

May 10, 2012 - Performance Report

Write-up by D. Bachelet, CBI.

Project Title: Creating a Soil Vulnerability Index to identify drought sensitive areas

Project Leader or Principal Investigator responsible for completion of project:

Dominique Bachelet, Conservation Biology Institute, dominique@consbio.org, 360-870-5782

Cooperators/Partners and anticipated project contributions: Wendy Peterman, Conservation Biology Institute, wendy@consbio.org, 541-971-1203, GIS soil analysis, development of soil vulnerability map, data uploading

Objectives of the project:

1. Produce decision support tools (data and model results) on databasin.org
2. Test assumptions of model projections by comparing the results of different types of models that use a variety of soil inputs at different temporal and spatial scales.
3. Produce spatial datasets that inventory soil characteristics, soil water resources, and trends in soil-vegetation dynamics as the climate changes.

Proposed Methods:

1. Sensitivity analysis of the MAPSS biogeography model (Neilson 1995), the MC1 dynamic global vegetation model (Bachelet et al. 2001), the process-based species model 3PGS (Coops et al. 1998), climate envelope models (Rehfeld et al. 2006) to soils data
2. Compare standard results from the MC1 and MAPSS models using coarser soils data from an on-going project with the USDA Forest Service (domain of the study is Oregon and Washington) with those obtained with Peterman's improved datasets.
3. Compare results from the process-based species model 3PGS (Coops et al. 1998) using coarse vs fine soils data
4. Compare results from climate envelope models (Rehfeld et al. 2006) in collaboration with Nick Crookston using coarse vs fine soils data.

Time Line:

1. Jul-Dec 2011: Integrated soil maps of all included areas at the 1:24,000 scale compiled, analyzed and updated with significant attributes.
2. Jan-Jun 2012: 1) Statistical correlations of individual and combined soil characteristics and forest dieback or expansion, and reports of areas affected by each, 2) Initial forecast maps of Peterman and Bachelet high, medium and low vulnerability areas based on soil characteristics, 3) Decision-tree analysis and further predictive maps based on soil vulnerability forecast maps.

Accomplishments to date - Jan - Jun 2012:

Data collections:

* Peterman collected all soils data available for the entire NP LCC: SSURGO data for CA, OR and WA with missing data for Six Rivers National Forest and Olympics National Park; STATSGO data for Alaska because SSURGO surveys have not been done yet. Data for Canada are very coarse and likely unusable, further queries will continue. SSURGO datasets were updated with more attributes to document soil moisture and temperature regimes, texture, minimum depth to a water-limiting layer and mineral or salt accumulations.

- * Peterman collected remote sensing data documenting tree dieback from 1997 to 2010 for all US regions, still trying to obtain dieback data from Forest Service Canada.
- * Peterman gathered model results for current and future tree species distributions from Coops's 3-PG model runs and from Nick Crookston's species viability models.
- * Peterman downloaded FIA forest plot, NDVI satellite and Landfire vegetation data for model validation purposes.

Modeling activities:

- * Peterman was trained by David Conklin (4 weeks training course) and learned to run the MAPSS and MC1 models; she is currently testing her skills by running the models on a handful of study sites under the supervision of Conklin.
- * Peterman gave a presentation at CBI Climate Change Modeling Team meeting summarizing her work and the type of datasets she is making available to test the models.
- * Peterman, Ferschweiler, Conklin and Bachelet had a work meeting to discuss available datasets Wendy could provide and started putting together blueprints about new model I/O to consume Wendy's new soil layers.
- * Peterman took a modeling class on OSU campus (Biological and Ecological Engineering course: Modeling Biological Systems) and became familiar with the 3-PG model.
- * Peterman met with CBI's Tim Sheehan to learn about the statistical models (logistic regression and AIC scores) she will use along with her skills in Decision-Tree Analysis and Machine Learning for this project.

Results Communication Jan-Jun 2012:

a. Oral presentations:

- * Peterman attended the "Planet under Pressure" international conference in London March 26-29 (<http://www.planetunderpressure2012.net/>) and presented preliminary results from this project:

Title of presentation: **Climate change and forest migration in coastal USA and Canada: a soils perspective.** Her abstract is posted on the CBI web page:

<http://consbio.org/newsroom/events/databasinorg-communicating-climate-change-information-conservation-practitioners-who-need-it>.

- * Peterman gave a presentation at the Spring Seminar seminar series organized by Bachelet on OSU campus (<http://consbio.org/newsroom/news/spring-seminar-series>).

Title of the presentation: **Simulating soil vulnerability to climate change and improving soil input to DGVMs.**

- * Peterman's abstract was accepted at ESA 2012 - in Portland, August.

Title of the presentation: **Soil properties affect pinyon pine juniper response to drought.** (<http://eco.confex.com/eco/2012/posters/papers/index.cgi?username=34621&password=779817>)

b. Publications:

- * Peterman has coauthored a paper for the journal Ecohydrology with R. Waring from OSU as a follow-up from class (BEE: Modeling Biological Systems). She added a nitrogen subroutine to the 3-PG model and looked at forest die-off in the Southwest US. The paper has been accepted and will be published this year. This confirms Wendy's ability to test 3PG sensitivity to different soils inputs.

Title: **Soil Properties affect pinyon pine – juniper response to drought.**

c. Data delivery via databasin.org

* Peterman created a group on databasin.org where the data relevant to the NP-LCC project can be visualized, manipulated on line as well as downloaded.

The link is: <http://bit.ly/LZMO8T>. There are 25 new datasets created by Peterman and a total of 350 spatial datasets available through the group site.

Members so far include: Peterman, Bachelet, Ferschweiler.

