



Modelling the effects of loss of soil biodiversity on ecosystem function

1. H. W. Hunt,
2. D. H. Wall

Article first published online: 9 OCT 2008

DOI: 10.1046/j.1365-2486.2002.00425.x

Issue



Global Change Biology

Volume 8, Issue 1, (/doi/10.1111/gcb.2002.8.issue-1/issuetoc) pages 33–50, January 2002

Additional Information

How to Cite

Hunt, H. W. and Wall, D. H. (2002), Modelling the effects of loss of soil biodiversity on ecosystem function. *Global Change Biology*, 8: 33–50. doi: 10.1046/j.1365-2486.2002.00425.x

Author Information

Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523, USA

* H. W. Hunt, fax +1/970 491 1965, e-mail billh@nrel.colostate.edu (<mailto:billh@nrel.colostate.edu>)

Publication History

1. Issue published online: 9 OCT 2008

2. Article first published online: 9 OCT 2008
3. Received 8 December 2000; revised version received and accepted 7 January 2001

- Abstract
- [Cited By \(/doi/10.1046/j.1365-2486.2002.00425.x/citedby\)](https://doi.org/10.1046/j.1365-2486.2002.00425.x/citedby)

[Get PDF \(284K\) \(/doi/10.1046/j.1365-2486.2002.00425.x/pdf\)](https://doi.org/10.1046/j.1365-2486.2002.00425.x/pdf)

Keywords:

ecosystem function; elevated atmospheric CO₂; functional groups; grassland; redundant groups; sim

Abstract

There are concerns about whether accelerating worldwide loss of biodiversity will adversely affect ecosystem functioning and services such as forage production. Theoretically, the loss of some species or functional groups might be compensated for by changes in abundance of other species or functional groups such that ecosystem processes are unaffected.

A simulation model was constructed for carbon and nitrogen transfers among plants and functional groups of microbes and soil fauna. The model was based on extensive information from shortgrass prairie, and employed stabilizing features such as prey refuges and predator switching in the trophic equations. Model parameters were derived either from the literature or were estimated to achieve a good fit between model predictions and data. The model correctly represented (i) the major effects of elevated atmospheric CO₂ and plant species on root and shoot biomass, residue pools, microbial biomass and soil inorganic nitrogen, and (ii) the effects on plant growth of manipulating the composition of the microbial and faunal community. The model was evaluated by comparing predictions to data not used in model development.

The 15 functional groups of microbes and soil fauna were deleted one at a time and the model was run to steady state. Only six of the 15 deletions led to as much as a 15% change in abundance of a remaining group, and only two deletions (bacteria and saprophytic fungi) led to extinctions of other groups. Functional groups with greater effect on abundance of other groups were those with greater biomass or greater number of consumers, regardless of trophic position. Of the six deletions affecting the abundance of other groups, only three (bacteria, saprophytic fungi, and root-feeding nematodes) caused as much as 10% changes in indices of ecosystem function (nitrogen mineralization and primary production). While the soil fauna as a whole were important for maintenance of plant production, no single faunal group had a significant effect. These results suggest that ecosystems could sustain the loss of some functional groups with little decline in ecosystem services, because of compensatory changes in the abundance of surviving groups. However, this prediction probably depends on the nature of stabilizing mechanisms in the system, and these mechanisms are not fully understood.

[Get PDF \(284K\) \(/doi/10.1046/j.1365-2486.2002.00425.x/pdf\)](https://doi.org/10.1046/j.1365-2486.2002.00425.x/pdf)

More content like this

Find more content:

- [like this article \(/advanced/search/results?articleDoi=10.1046/j.1365-2486.2002.00425.x&scope=allContent&start=1&resultsPerPage=20\)](/advanced/search/results?articleDoi=10.1046/j.1365-2486.2002.00425.x&scope=allContent&start=1&resultsPerPage=20)

Find more content written by:

- [H. W. Hunt \(/advanced/search/results?searchRowCriteria\[0\].queryString="H. W. Hunt"&searchRowCriteria\[0\].fieldName=author&start=1&resultsPerPage=20\)](/advanced/search/results?searchRowCriteria[0].queryString=)
- [D. H. Wall \(/advanced/search/results?searchRowCriteria\[0\].queryString="D. H. Wall"&searchRowCriteria\[0\].fieldName=author&start=1&resultsPerPage=20\)](/advanced/search/results?searchRowCriteria[0].queryString=)
- [All Authors \(/advanced/search/results?searchRowCriteria\[0\].queryString="H. W. Hunt" "D. H. Wall"&searchRowCriteria\[0\].fieldName=author&start=1&resultsPerPage=20\)](/advanced/search/results?searchRowCriteria[0].queryString=)