LANDIS-II Newsletter 2015

The LANDIS-II Foundation

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The **LANDIS-II Foundation** is now official! The IRS has granted us 501(3)(c) status. This milestone has its advantages, such as simplified taxes and an upgraded account on GitHub (see below). Meet the Board Members here: http://www.landis-ii.org/about-us

The LANDIS-II Foundation is a non-profit dedicated to model development, maintenance, training, and education. In order to generate income for ongoing model maintenance and other activities, we seek funding from book sales (see below), training, and from grants.

If you are writing a proposal that substantially depends on LANDIS-II, we ask that you consider allocating up to $5000 to the LANDIS-II Foundation. These funds will facilitate support and rapid bug fixes, if needed. Please contact us if you would like more information.

Meetings & Training

We are planning our next LANDIS-II training and general meeting for **July 2016** in **Madison, Wisconsin**. Watch the Users Group for further information.

If you are interested in attending the two day introductory training session, **please contact us**. Training space is limited to 20.

In keeping with our mission to raise funds for model maintenance, we will be charging fees for both the training and the general session.

New Extensions & Updates

The PnET Succession and Output extensions (v1.2) have been released! These extensions provide a mechanized model of cohort dynamics, including the accrual and depletion of C reserves, which triggers mortality when <1%.

Also new is the Land Use + Extension which allows maps of projected land use changes (or other disturbances, such as hurricanes) to be input and to create deterministic (i.e., lacking any stochastic variation) mortality of trees, up to development and the prevention of any establishment.

As always, a number of extensions have been updated to address minor bugs. Please check the extensions page to be sure you're updated.

LANDIS-II Training Book!

The third version of our training manual has been released: The LANDIS-II Foundation, Editors. 2015. Forecasting Forested Landscapes: An Introduction to LANDIS-II with Exercises. The LANDIS-II Foundation. Portland, Oregon.

This version includes important updates, minor corrections, and improved image quality. And it's cheaper, too!

The book is for sale for $35 on CreateSpace.com (https://www.createspace.com/4771081) and Amazon. All proceeds go to the Foundation.

Code Migration

Google shut down their free code repository that we have used for the past 10 years. As a result, we have migrated all of our code to GitHub.com. You can find everything there with a more modern interface: https://github.com/LANDIS-II-Foundation

Publications

More exciting publications! The following have been published (or accepted) since the last newsletter:

Di Febbraro M., Roscioni F., Frate L., Carranza M.L., De Lisio L., De Rosa D., Marchetti M. and Loy A. 2015. Long-term effects of traditional and conservation-oriented forest management on the distribution of vertebrates in Mediterranean forests: a hierarchical hybrid modelling approach. Diversity and Distribution (online ver.)

Simons-Legaard, E., K. Legaard, A. Weiskittel. 2015. Predicting aboveground biomass with LANDIS-II: A global and temporal analysis of parameter sensitivity.

Duveneck, M.J. and R.M. Scheller 2015 (online first). Measuring and managing resistance and resilience under climate change in northern Great Lake forests (USA). Landscape Ecology. DOI 10.1007/s10980-015-0273-6.

Gustafson, E.J., A.M.G. De Bruijn, M.E. Kubiske, Robert E. Pangle, Jean-Marc Limousin, Nate McDowell, B.R. Sturtevant, Jordan Muss, William T. Pockman. 2015. Integrating ecophysiology and forest landscape models to better project drought effects under climate change. Global Change Biology 21:843–856.

Newton, A. C. and E. Cantarello. 2015. Restoration of forest resilience: An achievable goal? New Forests: 1-24.

Duveneck, M.J. and R.M. Scheller. 2015. Climate Suitable Planting as a Strategy for Maintaining Forest Productivity and Functional Diversity. Ecological Applications 25: 1653-1668.

Jenny, H., J. Liem, M.S. Lucash, and R.M. Scheller. In press. Statistical surface method for visual change detection in forest ecosystem simulation time series. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing.

Yang, J., P.J. Weisberg, T.E. Dilts, E.L. Loudermilk, R.M. Scheller, A. Stanton, C. Skinner. In press. Predicting wildfire occurrence distribution with spatial point process models and its uncertainty assessment: a case study in the Lake Tahoe Basin, USA. International Journal of Wildland Fire.

Duveneck MJ, Thompson JR, Wilson BT. 2015. An imputed forest composition map for New England screened by species range boundaries. For Ecol Manage 347:107–15.

Blumstein M, Thompson JR. 2015. Land-use impacts on the quantity and configuration of ecosystem service provisioning in Massachusetts, USA. Journal of Applied Ecology 52:1009–1019.

Thompson JR, Fallon-Lambert K, Foster DR, Blumstein M, Broadbent EN, Almeyda Zambrano AM. 2014. Changes to the Land: Four Scenarios for the Future of the Massachusetts Landscape. Harvard Forest, Harvard University ISBN: 978-0-615-98526-8

Wang, F., D.J. Mladenoff, J.A. Forrester, J.A. Blanco, R.M. Scheller, S.D. Peckham, C. Keough, M. Lucash, and S.T. Gower. 2014. Multi-model simulations of forest harvesting effects on long-term productivity and CN cycling in aspen forests. Ecological Applications 24: 1374-1389.

Janowiak, M. K., L.R. Iverson, D.J. Mladenoff, E. Peters, K.R. Wythers, W. Xi, et al. 2014. Forest ecosystem vulnerability assessment and synthesis for northern Wisconsin and western Upper Michigan: a report from the Northwoods Climate Change Response Framework project. Gen. Tech. Rep. NRS-136. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 247 p.

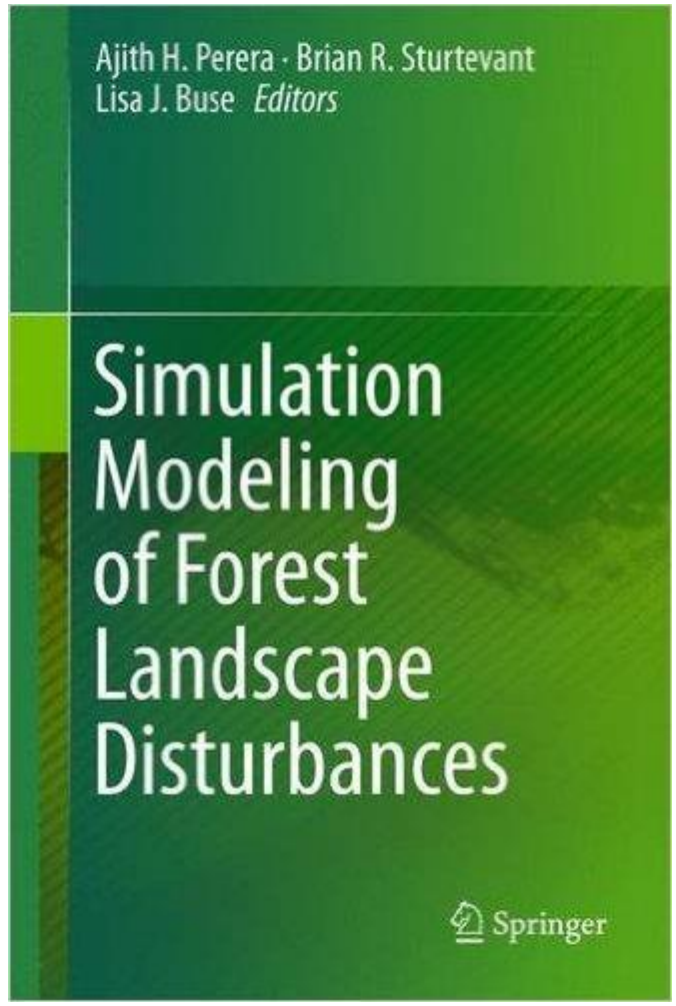
Handler. S., M.J. Duveneck, L. Iverson, E. Peters, R.M. Scheller, K. Wythers, L.

Brandt, P. Butler, M. Janowiak, P.D. Shannon, C. Swanston, R. Kolka, C. McQuiston, B. Palik, C. Turner, M. White. 2014. Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis. USFS General Technical Report NRS-133.

Handler. S., M.J. Duveneck, L. Iverson, E. Peters, R.M. Scheller, K. Wythers, L. Brandt, P. Butler, M. Janowiak, P.D. Shannon, C. Swanston, A. Clark-Eagle, J.G. Cohen, R. Corner, P.B. Reich, and others. 2014. Michigan Forest Ecosystem Vulnerability Assessment and Synthesis. USFS General Technical Report NRS-129.

Thomas-Van Gundy, M., and B.R. Sturtevant. 2014. Using scenario modeling for spruce restoration planning in West Virginia. Journal of Forestry 112:457–466

If you have published a manuscript, dissertations, white-paper, report, etc., of research that used LANDIS-II, please let us know!



New Book!

Although not only about LANDIS-II, a new book edited by Ajith Perera, Brian Sturtevant, and Lisa Buse bears special mention as it contains many chapters that used LANDIS-II in the course of the research: **Simulation Modeling of Forest Landscape Disturbance.** Now available from Springer. It's a great book and will be of interest to any LANDIS-II user.

Featured Research

New Forest National Park (UK): Browsing, Fire, Harvesting and Ecosystem Dynamics

Adrian Newton, Elena Cantarello, Phil Martin, Paul Evans, Arjan Gosal, Natalia Tejedor-Garavito, Gillian Myers

The New Forest National Park is situated on the south coast of England (UK) (Longitude from 1°17'59" to 1°48'8" W, Latitude from 50°42'19" to 51°0'17" N; see Fig. 1). The Park was designated in 2005 and extends over 57,100 ha (Newton, 2010). Its importance for nature conservation is reflected in its many designations, ranging from national-scale legislation (e.g. Site of Special Scientific Interest - SSSI), through European designations (e.g. Natura 2000 network), to global-scale designations (e.g. Ramsar Convention) (Cantarello et al., 2010). Some 20 SSSIs, six Natura 2000 sites and two Ramsar Convention sites are included at least partly within the Park's boundaries (Newton, 2010).

The major components of the vegetation are the extensive wet and dry heath with their rich mire communities and associated wet and dry grassland, the ancient pasture and enclosed woodlands, the network of rivers and streams, and permanent and temporary ponds. Nowhere else do these habitats occur in combination and on such a large scale. The existence of this habitats mosaic is of fundamental importance in creating niche separation for a wide range of plants, invertebrates, reptiles, birds and animals of national and international conservation importance (Cantarello et al., 2010). The unique character of the New Forest is strongly dependent on its history as a mediaeval Royal hunting reserve and the long-term survival of a traditional commoning system, with large populations of deer and free-roaming livestock (principally ponies and cattle) interacting with the processes of ecological succession and generating a high spatial heterogeneity at local scales (Newton et al., 2013) (Fig 2).

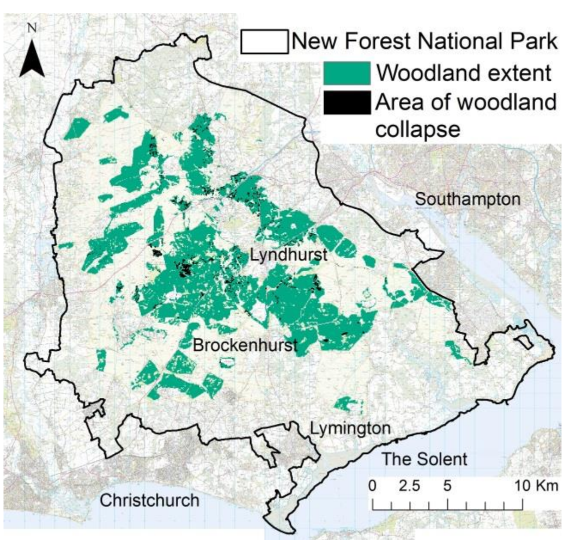
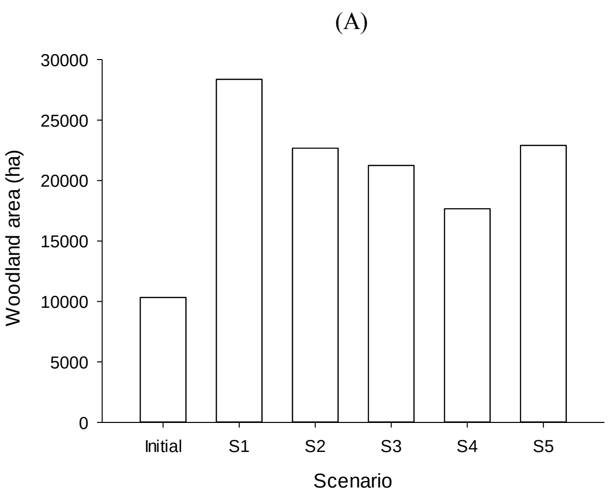


Fig. 1: Woodland extent within the New Forest National Park overlaid on an Ordnance Survey map (©Crown Copyright/database right 2015).

Fig. 2: Ponies and cattle roam freely over large part of the New Forest, and together with other herbivores, have influenced the landscape dynamics over a prolonged period of time.

Since 2005 our team has been employing LANDIS-II supported by the collection and analysis of empirical data, to examine the potential impact of different disturbances on the spatial dynamics and composition of the New Forest woodlands. The overall aim of the research is to inform conservation management plans, both in relation to browsing and to other forms of anthropogenic disturbance undertaken as part of management, including the cutting and burning of vegetation. Our results indicated that over the duration of the LANDIS-II simulations (300 years), woodland area increased in all scenarios, with or without browsing. While the increase in woodland area was most pronounced under a scenario of no herbivory, values increased by more than 70% even in the presence of heavy browsing pressure and rotational heathland burning. Model projections provided little evidence for the conversion of woodland areas to either grassland or heathland (Fig. 3A); changes in woodland structure and composition were consistent with traditional successional theory (Newton et al., 2013) (Figs. 3B-C).



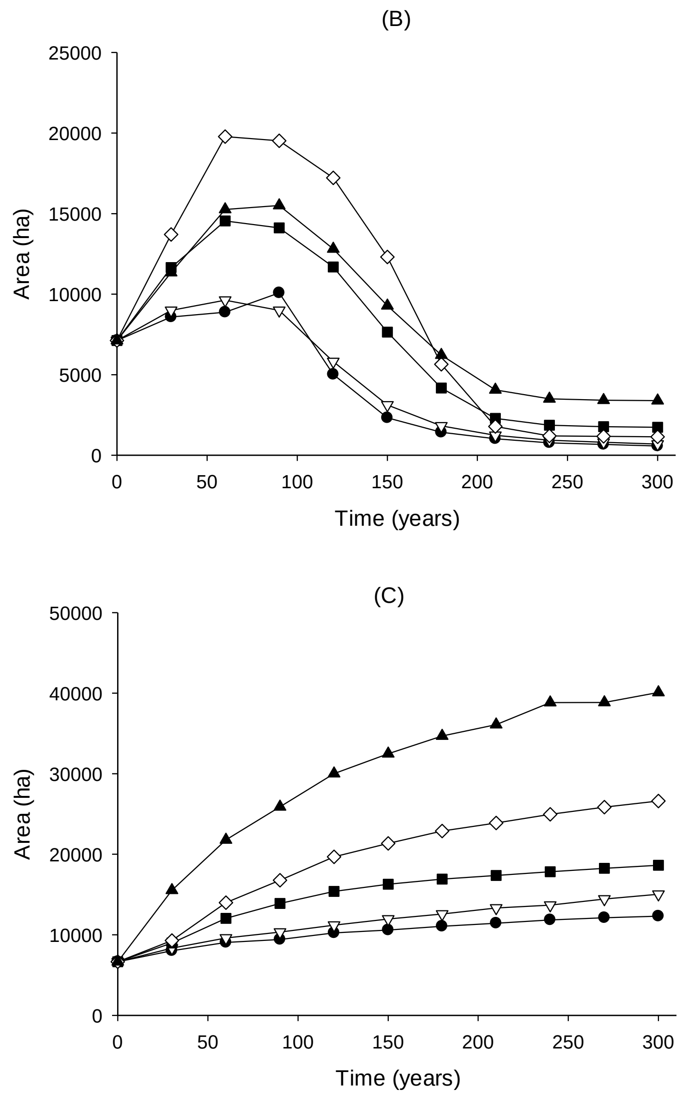


Fig. 3 (A): Projected woodland extent under different disturbance regimes. Values presented are the areas (ha) occupied by one or more of the five principal tree species (*Betula pendula*, *Fagus sylvatica*, *Ilex aquifolium*, *Pinus sylvestris* and *Quercus robur*), as individuals ≥ 10 years old. The values given under each scenario (S1-5) are those projected to occur after 300 years. S1, no disturbance (neither fire nor browsing); S2, browsing only; S3, fire only; S4, fire plus browsing; S5, browsing, fire and protection from herbivory by presence of spiny shrubs. In these scenarios, 'fire' refers to the use of burning as a heathland management tool, as currently practiced; and 'browsing' relates to current browsing intensities by deer and livestock. B-C): Projected extent of occurrence ('area') of selected tree species in the New Forest. B, *Betula pendula*; C, *Fagus sylvatica*. S1, empty diamond; S2, empty triangle; S3, filled square; S4, filled circle; S5, filled triangle. From Newton et al., (2013).

The New Forest has been remarkably resilient as a socio-ecological system, having withstood many internal and external shocks over the past 900 years, including the Black Death of 1346-53, a period of significant climate change (1550-1850), and a series of other major events primarily resulting from changes in how it was governed (Newton, 2011). However, some elements of this system are currently undergoing major changes in structure and composition as a result of the co-occurrence of multiple stressors, including climate change, atmospheric pollution and the spread of novel pests and diseases (Newton et al., 2015). *Fagus sylvatica* woodlands appear to be the most affected by these multiple stressors, and have started to show signs of collapse (Fig. 1).

Research is required to examine the potential impact of woodland collapse on the provision of ecosystem services at the landscape scale and to suggest management actions to strengthen woodlands resilience to emerging disturbances. Current pressures of forest ecosystems could lead to catastrophic declines in the provision of ecosystem services as a result of threshold effects (Newton and Cantarello, 2015). Key issues therefore include the identification of thresholds and feedbacks, which may lead to a transition from woodland to a vegetation type without trees; the identification of early signs of such transition; analysis of the interactions between different stressors affecting ecological systems; and the role of habitat connectivity in strengthening landscape resilience. Ongoing research in the New Forest under the NERC-BESS project is examining each of these aspects. Research activities comprise a combination of field surveys along gradients of forest dieback, resurvey of long-term plots and use of spatially explicit models of ecosystem dynamics (i.e. LANDIS-II with Century).

For more information on the LANDIS-II modelling contact Dr. Elena Cantarello
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Newton, A. C., Cantarello, E., Tejedor, N. and Myers, G. 2013. Dynamics and Conservation Management of a Wooded Landscape under High Herbivore Pressure. *International Journal of Biodiversity*, [Online]. Available: http://dx.doi.org/10.1155/2013/273948.