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Key Elements of Lake and Reservoir Water Quality

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Reed Green, U.S. Geological Survey, Arkansas Water Science Center (wrgreen@usgs.gov)

U.S. Department of the Interior
U.S. Geological Survey

Outline

- Common trophic state (water-quality) measures
- Temporal variation
- Spatial variation
- Phosphorus and chlorophyll relations
- Spatio-temporal hydrodynamics

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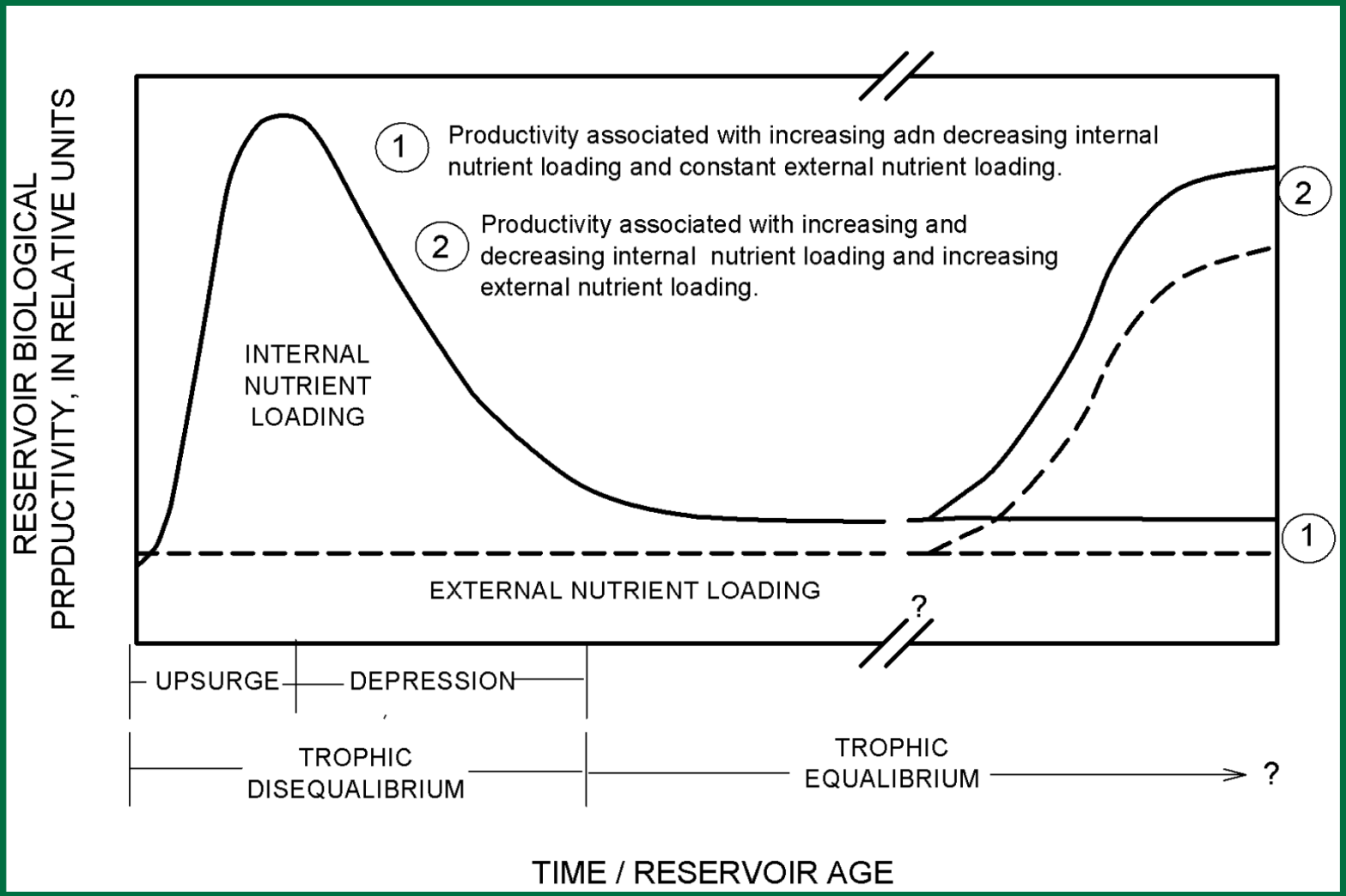
Carlson's Trophic State Index

TSI	Chl (μg/L)	SD (m)	TP (μg/L)	Trophic State Attributes	Water Supply
<30	<0.95	>8	<6	**Oligotrophy:** Clear water, oxygen throughout the year in the hypolimnion	Water may be suitable for an unfiltered water supply.
30-40	0.95-2.6	8-4	6-12	Hypolimnia of shallower lakes may become anoxic	
40-50	2.6-7.3	4-2	12-24	**Mesotrophy:** Water moderately clear; increasing probability of hypolimnetic anoxia during summer	Iron, manganese, taste, and odor problems worsen. Raw water turbidity requires filtration.
50-60	7.3-20	2-1	24-48	**Eutrophy:** Anoxic hypolimnia, macrophyte problems possible	
60-70	20-56	0.5-1	48-96	Blue-green algae dominate, algal scums and macrophyte problems	Episodes of severe taste and odor possible.
70-80	56-155	0.25-0.5	96-192	**Hypereutrophy:** (light limited productivity). Dense algae and macrophytes	
>80	>155	<0.25	192-384	Algal scums, few macrophytes	http://www.secchidipin.org

Reservoir Ageing



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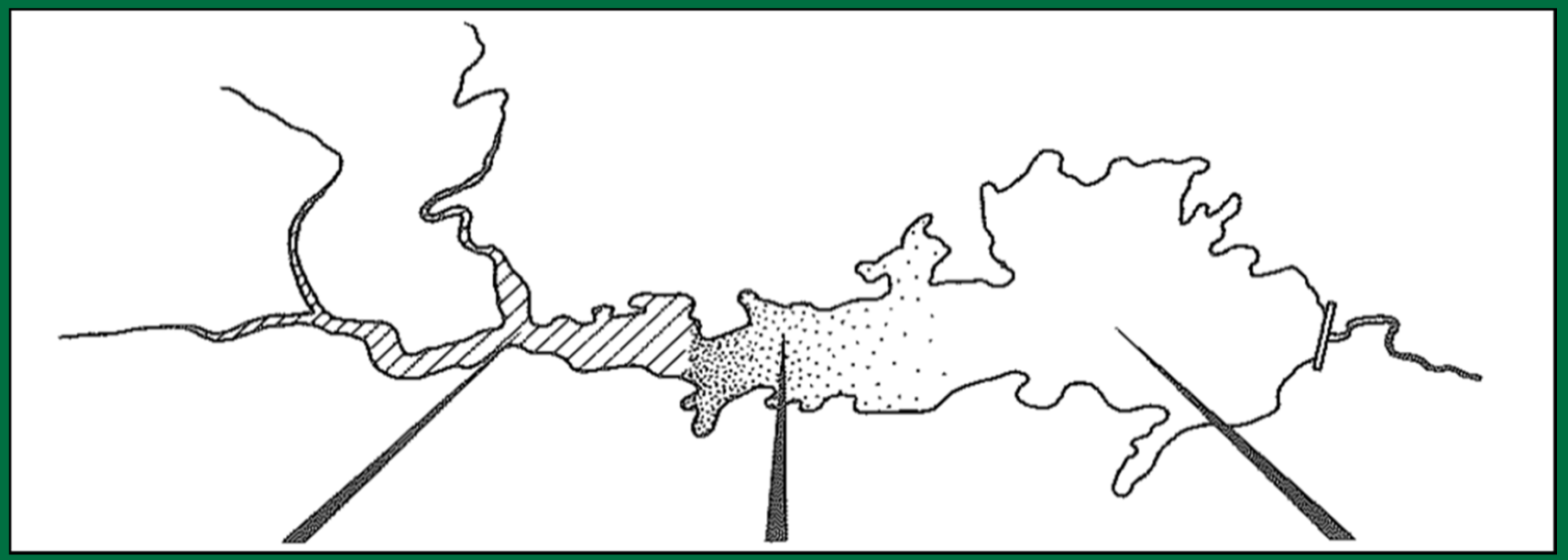
Modified from Kimmel and Groeger, 1986, fig. 2

Reservoir Zonation



Riverine Transitional Lake-Like

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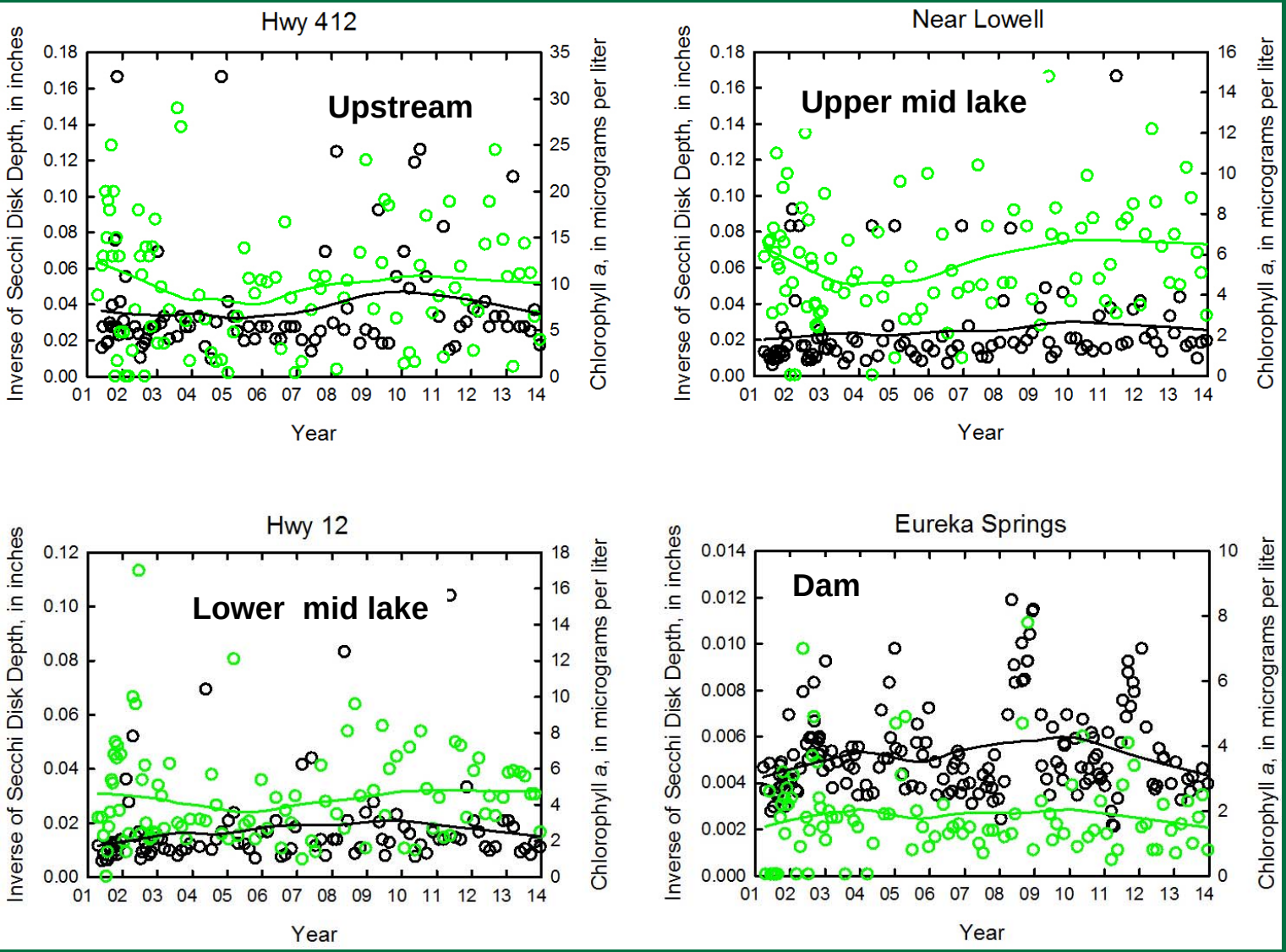
Secchi and Chlorophyll a Relations

Beaver Lake



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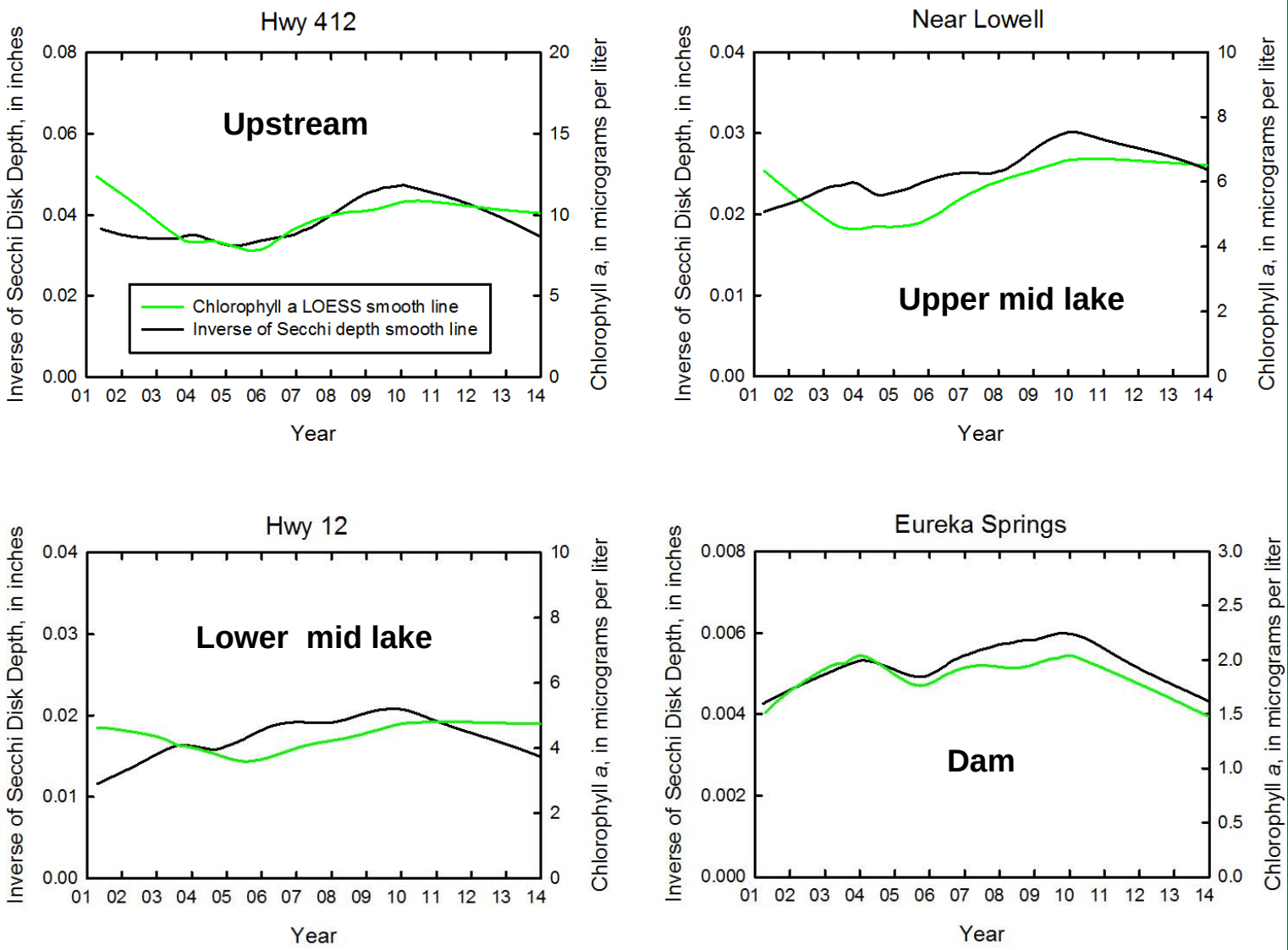

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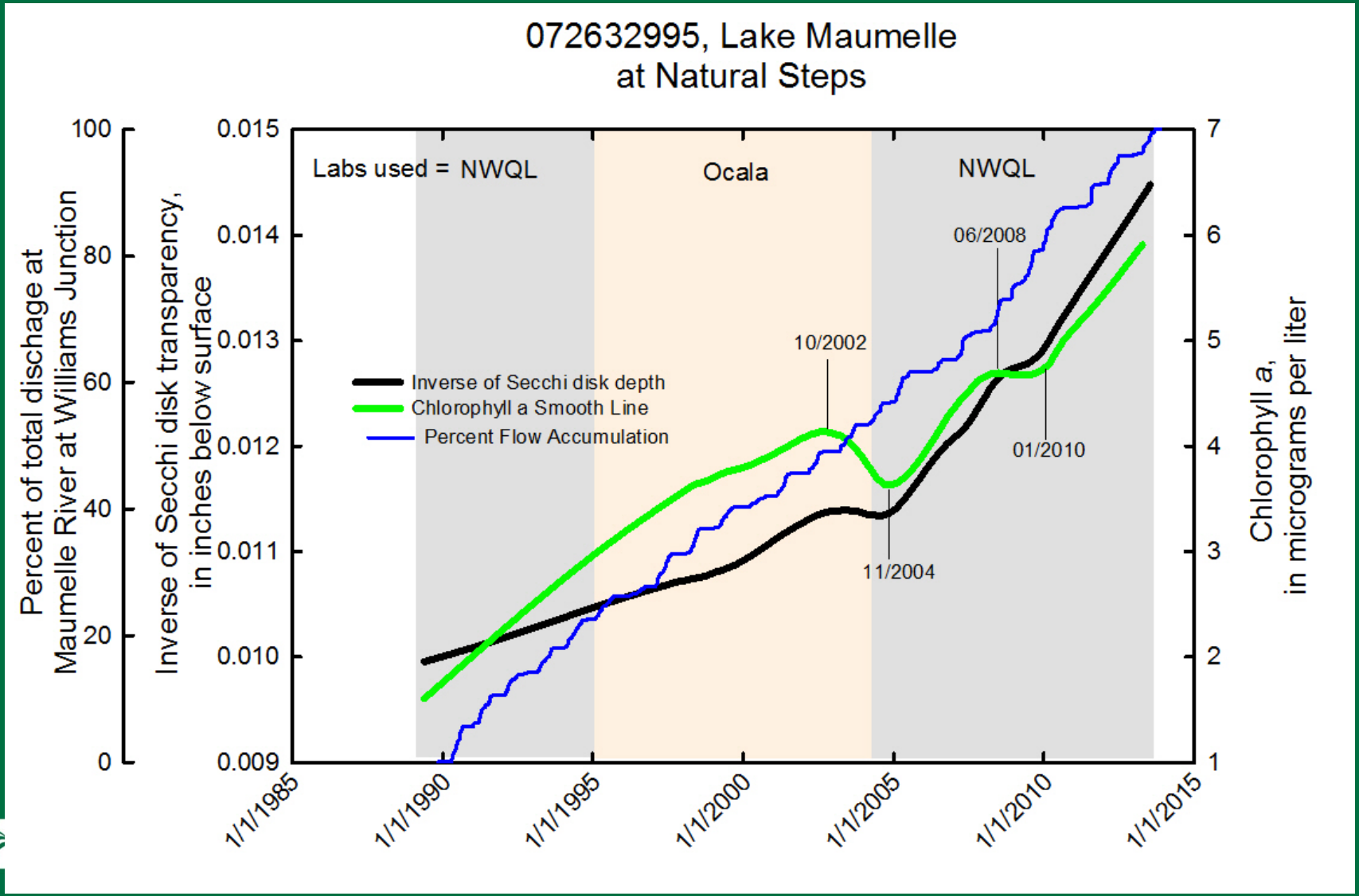
Secchi and Chlorophyll a Relations



Nutrient Enrichment and Algal Production

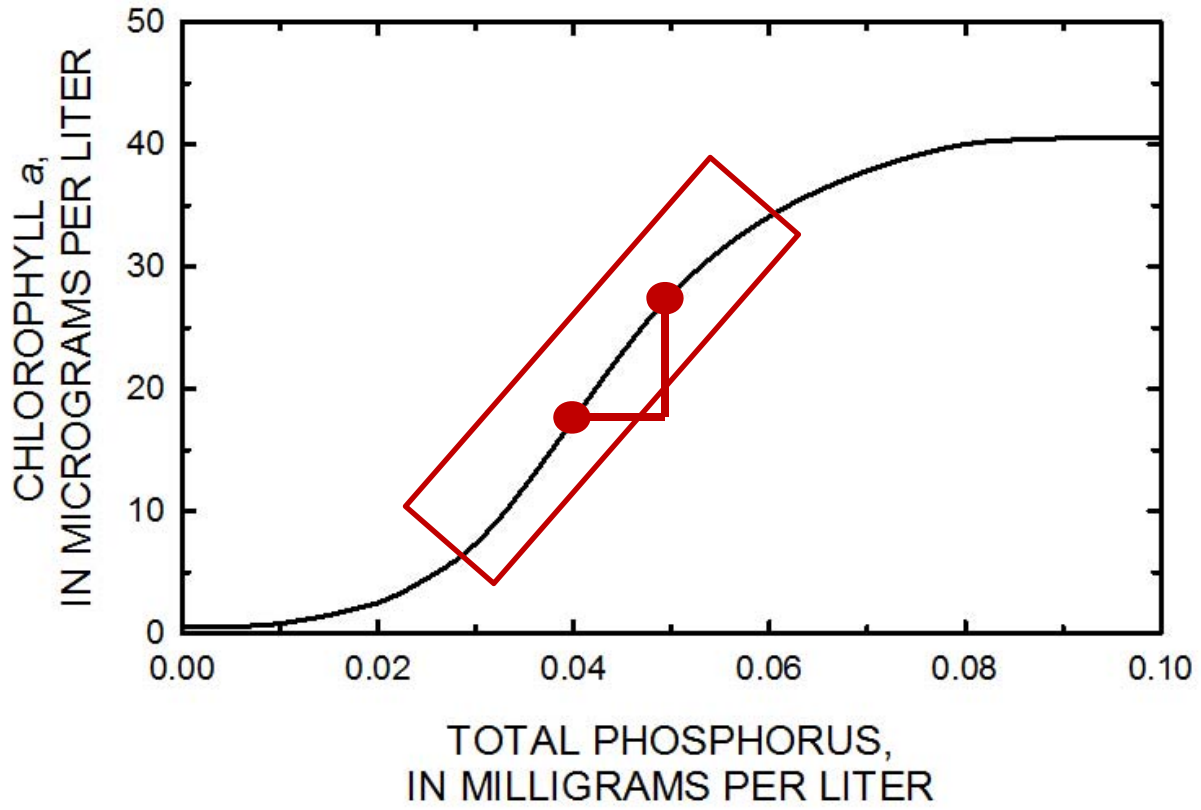


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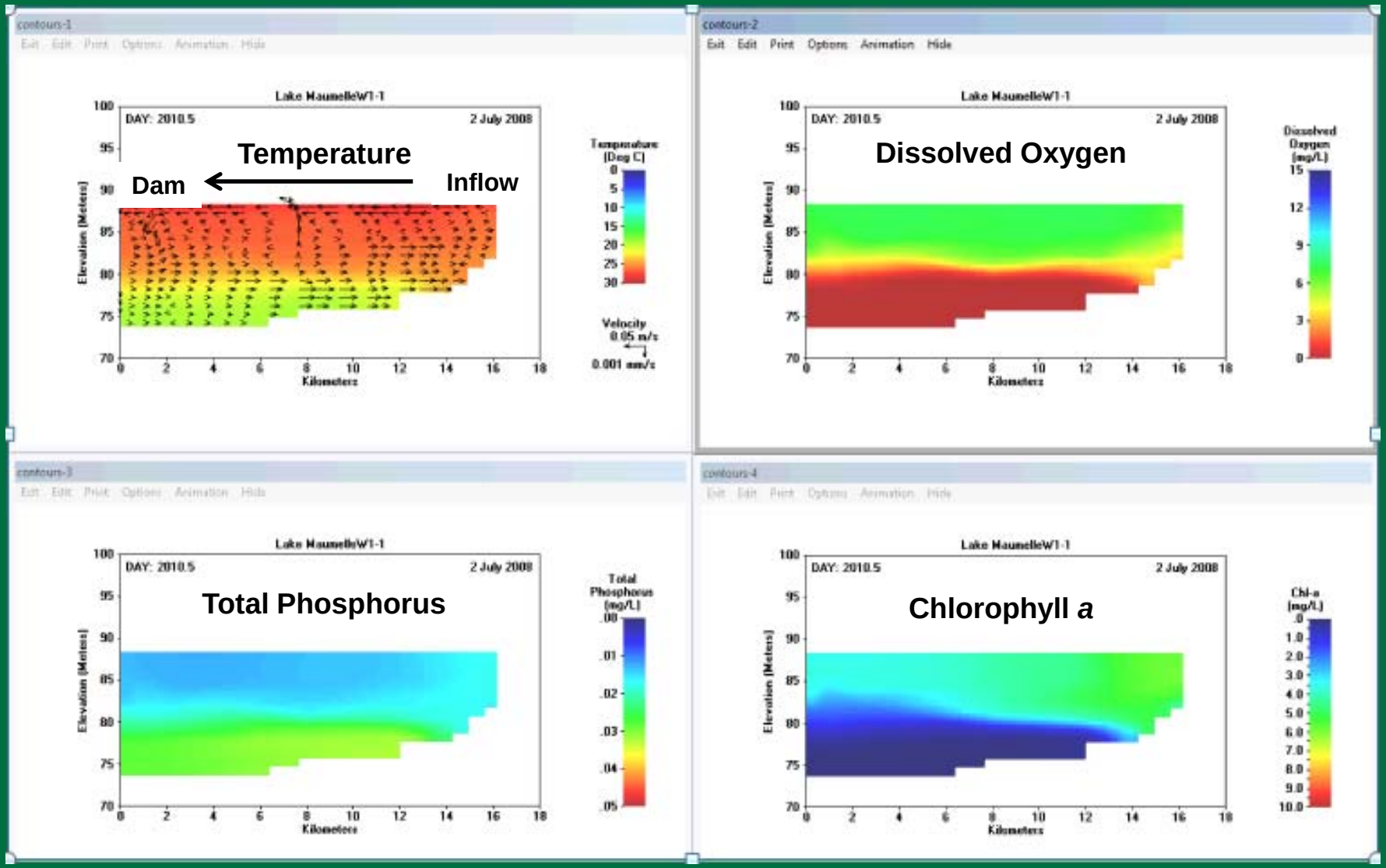
Figure 4. Relation between chlorophyll *a* concentration and total phosphorus concentration in lakes and reservoirs (modified from Straskraba, 1993, figure 11).

Spatial and Temporal Variability



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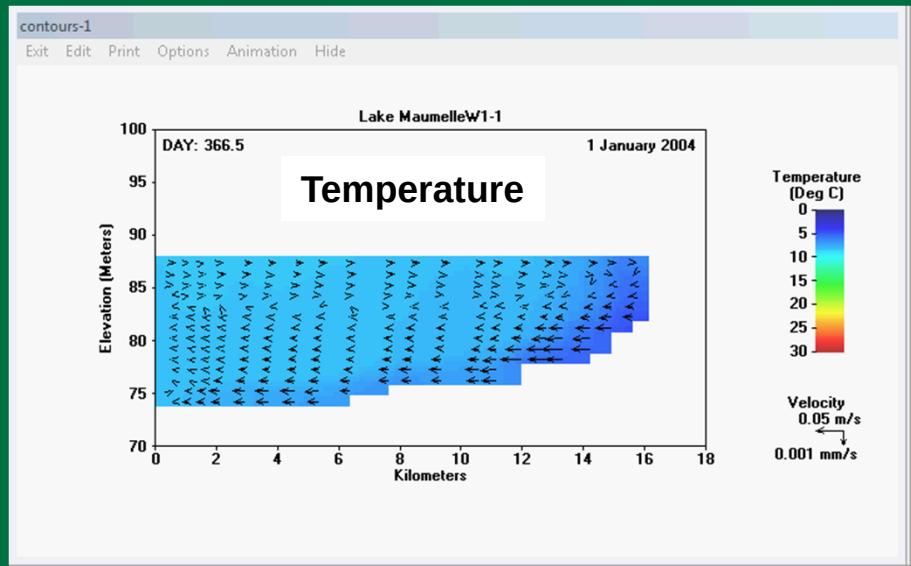

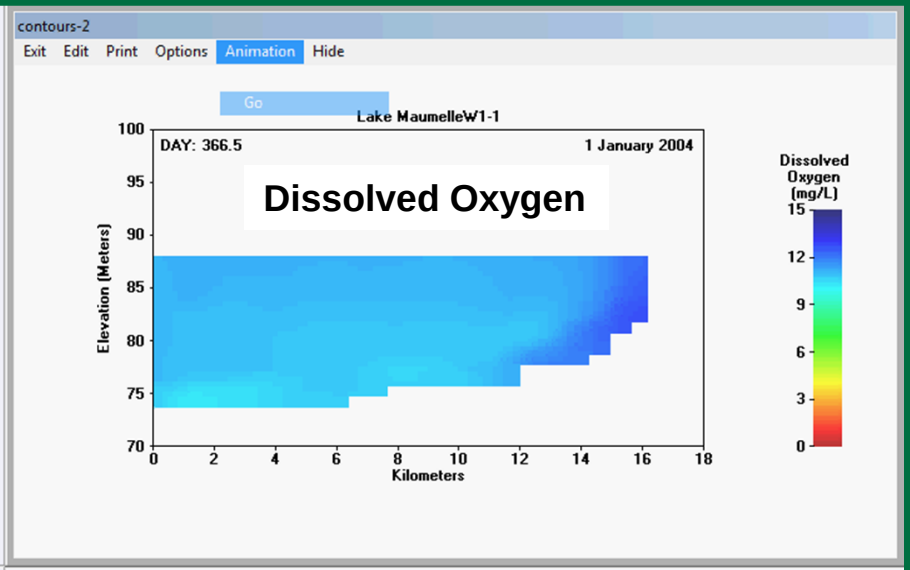

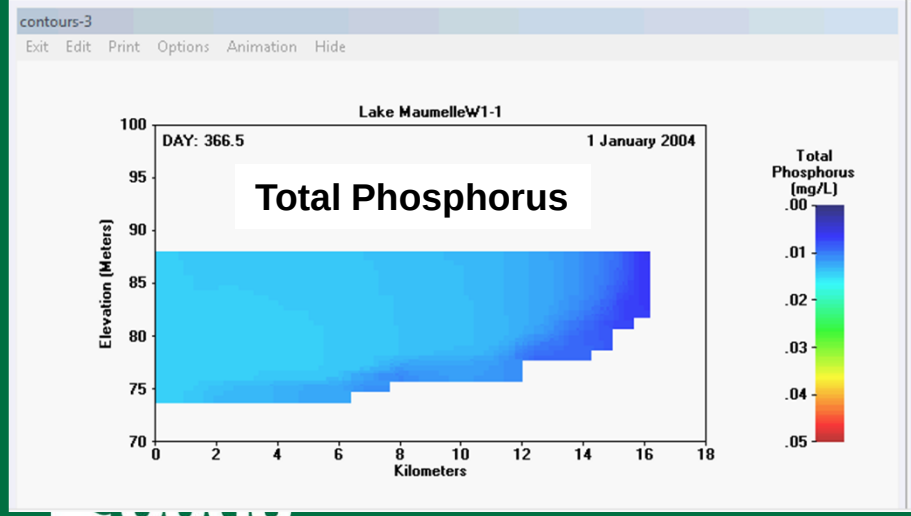

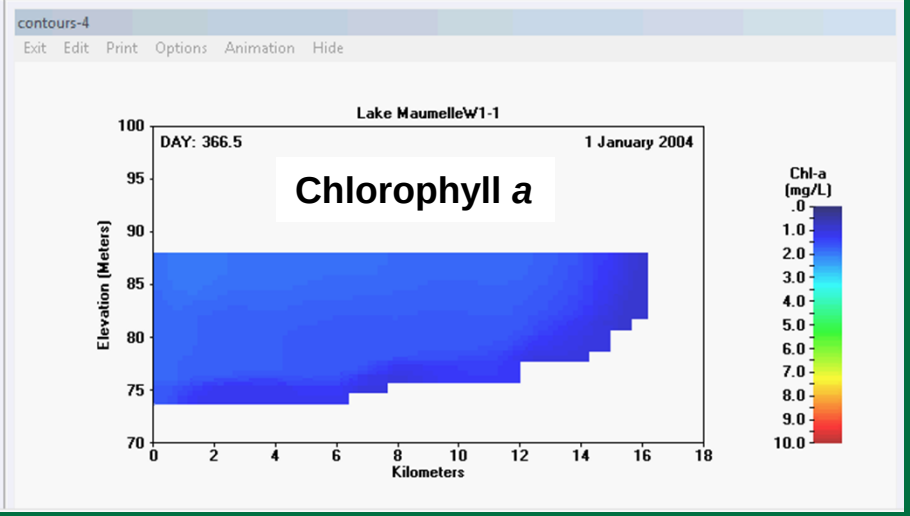

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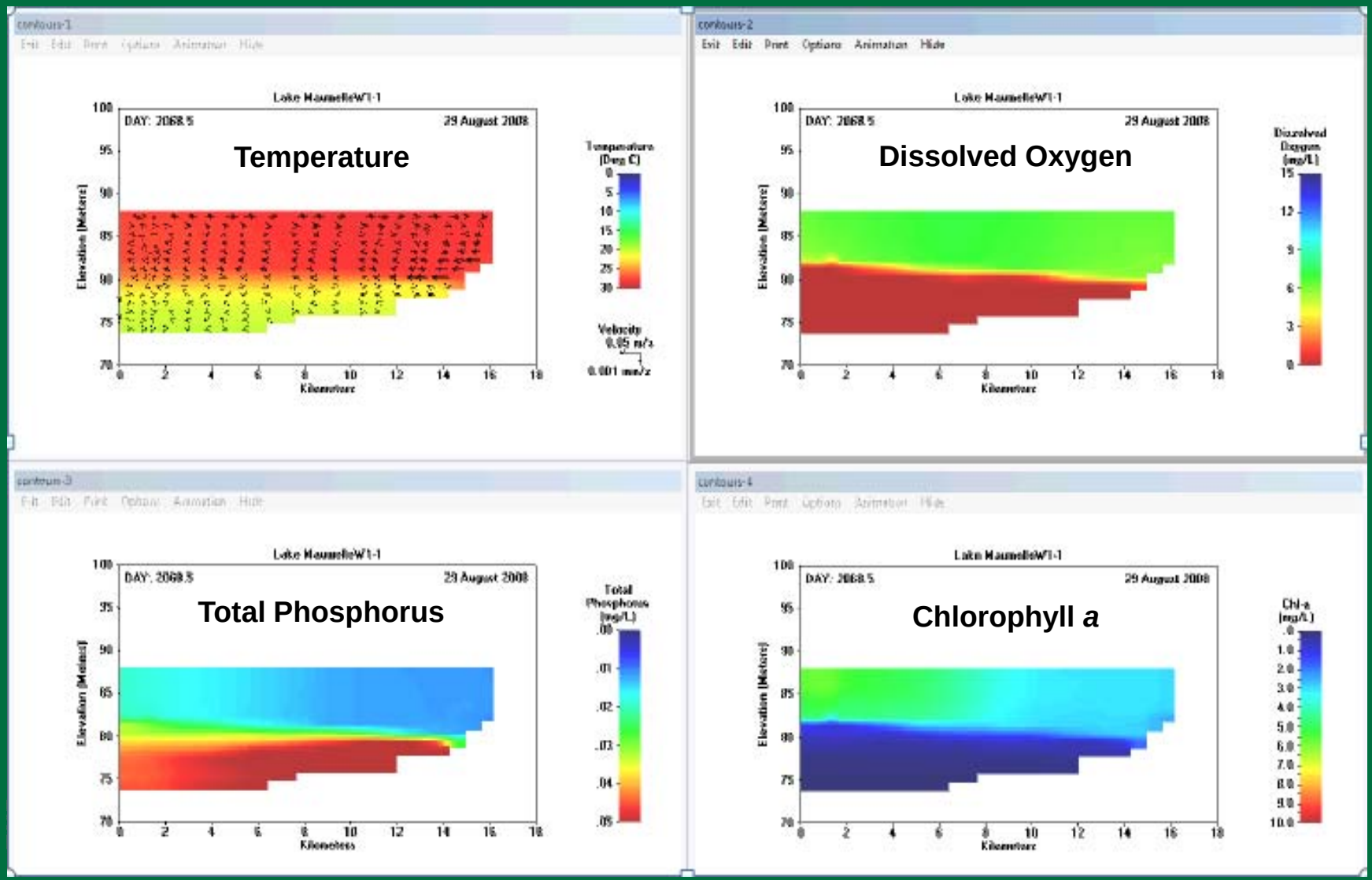

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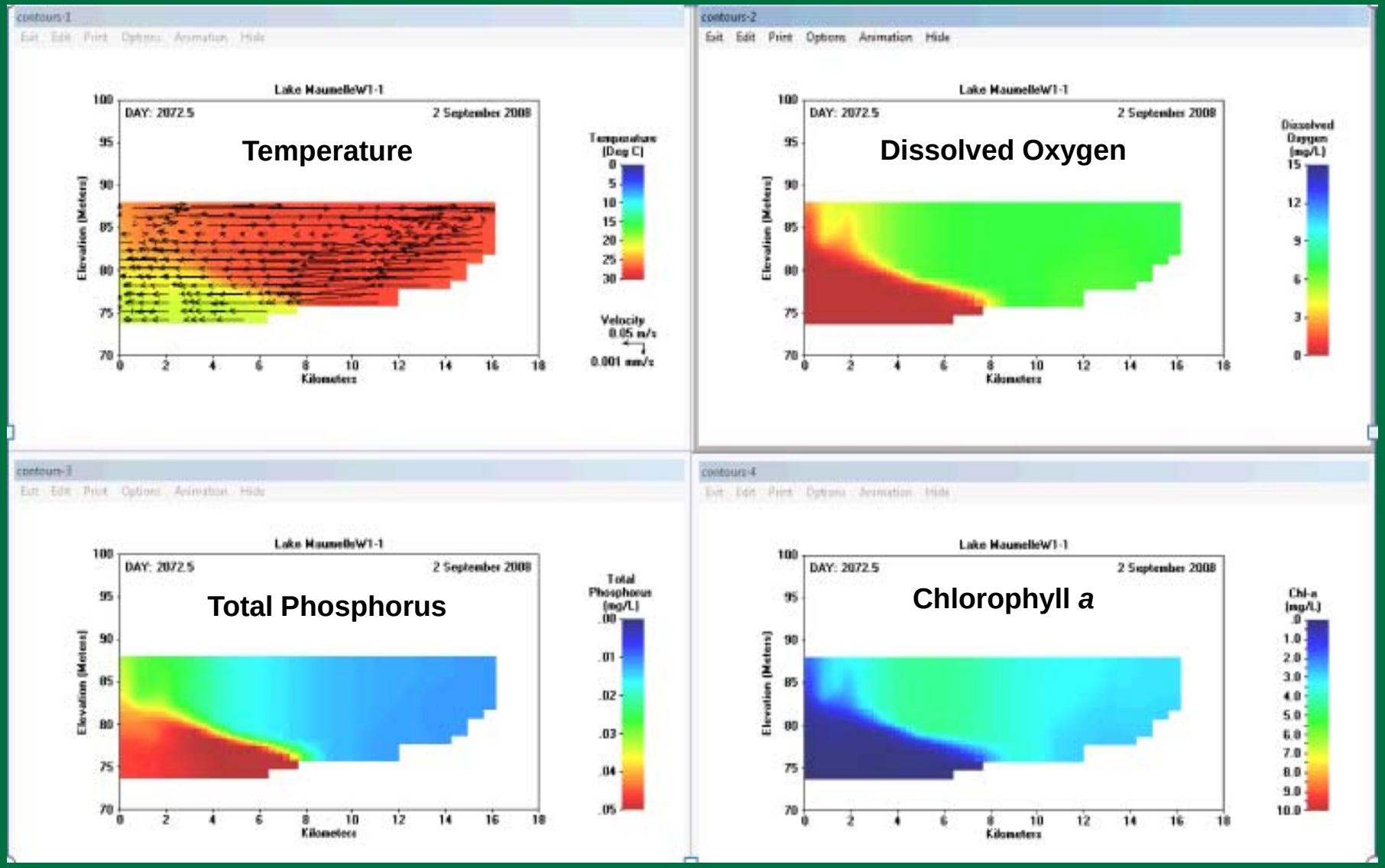

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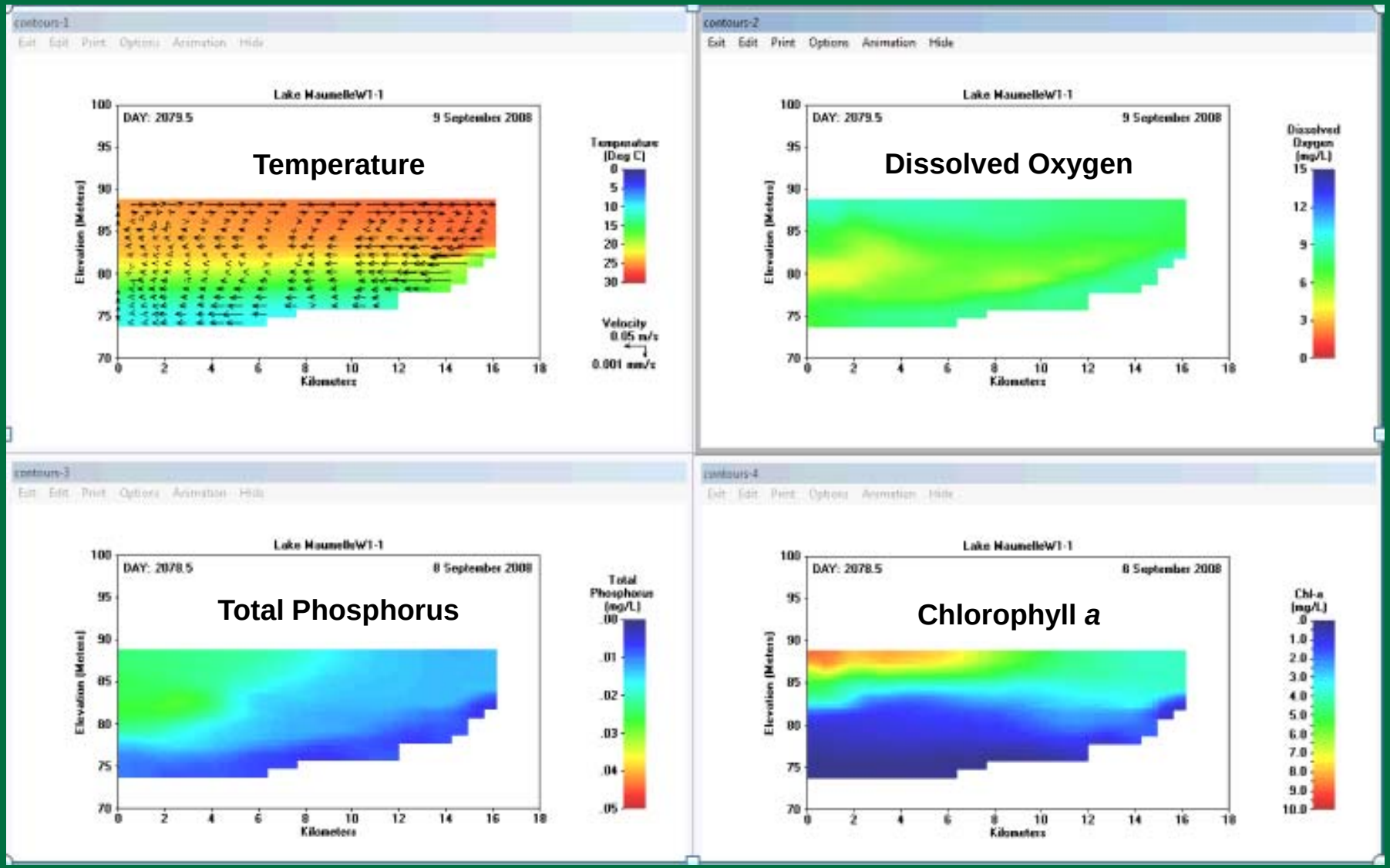

Questions?

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