**CNH Annual Workshop**

**Meeting Minutes, 5/18/2016 and 5/19/2016**

In attendance:

Griffin Adams

Kevin Boyle

Cayelan Carey

Kelly Cobourn

Chris Duffy

Hilary Dugan

Corinna Gries

Paul Hanson

Julia Hart

Amy Hetherington

Armen Kemanian

Jen Klug

Maud LaMarche

Lars Rudstam

Lele Shu

Pat Soranno

Mike Sorice

Nicole Ward

Kathie Weathers

Weizhe Weng

Summary of Action Items

* **Action Item:** Kelly will update Oneida Lake watershed in documents and presentations.
* **Action Item:** All will review authorship policy.
* **Action Item:** All will review, update, and provide feedback on Mendota plan by Tuesday, June 7th.
* **Action item:** all will update ODS with their subtasks
* **Action item:** VT team will set up Sunapee & Oneida in ODS based on Mendota subtask editing by the group
* **Action item:** update CNH overview video and disseminate with all team members

**DAY 1: May 18, 2016**

1. **Welcome Presentation**

* *Overarching Research Question #3*
* Define collective action. (Paul)
* Collective action is the action of coming together (in lake associations) with collective concerns to impact an agency or other entity.
* *Model Diagram*
* Define EMVs (Lars)
* EMVs stands for Essential Management Variables

1. **Lake and Watershed Overview Presentation**
2. **Lake Mendota - Paul**

* Yahara watershed has 3 inlets.
* There have been a lot of changes in the last 200 years.
* Now, the watershed is dominated by corn and cows.
* The focus is now management of phosphorus, harmful algal blooms (HABs), and invasive species.
* What’s the linkage between phytoplankton and HABs?
* Some species of phytoplankton or cyanobacteria produce toxins leading to harmful algal blooms.
* Oftentimes, limnologists interchange phytoplankton and algae.
* The Water Sustainability and Climate project at the University of Wisconsin-Madison is a similar project which we can learn from and potentially collaborate with members.
* Are there HABs each summer? What is harmful?
* Toxin levels are measured by agency officials.
* A consensus among limnologists on the definition of a bloom does not exist.

1. **Lake Sunapee - Kathie**

* 6th biggest pond in NH
* 1st GLEON buoy in Lake Sunapee in 2007
* Lake association engages with county agencies monthly.
* One stream contributes the majority (~55%) of the water.
* Impervious surface is an increasing issue in the watershed.
* Impervious surface around the lake is ~24%, but it only accounts for 6% in the watershed.
* Sedimentation and runoff are issues for the lake.
* There has been land use change since colonial times.
* Cyanobacteria are researched.
* Citizens are actively involved.
* The LSPA mission statement has been revised over time. Now, it is less about feeling and more about action.

1. **Oneida Lake - Lars**

* Oneida Lake is a bigger lake than Sunapee and Mendota, but it is shallower.
* It is a polymictic lake or mixes many times throughout the year.
* **Action Item:** Kelly will update Oneida Lake watershed in documents and presentations.
* The Oneida Lake Association (OLA) was started to stop fish pirates.
* The lake association is focused on the walleye fishery; however, cyanobacteria are now a public concern.
* There have been changes in the fishery over time.
* The lake association is concerned with the cormorant population on the lake.
* Invasive species are also a concern.
* GLM will need to consider zebra and quagga mussel filtration.
* The new Oneida Lake book is available for purchase through the American Fisheries Society.

1. **SDP - Kelly**

* SDP is not a model, but it’s a method of problem solving.
* Decisions on future periods depend on the past.
* Stock links time periods.
* Uncertainty can be built into equations.
* Weather realization = Storm
* How spatially explicit are the inputs? One can specify farmer types by land characteristics and spatial components.
* Can the expected price may change over the growing season? Expectations at the beginning of the growing season will be used. Stochastic or extreme events are difficult to model.
* Decisions are made in advance.
* SDP can account for a precipitation event and then the additional application of fertilizer.

1. **PIHM - Chris**

* Statsgo data will be used for the Oneida Lake watershed because some of the Surgo data is missing.
* Use HUC 12s.
* Oneida has 50+ HUC12s.
* An open Source GIS tool accompanies HydroTerre/PIHM.
* Use NOAA for precipitation data. NLDAS2 is corrected for elevation.
* PRISM data is incorporated into NLDAS2.
* How would I run the model on all lakes in WI? Can I get all geospatial data from HydroTerre?

1. **Cycles - Armen**

* The water balance (includes irrigation) is the driver. It is important to get the water balance right.
* Daily is the timestep to use. You can use sub-daily, but it is a waste of computational resources.

1. **GLM - Hilary**
2. **Hedonic - Kevin**

* Value is in the land.
* Houses just complicate the issue.
* Control for the houses.
* A lot of the lake variables are correlated, so this causes problems.
* Error term is really important in hedonic models.
* Non-linear functions – What are the structures of the curves?
* Water clarity is likely a log relationship which is potentially correlated with lake area and depth.
* We have so much data that we’re going to be data mining to define EMVs.
* Big data is changing things now.
* Is the hedonic model only considering properties that touch the lake? Yes, or across the street from the lake, because the value gradient decreases sharply.

1. **Social Science - Mike**

* Lake associations are effecting social change impacting water quality.
* Free-rider effect is an issue for these volunteer organizations.
* Idea of effectiveness is nebulous, not well defined. It is based on organizational capacity and membership engagement.
* The social science component is going to be very exploratory.
* Correlations are going to be difficult to find.
* A retrospective analysis of lake association documents will be performed.
* Qualitative data mining will be performed.
* Cayelan – LSPA has many documents
* How would you prioritize the many LSPA documents? What documents are the most important?
* The lake association mission, newsletters (what do the organizations do), connection to policy (links with state agencies), and member awards for accomplishments are all important.
* Visits will guide to documents.
* The Lake List database includes list of activities, scanned newsletters, and newspaper documents.
* Revenue information for lake associations is a new component to the database.
* Google uwexlakes.
* Search for lake associations on left.
* How much do lake associations interact with farmers?
* In Maine, lake associations coordinate with farmers.
* In CNY, consider watershed associations in additional to lake associations.
* Yahara pride farms is an organization to investigate.
* What is the end result? Best management practices for lake associations?
* Measure of success will be feedback from lake associations in the future.
* A broader impact is to connect agencies with the general public.
* Be mindful of telling lake associations what to do.

1. **Team Discussion – Kevin**

* Is current versus future important for the definition for scenarios?
* Scenarios can define manipulations to force models or find pathway.
* Scenarios have been developed for climate realization, land use change, and resilience.
* Scenarios should consider the range from worst to best case.
* Scenarios can identify thresholds.
* Scenarios can consist of manipulations which drive policy scenarios or policy scenarios are a desired state.
* A policy scenario could consider a carbon tax.
* The LSPA scenarios consist primarily of land use change because the land use is mainly forested.
* For the Water Sustainability and Climate project, four main scenarios were developed based on interviews of stakeholders.
* Consider beginning with changes that lake associations can implement.
* Begin with well-scoped questions, develop narratives, and define models used.

1. **Team Discussion Break-Out Sessions**

* What are the most important science questions to be addressed from the CNH project?
  + *Report Back1 - Paul*
    - Questions that can cross different groups and different models
    - What changes in land use practices change water quality and property values?
    - What are the EMVs in each stage of the coupling? How do they relate to each other?
    - How can we simplify, so that we can scale-up?
    - What are the values and definitions of ecosystem services? What will people pay for these services?
    - Where do you enter the circle?
    - What external shocks create the greatest impacts on water quality?
    - What are the 3 simplest changes in a watershed which can improve water quality?
  + *Report Back1 - Kelly*
    - Blue-Green Algae, Weeds, Flooding, Beach Erosion, Drought, Too Little Snow, Urbanization Reducing Stormwater
    - Determine style of scenarios.
    - How much can you improve or deteriorate water quality?
    - Address uncertainty.
    - How do water quality curves changes based on land use and climate change?
  + *Report Back1 - Jen*
    - Determine land use and climate change impacts and interactions.
    - Determine which drivers are most important based on magnitude.
    - Identify water quality improvements and thresholds.
    - Determine how curves change?
    - How does a change percolate through models? (Perform sensitivity analyses)
    - Consider current regulations and model these scenarios (e.g., Lake Erie).
    - Can you improve water quality? Can you slow the decline?
  + *Report Back1 - Cayelan*
    - Consider questions above watersheds and include all 3 watersheds.
    - Determine changes that affect all 3 watersheds which is important to scaling-up.
    - Look for unintended consequences such as impacts on methane?
    - Consider impacts of phosphorus ban in lawn fertilizers.
    - Determine impacts of changes in water quantity.
    - In some climate scenarios, headwater streams dry-up which can have an effect. (Chris)
    - How do flood events affect property values?
    - Consider best management practices for agriculture.
    - NOTE: Best management practices are voluntary, so it is important to consider the % of farmers that implement them.
    - Limit potassium.
    - Test wet years versus dry years to understand extremes.

1. **Team Discussion of Papers & Authorship - Kathie & Paul**

* Identify big overarching questions.
* **Action Item:** All will review authorship policy.
* State position and willingness to contribute to publications.
  + Kathie – Senior scientist; Not up for tenure; Willing to help
  + Paul – Professor; Not up for tenure; Willing to help
  + Kevin – Professor
  + Kelly – Assistant Professor; going up for tenure next August; Lead publications
  + Cayelan – Assistant Professor; Up for tenure in 2 Years; Lead publications
  + Corinna – Soft Money; Assist with data and DOIs
  + Lele –PhD student (4th year); Provide ouput from PIHM
  + Weizhe – PhD student (2nd year); Dissertation research is CNH project
  + Jen – Associate Professor; Up for promotion soon; Determining how best to contribute; Participate in publications
  + Mike – Assistant Professor; Up for tenure in June; Determining how best to contribute
  + Armen – Associate Professor; Assist students, early career scientists, and Chris/ Kelly
  + Hilary – Post doc; Seeking permanent job; Contribute to Mendota lake modeling effort and associated publications
  + Julia – PhD student; GLM-Mendota; Willing to lead
  + Nicole – PhD student; GLM-Sunapee; Excited
  + Chris – Professor; Provide assistance as necessary
  + Pat – Professor; Determining how best to contribute now; Joe is a new PhD student focused on Lagos extrapolations.
  + Lars – Tenured Professor; Potentially lead mussel/zooplankton interactions
  + Maude – Database designer and analyst substituting for Eric Olsen; Interested in continued involvement
  + Amy - Post doc; Interested in team science, modeling interactive effects of climate change and land use on water quality using GLM and distributed computing, and investigating tradeoffs between water quality and producer profits
* *Paper Topics/Titles*
  + Proof of concept for Mendota or virtual system – All models coupled
  + Complex model integration over different temporal and spatial scales – How do you enter the circle?
  + White paper/framework paper – Stress lake associations/long-term monitoring/What is needed for complex modeling? Justify EMVs. State questions. Journals – AGU, Frontiers
  + Importance of the team/team science
  + Methods to illicit EMVs and pairwise model couplings; Identify analyses to identify EMVs; What are the EMVs? The World Meteorological Organization and other organization have defined essential climate and terrestrial variables. Why another acronym? Justify EMVs. Use LAGOS to identify gaps. Journal - Ecological Modelling
  + Resonance in time scales and lags in data; Scales in coupled human natural systems
  + Scenario examples with processes
  + Literature review on coupled modeling systems
  + Economics papers - How can economists can interact with other scientists? Consider fisheries and stock models; Ecopath and ecosym couple economics and biology.
  + Data paper/Lessons learned from data collation/process
  + GLM documentation/GLM parameters library
  + Process for collecting climate data

**DAY 2: May 19, 2016**

1. **LAGOS - Pat**

* Temperature profile, hypsography, and inflow and outflow data, and cropland data layers are not included in LAGOS.
* LAGOS does include a classification system assessing connection between lakes and connection between streams.
* Domain experts were consulted to confirm similar data collection methodologies.

1. **Project Planning**

* **Year 1 Papers**
* Framework Paper
* Time Scales Paper
* CNH System Coupling Literature Review
* Consider creating an anonymous survey to gather feedback on the authorship policy.
* **ODS**
  + **Action Item:** All will review, update, and provide feedback on Mendota plan by Tuesday, June 7th.
  + Consider restructuring ODS to assist with NSF reporting.
  + Consider establishing lead to remind project participants of tasks.
  + Consider implementing email reminder functionality into ODS.
  + Since ODS is public, use Dropbox (storage of sensitive information) in conjunction with ODS (tasks).
  + **CNH Public Website:** <http://cnhlakes.frec.vt.edu>
  + **CNH Video**
    - Consider including NSF disclaimer statement.
    - Consider posting the video link on university college and department sites.