

LANDIS-II Newsletter

Summer 2011

It is time once again for the LANDIS-II summer newsletter! If you want to contribute to the newsletter, please send me an email. As usual, your feedback is welcome and appreciated.

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LANDIS-II Meeting 2012

We are planning our next LANDIS-II meeting for early January of 2012 in Madison, Wisconsin. We are currently assessing demand and computer/space needs.

If you are interested in attending a two day introductory training session and/or the general meeting (presentations and discussions), please **contact us soon**.

LANDIS-II v6 Released!

LANDIS-II v6 has completed beta-testing - over 12 groups world-wide have put the new version through its paces. Release Candidate 1 (meaning that this release has a high likelihood of becoming the final release) now replaces v5.1 and its extensions. v5.1 and its associated extensions are **no longer available** and are **no longer supported**.

As a result of these changes to the Core, all extensions were updated, and will need to be re-installed to work with the new core. Visit the web site (www.landis-ii.org) for further information.

LANDIS-II was first released in 2005. We anticipate that the changes encapsulated within v6 will provide us with a robust platform for continuing our research efforts for the next 6 years or longer.

This research was funded by USFS Northern Research Station in Rhinelander, WI and by Portland State University.

Major Improvements Include:

1. We incorporated the Geospatial Data Abstract Library. This allows users to read

and write many more raster formats, and is compatible with the ERDAS 7.4 format (*.gis).

2. We added pre-verification of all inputs files so that input parameters are verified before program model simulations begin.

3. We changed the Core and all extensions to compile with standard 'project' files. These files work with many IDEs on multiple OSs. Doing so standardizes the extension programming experience and lowers the barrier for scientists hoping to create their own.

4. We split the spatial component off into a separate open-source library. This library could support *any* spatial modeling project, regardless of the system, i.e., it need not be forest related!

5. We simplified extension programming through changes to the architecture and the supporting tools.

6. We moved all of our extension code and libraries to Google Code, which offers a robust environment for viewing, downloading, and tracking updates to our code. (See the developer's web page for further information.)

Publications

It has been a great year for LANDIS-II publications! The following have been published (or accepted) in the past 12 months:

Gustafson, E.J., A.Z. Shvidenko, R.M. Scheller. In press. Effectiveness of forest management strategies to mitigate effects of global change in south central Siberia. Canadian Journal of Forest Research.

Thompson, J.R., D.R. Foster, R.M. Scheller, D. Kittredge. In press. The influence of land use and climate change on forest biomass and composition in Massachusetts, USA. *Ecological Applications*.

Scheller, R.M., S. Van Tuyl, K. Clark, J. Hom, I. La Puma. 2011. Carbon sequestration in the in the New Jersey pine barrens under different scenarios of fire management. *Ecosystems*. DOI: 10.1007/s10021-011-9462-6

Xu, C., G.Z. Gertner, and R.M. Scheller. 2011. Pathways for forest landscape response to global climatic change: competition or colonization? *Climatic Change*. DOI 10.1007/s10584-011-0098-5

Syphard, A.D., R.M. Scheller, B.C. Ward, W.D. Spencer, J.R. Strittholt. 2011. Simulating landscape-scale effects of fuel treatments in the Sierra Nevada, California, USA. *International Journal of Wildland Fire* 20: 364-383.

Berland, A., B. Shuman, and S.M. Manson. 2011. Simulated importance of dispersal, disturbance, and landscape history in long-term ecosystem change in the Big Woods of Minnesota. *Ecosystems* 14: 398-414.

Spencer, W.D., H. Rustigan, R.M. Scheller, J.R. Strittholt, W.J. Zielinski, and R. Truex. 2011. Establishing a habitat and population baseline for fisher (*Martes Pennanti*) for modeling future species viability in the southern Sierra Nevada, California. *Biological Conservation* 144: 788-803.

Scheller, R.M., D. Hua, P.V. Bolstad, R. Birdsey, D.J. Mladenoff. 2011. The effects of forest harvest intensity in combination with wind disturbance on carbon dynamics in a Lake States mesic landscape. *Ecological Modelling* 222: 144-153.

Miller, W.W., D.W. Johnson, S.L. Karam, R.F. Walker, and P.J. Weisberg. 2010. A Synthesis of Sierran Forest Biomass Management Studies and Potential Effects on Water Quality. *Forests* 1: 131-153.

Shinneman, D.J., M. Cornett, B.J. Palik. 2010. Simulating restoration strategies for a southern boreal forest landscape with complex land ownership patterns. *Forest Ecology and Management* 259: 446-458.

Xu, C., G. Z. Gertner, B. Güneralp, R. M. Scheller. 2010. Elasticity and loop analysis: tools for understanding forest landscape response to climatic change in spatial dynamic models. *Landscape ecology* 25: 855-871.

Gustafson, E.J., A.Z. Shvidenko, B.R. Sturtevant, R.M. Scheller. 2010. Predicting global change effects on forest biomass and composition in south-central Siberia. *Ecological Applications* 20: 700-715.

If you have published a manuscript, dissertations, white-paper, report, etc., of research that used LANDIS-II, please add your publication to the list: www.landis-ii.org/documentation/PublicationsPage.

Featured Research

This newsletter's feature is provided by Adam Berland, University of Minnesota-Twin Cities:

LANDIS-II has been applied widely to project future ecological conditions, but research from the University of Minnesota shows that the model is also useful for understanding past ecological changes. In a recently published paper, Adam Berland, Bryan Shuman and Steven Manson used LANDIS-II to simulate changing vegetation composition from approximately AD 1250-1850 in Minnesota's Big Woods region.

Located in south-central Minnesota (Fig. 1), the Big Woods have been well studied using traditional paleoecological methods. Pollen data show that the Big Woods forest, characterized by dense stands of American elm, basswood, ironwood, and sugar maple, formed in the last millennium in the midst of surrounding prairie and oak woodland. These records also show changing fire and climate regimes around the time of Big Woods forest expansion, but

the resolution of empirical data leave researchers to hypothesize about the driving mechanisms of this ecological change. The authors believed that, by parameterizing LANDIS-II with empirical data and reasonable assumptions about vegetation, climate and fire, they could use a series of simulation experiments to isolate ecological factors and demonstrate their relative importance in the history of Big Woods forest expansion.

The authors conducted nine experiments to isolate the effects of factors such as landscape firebreaks and pre-expansion Big Woods distributions on forest expansion. For example, several experiments tested the idea from empirical research that water bodies and rough terrain provided shelter for fire-sensitive Big Woods forest species. Conducting an experiment where water bodies were removed from the landscape tested their importance in blocking fire spread during Big Woods expansion; another tested whether initial Big Woods populations needed to be clustered around firebreaks for the forest to achieve its historical distribution by AD 1850. The interpretation of these results led to a more nuanced theory of how fire, vegetation and the landscape interacted in this region. Specifically, because the simulated AD 1850 forest relied on initial forest populations focused near firebreaks, and because firebreaks were not influential once the forest began expanding, the authors concluded that the AD 1850 Big Woods forest distribution was a transient legacy of severe pre-forest expansion fire regimes, and not simply a result of the fire regime during forest expansion. See Berland et al. (2011) for a detailed description of study design, LANDIS-II parameterization, and discussion of findings.

Paleoecological modeling shares some of the uncertainties and difficulties that LANDIS-II users encounter when projecting future scenarios. For example, empirical values are not always available to parameterize the model, and sensitivity testing is required to ensure ecologically

reasonable outcomes. However, this type of modeling is different because real-world initial conditions are not precisely known, while real-world conditions at the end of simulations may be well documented. The Big Woods study highlights the need for both spatial and temporal records of past vegetation change, because model comparisons to either pollen data or a historical vegetation map alone would have led to fundamentally different conclusions about the region's ecological history than when both were used in conjunction. The authors hope that similar research will take place to further develop techniques for spatially explicit modeling of past ecological scenarios.

Funding for this research was provided by the University of Minnesota.

Literature cited

Berland A, Shuman B, Manson SM (2011) Simulated Importance of Dispersal, Disturbance, and Landscape History in Long-Term Ecosystem Change in the Big Woods of Minnesota. *Ecosystems* 14: 398-414.

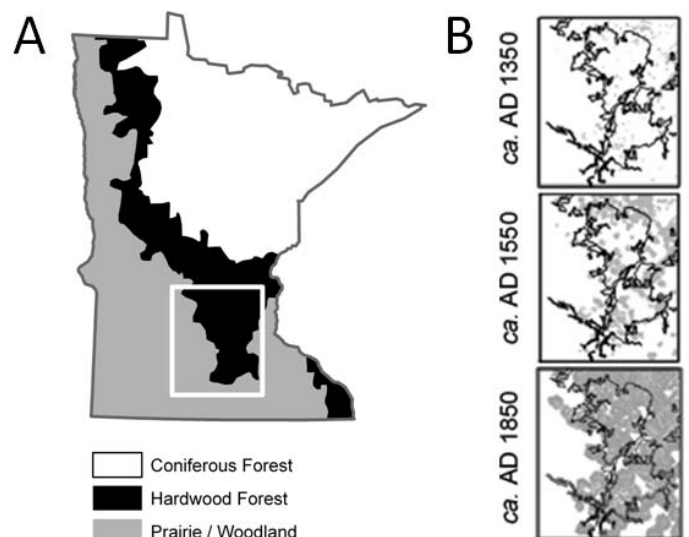


Figure 1. (A) The Big Woods study region (outlined in white) in south-central Minnesota. (B) Modeled extent of Big Woods forest taxa (gray) at 3 time steps during LANDIS-II simulation, with the AD 1850 Big Woods forest outline in black for reference.