

**VENUE**

AMK University of Wyoming / NPS Research Station

**PARTICIPANTS**

AMK – Hank Harlow

Chef – Jodi Stevens

LCCVP team – Patrick, Scott, Bill, John (call in), Dave, Forrest, Jun Xiong, Tom, Regan, Tony, Nate, Andy

UM - Steve Running

**SUNDAY MAY 19**

Overview of hiking plans

Discussion with Steve Running: Climate Science and society directions, NTSG, NASA directions

**MONDAY MAY 20**

Group hike up Cascade Creek

Begin meeting

Introductions

Welcome and overview of AMK - Hank Harlow

Review of agenda

Overview of project status

Discussion of possible products

Book

Climate Adaptation Planning: Initial Applications to Federal Lands

or

Climate Adaptation Planning: Initial Applications in the Rocky and Appalachian Mountains.

Introduction

General approach

Assessing conservation issues

Exposure across the GNLCC and APLCC

Climate change 1900-2100

Land Use Change

Ecosystem Processes

Potential impact on vegetation across the GNLCC and APLCC

Ecological system types

Tree species

Assessing Vulnerability across the GNLCC and APLCC

Approach

Methods

Results

Management evaluation and implementation

Case Study PACEs

Rocky Mountain PACE

Greater Yellowstone PACE

Great Smokey Mountain PACE

Delaware Watergap PACE

Synthesis, Lessons Learned, Next Steps

Resource Briefs

Climate Change

Land use change

Ecological processes under climate and land use change

Vegetation response to climate and lnd use change

Assessing vulnerability

Management evaluation and implementation

Map and data atlas

More detailed maps and data to support the book chapters

Methods as SOPS

Peer-reviewed papers

Role of interannual variation in climate projections in species distribution modeling

Range wide vs regional calibration of species distribution models

Challenges to management under climate change: climate phases, making sense of models, jurisdictional cooperation, coping with uncertainty

Using range wide ecological forecasts to inform PACE-scale vulnerability assessments.

**TUESDAY MAY 21**

Team work session

Linking with collaborators – Andy

Tom’s cross scale partners and decision support products

Rocky mountain forum proposal idea.

Packing data and translation.

We need id a key contact in our group for each of the client groups.

John Varly four products to complete a project: management report, peer review papers, resource brief, sound bite.

LC map can help with data serving. Sean Finn is science coordinator. Matt Heller is the data manager.

Tom likes linking with the southern atlantic LCC but would also like to make another run at the APLCC.

Synthesis of current knowledge

Climate in ROMO and elsewhere – John

John has nice climate primer.

We would like to have standard format that we use for each park.

How should we distribute these primers?

Laminate hard copies?

Learning center web pages?

Email pdfs to all collaborators?

Can we pull out the interesting and important climate change wrinkles for the particular place? E.g., climate/snowpack/runoff in Rockies, more rapid warming at higher elevations?

Let’s set a date and distribute these as products.

Call these as a standardized climate brief

Do this by sept 1. Do series of conference calls to get there

Climate in GYE – Tony

Nice primer with graphics requested by Ann Rodman. Asking collaborators in advance what they want is a good stroke.

Some novel approaches that should be integrated into the general primer.

High vs low elevation climate may have become decoupled since 1997.

Vegetation in APLCC and GRSM – Patrick, Scott

Excellent set of analyses on forecast range shifts for tree species and forest communities.

Vegetation in GNLCC and GYE – Andy

New Science to access vulnerability

Land use modeling, land facets, soils – Dave

Dave is interested in doing another future land use projection that makes better assumptions about rural lands and uses state projections of population rather than national and also uses past growth to predict future growth.

Dave will produce fine topo and soil variables and combine them into land fascets. Call them micro topographic units MTUs?

Climate downscaling and TOPS modeling – Forrest, Jun

Outstanding progress on both fronts.

If WBP only needs climate within its tolerances every 5 years, we should use individual climate models as they show interannual variability to see if the species could persist based on one good year out of every 5.

We might need a water routing model for mountain applications for microrefuguia, tops does not do this.

Resource managers will need to pay attention to weather and climate as fire mgt people do now.

 Lunch and leisure

 Team work session

New Science to access vulnerability

Vegetation modeling – Patrick, Scott

Be sure to add tops products to predicter variables for these models.

Look at patrick gonzalis maps for the west

Think about what response data to use at lcc level vs pace level, how to use EST from NatureServe vs FIA data. Does soil/topography need to be done to use EST under future climate?

Vegetation modeling – Bill

Nice messages about using both range-wide and regional models for predicting response regionally. Local adaptation speaks for using regional models, unfilled suitable niche space locally argues for using range-wide models. Use both and examine consistencies and discrepancies.

Vegetation modeling – Tony, Nate, Andy

Synthesis of results via expert panel – Tom

Do workbook in advance on exposure, sensitivity, potential impact, etc so that they can come prepared.

This should include what we know about adp capacity such as connectivity, land facet MTU – micro topographic units.

Pre-meeting webinar

Do it in Nov in GNLCC?

Do the vulnerability assessment lcc wide but also within units in the lcc or ecoregions within the lcc

Also ask participants to connect the dots as to how these variables are relevant to management.

Help collaborators to have buy-in to the products of the project

Ask them what DS would be useful to them. (e.g. do a focus group approach for what is a good product to sell).

End this with a preview of the next workshop (mgt evaluation).

Development and evaluation of management alternatives – Regan, Tom

Results of collaborator surveys - Regan

Management implementation opportunities – All

Decision support - All

Evening discussion

Listing of target publications and products

Opportunities for future collaboration

Next team meeting in association with the experts VA workshop in Nov

In spring 2014, meet near DEWA.

**WEDENSDAY MAY 22**

Meet with GTNP in their offices

Collaborators Present: Sue, Kelly (veg ecologist), Cathy Melander (gis, hydro), Karl

Collaborator Climate related issues

Snow, hydrology, runoff, recreation, fish, economics there of.

Vegetation

Wildlife

Discussion

Finer scale modeling may be more management relevant

Help inform where to monitor to allow finer scale extrapolation

Sagebrush loss to development (ca 20% so far), invasives are building in these areas. (mention to Bill Loenroth)

What additional stuff is at risk under changing climate? Will climate change make more expensive current management actions (e.g. invasives).

Valuation of ES may be helpful for decision making.

Spruce fir is climax comm for ca 60% of GTNP. We should model it.

Think about how to define vegetation communities. Cover types

Keep products simple.

Here is what we are seeing now and what can we do know that will help cope with future conditions. What can we do about it in my time frame? E.g., can we help them evaluate their current wbp planting experiments to intreprete significance to climate change.

Might drought favor wbp because competitors are less tolerant to drought?

Sue would like tools to allow climate and forecasts to be resolved for a particular project area.

**Action items**

Explore doing a proposal to the GNLCC and couching the expert panel VA in the context of the Rocky Mountain Forum. **Tom and Andy**

Set date (Sept 1) to complete climate primers and distribute them. **John** will coordinate, all will contribute.

**Tom** will try again to engage the APLCC via a webinar on our results for that area.

**Andy** will ramp up analyses of vegetation shifts from current studies of GNLCC (Coops and Waring data, Rehnfeldt et al. 2012 biome types, Moscow ID USFS tree species).

**Tom** will introduce Matt Heller, GNLCC data manager to the group.

Plan and schedule experts workshop to rank vulnerability for Nov 2013. **Andy, Tom, Regan**

The big need is to look at all our results to tell the story of change for our key locations.

How does interannual climate variability lead to mgt options that vary from phase to phase?

e.g., limit fire during warm phase or plant far north in warm phase.

Model interannual variation for wbp species vs pika. One only needs adequate ontidions 1 out of 5 yrs and the other needs every year good. Do paper on this.

Add Spruce/fir to EST we model in the GNLCC. Define our vegetation community level better. Nate

Products

Discussion of possible products

Book

Climate Adaptation Planning: Initial Applications to Federal Lands

or

Climate Adaptation Planning: Initial Applications in the Rocky and Appalachian Mountains.

Introduction

General approach

Assessing conservation issues

Exposure across the GNLCC and APLCC

Climate change 1900-2100

Land Use Change

Ecosystem Processes

Potential impact on vegetation across the GNLCC and APLCC

Ecological system types

Tree species

Assessing Vulnerability across the GNLCC and APLCC

Approach

Methods

Results

Management evaluation and implementation

Case Study PACEs

Rocky Mountain PACE

Greater Yellowstone PACE

Great Smokey Mountain PACE

Delaware Watergap PACE

Synthesis, Lessons Learned, Next Steps

Resource Briefs

Climate Change

Land use change

Ecological processes under climate and land use change

Vegetation response to climate and lnd use change

Assessing vulnerability

Management evaluation and implementation

Map and data atlas

More detailed maps and data to support the book chapters

Methods as SOPS

Peer-reviewed papers

Climate primers for GYA, ROMO, etc.

Role of interannual variation in climate projections in species distribution modeling

Future land use projections based on more normal assumptions for rural lands.

Papers on downscaled climate, tops model outputs methods and results nationally, and for parks/lccs?

Range wide vs regional calibration of species distribution models

Challenges to management under climate change: climate phases, making sense of models, jurisdictional cooperation, coping with uncertainty

Using range wide ecological forecasts to inform PACE-scale vulnerability assessments.