Applying the Assemblage Toxicity Index Concept to Assessing the Risk of Atrazine to Aquatic Plant Communities

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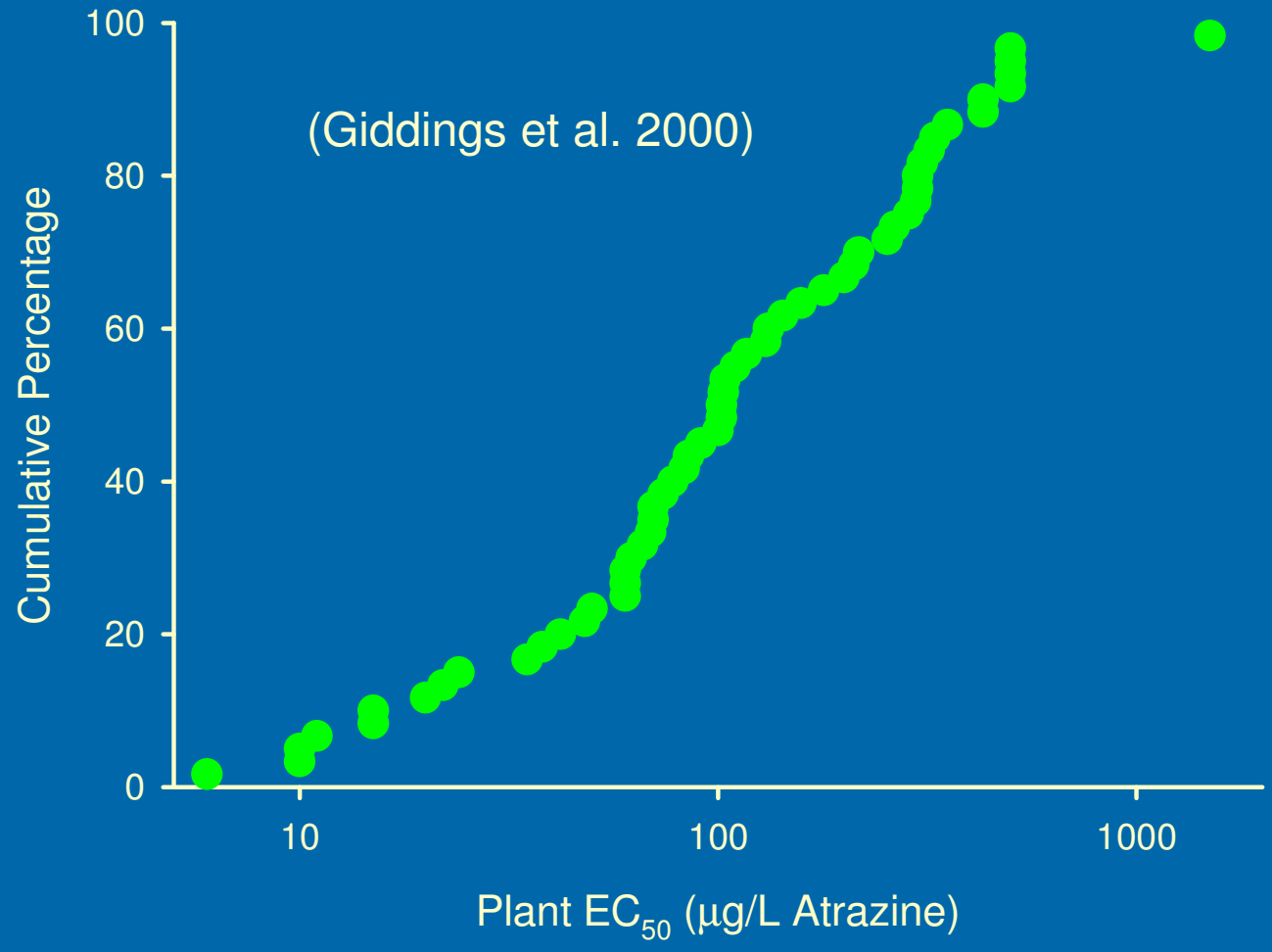
Meeting on Revising U.S.EPA's Guidelines
for Deriving Aquatic Life Criteria

September 16, 2015
Arlington, VA

EPA Office of Research and Development
National Health and Ecological Effects Research Laboratory, Mid-Continent Ecology Division

Atrazine Species Sensitivity Distribution



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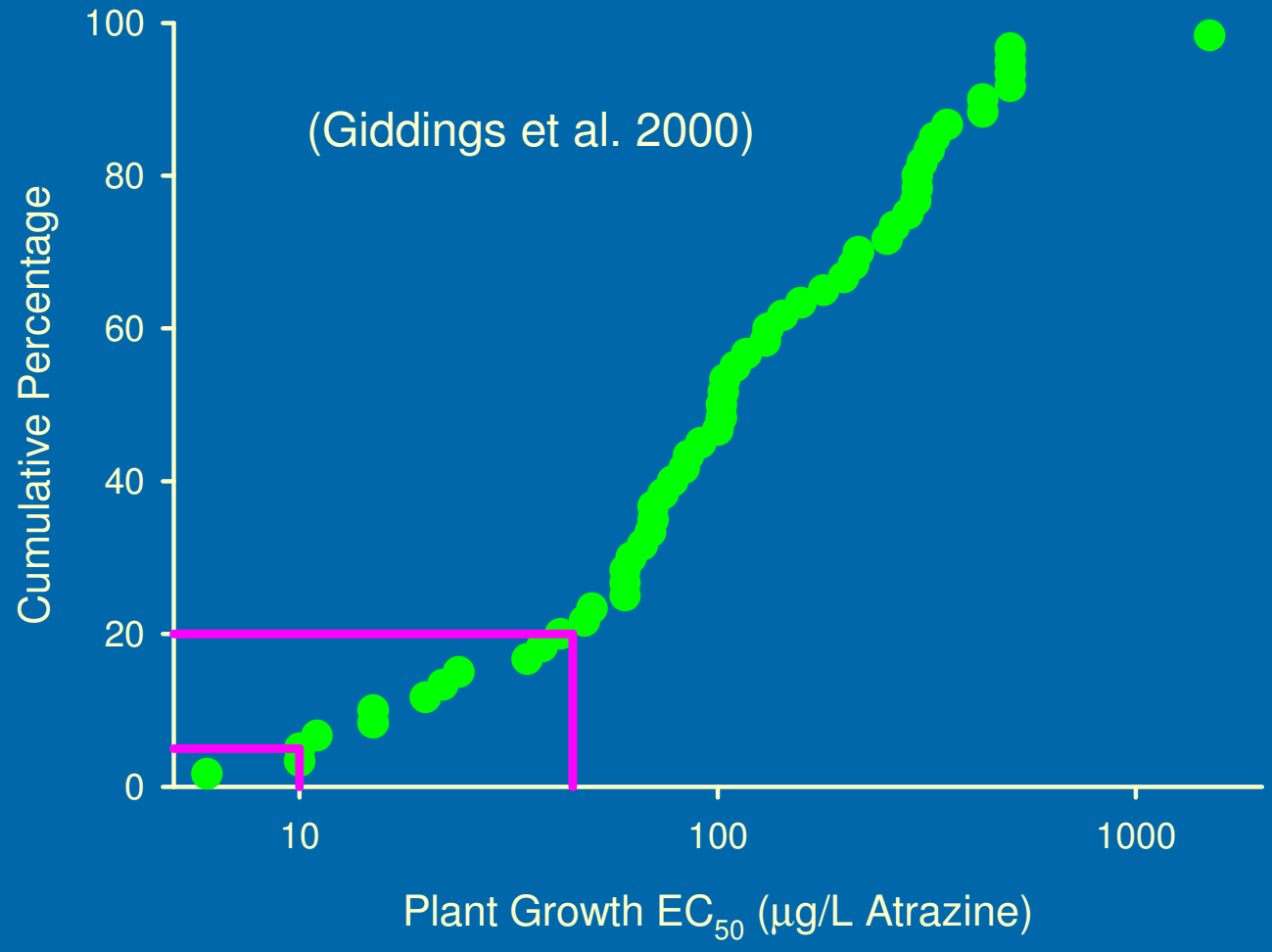

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SSD Limitations

Often an important/effective tool for risk assessments, but risk characterizations can be ill-defined due to:

(1) Different effects endpoints – nature of effects can be inconsistent.

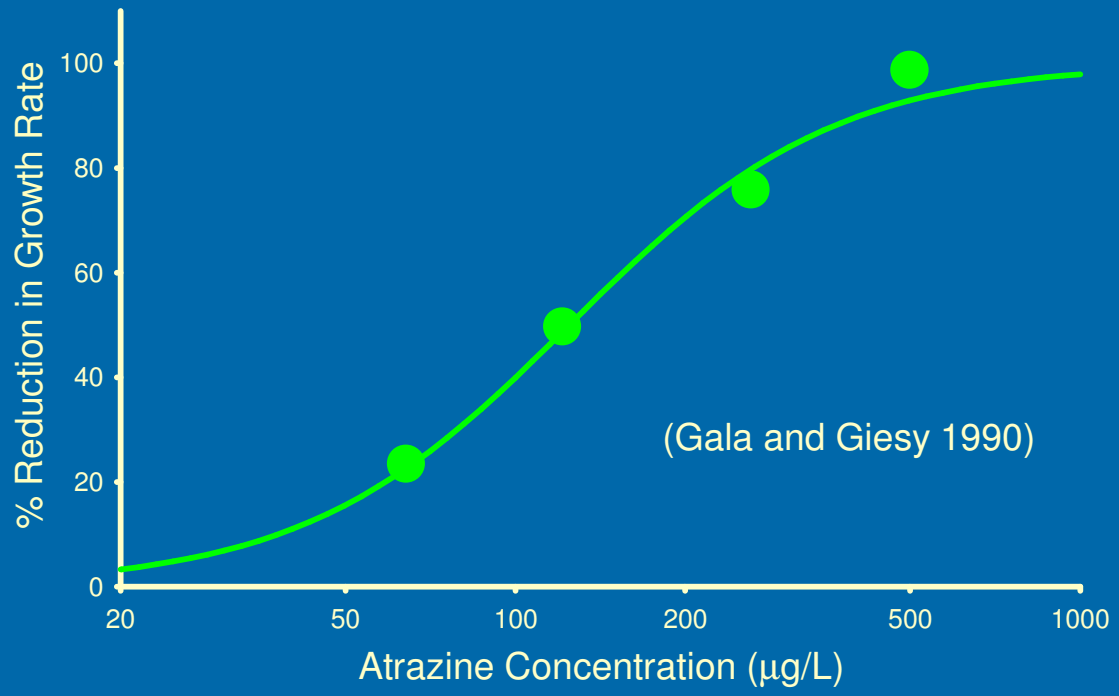
(2) Discrete effects endpoints – does not address other levels of effect.

(3) Discrete exposure duration – does not address time dependence.

(4) Basis for percentile choice – how does this relate to ecosystem risk?

Toxicity Relationships

Use information on entire effects-concentration curve rather than just the EC50.



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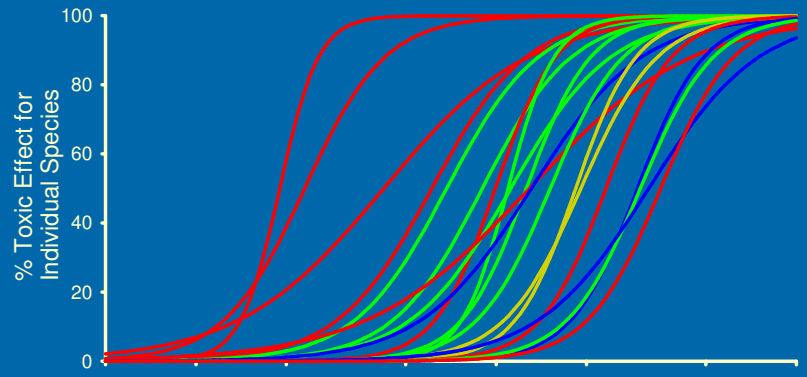
Plant Assemblage Toxicity Index



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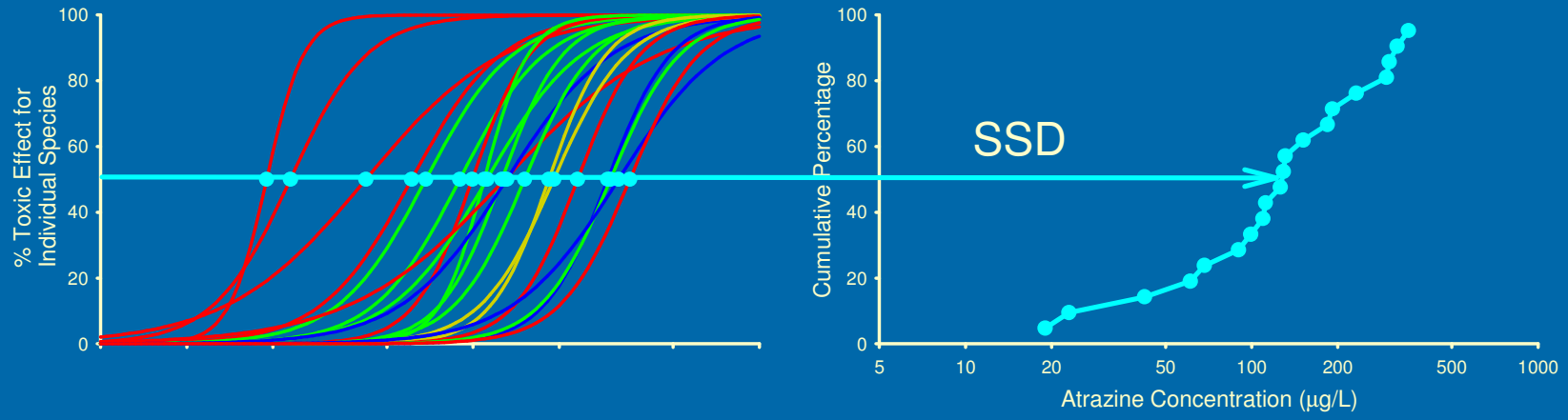

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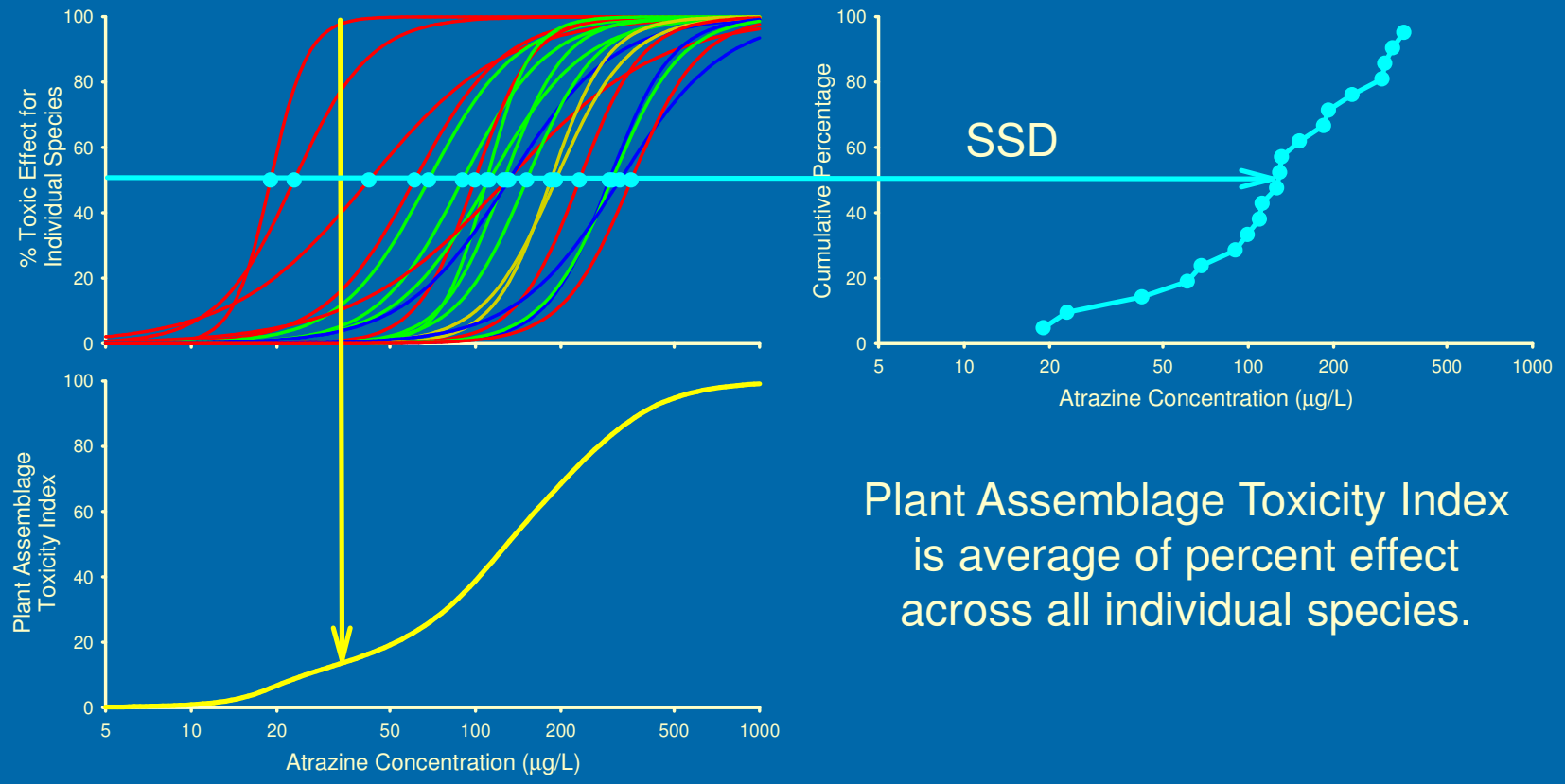

Plant Assemblage Toxicity Index is average of percent effect across all individual species.

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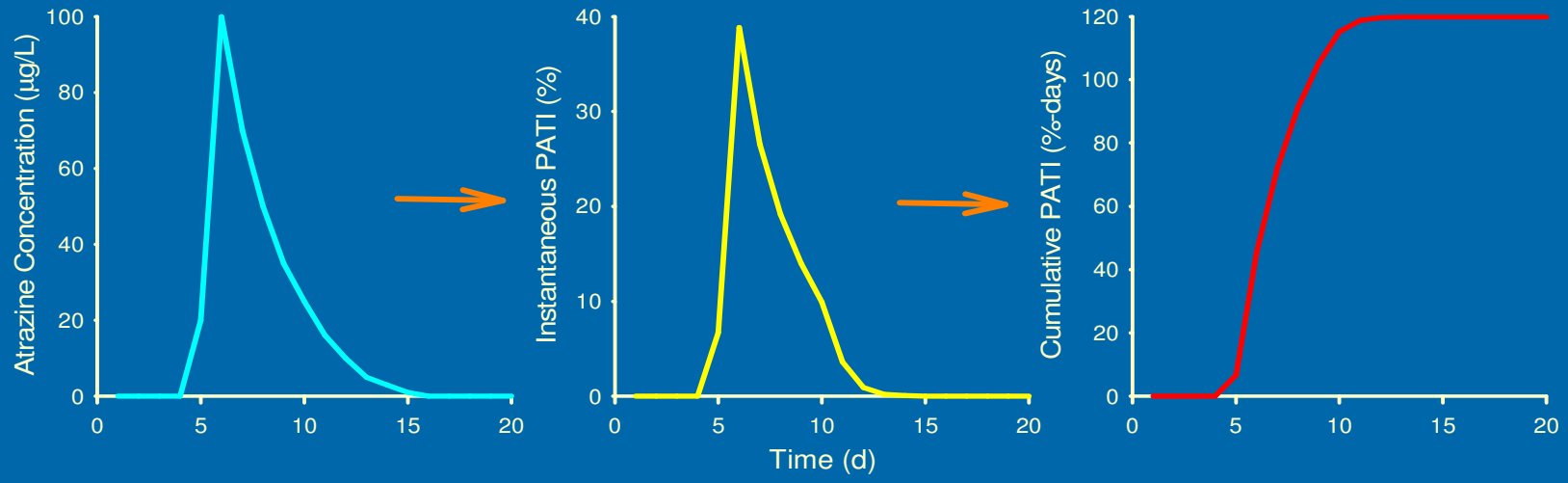
Cumulative PATI

PATI relationship integrated across exposure time-series to provide a “cumulative” PATI describing total toxic impact



This generation of cumulative PATI values is consistent with mathematics of SGR in plant growth equations.

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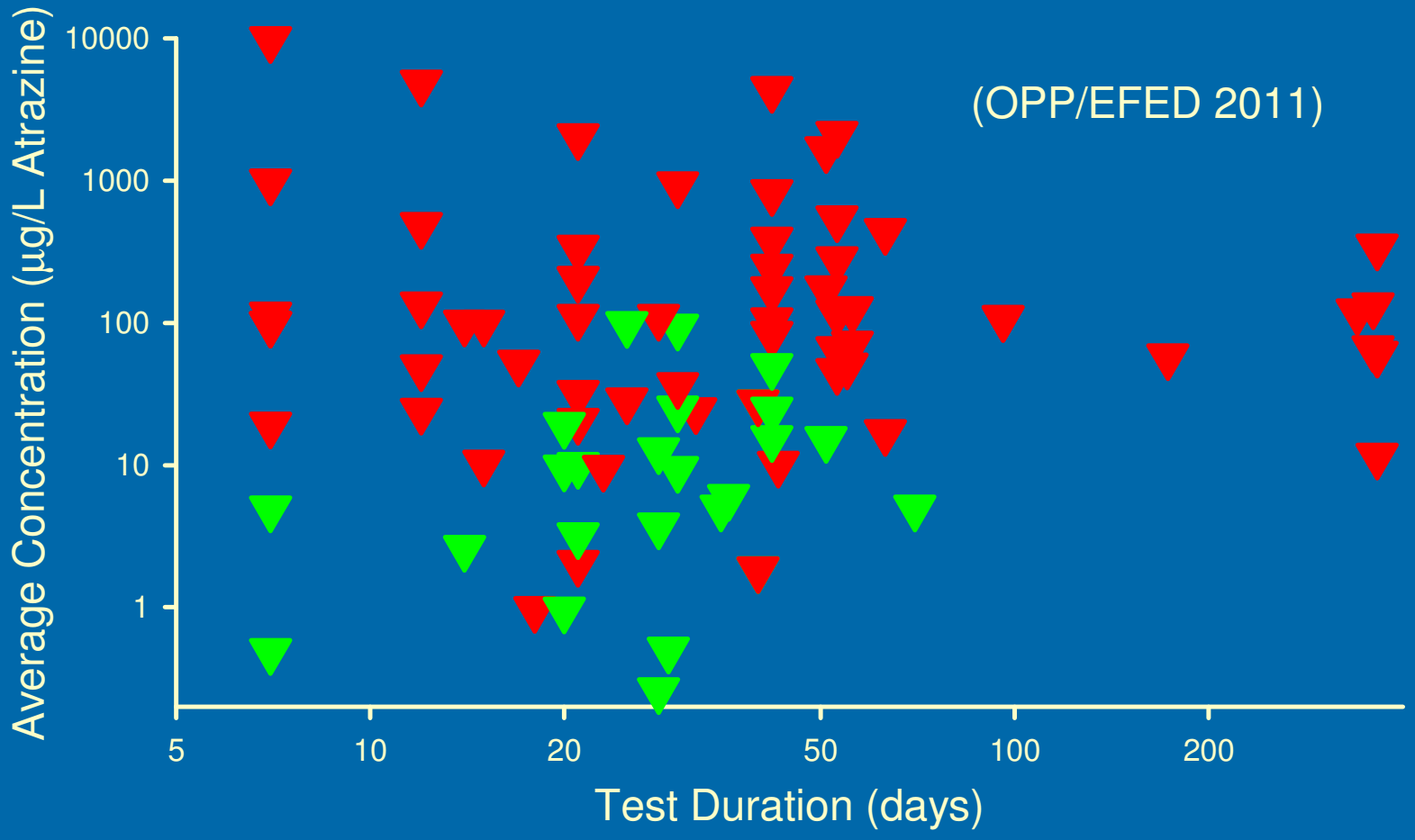
Experimental Ecosystem Effects



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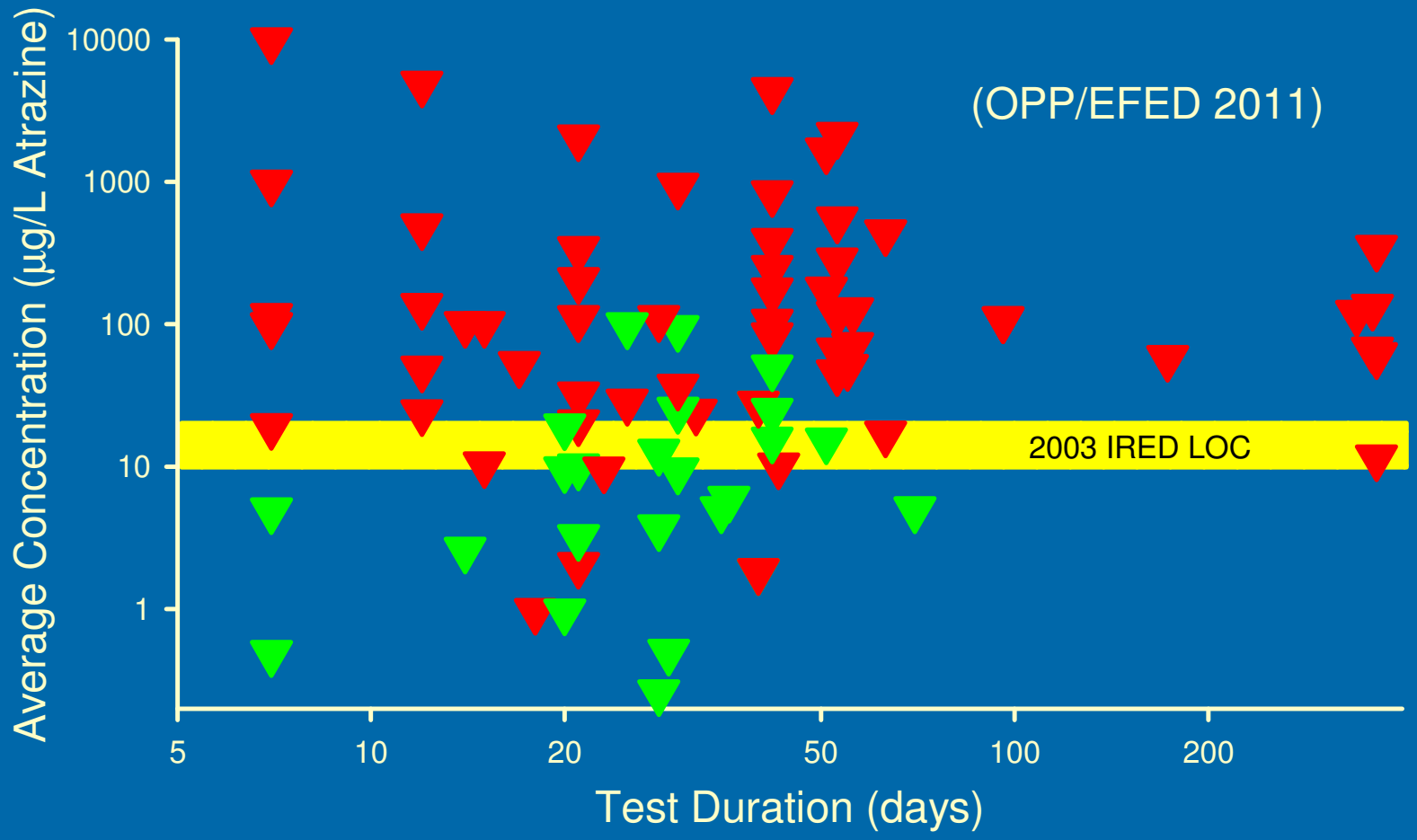

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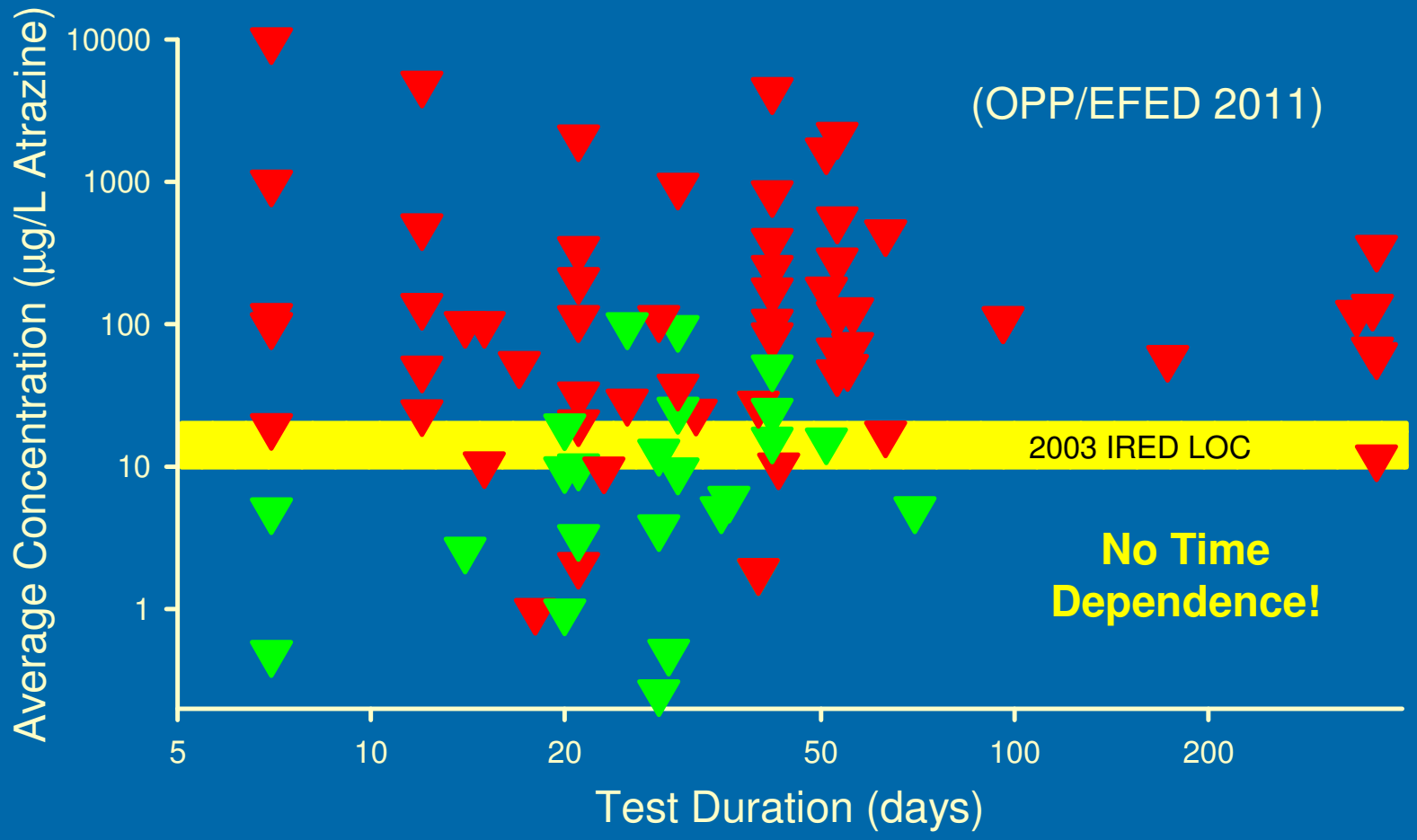

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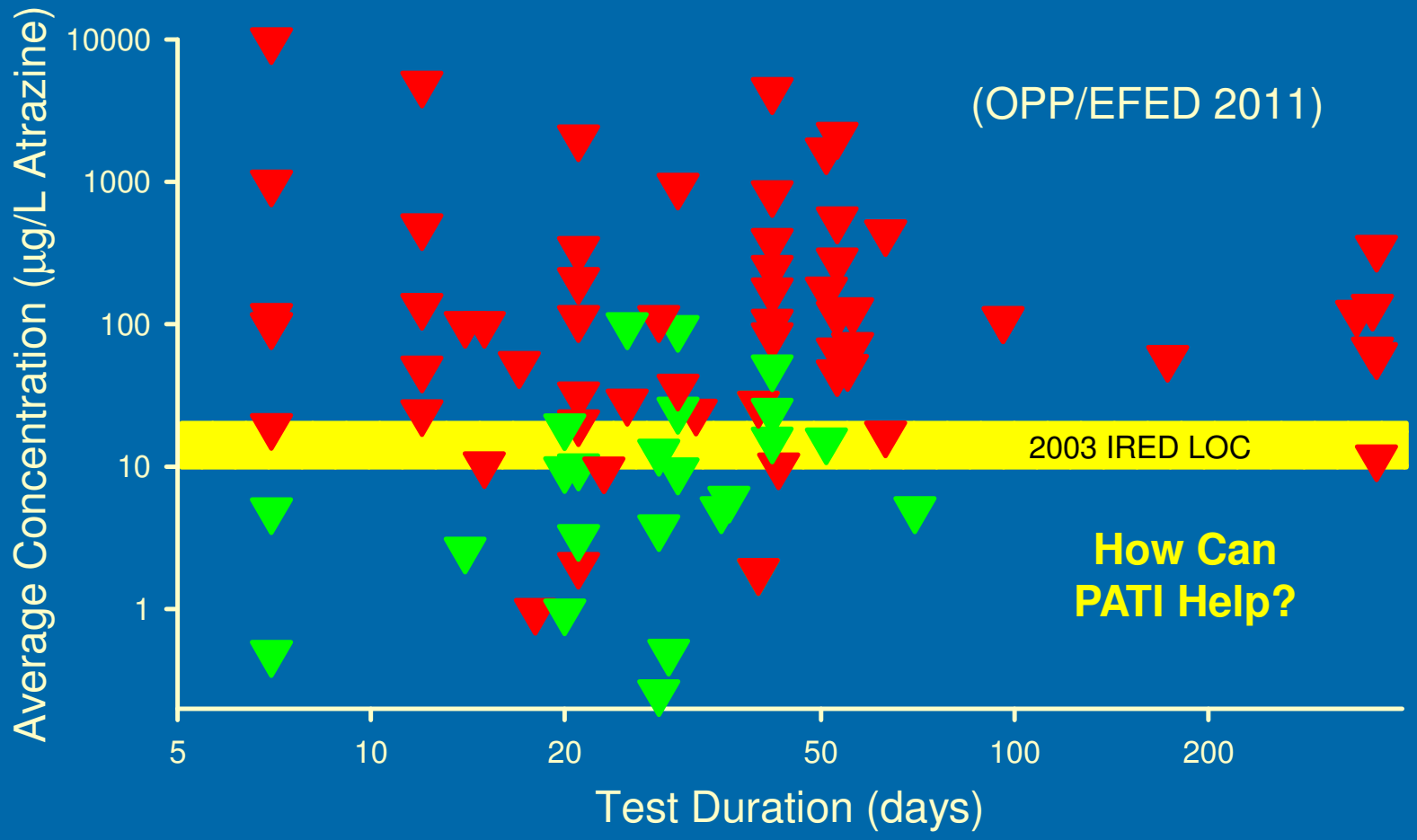

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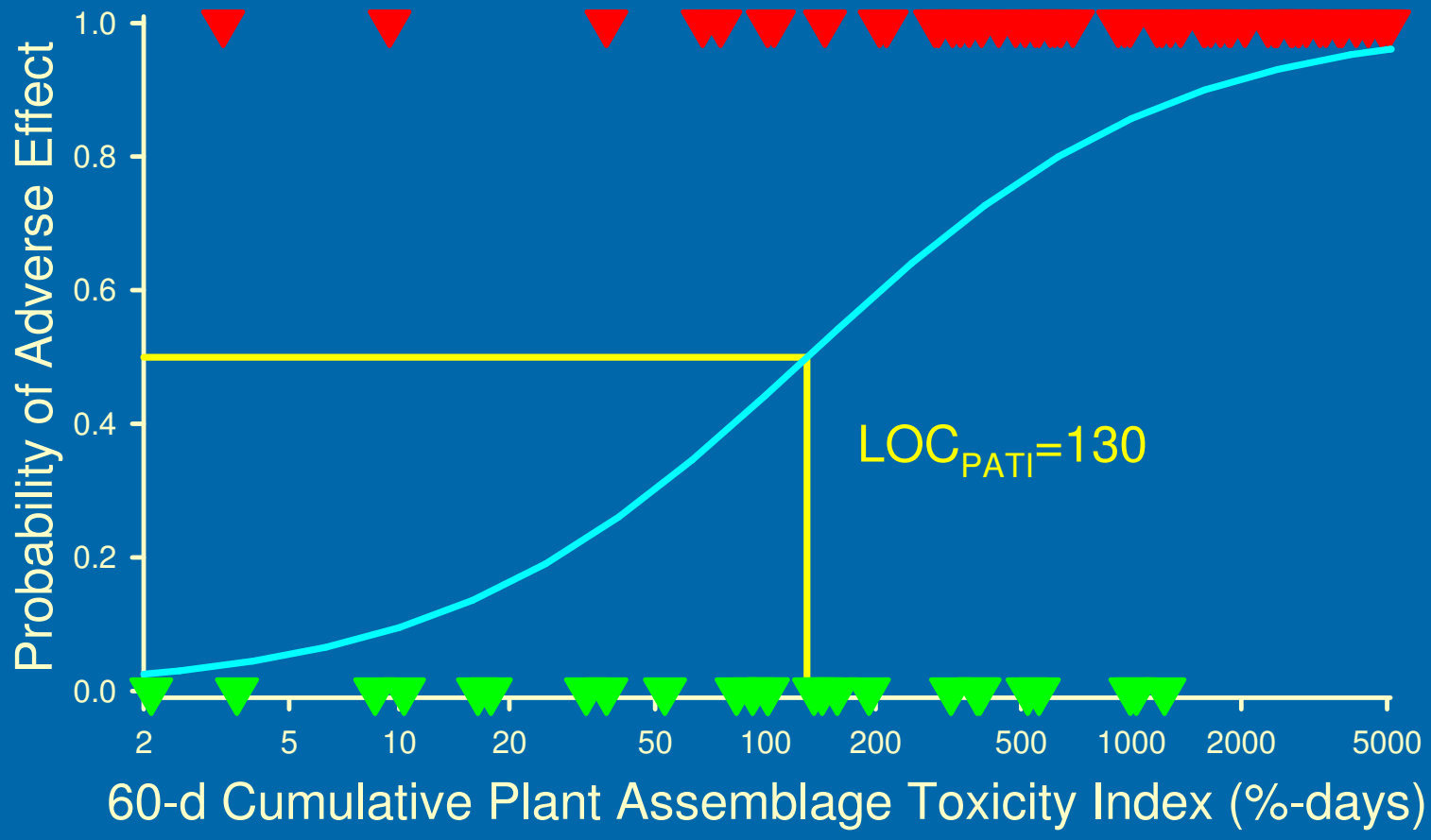
Cumulative PATI Level of Concern



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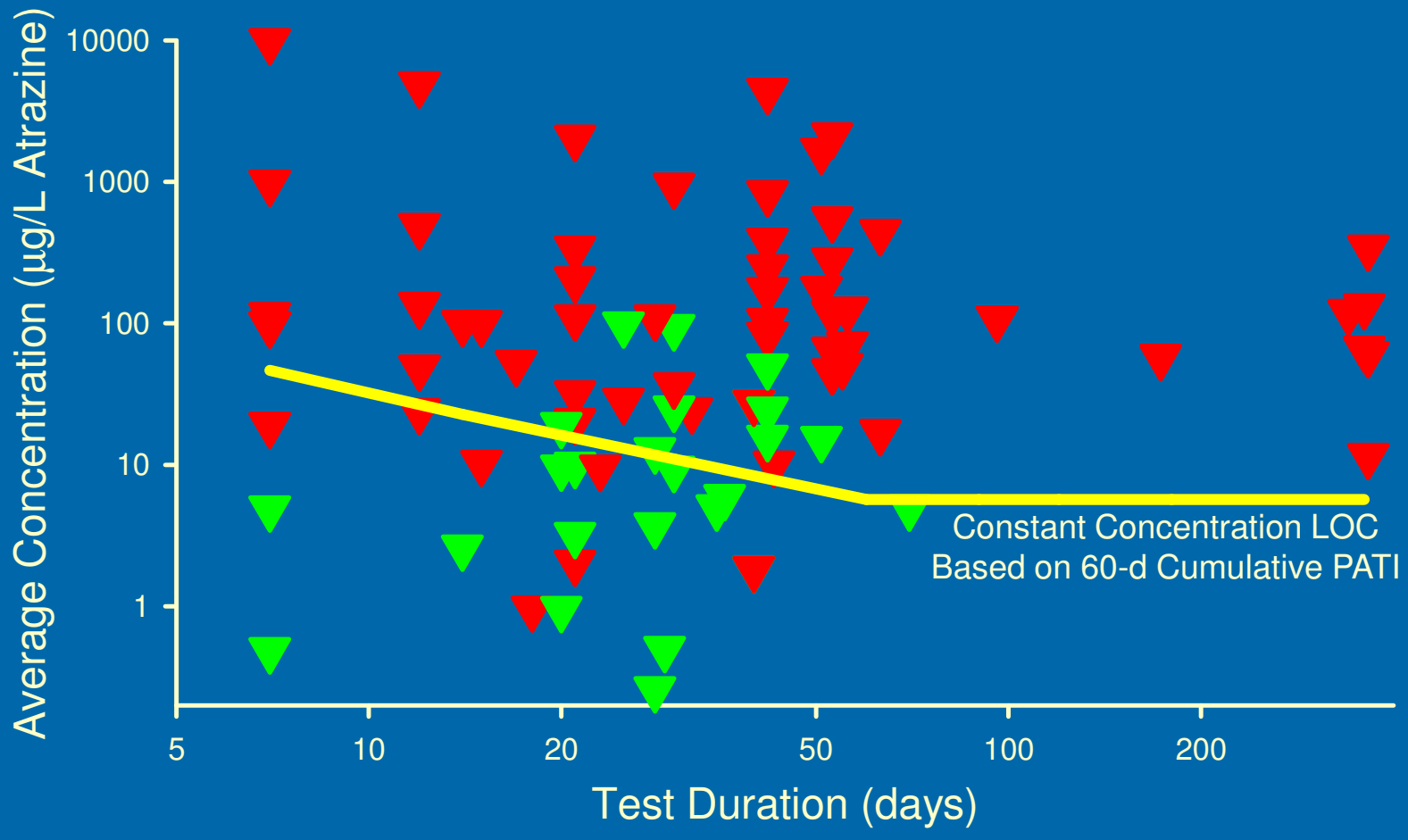

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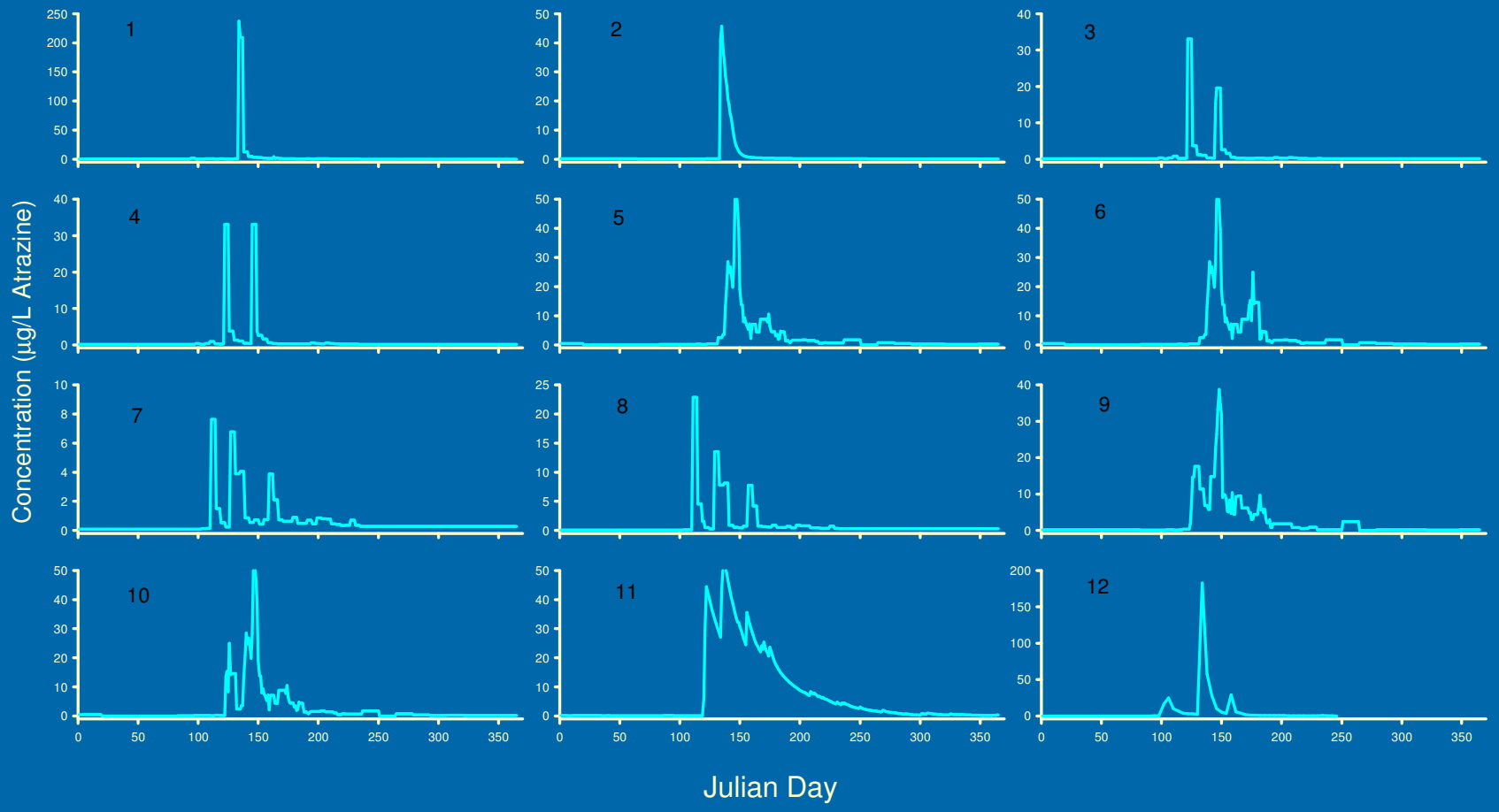
Applying PATI LOC to Field Exposures



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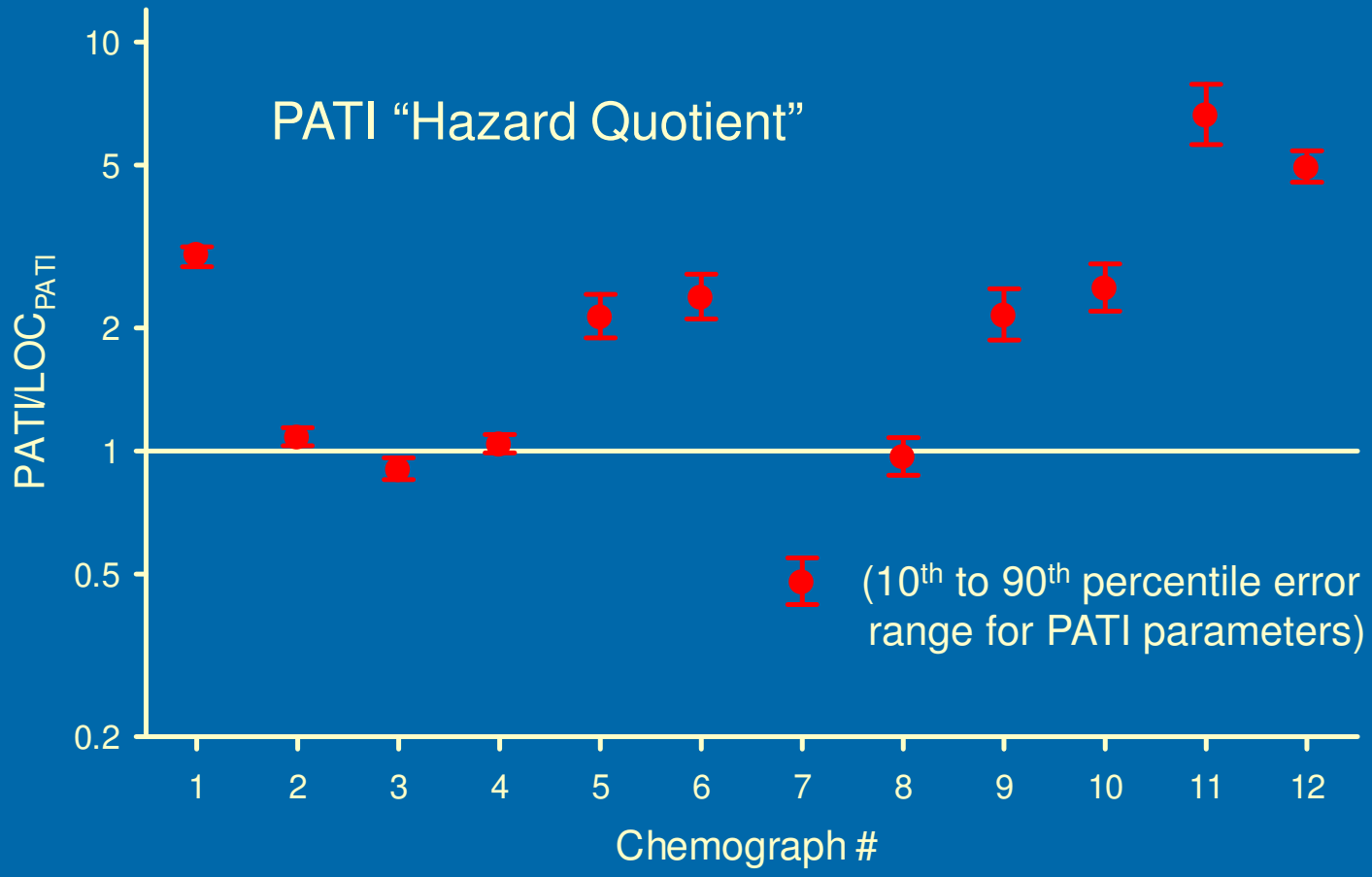

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Summary

(1) The ATIs can extend the SSD concept to provide a more meaningful and graded measure of toxic impact on a species assemblage that addresses time-variable exposures.

(2) For atrazine, a “Plant Assemblage Toxicity Index” based on specific growth rate effects and integrated over exposure time series allows comparison of the *relative* cumulative toxic impact of different exposures.

(3) By establishing a level of concern for this relative index based on community-level effects, these effects can be extrapolated to other exposures, with limited uncertainty arising from the index.