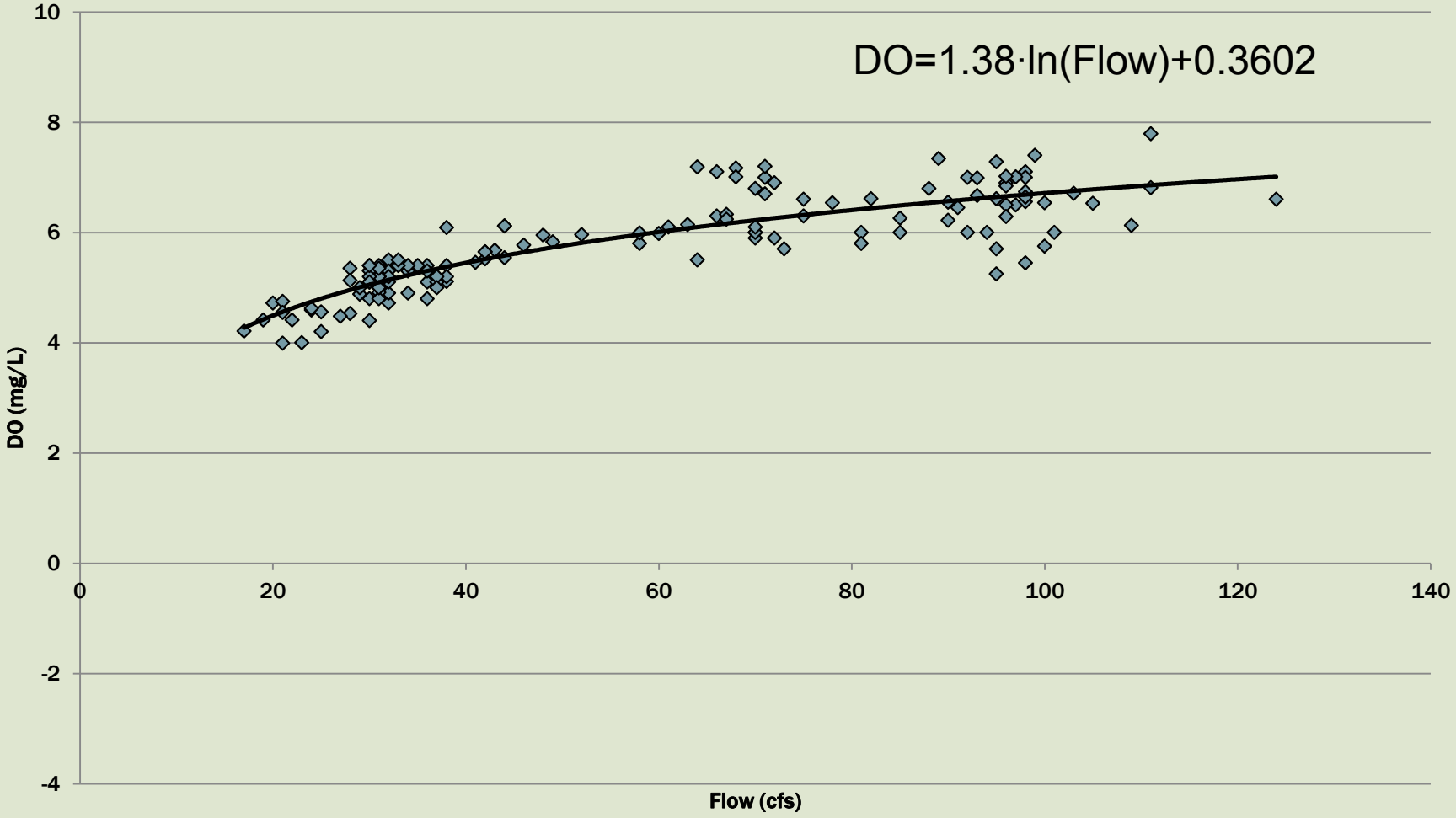
Parthenia Springs Regression Expression



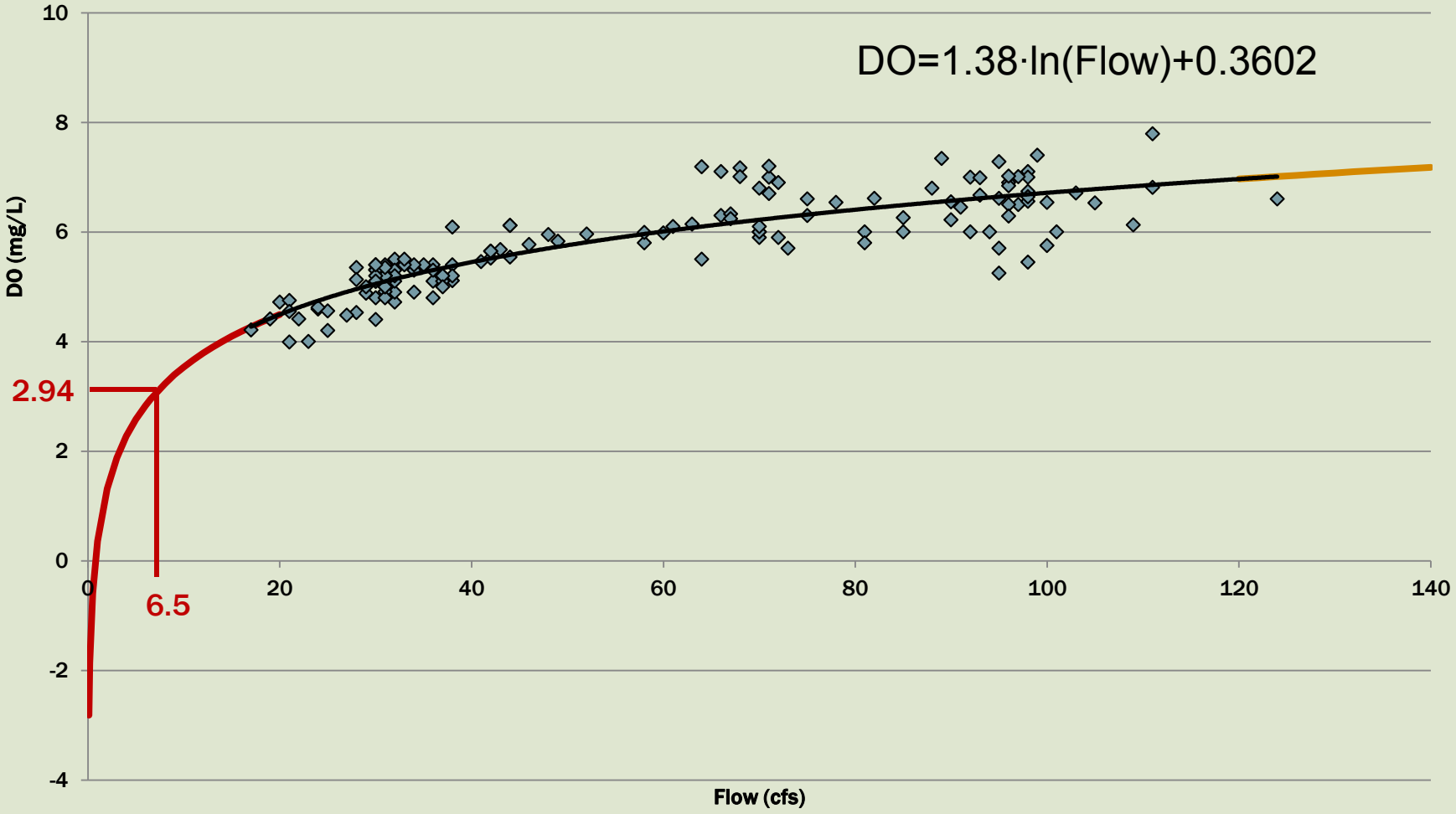
Parthenia Springs Regression Expression



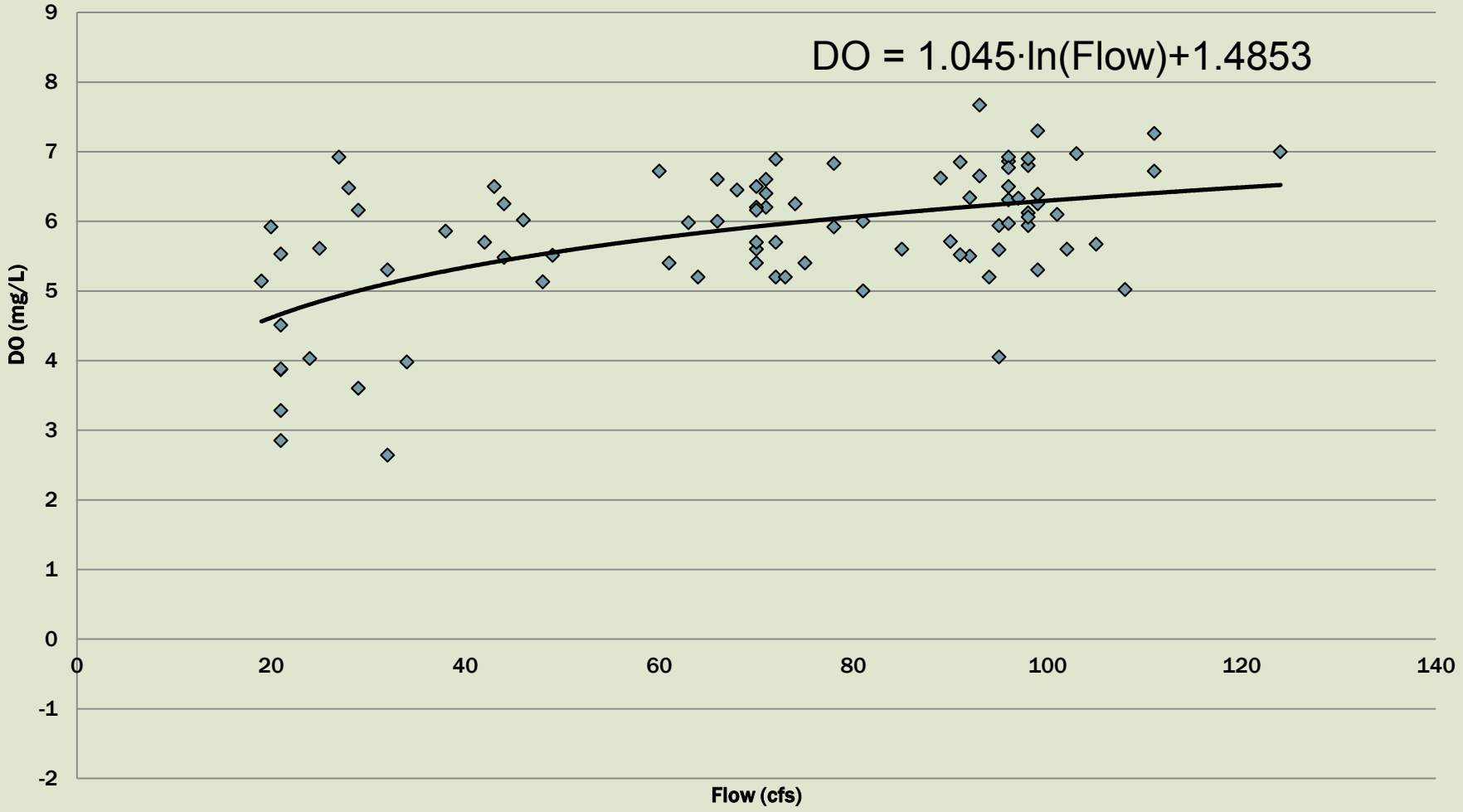
Eliza Springs Regression Equation



Eliza Springs Regression Equation



Old Mill Springs Regression Curve



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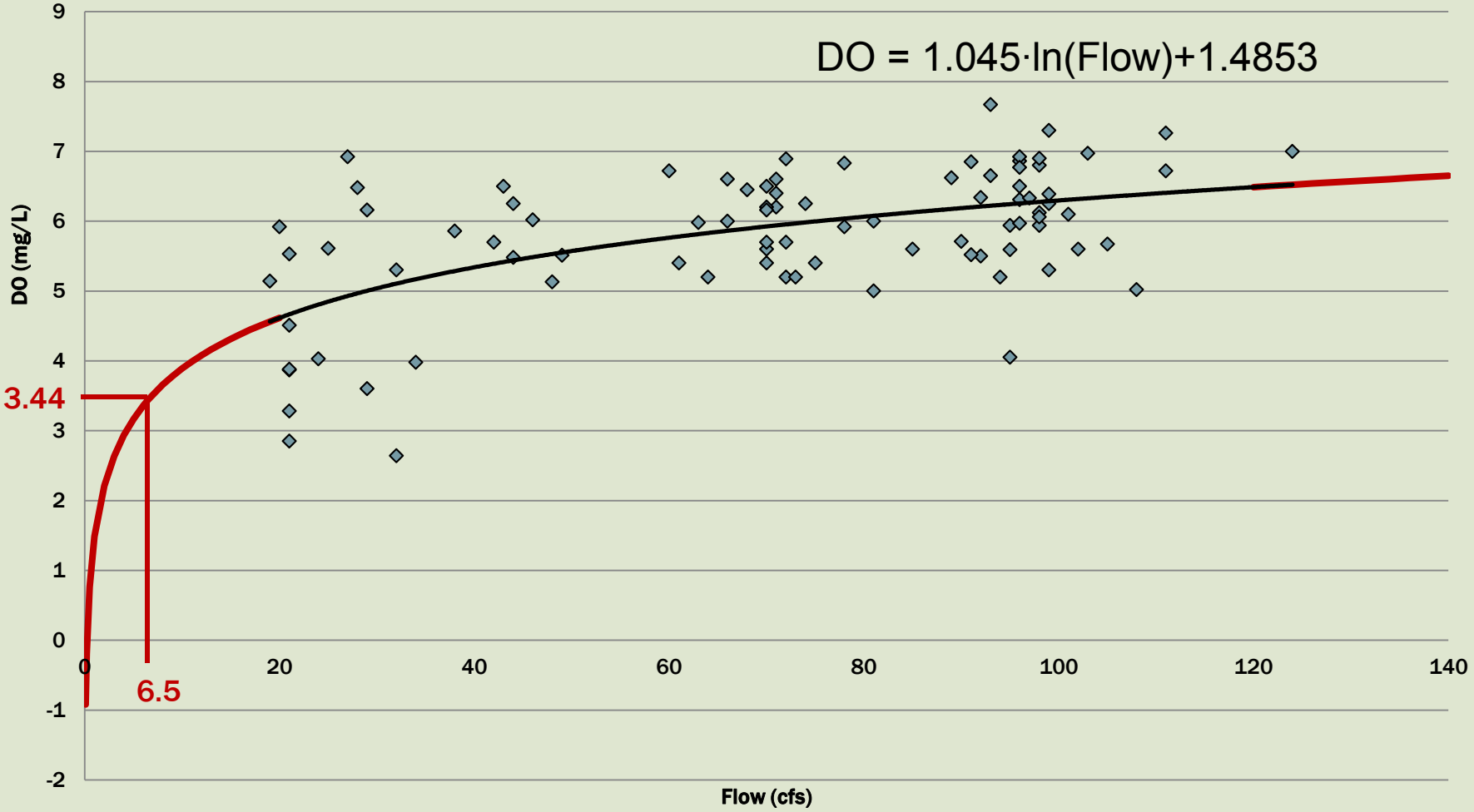
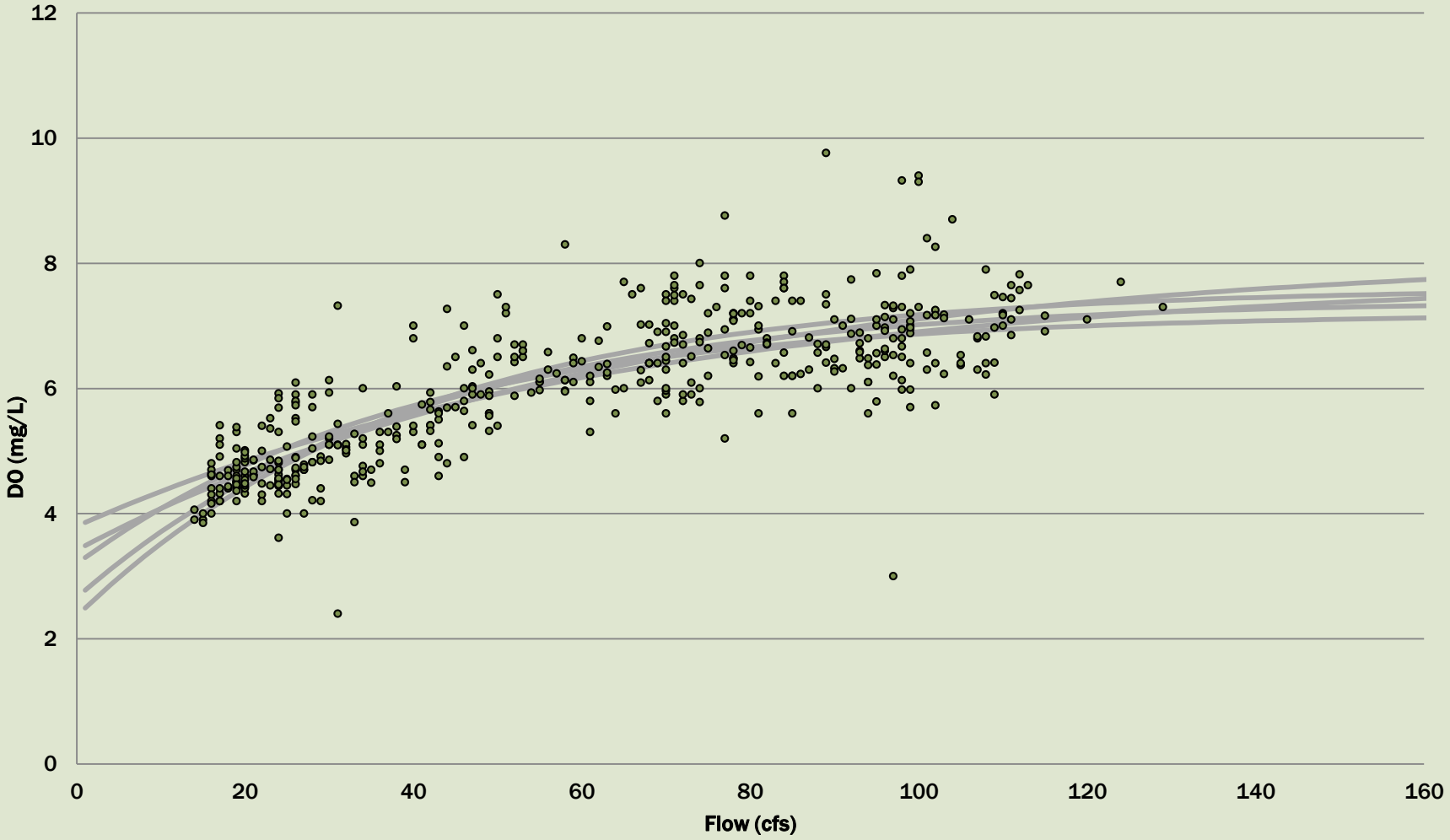


6 Possible Exponential Association III curves for Parthenia Spring



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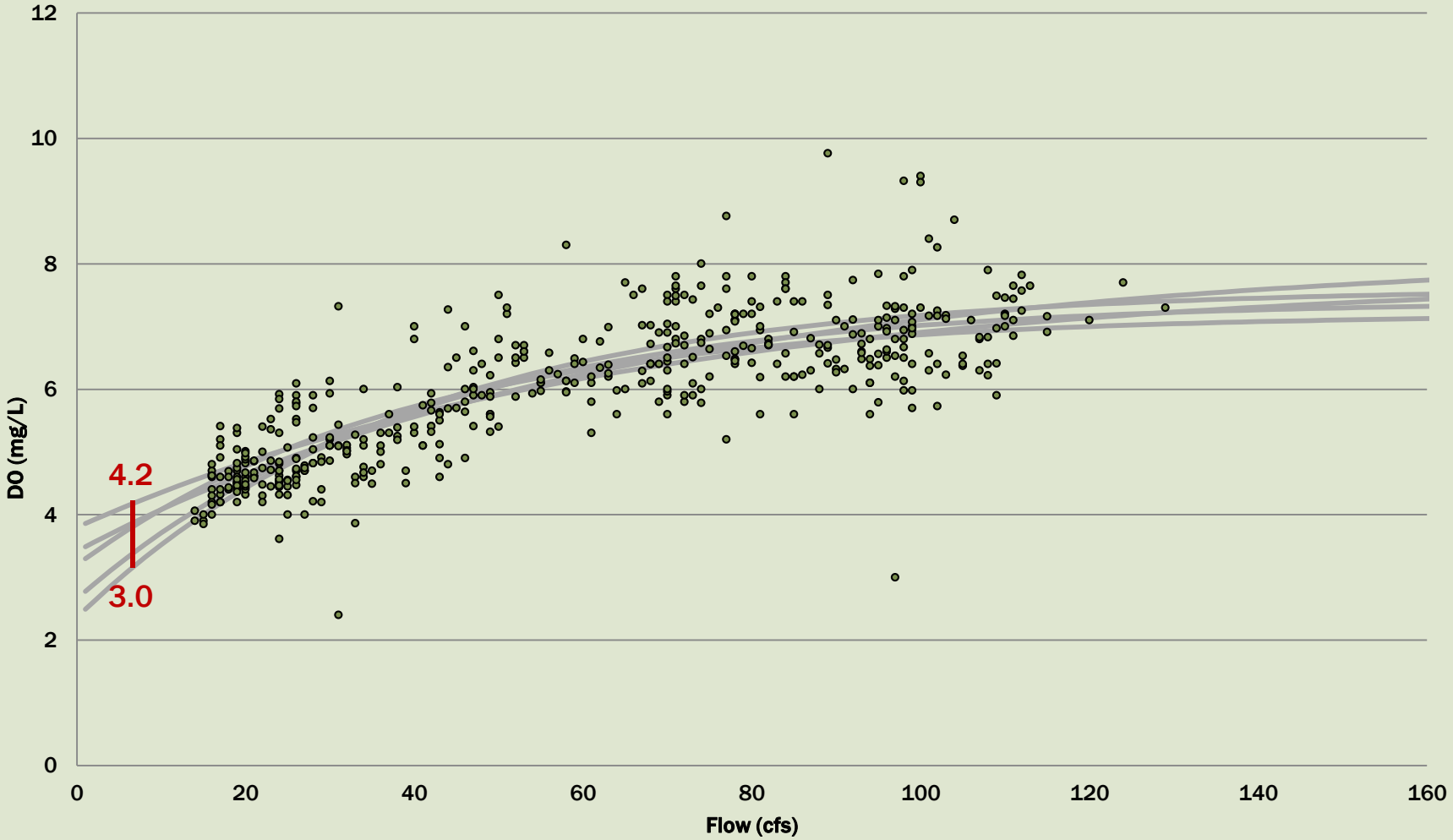
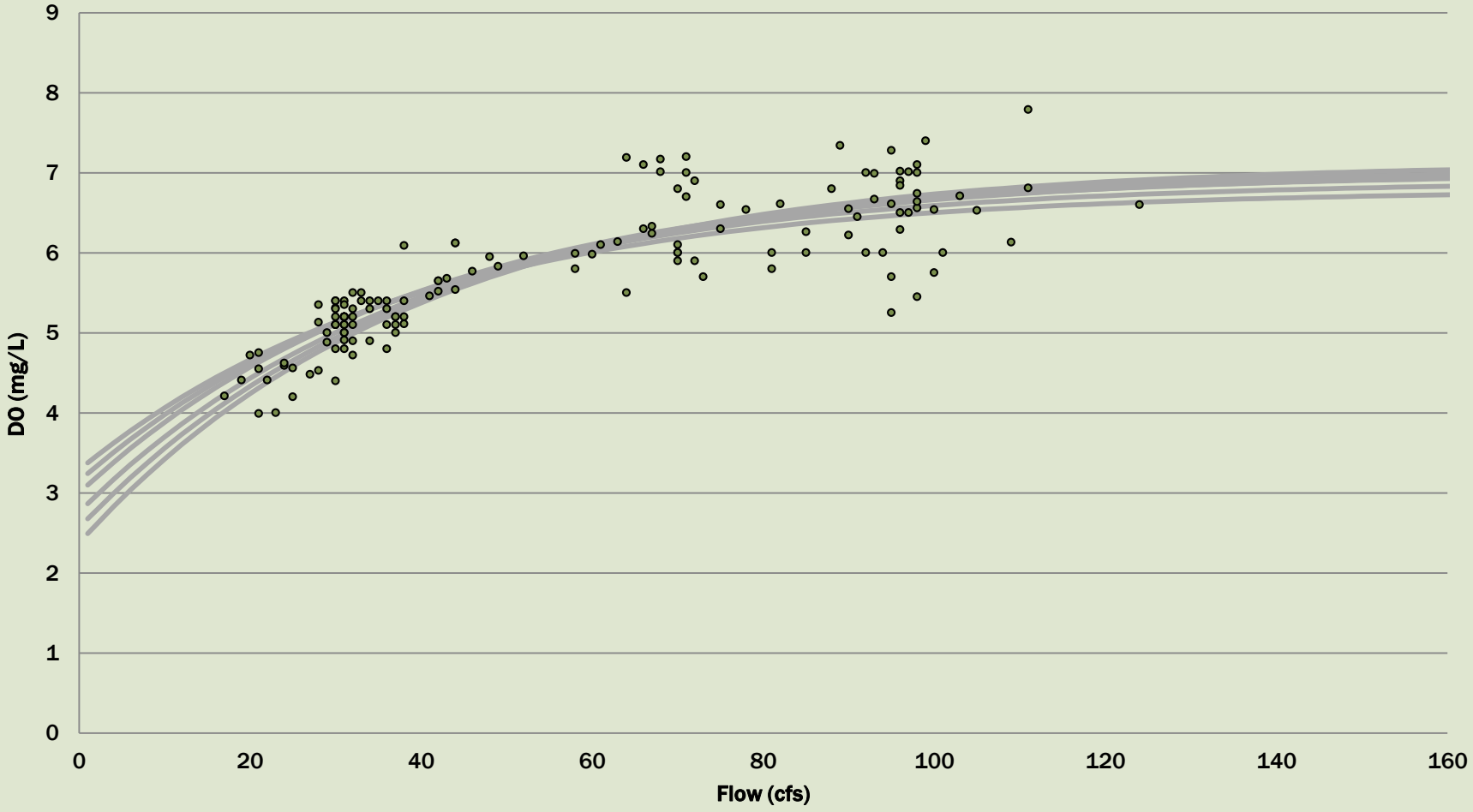


6 Possible Exponential Association III curves for Eliza Spring



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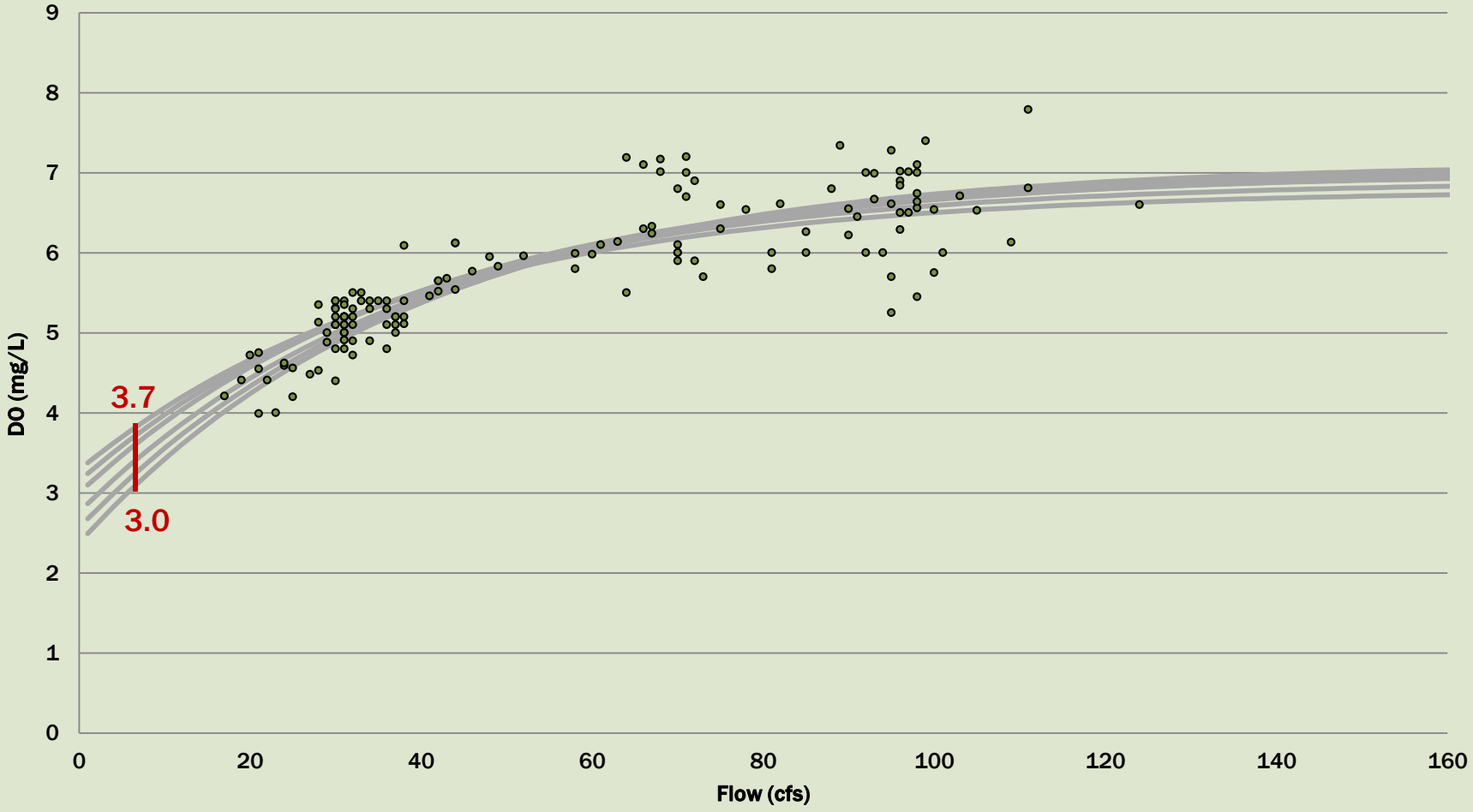
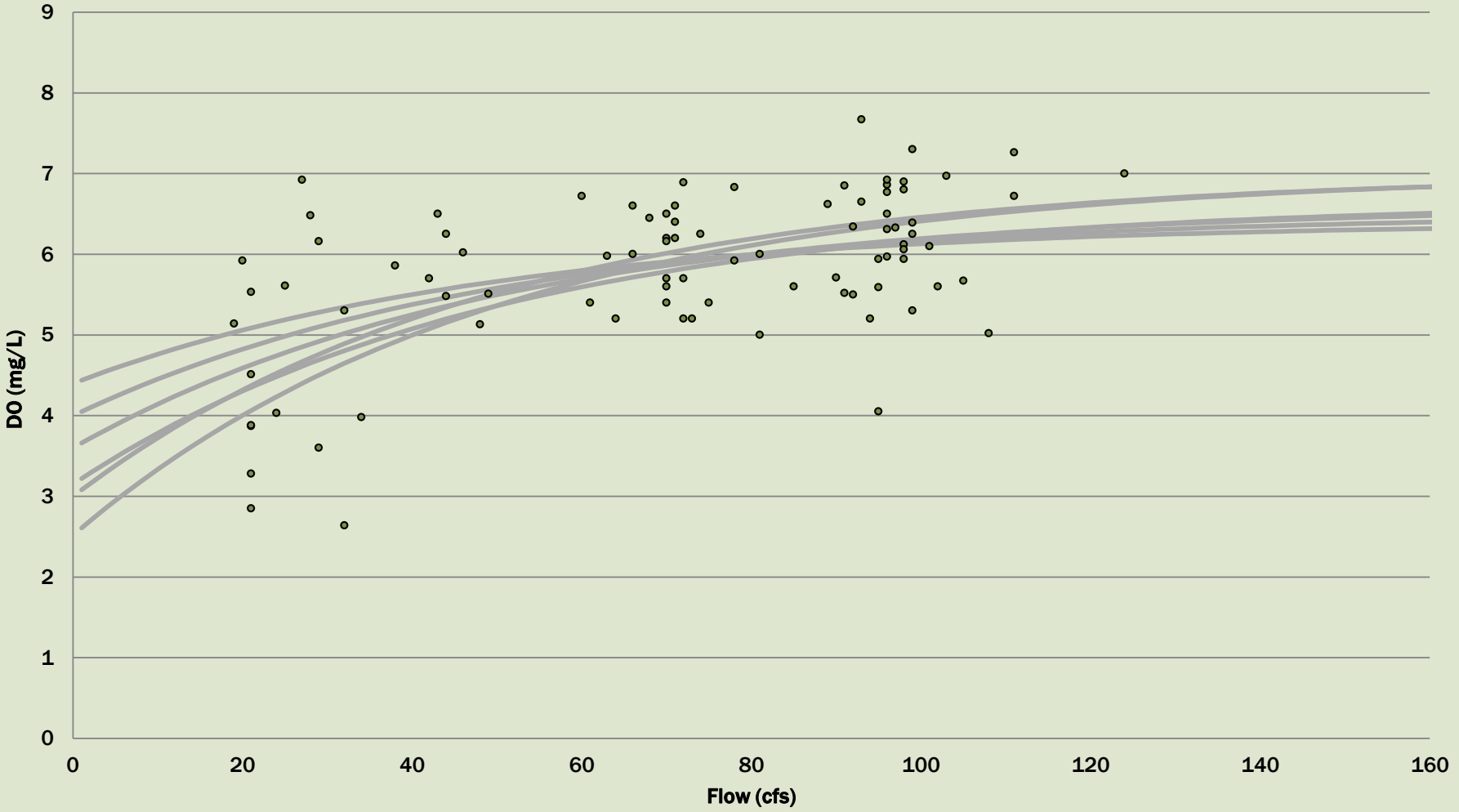


6 Possible Exponential Association III curves for Old Mill Spring



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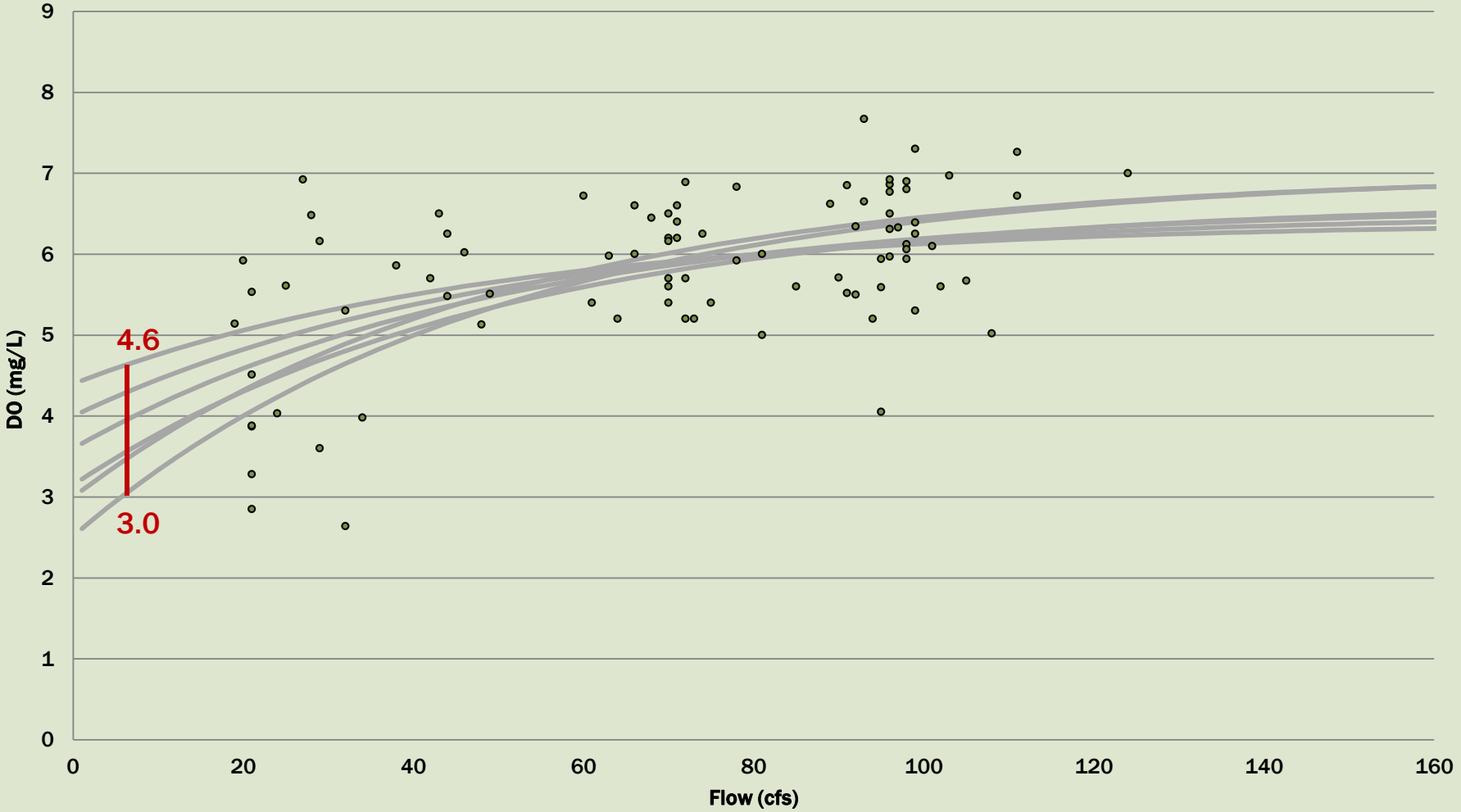

CONCLUSIONS

- Maintaining flow at Barton Springs is essential to maintaining dissolved oxygen levels in the water.
- More data is needed to evaluate the effects of extreme values of low flow and to distinguish between the various statistical models.