

## LANDFIRE Product Application Summary

### Are investments to promote biodiversity conservation and ecosystem services aligned?

#### Authors

- Stephen Polasky, University of Minnesota, St. Paul, MN , 55108, USA
- Kris Johnson, The Nature Conservancy, Minneapolis, MN 55415, USA
- Bonnie Keeler, University of Minnesota, St. Paul, MN , 55108, USA
- Kent Kovacs, University of Minnesota, St. Paul, MN , 55108, USA
- Erik Nelson, Bowdoin College, Brunswick, ME, 04011, USA
- Derric Pennington, World Wildlife Fund, Washington, D.C., 20037, USA
- Andrew J. Plantinga, Oregon State University, Corvallis, OR 97331, USA
- John Withey, Florida International University, Miami, FL, 33174, USA

**Application Location:** 44.9833° N, 93.2667° W (Watersheds around Minneapolis, MN, USA)

#### *Objectives:*

- To investigate the degree of alignment between investing conservation funds to target biodiversity conservation and investing them to target the value of ecosystem services
- Evaluate the value of conservation to protect biodiversity versus the value of conservation to provide services that contribute to human well-being

#### *Description of the project/analysis:*

Analysis compares the outcome of land acquisition for conservation aimed at maximizing ecosystem services with land acquisition for conservation aimed at maximizing biodiversity.

1. Assumption of static land use and again under a dynamic land-use change model
  - a. Land-use and land-cover data
    - i. Baseline 2001 land use map – modified National Landcover Database for Minnesota
      1. National map of private and public lands (Conservation Biology Institute, 2010)
      2. 100-meter buffers around centerlines for 52 major rivers in Minnesota (Minnesota DNR, 2012)
    - ii. Predicted 2026 land use maps
      1. Radeloff land-use transition matrix
    - iii. LANDFIRE National Biophysical Settings
      1. Potential natural vegetation (proportional mix of forest, prairie, or wetland)
  2. Carbon storage and sequestration
    - a. Calculated carbon storage values for each land-use type
      - i. National map of soil carbon combined with land cover and county boundary data
      - ii. Carbon storage in above-ground biomass
        1. FIA data

3. Water quality: phosphorus retention
  - b. InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) water models

***Results/findings of the analysis:***

Alignment between ecosystem services and biodiversity conservation strategies

- Static system:
  - Optimal solution when targeting ecosystem services generated 53% of the biodiversity score as compared to targeting biodiversity
  - Optimal solution when targeting biodiversity generated 70% of the value of ecosystem services as compared to targeting services
- Under either strategy, the benefits of conservation outweigh the cost
  - Development and other landscape changes separate from acquiring conservation land will likely have a much greater impact on land use
- If there were no conservation strategy on the dynamic 2001 – 2026 landscape, predict the value of ecosystem services would rise by \$8.245 billion, while the biodiversity score would fall by 6.7m
  - Forests are expected to have the largest net gain followed by urban, range, and pasture
  - Movement out of croplands tends to increase the value of ecosystem services generated, but value of cropland for habitat is relatively high, especially on those croplands adjacent to water and wetlands
  - Movement out of croplands and into other types of land use results in a drop in the biodiversity score
- On-going land use change
  - Targeting ecosystem services also increases biodiversity conservation and vice-versa
  - Optimal solution when targeting ecosystem services generated 47% of the biodiversity score as opposed to targeting biodiversity
  - Optimal solution when targeting biodiversity generated 65% of the value of ecosystem services as compared to targeting services.

***LANDFIRE products used***

BpS – LANDFIRE National (cited as NatureServe 2009, so assume 2009 available data).

***Value of the work to the natural resource management/conservation community***

Enables development of conservation strategy, e.g. if there were no conservation strategy on the dynamic 2001 – 2026 landscape, we predict the value of ecosystem services would rise by \$8.245 billion, while the biodiversity score would fall by 6.7m.

- Provides an analysis on the way we think about conservation.
- With the push for ecosystem services as a means for conservation, this paper provides an important discussion around the ethics of protecting land for people versus the ethics of protecting land purely for biodiversity.

- The findings of the paper actually show that protecting land for ecosystem services (human benefit) provides benefits to biodiversity protection and that protecting land for biodiversity can have clear human benefit.
- This shows that from a conservation standpoint, the most important thing is to protect and conserve land and that the benefits of conservation will outweigh the costs.