

LCC-VP Bozeman Workshop Notes  
Mar 5-7 2012

Participation

Research Team:

Present:

Scott Goetz, Patrick Jantz, John Gross, Dave Theobald, Forrest Melton,  
Weile Wang, Tom Olliff, Dave Thoma

Call in

Bill Monihan

Collaborators/Visitors

Present

Todd Kipfer, Institute For Ecosystems, MSU  
Virginia Kelly, GYCC Coordinator  
Kristen Legg, GYRN I&M Coordinator

Call in

Sean Finn, GNLCC Science Manager  
Kelly McCloskey, Grand Teton NP  
Roy Renkin, YNP  
Dan Reinhart, YNP  
Others??

Attendees of Social

20 + members of Bozeman academic, agency, NGO communities.

Action Items

- **Revise LCC-VP Project Plan based on meeting discussions by 1 April 2012. All**
- **Next monthly conference call: Apr 10 at 10 am MT. All**
- Develop a set of graphics that represent each quarter of the Glick et al. framework and represents our project. All
- Prepare poster summarizing project for National LCC meeting in Denver in late March. Andy
- Place all meeting ppts on project website. Andy
- Contact Lou Iverson on tree species and community type modeling. Scott/Patrick
- Do paper/ppt summarizing what climate downscaling method is used and how it compares to other efforts. Forrest/Weile/John
- Consider doing a Running et al. 2004 map of locations where temperature, ppt, and light limit primary productivity. Forrest/Weile?
- Have Linda Phillips get into LCcmap and be the community manager for this project. Andy
- Identify the pubs that we want to produce in this project, especially the synthetic ones that we would not do as individuals.
- Establish a group of "Early Adapters" to help the project better reach the broader set of collaborators. Tom/All.

## Notes

### Overview of Great Northern LCC – Tom

- Overview of LCC & Climate science centers, challenges re: coordinating.. bottom line re: GN-LCC "Protecting resources by connecting resources"
- GNLCC draft strategic conservation framework Jan 2012
- NPS "Climate Change Response Program" - 2010 report
- National fish, wildlife and plant climate adaptation strategy
- Climate Smart Adaptation Guidebook
- Arctic and Coastal Alaska - scenario study
- Josh Lawler - vulnerability work
- "LC Map" activity - need base data layers (e.g. 5 classes of ecotype might be good basis for this)
- Connectivity analysis and development of "best practices" (e.g. W Governors Initiative effort that Dave is involved with) integrated with climate and LU change?
- What data does this project need for Canada. Tom can help find it thru LCC connections
- GNLCC and State Wildlife Plans have identified priorities, we can use these to help select our key response variables rather than doing new workshops. Ecosystems of high priority ided by GNLCC are Shrub-steppe, aspen, mixed conifer, grasslands, subalpine. Priority species include: WBP, grizzly, wolverine. Processes of interest are connectivity and forest health, phenology, snowpack.
- How do we integrate previous planning to id the indicators we have as highest priority? E.g., ecosystem types. We need to synthesize these efforts and then present these to our collaborators at a workshop in the second year. Do this in next 2 months then run our choices back thru the RM forum.
- Nested levels of the GNLCC: LCC, Forums (e.g., Rocky Mts), Greater ecosystems, Land management units (e.g. YNP).
- We should do a paragraph in our project plan summarizing the GNLCC as a basis for establishing what our project can contribute.

### Dave

#### LUC & facets:

- moved from housing density to LU classes [NLCD equivalents]; lots of complications arise here from his original work based on census..
- landscape facets / ecological land units: combined substrate, landscape position, topo aspect, etc - idea is to get at relatively constant land facets.
- what Facets are there within Eco-System-Types? that's more interesting than facets, per se..
- Magus et al. paper [Ecosystems - on facets]; Anderson et al. paper
- "protecting the stage not the actors" idea

#### Connectivity:

- Yale framework on "levels of ecological organization"; strategies to maintain ecological processes

- Map each of our products to the exposure, sensitivity, etc to the Glick et al framework.
- human modification / ecosystem "integrity" effort
- related discussion:
  - (Andy) Landscape integrity. Dangers of it. Do 4-5 levels of "connectivity" as part of this project. Use term degree of human modification. Human modification; genetic, sub pop connectivity; tree dispersal under climate change, fire spread.
  - landscape "integrity" term is loaded and misleading, perhaps counter-productive (alho conservative W Gov Init has accepted it). Dave notes it is "human modification"
  - connectivity is top priority for GN-LCC (along with aquatic integrity and data management)
  - integrate "active (adaptive) management" with more traditional "protect the good natural areas"; the former assumes CC has happened now how can we manage.
  - example of pinyon pine in SW; one view is managing to maintain pinyon (good food for species) -vs- other view that pinyon was historically not naturally occurring in the area..

#### TOPS BIOME-BGC – Forrest/Weile

- downscaled climate scenarios ala Maurer et al. 2007
- working with Phil Duffy & Bridget Thrasher of Climate Central, and Karen Debor at CI
- BSCD method: GCM bias correction using 50-60 years of observations; time-step compare to historical climatology and spatially downscale (Ta, PPT); iterate through time-steps.
- this is a statistical downscaling approach; technically feasible, scientifically defensible, agency buy-in / use (esp for hydrology)
- more info at: [http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections?](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections?)
- similar to Hayhoe at USGS (1km daily) - they did a "handbook" on downscaling
- John G will prepare summary based on various inputs
- use ArcGIS Server to distribute to NPS? Map LC?
- Scenarios: 1950-2100
  - TOPS using TOPOMET climate variable inputs (T,P,VPD,PAR)
  - using 8-9 GCM ensemble means
  - daily baseline runs for 2000-2010 plus 9 1km monthly climate scenarios
  - then 9 possible emissions scenarios (A1B, A2, B1 each with average, high & low)
    - at what point can we work with AR5 scenarios? these have more realistic / rapid emission scenarios.
    - is LPJ worth our while or can we e.g. look at trends in GPP and shift biome based on mortality
- related discussion
  - note that we miss species / "eco-system-types" changes within biomes (could Fire-BGC - includes GAP model - provide this at very local scales?)

- EPSCOR activity at UMT or W Climate Center could fund a postdoc for some piece of this for GN-LCC?

- in the GN-LCC if lodgepole is not viable shift to subalpine zone it may be grassland / sage shift which would have huge hydrologic / productivity implications

- none of this incorporates increase in fire disturbance (and they assumed veg was not limiting fire, i.e. it will all burn)

- produce maps of limiting factors (temperature -vs- precip) even as a video clip, for communications efforts w.managers

### Ecological System Type Modeling – Andy

Some Conclusions:

- Existing efforts include enough spp. and cover enough area to allow aggregation to coarser biological levels and for useful summaries and we should do this.
- However, differences in modeling approaches limit our ability to make quantitative comparisons
- We decided (in addition to synthesis) to do vegetation modeling as needed to have consistency in the project in how the climate and land use scenarios we run play out through ecological processes, biodiversity, and drive the vulnerability assessments.
- We should link with folks like Iverson et al. to avoid reinventing the wheel on this modeling.
- This should include synthesis of projected climate change and response of tree species and ecological system types.
- We can add value to these by additional analyses of change in habitat area, role of disturbance, dispersal ability, landscape resistance under land use change.
- We can also do finer resolution modeling for select species/types of high interest to collaborators (e.g., WBP).
- Patrick is investing in learning lots of statistical approaches and will share with the group.

John

- vulnerability assessment and unique contribution of our group / project relative to e.g. Magness, D. R., J. M. Morton, F. Huettmann, F. S. Chapin, and A. D. McGuire. 2011. A climate-change adaptation framework to reduce continental-scale vulnerability across conservation reserves. *Ecosphere* 2:art112.

We should id how each of the indicators dealt with in the study maps to exposure, sensitivity, and adaptive capacity (John has a slide that tis a start on this)

He points out that each quarter of the glick et al. has a different conceptual model. We need dev this graphic to illustrate our project and then to represent the details of our methods.

His conclusions:

- Focus of analysis – CEC3, ecological systems, parks/refuges, “units of concern” (e.g. GYC)
- Could include species or biodiversity – e.g. # of species of special concern (avoid T&E)
- How to define facets. Many potential variables and methods
- Approach might be better suited to management units than ecosystem types (could use PACE to define)
- Some ‘fuzziness’ between sensitivity and adaptive capacity (semantics).

#### Whitebark Pine Discussion

- critical food for some 100 spp; dispersed solely by Clark's Nutcracker; declining at rapid rates (mortality, reduced cone crop, losing niche); esp hard hit in Glacier Park (>50%), Crown of Continent, Bob Marshall wilderness; susceptible to mtn pine beetle (a native spp), but esp blister rust (eurasian exotic), +climate change (drought, facilitates spread of rust, beetles and fire - triple whammy); easily killed by fire but fire not common in its high elev habitat; listing declined for "threatened" spp (precluded by other factors) so it's a "candidate" spp; 85-90% of presence is on Fed'l Lands. Multiple stress interactions? (not yet clear)

- Get wbp restoration GTR due out in spring.
- Much of there focus is on annual to 5 yr interactions between WBP demography, beetles, climate.
- They have not been too tied in to the climate envelope analyses of wbp and long term reduction in habitat suitability. We can add this aspect.
- They have lots of wbp down to 7000feet with regeneration. How does this get established e.g. after fire. Do these reach reproductive age?
- Also 1988 post fire work with seedling demography. We could do niche modeling by age class and by reproduction class under climate change.
- As long as they have natural regen, then do not need to be heavy handed mgt, but it would be done if natural regen ceases.
- Field work needed to better understand spatially explicit demography.
- Competition with other species is important and should be modeled.
- They want to know where to plant in the future.
- Bill – model nutcracker, do phys niche modeling of wbp based on weaver paper

#### Data distribution:

- credible science couched as a good story (e.g. losing trout fishing in MT because of drought, warmer stream water, loss of snowpack, etc)
- LC Map system; uncertain utility wrt our project activities.
- Reinventing Discovery is a book that describes the logic behind LCMAP.

Summary points re: impact points or what we can deliver [Tom]

1. data layers – users not yet defined. Within lmap for example.
- 2.. downscale climate – 1 km better than all others. Comparison of this with other downscale efforts

3. test theory of vul assessment with pilot fine scale mgt relevant vul analysis.  
Wbp. Right scale and informs management.

4. help dev metrics for conservation targets. E.g. permeability; bird diversity as indicator of diversity

5. training. Dev group of early adaptors (EA) e.g. biologists, spatial analysts, planners. How should we interface with them? Social science basis: EAs transfer info to others. EAs also provide feedback to us. How do we get people that will stick with us?. Choose from across the agencies and NGO.