CSPA-77
GFredLeeWorkshopOverview

California Water & Environmental Modeling Forum

Technical Workshop

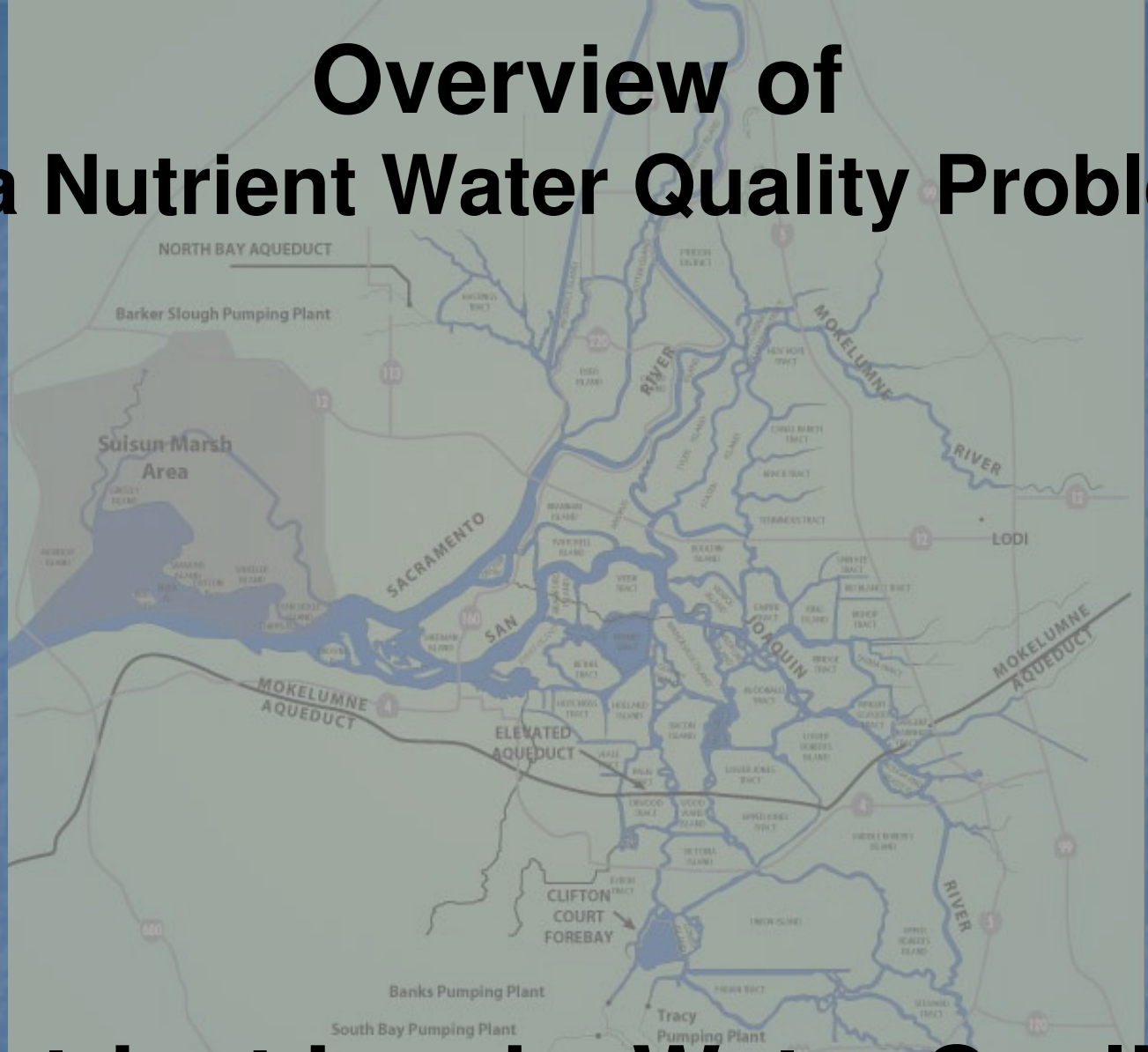
Overview of Delta Nutrient Water Quality Problems Nutrient Load – Water Quality Impact Modeling

Technical Workshop

Welcome

California Water & Environmental Modeling Forum

Overview of
Delta Nutrient Water Quality Problems:



Nutrient Load – Water Quality Impact Modeling

Nutrients

N&P

Managing Nutrient (N & P) Water Quality Impacts in the Central Valley, CA

G. Fred Lee, PhD, PE, DEE & Anne Jones-Lee, PhD
G. Fred Lee & Associates
El Macero, CA

Tastes & Odors

Water Hyacinth on Channel

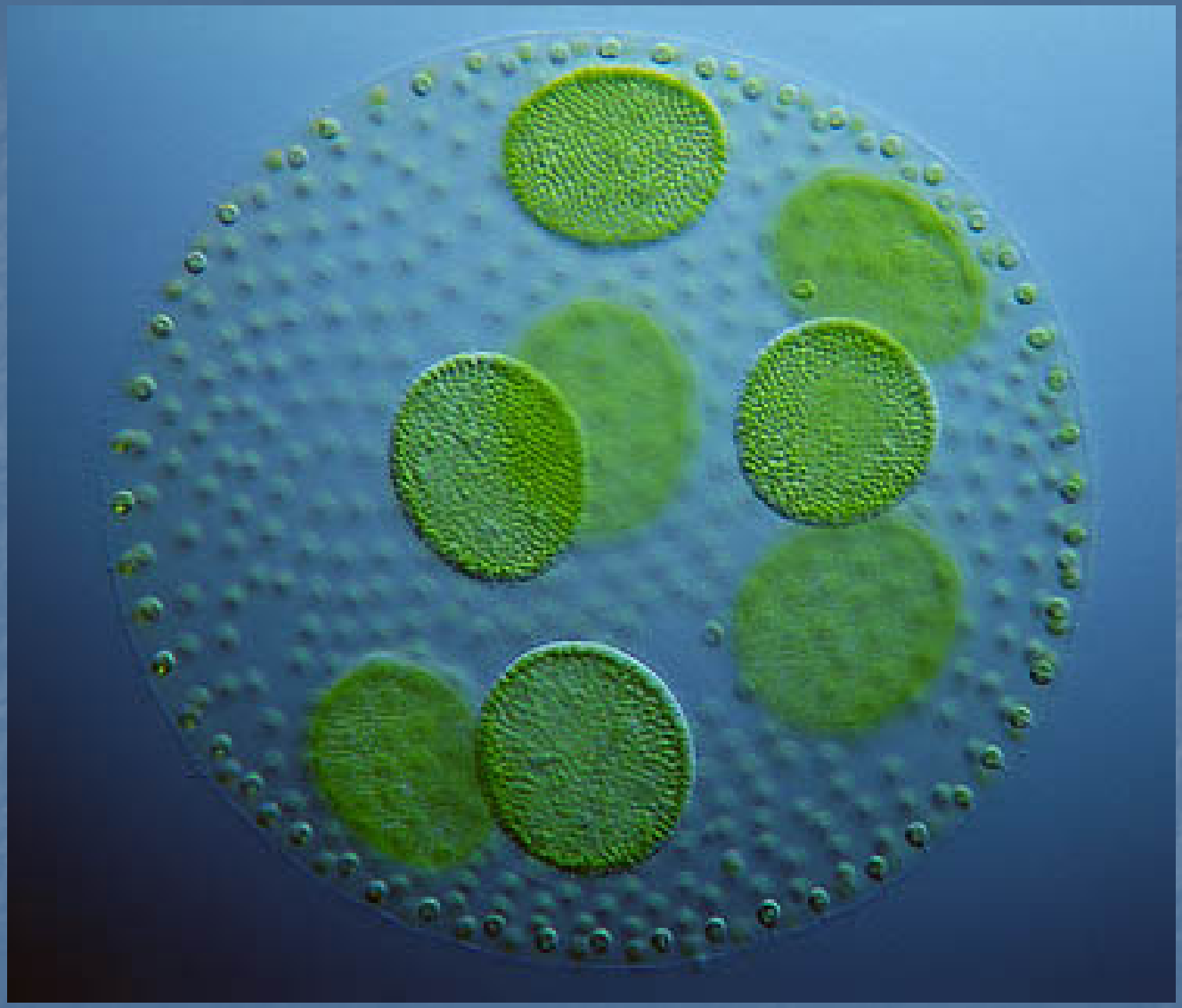
Algae-Caused Low DO — Fish Kills

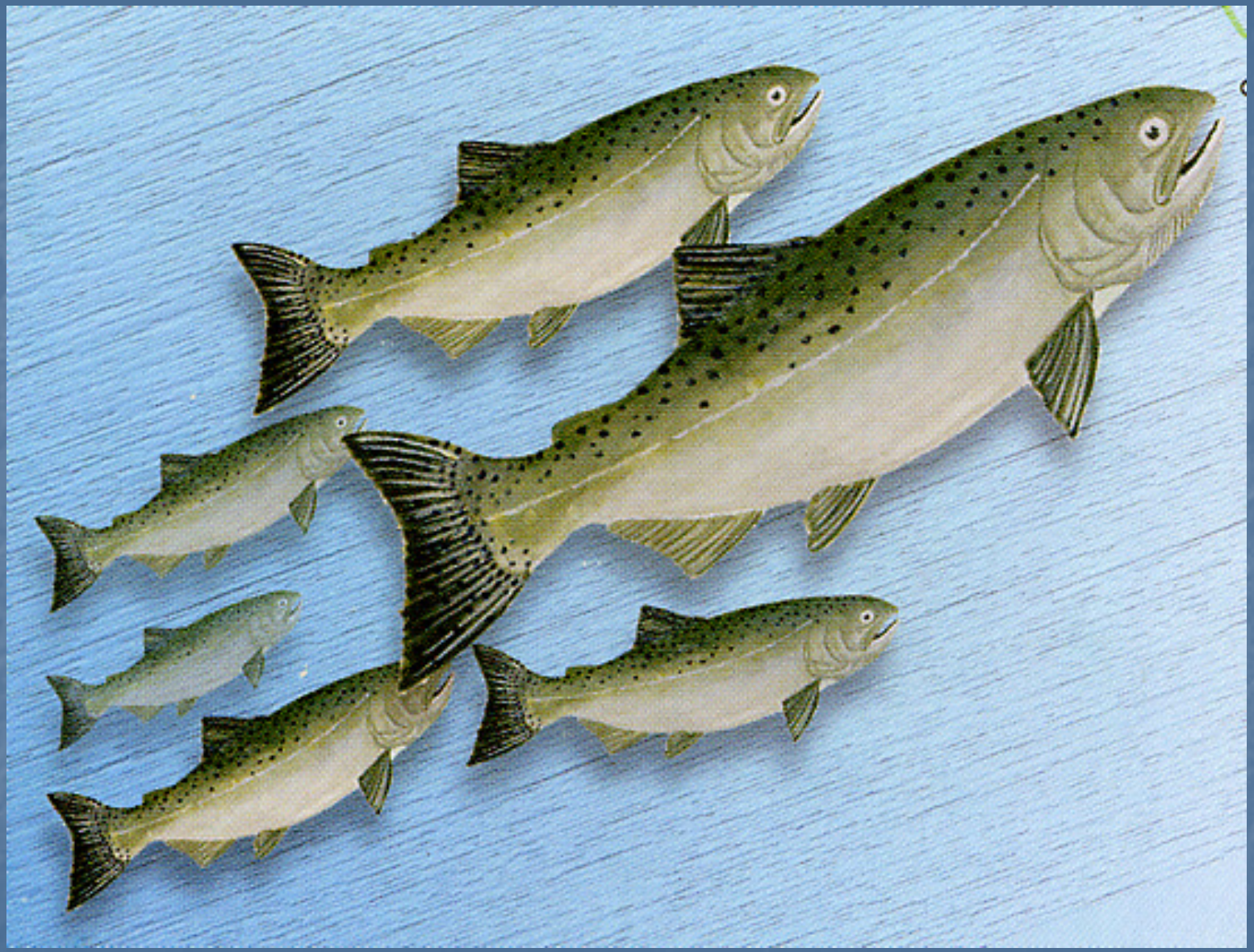
Attached Algae

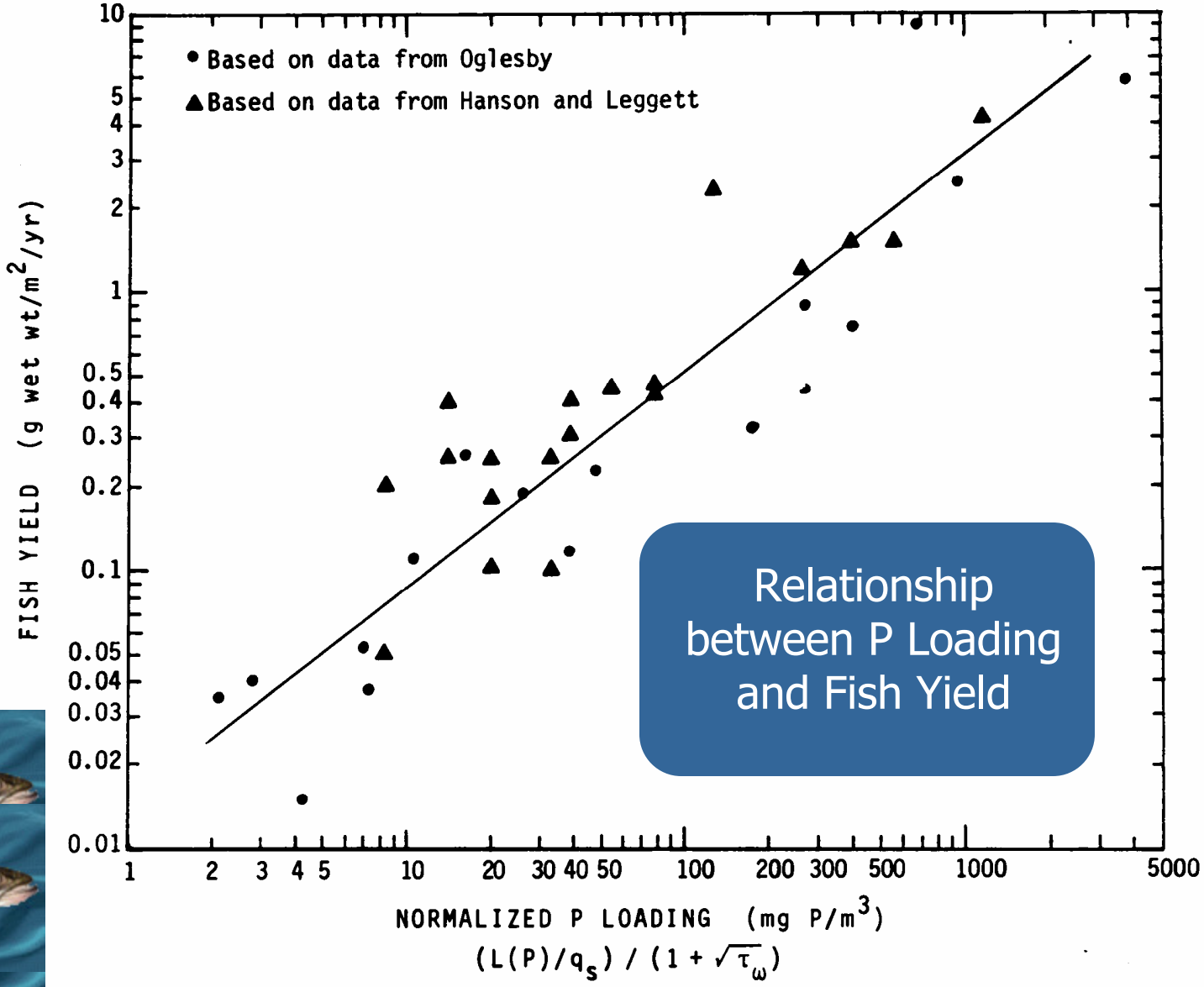
Excerpts from:
Lee, G. F. and Jones-Lee, A., "Review of Management Practices for Controlling the Water Quality Impacts of Potential Pollutants in Irrigated Agriculture Stormwater Runoff and Tailwater Discharges," California Water Institute Report TP 02-05 to California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 128 pp. California State University-Fresno, Fresno, CA, December (2002). Available at: http://www.gfredlee.com/BMP_Rpt.pdf]
Updated September (2007)

Available at: http://www.members.aol.com/GFLEnviroQual/CentralValleyNutrientMgt.pdf

Nutrients

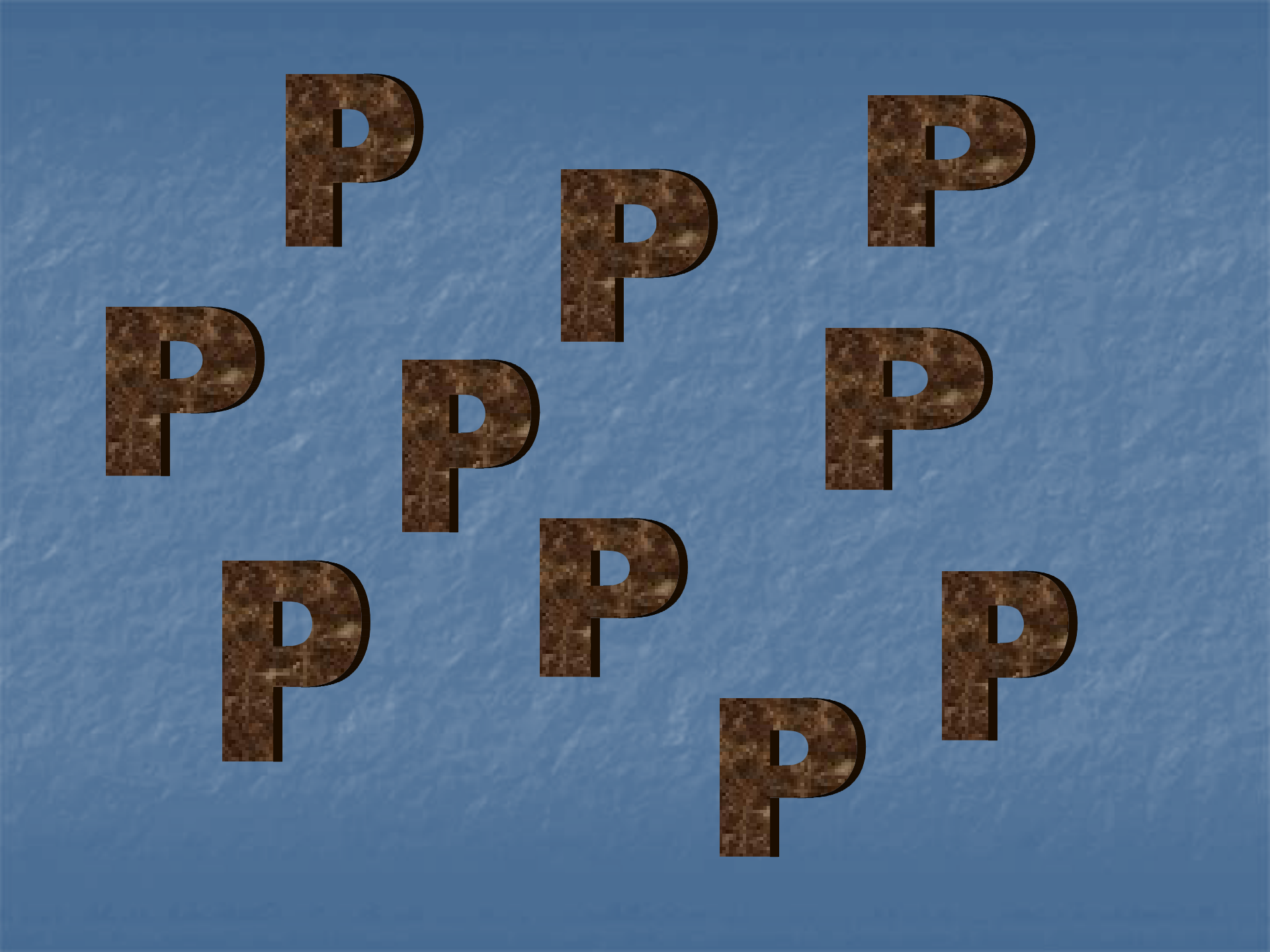






Relationship between P Loading and Fish Yield


P
P
P
P
P


P
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Workshop Objectives

- Overview of Delta Nutrient-Related Water Quality Problems
  - Flow Characteristics of Delta That Impact Nutrient Distribution/Concentrations
  - Domestic Drinking Water Quality
  - Excessive Growths of Aquatic Weeds – Hyacinth, Egeria
  - Low-DO Problems in SJR Deep Water Ship Channel
- Review Modeling Needed to Relate Nutrient Load/ Concentrations to Water Quality Impacts
- Brief Introduction to
  - How Planktonic Algal Populations Have Responded to Reduction in P Input to Delta
  - Nutrient Sources for Delta
  - Regulatory Issues for Control of Excessive Fertilization of Delta

Possible Follow-on Special-Focus Workshops

- Nutrient Sources & Their Control
- Impact of Nutrient Input Reductions on Primary Production (Algae) & Fish Production in Delta
- How Future Delta Channel Flow Manipulations May Impact Delta Nutrient-Related Water Quality Characteristics
- Modeling Delta Nutrient-Related Water Quality Impacts
- Balancing Nutrient Control with Fish Production
- Development of Site-Specific Nutrient Criteria
- Others Suggested by Participants

Developing Site-Specific Nutrient Criteria & Allowable Discharge Limits

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Developing Site-Specific Nutrient Criteria & Allowable Discharge Limits

- Experience & Research in Nutrient-Related Water Quality Issues & Management Extends Back to Early 1960's
- Key, More Recent Reviews of Issues & Approach
  - Lee, G. F. and Jones-Lee, A., "Developing Nutrient Criteria/TMDLs to Manage Excessive Fertilization of Waterbodies," Proc. WEF TMDL 2002 Conf., Phoenix, AZ (2002a). http://www.gfredlee.com/WEFN.Criteria.pdf
  - Lee, G. F. and Jones-Lee, A., "Assessing the Water Quality Impacts of Phosphorus in Runoff from Agricultural Lands," IN: Hall, W. and Robarge, W. (eds), Environmental Impact of Fertilizer on Soil and Water, ACS Symp. Series 872, Oxford Univ. Press, pp. 207-219 (2004). http://www.gfredlee.com/ag_p-1_012002.pdf

TMDL Development Approach to Nutrient Criteria Development

(from Lee and Jones-Lee, 2002a, 2004)

- Develop Statement of Problem(s) Caused by the Excessive Fertilization
- Establish (Quantify) Goal for Nutrient Control (i.e., Desired Eutrophication-Related Water Quality Characteristics)
- Determine and Quantify Nutrient Sources, Focusing on Available Forms
- Establish/Quantify Cause-Effect Linkage between Nutrient Loads and Eutrophication-Related Water Quality Characteristics (Modeling)

TMDL Development Approach to Nutrient Criteria Development (cont'd)

- Initiate a Phase I Nutrient Control Implementation Plan to Control Nutrients to Level Needed to Achieve Desired Water Quality Characteristics
- Monitor Waterbody for 3 to 5 yrs after Implementation of Nutrient Control to Assess Achievement of Desired Water Quality Characteristics
- If Desired Water Quality Characteristics Not Achieved after 3 to 5 yrs, Initiate a Phase II Plan
  - Improve Load-Response Model via Monitoring to Enable More Reliable Estimate of Nutrient Load Control Needed to Achieve Desired Water Quality Characteristics.

TMDL Development Approach to Nutrient Criteria Development (cont'd)

- Approach Is Iterative
  - Over Period of at least 5 - to Possibly 15 yrs
  - Through 2 or more Consecutive Phases
  - It Will Be Possible to Achieve Desired Water Quality Characteristics, and thereby
  - Define Nutrient Loads That Can Be Translated into In-Waterbody Concentrations for Specific Waterbody, and
  - Establish Meaningful Nutrient Criteria for the Particular Waterbody
- Criteria Cannot Be Presumed to Be Appropriate for Other Waters

Components Discussed in:

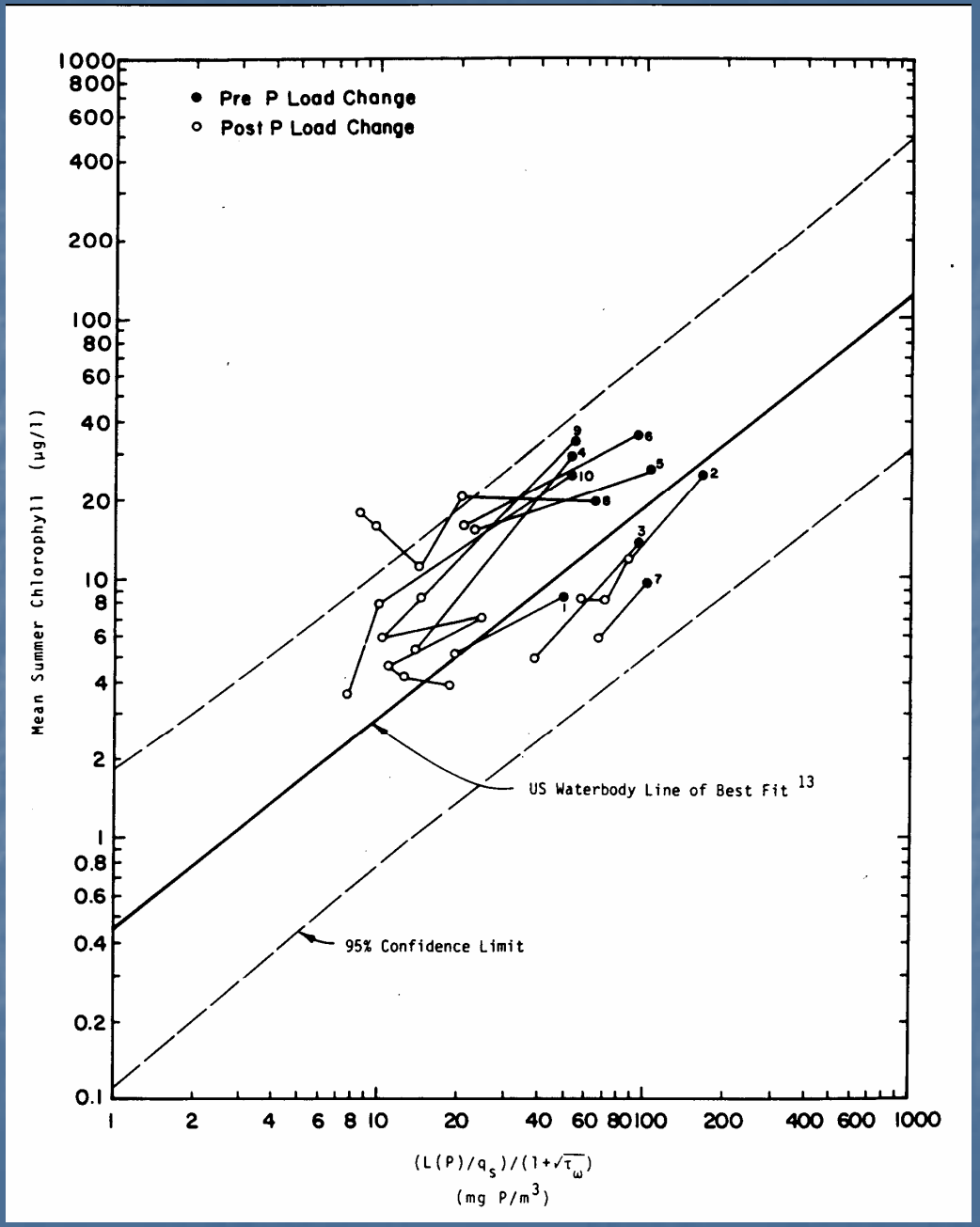
- Lee, G. F. and Jones, R. A., "Effects of Eutrophication on Fisheries," Reviews in *Aquatic Sciences* 5:287-305, CRC Press, Boca Raton, FL (1991). http://www.gfredlee.com/fisheu.html
- Lee, G. F. and Jones-Lee, A., "Developing Nutrient Criteria/TMDLs to Manage Excessive Fertilization of Waterbodies," Proceedings Water Environment Federation TMDL 2002 Conference, Phoenix, AZ, November (2002a) http://www.gfredlee.com/WEFN.Criteria.pdf
- Lee, G. F., and Jones-Lee, A., "Managing Nutrient (N & P) Water Quality Impacts in the Central Valley, CA," [Excerpts from: Lee, G. F. and Jones-Lee, A., "Review of Management Practices for Controlling the Water Quality Impacts of Potential Pollutants in Irrigated Agriculture Stormwater Runoff and Tailwater Discharges," California Water Institute Report TP 02-05 to California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 128 pp, California State University Fresno, Fresno, CA, December (2002b)], Report of G. Fred Lee & Associates, El Macero, CA (2002b).http://www.members.aol.com/GFLEnviroQual/CentralValleyNutrientMgt.pdf
- Lee, G. F. and Jones-Lee, A., "Assessing the Water Quality Impacts of Phosphorus in Runoff from Agricultural Lands," In: Hall, W. L. and Robarge, W. P., ed., Environmental Impact of Fertilizer on Soil and Water, American Chemical Society Symposium Series 872, Oxford University Press, Cary, NC, pp. 207-219 (2004). http://www.gfredlee.com/ag_p-1_012002.pdf

Further Information

Consult Website of
Drs. G. Fred Lee and Anne Jones-Lee

http://www.gfredlee.com

Demonstration of Predictive Capability of US OECD Eutrophication Modeling Approach



Delta Excessive Fertilization & the POD

- Dramatic Decrease in Several Pelagic Organism Species in Delta
  - Delta Smelt, Others
- Dr. B. Herbold – US EPA & a Lead Scientist in POD Studies – Stated at POD Briefing at Delta Vision Task Force Meeting March 20, 2008
  - Delta Becoming More Like a Eutrophic Lake
  - Excessive Fertilization May Contribute to POD
  - Bluegreen Algae
    - Food Quality
    - Toxicity
  - Ammonia
  - Egeria
- Address in Future Workshops