

Reservoirs and Lake Management at G14



**Adam Carson, Dave Johnson, Guangwei Zhu,
Lisa Borre, Jeng-Wei Thai, Thomas Harmon,
Susan Waldron, Cayelan Carey, Susan
Hendricks, Don Pierson**

G14 Questions: Reservoir

The important water body tightly link to **Management**

- Reservoirs are hybrid systems, what's their emergent properties? Could high-frequency data help to understand their ecological, physical, and biogeochemical processes?
- What is the effect of retention time on stability (thermal stratification) in reservoirs?
- How landuse change relate to reservoirs control green house gas efflux?
- What are the effects of hydrological processes on water quality of reservoir itself and downstream?

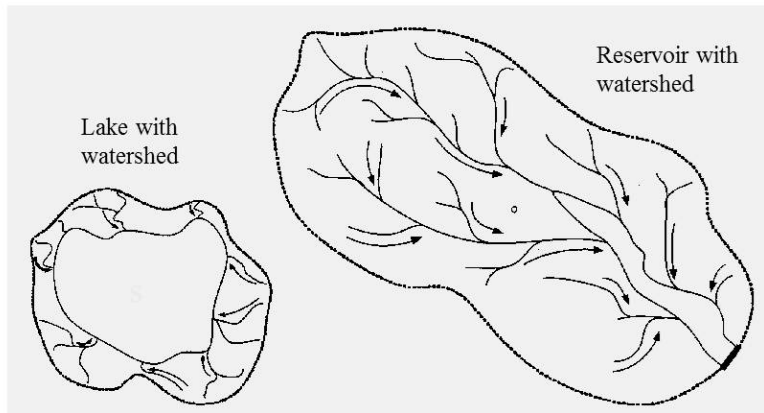
Reservoir: a white paper in July

Lakes and Reservoirs are Different

Compared to lakes, reservoirs typically display

- large drainage area to storage capacity ratios,
- large shoreline length to surface area ratios,
- short average hydraulic residence times (AHRT)

Reservoir ecosystem are more **dynamic** than lake ecosystem



Schematic of watershed-pool area relationship in natural lakes and constructed reservoirs

Variable	Lakes n = 309	Reservoirs n = 306
Drain Area/Surf Area	33	156
P Loading (g P/m ²)	0.9	2.9
TP (ppb)	54	53
CHA (ppb)	14	10

Taken from AAC report to DEQ, after Cooke and Carlson (1987)

Response to the QUESTIONS

Q1: Does the interaction of two distinct sets of characteristics (riverine, lacustrine) lead to emergent properties unique to reservoirs.

Of course, need more accurate description.

Q2: How does retention time and discharge schedule affect spatial variability of water quality ?

Most interesting topic.

Q3: Can new water quality indicators be developed, based on high frequency sampling, that are more useful to lake/reservoir managers than the traditional trophic state indicators, based on low frequency manual sampling?

Yes, TSI could be estimated.

Response to the QUESTIONS *cont.*

Q4: How does the atmospheric deposition of sulfate affect the input of DOC to lakes and reservoirs (i.e., affect the carbon budget of lakes and reservoirs). Does the larger watershed area of reservoirs enhance the effect?

No deep discussion.

Q5: How does GHG efflux vary among lakes and reservoirs?

Need more data.

Q6: Can reservoirs act as climate sentinels?

Yes, of course. Combined with ecological model tools.

G14 Questions: Lake Management

- What findings from GLEON-related research might be relevant for lake management?
- How can high frequency data (GLEON buoys and sensors in the watershed) help improve lake management?
- Can the carbon budget of the lake be used to study atmospheric deposition of sulfur in the catchment?
- Develop GLEON tools for lake and reservoir managers:
 - classification matrix
 - water quality indicators based on high frequency sampling
- Develop outreach materials targeted to lake managers
→ Communicating Science Working Group

Alicia Caruso GLEON Survey project

1 Aug – 15 Dec, 2013 in China



Alicia Caruso
Graduate student
Environmental Policy
Bard College, NY
Supervisor: Robyn Smyth

- Master's Thesis project: Applications of environmental sensor data
- Two sets of questions:
 - ① GLEON sites: Application of lake buoy data (academic and nonacademic)
 - ② Lake Taihu: Utility of model results and forecast report by local officials
- Current status:
 - Asking for feedback on survey
- Future Opportunity:
 - Collaborate with reservoir/lake group on paper about the use of high frequency data for policy and management
 - Survey results
 - Literature review
 - Case studies