Report Prepared by Lauren Kinsman-Costello and Ariane Peralta
October 10, 2012

Flooding farm fields, draining wetlands, and damming rivers: The effects of hydrologic regime change on ecosystem processes

2012 LTER ASM Working Group-Brainstorming
Monday, Sep 10, 2012, Ruesch Auditorium-Dodge, 16:00-18:00
Organizers: Lauren Kinsman-Costello, Ariane L. Peralta & Jason Martina
Final Report

Synopsis

An ecosystem's hydrology is one of the strongest driving forces determining its structure, function, and rate at which it supplies valued services (e.g. denitrification). Globally, ecosystems are experiencing hydrologic regime changes outside of their historical range due to human engineering projects and climate change. The intensity of change is such that complete ecosystem transformation is common: rivers are transformed to lakes as dams and reservoirs are built, upland soils are converted to wetlands as treatment wetlands are constructed, etc. In some cases, natural hydrologic fluctuation has been repressed: floodplains are disconnected from rivers, wetlands are drained for agriculture, and lake water levels are stabilized. Many systems that previously experienced seasonal or decadal flooding and/or drying have now lost these natural pulses of water, energy, and nutrients. These drastic changes increase the importance of quantifying processes across entire hydrologic gradients: from flooded to desiccated, from stable to fluctuating. Comparing effects of hydrologic regime change on nutrient cycling across LTER sites, particularly by contrasting sites from the more heavily managed urban and agricultural LTERs with less managed locations, could provide useful insights for ecologists and ecosystem managers weighing ecosystem service trade-offs between different hydrologic management scenarios. The goal of this working group is to initiate a cross-site synthesis of LTER research pertaining to the effects of hydrologic regime change on ecosystem function, specifically related to the cycling of carbon, nitrogen, and phosphorus, and to explore ideas and data availability. Ultimately, we plan to form a cooperative group that will synthesize new ideas, explore previous research, and/or analyze existing LTER data for publication.

Brainstorming Working Group Goals

- Solicit input & participation from:
  - Diverse LTER sites & Research Interests
  - Hydrologists
  - Social Scientists
- Identify focal research questions & themes to guide synthesis work

Agenda

1. Introductions (10-15 min)
   a. Introduce Lauren, Ariane & Jason
   b. Introduce others in room—Name, LTER affiliation, brief description of research interests
2. Introducing the topic (20-30 min)—PowerPoint Presentation and/or handout—esp. explain our motivations for organizing this Working Group
3. Brainstorming session (30 min*): Make a worksheet to fill out? w/ Question on Left Column & Data on right, maybe third column of "overarching theme"?*
   a. If <10 people attending, brainstorm as a group, if >10, split into groups of ~5-10 people to brainstorm. If splitting into smaller groups, tell groups to assign one person to be "secretary/reporter"
   b. Brainstorm a "Wish list" of interesting scientific topics/questions to investigate within the theme of the effects of hydrologic regime change on ecosystem processes. For each

question on your wish list, think about what kinds of data, and at what scales, would be required to address the question.

4. Regroup (30 min):
    a. If split into smaller groups, have each group report back, and record wish list questions on large pad of paper.
    b. Look at questions that have come out of brainstorming session to see if any overarching themes have emerged with which to organize our synthesis. Attempt to define our scope, and identify topics that are within and not within that scope.
5. Closing (10-15 min):
    a. Start to discuss whether a synthesis of existing published results & conclusions ("ideas" paper) and/or a synthesis of data would be more appropriate to answer our question(s)
    b. Thank participants for attending, let them know that we'll e-mail them and ask if they are interested in continuing with this.
    c. Tell participants that the next steps will likely be:
        i. Going through question & data wish list and looking to see if those data actually exist.
        ii. Applying to the LTER for synthesis funding to support a future meeting of participants to work on a product, most likely a publication

Activities

- Participants: A total of 20 participants attended, from the following LTER sites:

First Name	**Last Name**	**LTER**	**Institution**
Amber (Amy)	Churchill	NWT	Uni Colorado Boulder
Wakene	Negassa	KBS	MSU
Chris	Neill		Maine Biological Lab
Charles	Schutte	GCE	UGA
Leila	Desotelle	KBS	MSU
Gavin	McNicol	LUQ	UC Berkeley
Sinuiu	Goswami	HBR	Miami University, Ohio
Peter	Groffman	BES	Cary Institute
Jill	Thompson	Luquillo	Centre Ecology Hydrology UK
Jorge	Ramos	CAP	Arizona State University
Nat	Morse	PIE	UNH
Natalie	McLenagham	GCE	UGA
Richard	Lowrance	USDA-Agric.Res.Serv	
Rick	Bourbonniere	Environment Canada	
Steve	Davis	FCE	Everglades Foundation
Sylvia	Lee	FCE	FIU
Christine	Sprunger	KBS	MSU
Steve	Decina	BNZ	University Alaksa, Fairbanks
Sylvia	Schaefer	GCE	UGA
Brian	Smithers	CCE	UC Davis
Jenny	Davis	JER	NMSU
Dave	Ganly	FCE	FIU

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- Introduction: See File "Intro_LTERHydroEcoSynth_2012LTERASM.pptx"
- Brainstorming: Participants split into 5 groups at random (counting off), and reported back the following:
    - Group 1
        - Scale
    - Group 2
        - Nutrients→Plant Communities
        - Drivers: Tide, Snow
        - Time Scales
        - Change in Rate of Process
    - Group 3
        - *Hydro Mod→Eco Services?
        - N& P cycling
        - *management-scenario tradeoffs
        - trophic component
        - economic-ecosystems link
        - assess trade-offs
        - NEED TOOLS
        - Water Use→Humans vs. Nature
    - Group 5
        - Urban vs. Ag
        - Biogeochemical trade-offs
        - LTER-LTAR (USDA-ARS)-CEAP
        - N & P dynamics
    - Group 4
        - Wetland-C balance
        - +/- ecosystem services
        - biodiversity vs. ecosystem services
        - Management Types
        - Trade-offs
        - Homogenization of landscape
        - Compare Urban vs. Ag vs. Restored wetlands

Future Work

Our ultimate goal is to produce a publication synthesizing data from the LTER and complementary long-term research networks (e.g., Long Term Agro-ecosystem Research network, Conservation Effects Assessment Program) about the effects of hydrologic change on ecosystem function. We are submitting a proposal to the LTER Network to request funds for a data synthesis meeting to follow up on our brainstorming working group held at the 2012 LTER All Scientists Meeting in Estes Park, CO. We aim to synthesize LTER research on effects of human-engineered hydrologic change on ecosystem function, specifically related to the cycling of carbon, nitrogen, and phosphorus.