PRAGMA32 lake expedition report-back

Arianna, Cayelan, Nicole, Mary, Ryan, Jon, Kait, Paul, Jaikrishna, Ken, & Renato with helpful visitors Phil, Bill, and Peter!

Thank you MIST Center team!

Most of this week has focused on model output interpretation

- We have identified multiple steps and timelines for completing the GRAPLEr manuscript
  - Model improvements
  - Additional analyses of GRAPLEr output
- We want to understand nutrient responses under future conditions of changing flow and temperature: important for water quality
  - Most interesting GRAPLEr combinations: flow – 0.8, 0.9, 1.0, 1.1, 1.2; temp – 0, 1, 2, 3, 4, 5, 6, 7 +oC
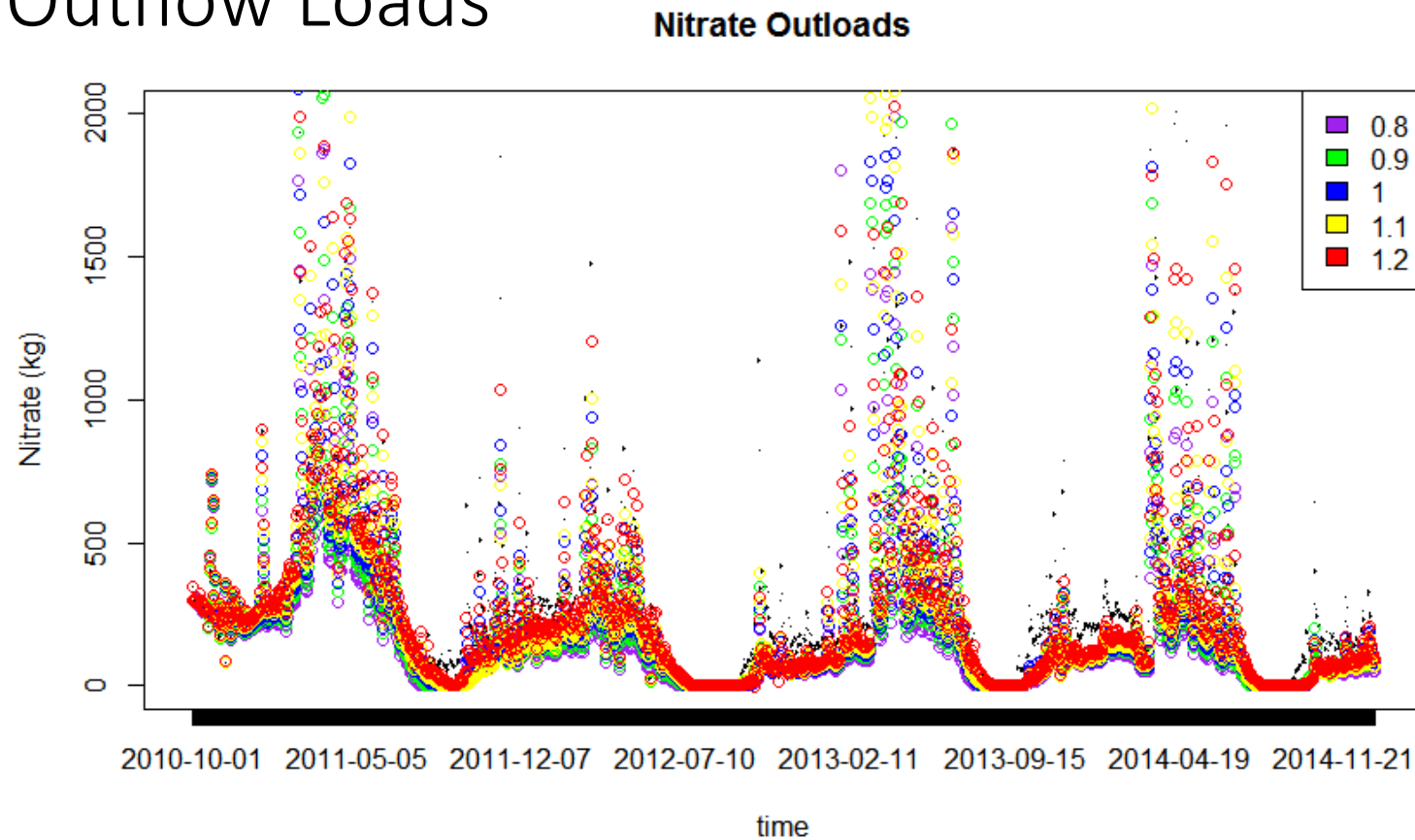
Mendota nutrient dynamics

Slide: Nicole/Ryan
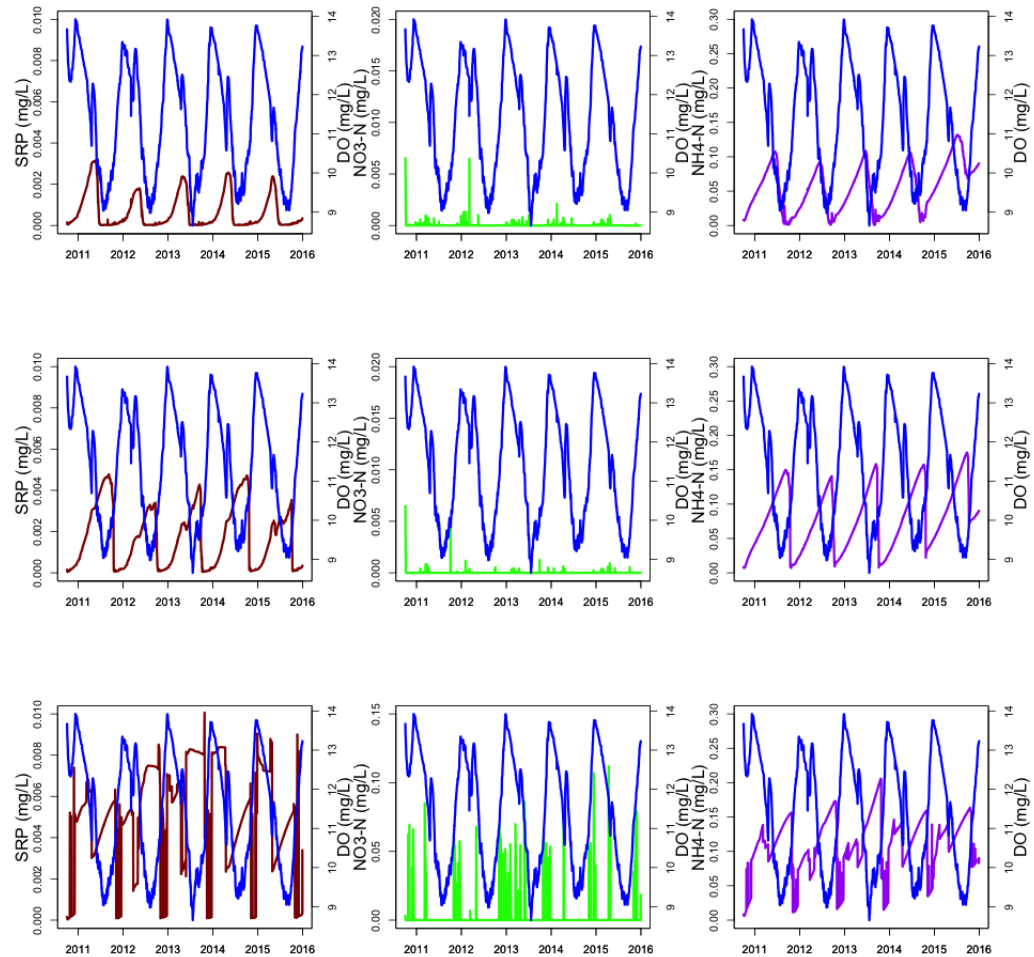
Outflow Loads

Outflows of nitrate increase modestly in maxima with
increasing flow; seasonality shifts slightly later

What are the long term questions/goals?

- Broadly, *How do changes in flow rate and temperature influence nutrient cycling in a eutrophic vs. oligotrophic lake?*
- More questions
  - What drives differences in sediment and surface level responses?
  - What mechanisms can we identify to explain contradictory changes observed in various nutrients?
- Goal: rerun simulations and work on visualizations; brainstorm methods of data analysis (short-term), implement (long-term), scale to other lakes globally

GRAPLEr runs @PRAGMA: by the numbers

- 12 GRAPLEr submissions
- 10,480 simulations: ~72.7 days manually vs. 4.4 hrs: **WHOA**
- 6 post-processing scripts
- 10+ visualization scripts/methods

To-do's over next few weeks

- Residence time at 80%, 100%, 120% for Sunapee: Nicole
- NH4 issue for Sunapee: CCC & NKW
- Overflow correction for postprocessing and rerunning all sims: AIK
- Making the new figures with speciation over time using Paul's code to track the mass balance of N, P (AIK)
  - Look at phyto responses (MEL)
  - Brainstorm other visualization options once we have these set (all)
- Building time series models for focal vars (temp, DO, flow + nutrients)
  - Start with baseline and then extreme scenarios of temp/flow: Kait with helpers
- Work with PRAGMA team to get GRAPLEr on Graphite (Phil, Paul, CCC, Renato)
- Build in GLM v2.2 capacity (Jaikrishna, Vahid, Paul)
- Brainstorm what GRAPLEr visualizations we want using Spark & Jupyter notebooks (ALL → Arianna to work on with the GRAPLEr Figueiredo lab at UF this summer)
- Next meeting: May 3rd!

Take-homes from this week

- "GRAPLEr allows ecologists to be ecologists, not spreadsheet monkeys" - Arianna and Mary
- "I've learned that a petaflop is *not* a massive rabbit" – Lake expedition ecology student
- "I never saw what GRAPLEr was being used for before… I've always been working on the backend- this was really interesting!" – UF GRAPLEr team student
- Massive knowledge transfer within and across research groups
- Envisioning future GRAPLEr applications much easier
- Successfully set a template for future PRAGMA meetings as working meetings with a product at the end (developed idea and data for multiple papers)

Overarching research question:

- How do changes in flow rate and temperature influence nutrient cycling in a eutrophic vs. oligotrophic lake?