**CNH Lakes Year 3 Workshop Minutes**

May 16 – 18, 2018

Sunapee, NH

Attendees: Kelly Cobourn, Cayelan Carey, Chris Duffy, Kait Farrell, Paul Hanson, Armen Kemanian, Mike Sorice, Kathie Weathers, Sreeya Brahma, Leah Fitchett, Reilly Henson, Joe Stachelek, Nicole Ward, Weizhe Weng

WEDNESDAY, MAY 16, 2018: Team updates

***Cycles update (Armen)***

* Complete:
	+ Prepare outputs for SDP work
	+ Simulate crop yields
	+ GHG partial balance
* Ongoing:
	+ Combine outputs with PIHM to produce surface and sub-surface N loads into the lake
		- Chris will present an approximation
	+ Phosphorus
		- Have outline of surface losses
		- Outline of soluble P losses
		- No full model yet
	+ Doing BMPs now (CC, SW, tillage)
	+ Building “manure” database
* Results:
	+ Cover crops reduce N leaching, but not always
	+ <https://www.cycles-model.psu.edu/Cycles/CyclesModel.html>
		- Will have “Projects” tab with CNH lakes
		- Can access all simulation results
* Products:
	+ Complete Cycles-SDP circuit when BMPs done
	+ Link with Cycles
* How does lawn compare with agriculture? 2-4X more fertilizer than a corn field; effect depends on total area in lawns (there is a threshold effect)

***SDP update (Kelly)***

* Aggregate model is consistent with Cycles approach
	+ allows the use of PMP calibration, which ensures model output is consistent with historical data (takes into accounts real constraints that are typically not incorporated into models)
* Looking into optimal policies to address multiple issues (loading and emissions)
* Question: Is there a story in wet year/dry year applications and leaching? What about policy that targets multiple environmental outcomes?

***PIHM update (Chris)***

* Data
	+ HydroTerre (NED elevation, SSURGO, Statsgo, NLDAS climate, NHD streams, NHD HUC 12, NLCD, Soils)
		- Question: Would there be any gain in moving from NLCD to USDA CDL?
	+ Weir boundary conditions are important to the model
* Results:
	+ Map of groundwater elevation and depth to water table
	+ Map of soil moisture storage of water
	+ Map of greatest flooding potential
	+ Map of land-cover change
* Questions/comments
	+ 2002 land-use became a salient issue in Sunapee watershed
	+ Having comparison between no forest and current forest would be useful to LSPA
	+ Policy suggestion from LSPA: Property tax allocated based on total land/building value, but land is more valuable than buildings; so you are penalized for keeping a forest, but if larger value put on buildings (rather than forest) then you would incentivize land in forest
	+ When we increase speed of the hydrologic cycle, we get increased nutrient flow into the system as well; it’s not just along the edge of the lake, it’s also relevant in the uplands where tributaries originate
	+ What is the groundwater contribution?
	+ Use PIHM to use locational what-if scenario; look at location of forest in catchment; what would be the effect of cutting in wetlands, shallow slopes, steep slopes?
	+ Change in contaminant loads with changes in catchment; loon eggs tell a story that DDT was used (can also see this in sediment cores)
		- Sunapee heavily logged in 1840s-1850s
		- Cleared for sheep boom
		- Reforested since then
	+ Can we simulate incentives for different tree species? To a degree (~120 land cover classes)

***GLM update (Cayelan, Paul, Kait, Nicole)***

* Past year
	+ ESA presentations (CC, Nicole, Paul)
	+ Age of Water/Carbon paper
	+ 2 GLM workshops for UGs in freshwater ecology (EDDIE project)
	+ GLM presentation (Nicole)
	+ Paul upgraded to GLM v2.8 for 37-year Mendota simulation (running in parallel to Sunapee simulation)
	+ Kait presented GLM + GRAPLEr project at PRAGMA
* Mendota modeling
	+ Biogeochemical modeling: model well calibrated; low DO in lower levels of the lake (anoxia) in late summer (avoid this; causes fish mortality); also results in release of nutrients from sediments
	+ Scenarios for hedonic model: eliminate nutrients to double nutrients; some legacy nutrients support chl-a even with no nutrients (but level is much lower); seasonality dwarfs scenarios
		- In the no nutrient scenario, does that assume no legacy P coming from tributaries?
* Phosphorus model
	+ Sediment-water interface model developed (simple)
		- Mass balance developed to look at that interface
		- Then asked if accurate predictions are possible
	+ Description
		- P gets buried in sediments, but also released
		- Mendota has great long-term P observational data (especially for surface)
		- Computer science approach to reducing errors
		- Can be used to predict algae growth
* Sunapee modeling
	+ Great calibration on buoy and manual measurements – the buoy has been critical for supporting the model
	+ Chl-a peaks each summer
		- What is the contribution of climate and P to phytoplankton production?
		- Important seasonal differences in drivers: P drives fall levels; temperature drives summer levels
		- Gleo blooms might be driven by different drivers in different seasons, can have management implications
	+ Challenges
		- GLM model versioning – how do we manage different models with different underlying equations? Need same version for Mendota and Sunapee
		- Calibration goals vary with focal response variables (e.g., phyto vs. anoxia vs. nutrients); need method for data management
	+ Next steps
		- 30-year calibration for Mendota
		- P model and paper
		- 30-year Sunapee GLM
		- Force lakes with different land use and decision scenarios
		- Kait GRAPLEr paper
		- Oneida GLM
		- Simulate human effects and water quality
	+ Questions/comments
		- Policy story is that it may be possible to improve water quality by reducing fertilizer use, but it may not be a meaningful change to the residents around the lake; perhaps a more reasonable policy scenario is to maintain water quality, rather than improve it

***Hedonic update (Weizhe)***

* Accomplishments
	+ Hedonic calibrated
	+ Coupled GLM-hedonic for Mendota
* Mendota model
	+ Management change and structural property sales breaks in 2008
	+ Focus on 2009-2015 with observed WQ data 2008-2015
	+ Result: property values are higher with better water quality (robust result); significant effect only for lake-front homes (insignificant for others)
* GLM-hedonic coupling
	+ Aggregate daily data from GLM to summer months
	+ Estimate property value change
	+ Aggregate to community level to predict change in tax revenue
	+ Predict that a 25% increase in Secchi leads to ~$600 increase in home price and ~$100k increase in total tax revenue
* Moving to Sunapee
	+ Differences: topography (more variable for Sunapee); Sunapee summer Secchi is larger and less variable
	+ For Mendota people can see changes in water quality; likely that people in Sunapee cannot see the water quality changes
	+ Think about different things for Sunapee
		- Viewscape analysis using Lidar data (better view of lake due to differences in elevation) and Euclidian distance; can look at land use as a driver of property values
		- Link land-use model with hedonic model
* Identify EMVs
	+ Methods: machine learning to shrink set of important variables (e.g., Lasso, Elastic Net, Spike-and-Slab Lasso)
	+ Dimensionality
		- Variable (Secchi, chl-a, DO, etc.)
		- Zones of the lake (surface, bottom)
		- Summary statistics
		- Time frame (days before sale, summer month, non-ice season, time lags)
* Upcoming
	+ Weizhe – Oneida Lake
	+ Sreeya – scaling up hedonic model
* Questions/comments
	+ Tax rates differ in Sunapee along the lakeshore vs. far from the shore (could be a decision-making factor)
	+ Sunapee tax data includes increased taxes based on view (“view tax”)
	+ Could people in Sunapee respond more to gleo blooms vs. Secchi/chl-a?
	+ EMV analysis will start with Mendota; EMVs for Sunapee are things you can’t see (hidden variables could be really important); can we compare EMVs for the two lakes and see how much they differ?

***Civic engagement update (Mike)***

* Text analysis on property value discussion in LSPA newsletters
* Question: how do lake associations contribute to natural resource governance?
	+ Find indicators of governance, effectiveness, capacity
	+ Examine change over time, describe each case, compare results across cases
* Conceptual framework work over past year (will be a paper)
	+ Organizational capacity as a function of different types of capital (natural, political, etc.)
	+ Mission as a function of environmental, social factors
	+ Actions as a function of policy change, guidance, research, bridging, direct, etc.
* Effectiveness measured as achievement of self-selected goals
	+ Reputation as a measure of who looks to the organization and up to the organization
	+ Organizational capacity: member engagement, leader development, assets
* Pathways from organizational activity to environmental change
	+ (A) direct action
	+ (B) education; guidance
	+ (C) advocacy; lobbying
	+ Not listed: partnerships (which could aid in any of the 3 pathways)
* Analysis of *Beacon*
	+ What can Secchi tell us about lake associations?
		- Started looking in Mar. 1995
		- Primarily reporting out on clarity
		- Shift over time from discussing individual events and years to discussing long-term trends and patterns; change in focus from event to pattern
		- Next? System-focused?
	+ Need to read to identify themes
	+ Property values and lake associations?
		- Found it ~20 times, primarily in reference to milfoil
		- Doesn’t seem to be the focus, but it is a rallying point
* Questions/comments
	+ Policy change? What does that mean? Think about town/state/federal policy changes, e.g. new hire shared between New London and Sunapee (zoning administrator); LSPA works at all those levels; LSPA reps on state committees
	+ Constrained time frame to 1995 forward so that they can look at all 3 catchments over that timeline
	+ Could we use dictionary of keywords to start developing an ontology for machine reading?

***Scaling up and extrapolation update (Joe)***

* Working on abstracting several linkages
	+ GLM-PIHM linkage
		- Coarsely define connectivity to examine whether connectivity influences lake P retention
		- Build semi-process models (think of them as statistical models)
		- Connectivity (low/high) metrics (connectivity of lakes to watersheds)
			* Closest lake distance: greater distance, higher connectivity
			* Avg. link length: high length, high connectivity
			* Calculate at 2 scales: network watershed scale (all area upstream) and interlake watershed (upstream of focal lake that includes small but not large lakes)
		- Using Bayesian hierarchical modeling to determine distribution of coefficients (P retention) under no connectivity effect vs. connectivity effect
		- Results
			* Spread based on connectivity is more apparent at network watershed scale
			* Connectivity is related to P retention (effect size is present, but not large)
	+ Next manuscript: SDP-GLM linkage
		- Land cover as a predictor of lake TP
		- R-squared in literature is on the order of 0.22-0.28; can we do better with more detailed agricultural data?
		- Data sources: USGS manure and fertilizer inputs; USDA census/ surveys; other sources?
		- Approach: predict TP and TN concentration (mass); characterize uncertainty with Bayesian hierarchical models
	+ Questions/comments
		- Could you use drainage density to describe connectivity? Area is key driver; watershed:lake area ratio as a proxy for residence time brings in connectivity
		- Is Joe using FIA? Richer set of data than the ag data; could also use EPA tree cover data (RTI enhanced spatial data on land use); Kevin can put Joe in touch with people there for data
		- Runoff ratio could also be used (or ET/rainfall); looking for whether there’s a lot of conversion or a little
		- Would it be possible to tease out connectivity across space vs. across time?

WEDNESDAY, MAY 16, 2018: Brainstorming & Discussion about “big paper”

* What question do we want our “big paper” to answer? Through our discussion, we arrived at this guiding question about positive/negative feedbacks:
	+ **How do history, current conditions, and feedbacks shape trajectories of coupled human-lake catchment systems?**
		- How does this interact with discrete events? (disturbance, forcing, pulse-press dynamics)
		- Time and spatial scales
		- Emergent properties
		- Collective action
		- Driving forces: management, disturbance, etc.
		- Limiting cases, end-member scenarios

THURSDAY, MAY 17, 2018: Engaging Citizens & Lake Associations

* Questions from LSPA about visualizations/results
	+ Why did we choose to study lakes that are all at the same latitude?
	+ What is the relative size of each lake?
	+ How much of Sunapee’s water comes from springs? Do springs come and go? Is there a water quality difference in spring vs. other water sources?
	+ How big are the PIHM mesh cells?
	+ Does GLM take bathymetry and internal currents into account?
	+ Do Oneida and Mendota have bubblers for avoiding ice?
	+ What’s the big deal if P increases with climate change if it’s not by that much?
	+ What is the confidence level of the GLM findings? When can LSPA use these findings in their educational materials?
	+ Do we have long-term sediment data?
	+ Would property value decrease in Sunapee with a change in water quality?
	+ Invasive species likely also influence property values in Sunapee.
	+ Were we surprised by the number of lawns on Sunapee? Lawn area is increasing.
	+ Is there an incentive for farmers not to rotate corn and soybeans?
	+ What concentration of lawns is needed for a major effect on water quality?
	+ If different lawn types have different water quality impacts, is it valid to encourage people to have one type of lawn over another?
	+ Do we know what percent of N and P in lakes comes from lawns?
	+ Don’t trees and shrubs absorb N and P differently from lawns?
	+ How does steepness affect nutrient loading?
	+ Are citizen science groups producing more data now than previously, or are we seeing a decrease in agency-produced data?
	+ Knowing the newsletter is examined by researchers changes their way of thinking about it (this was meant as a joke, but seemed to resonate).
	+ When did Sunapee first have gleo?

***Economic Working Group***

* How we can get more members to join LSPA?
	+ Background of members has not changed for years
	+ Showing property owners the potential outcome for property value loss if we increase nutrients inflow since they have not aware the lake problem right now
	+ Water Quality is gradually changing
* How will property tax (tax credit) change people’s behavior of BMP adoption?
	+ Tax range will change the incentives
	+ Tax range will have impacts on local business
* Invasive Species is a potential threat

***Limnology/Hydrology Working Group***

Bill, Tim Eliassen, Tanya Wilkie, Kait Farrell, Dave Beardsley, Chris Duffy, Woody Wood, Paul Hanson, Kristen Begor, Nicole Ward, Cayelan, Midge

* Tim: thinks that I-89 changed groundwater hydrology?
* Bill: patchy flow paths affecting wells; granitic bedrock has large effect, many springs
* Kristen: geology of area interesting, slopes of water draining into lake
* Chris: low clay content means lack of buffering for contaminants/septic systems; lots of certainty in model predictions of surface flow; less certainty in subsurface flow
* Tim: storm events are important for water flow
* Kristen: blacktopping counter-intuitively stopped sediment flumes into lake from Jobs Creek; emphasis on improving road ditches
* Chris: use LIDAR to build slope maps for targeting source areas. Then correlate with sediment maps to determine where sediment is most likely to move to prioritize interventions.
* Woody: visualization on water movement is needed that captures groundwater, subsurface flow, surface flow and complexity thereof.
* Bill: can we get water quality of lakes/ponds in catchment up stream of Sunapee; how much of downstream Sunapee water quality is affected by upstream lake water quality
* Armen via Kait: 10 people on septic system = 1 acre of lawn for nutrient runoff
* Kait: seasonal changes in demography might drive seasonal changes in nutrient loads
* Tim: difference in tax structure in towns around Sunapee might influence our modeling: only source of revenue is property taxes (no income or sales tax), which are very high. YET! The nearshore homeowners don’t vote because they aren’t town residents
* Potential leverage point: town office may not be fully aware of effects of development on property values, which could feedback to influence town amenities
* Kristen: are bacteria in GLM?
* Woody: only current E. Coli data are at town beaches
* Tim: old photos of deforested landscape
* ACTION ITEMS:
1. Chris work with Woody to use PIHM to get visualization of different areas of catchment and lake 🡪 share with Woody
	1. Can apply different land use scenarios
	2. Work with Midge and history team to look at land use over time
2. CNH team to think about how best to provide guidance on ranking risk of different nutrient sources into lake (septics vs lawns vs. upland/nearshore, and how that changes seasonally)
3. Nicole share data and visualizations of different water quality of streams coming into lake during storm events
4. CNH team get sewered vs septic system coverage of lakeshore and time series of sewer overflows (septic surveys this summer as part of LSPA watershed management grant?) 🡪 informing GLM
5. GLM team to look into turning on bacteria modules?
6. Woody wants visualization of currents and 3D water movement in lake

Kak: could we come back together in 7 months to share initial visualizations?

***Civic Engagement Working Group***

Mike and Leah posed the questions to the group: *What are the challenges your organization comes up against? What makes you an effective organization?*

*Response of LSPA members:*

- the problem is that “people don’t know or choose not to know”

- might need “cute” diagrams that are easy to communicate to people with

- some people might not *want* to be aware of certain things (hard truths need to be made more palatable for people to be open to hearing and accepting of them)

- how do we communicate science?

- how do we go from good facts to creating peer pressure?

- how do we convince those who don’t want to know what they are doing wrong?

- LSPA produces great pamphlets and uses these to communicate information to the general public

*What have been some major turning points for LSPA over the years that you’ve been with the organization?*

*Response:*

* In the early years LSPA’s efforts were focused on people immediately surrounding the lake, but in ’95 Kathleen and John Taylor came on board and started reaching beyond the population directly around the lake to people in the whole watershed.
* In ~2000 the LSPA had a plan for the entire watershed, but it started expanding to include watershed towns
* The LSPA began using the terms “Sunapee area” and “Sunapee region”
* Now, the LSPA lab tests water for 25 lakes & ponds in the Sunapee region
* There is no regional lake association, just NH Lakes, which is a state-wide organization that has a lobbying component in Concord.
* LSPA’s educational reach has expanded

*The conversation turned towards some of the current activities and issues LSPA has been engaged with recently:*

* LSPA has a watershed committee. This committee invited the boards of all the towns in the Sunapee area to look at compliance & compared between the towns
* Towns look to LSPA as the “go to for facts”
* LSPA pointed to Newbury as a good example to follow because they have a zoning administrator on staff, then, 4 years later, all the towns have one!
* Conservation boards are more understanding
* There is a lot of turnover in town boards, so LSPA is having to re-educate the boards every 3 years or so (maybe they could use some materials/visuals from our project for this purpose)
* June works with Osmond Sargent (I’m not sure about that spelling, but I think it’s a local land trust of sorts)
* LSPA has also delt with people who handle the road plowing in the area (NH Dept. of Transportation)
* There is training for plowers in distributing salt
* LSPA is looking into distributing salt in parking lots and the new “brining” process, that uses less salt, or is more environmentally friendly, but requires high initial costs for instigating the process, so it hasn’t been adopted in the area.
* “You just have to keep badgering people (in a nice way)”
* There is a mindset that people have that LSPA is combating against, which is the idea that things will just be “washed down” and that that’s okay (out of sight, out of mind type of mindset)
* LSPA is trying to show people that everything is interconnected

*What has LSPA done that was effective? (continued):*

* purchase of LSPA house
* provides a location for meetings, educational opportunities, and displays
* this was another turning point for LSPA
* The house also comes with challenges because some people wonder what LSPA is doing up in their nice house right on the lake
* “elitism plagues [LSPA] constantly”
* Consensus that it boils down to what LSPA does for education. It “reduces to education”
* The group briefly discussed the possibility of adding the words “education center” to the sign out front of the house because that sign says “this is who we are”
* They also talked about how they can’t put the word “science” on the sign because that scares some people away
	+ One lady said, “I don’t want to scare people”
	+ Another replied, “I do!”
* They asked “How do we get information out to draw everybody in?”
* They pondered the idea of sending the Beacon newsletter out to everybody on the lake rather than just LSPA members

*Conversation turned towards the perceptions other people in the area have of LSPA and what LSPA does:*

* Perceptions in the towns vary greatly
* Kathleen believes LSPA has a larger education problem 🡪 there’s a large % of the adult population in the area that don’t have the ecological base knowledge required to understand the issues threatening Lake Sunapee
* Some people find comfort in lawns and suburban lifestyles due to fear of the natural world (it is what is familiar to them…they want to bring the environment they are used to Lake Sunapee when they move here or only live here part time)

THURSDAY, MAY 17, 2018: Brainstorming & Discussion about EMVs

* Discussed the nature of Essential Management Variables as they relate to ECVs (climate) and EBVs (biodiversity); the potential for defining EMVs in our project

FRIDAY, MAY 18, 2018

***Team Discussion: Plan for Papers & Moving Forward***

Think about: What are the gaps in your discipline that you are most excited to address as part of this project?

* A protocol or workflow for managing team data
* Distributed N & P loadings - where and when does denitrification happen in the landscape?
* How do policies change behavior? Conservation programs and crop insurance? Interaction effects and environmental outcomes?
* If we target policy to N application, how is it different from targeting N loading or WQ outcomes?
* Dynamics of land use & ecosystem change over a long time scale
	+ Adding land use change to PIHM
	+ Fully couple PIHM-GLM
	+ Endogenous vs. exogenous processes pushing land use change
* Can humans modify the trajectory of lakes without degradation? Can lake associations be the vehicle?
	+ Coupling GLM with Civic Engagement directly
* No undo button - how can we nudge pathways to get a more favorable trajectory? How long would this take?
* PIHM-GLM relative contributions of SW & GW flows?
* Positive narrative about what we can do, positive human effects
* What WQ variables are incorporated into property value? Create a protocol
	+ View scape and land use modeling
* Linking LAGOS & hedonic
* Integration of lake association work with other project components, closing the loop with qualitative component. How do civic associations contribute to governance? Potential to link changes in WQ with lake association documents (as in short changes all at once, as opposed to slow changes in overall magnitude)
* Combining multiple social science theories, interactions, emergent properties from theories
* Thresholds - how can this be visualized and communicated? Defining resilience?
* Representativeness of training data, how broadly can we extrapolate citizen science? More exploration of scaling - what level of detail?

***Objectives moving forward:***

* Armen
	+ Quarter: work on BMP paper
	+ Q: distributed loading model
	+ Year: Work with Joe on machine learning, etc. connecting cycles with lagos
	+ Y: work on indicators for lake catchments
	+ Y: look into lawn comparison with crops
* Chris
	+ Q: finish Sunapee calibration
	+ Mendota catchment hydrology paper (see Paul)
	+ Y: meta-model for nutrients using data from large model
	+ Y: simulate end-member landscapes
	+ Y: put all sub-basin analysis together to hand over to LSPA
* Weizhe/Kelly
	+ Q: thinking about the future of this project (CNH Lakes 2.0)
	+ Q: Refine big-picture questions we're addressing as a team
* Cayelan
	+ Quarter: help Weizhe finish GLM-hedonic paper
	+ Q: meet with Chris to look at new PIHM results for Sunapee (how do these compare with GLM modeled hydrology)
	+ Q: GLM parameter comparison
	+ Q: Meet with Mike to talk about GLM-civic engagement coupling
	+ Y: Sunapee GLM paper
	+ Y: Mendota paper???
	+ Y: How anoxia affects water quality? Education for LSPA?
	+ Y: Scaling GLM
	+ Y: closing the modeling loop
* Paul
	+ Q: calibrate Mendota simulation (coordinate amongst GLM team)
	+ Y: develop manuscript about hydrology for Mendota
* Kait
	+ Q: double check N & P model, look at inter- and intra-annual properties; drafting this manuscript
	+ Y: GLM versioning comparisons between versions
	+ Y: work with GRAPLEr team
* Nicole
	+ Q: submit lit review paper
	+ Q: get final results for GLM paper
	+ Q: field stuff in Sunapee
	+ Y: UCOWR & ESA
	+ Y: Get the GLM paper out
	+ Y: get together paper about field work
* Weizhe
	+ Y: Graduate!
	+ Y: finish dissertation
	+ Q: send out GLM-hedonic paper to JEM
	+ Y: BMP paper with Armen
* Sreeya
	+ Q: Review workshop materials
	+ Q: Review literature on scaling up models
	+ Q: get started on research
* Mike
	+ Q: framework manuscript about lake associations
* Leah
	+ Y: data analysis
	+ Y: thesis (hopefully a manuscript)
	+ Q: present at UCOWR
	+ Q: launching bulk of data analysis over the summer
	+ Q: maintaining communication with GLM and Hedonic teams
* Joe
	+ Q: Proof of concept for paper (below)
	+ Y: paper on extending predictions of P concentration based on percent land cover
* Kathie
	+ Q: put together 3-5 bottom lines from this workshop (claim this in report)
	+ ASLO talk including CNH Lakes
	+ Q: put together state of the lakes
	+ Y: have another LSPA meeting to discuss the project in depth
* Reilly
	+ Q: Organize and publish materials from this workshop
	+ Q: Help plan UCOWR logistics and presentations
* Where to have next year's workshop?
	+ Beach, Asheville, DC (have NSF program officers)
	+ Strategically planning sub-group tasks

***Wrap-Up & Logistics***

* Thinking down the road - NSF wants us to make data accessible and usable
* For data we're allowed to publish, we have to publish them by the end
* Many journals require publishing of data as well
* GLM-hedonic using a shared google drive
	+ This is easy and straightforward
* Within GLM team, share files within DropBox
	+ This needs to be cleaned up, but works pretty well
	+ Dropbox is one of only viable solutions because of file size allowance
* Challenges with these: integration with desktop and over-nesting of folders
* Instead of moving files, maybe use a shared network
* Don't necessarily need to get other people's raw output files
* Issues with file storage
* TO DO: look into minnow-style network sharing
* Armen uses Penn State Data commons for data that are being published (last stage)
	+ Box or Dropbox for internal sharing
* What are the circumstances when a group is looking for someone else's data, when they don't want to ask the person directly?
* For visualizations, need to make sure everyone is communicating
* Not just passing data between models, but need driver data as well
	+ Potentially could have static datasets all in one place
* First step: have a point-person for each type of data
* Data versioning is a problem for Joe and Armen
* TO DO: get rid of the data on the archive?
* Cayelan thinks the archive is useful
* Have data use agreements for data
* Chris says metadata is under-shared right now, more important than the data themselves
* GLM team has run into metadata problems
* The people that make the data ought to do the metadata (real-time)
* EDI model/protocol
* But how do we catch up and move forward?
	+ Cayelan and Kelly could think about the passing from one team to the next
	+ Prevent people from passing data without metadata
* Cayelan echoes EDI format
* Paul and Corinna work on EDI
* How to assign authorship for a dataset?
	+ TO DO: Revisit this when we revisit the authorship memo
* EDI datasets can be revised and updated over time - these have DOIs
* EDI has a training program to become an expert, I could do this
	+ TO DO: become an expert in EDI
	+ Cayelan and Kait are doing this training next Thursday
* Keep in mind that output data being passed are separate from driver data
* Hedonic data has limited metadata?
* TO DO : schedule sub-group meeting to figure out who will be leading the big paper, brainstorming what it will look like
* TO DO: Kelly and Cayelan can work to figure out EMV solutions
* What to report back to LSPA board about this workshop:
	+ Make an infographic?
	+ Send people the presentation that Kelly gave on Thursday morning
		- Include a key bottom line for each point on the circle diagram