Role of landscape Design in Mitigating Agricultural Intensification





Douglas A. Landis
Department of Entomology &
Great Lakes Bioenergy Research Center
Michigan State University
East Lansing, MI USA

Dawn M. Olson, Research Entomologist
Crop protection & Research Management Unit
USDA-ARS, Tifton, GA USA

Landis, 2016 Basic and Applied Ecology

Intensification of agriculture has been linked to declines in…

Biodiversity

- Plants (Geiger et al. 2010)
- Arthropods (Hendrickx et al. 2007)
- Birds (Donald et al. 2001)
- Mammals (Sotherton 1998)

- **Ecologists can play a key role in addressing this problem**

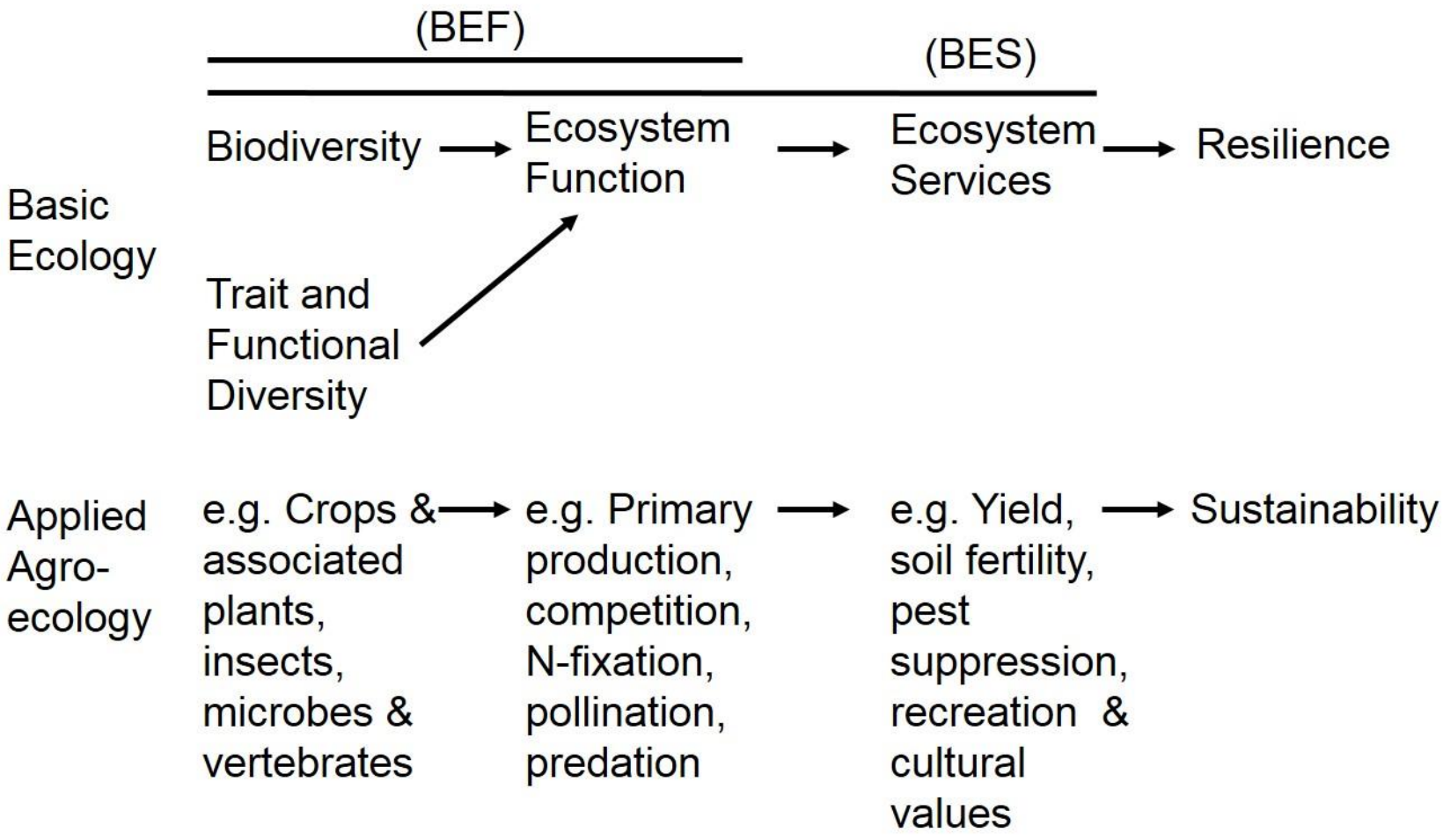
Functional Diversity

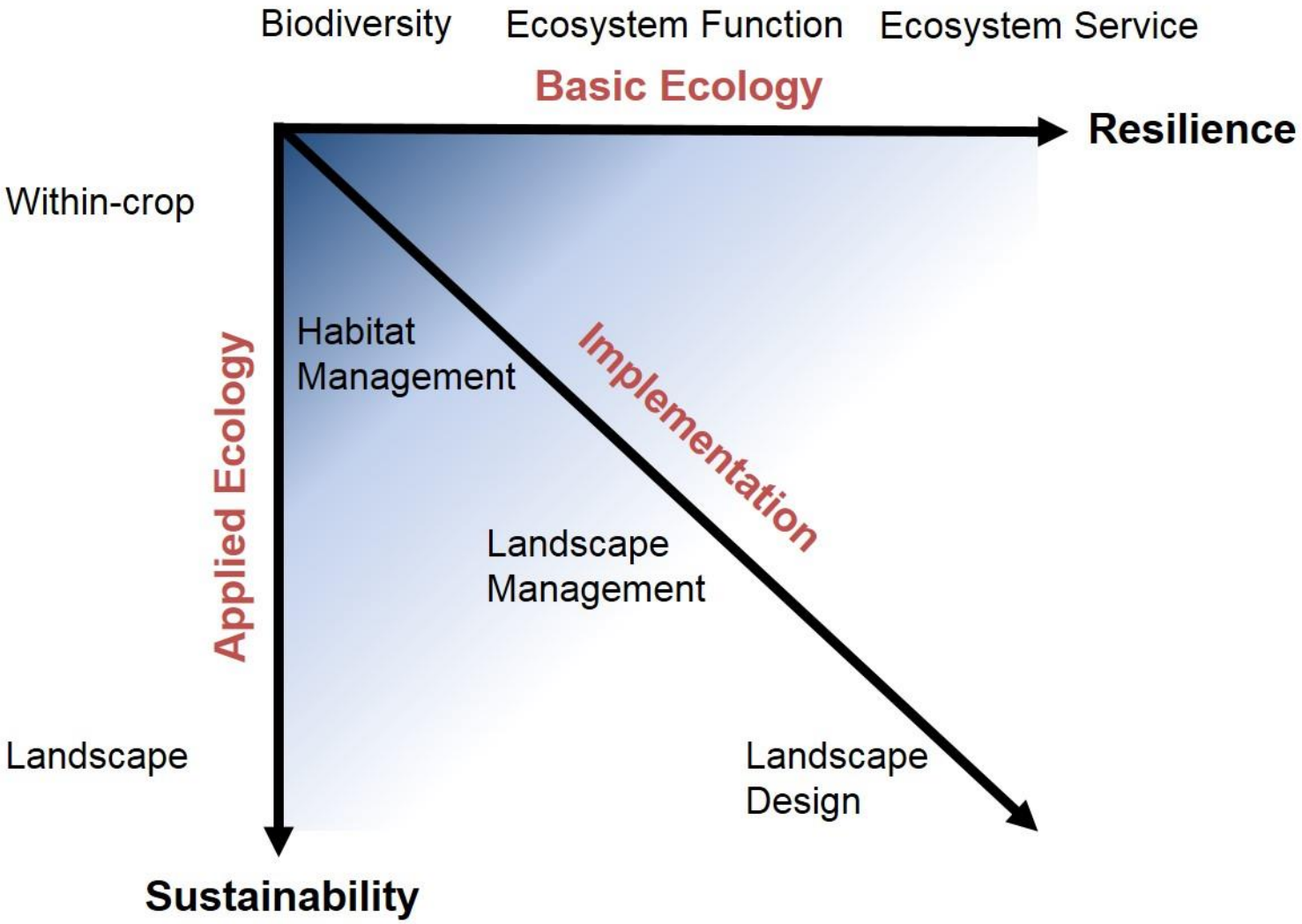
- Birds, mammals (Flynn et al. 2009)

Ecosystem Services

- Pollination (Kremen et al. 2002, Garibaldi et al. 2011, Deguines et al. 2014)
- Biocontrol (Biabchi et al. 2006, Chaplin-Kramer et al. 2011)

Biodiversity Function/Service Relationships




Biodiversity
Ecosystem Function
Ecosystem Service
Basic Ecology
Resilience
Within-crop
Habitat Management
Implementation
Applied Ecology
Landscape Management
Landscape
Landscape Design
Sustainability

Additional Trends

- Both local and landscape scales are important
- Common scale of response for natural enemies 700-2000 m
- Implies that in most landscapes, some level of cooperative action by stakeholders will be necessary to effect change

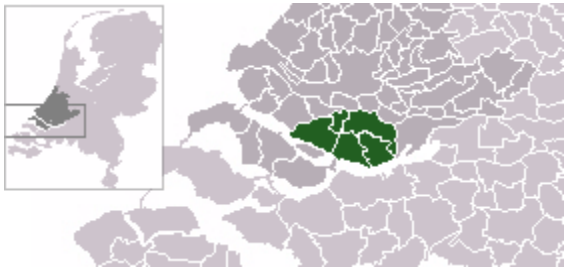
Engaging with stakeholders

- Ecologists will need to engage with farmers and other stakeholders and socioeconomic experts to develop context-specific solutions & promote implementation—be transparent & make uncertainty explicit

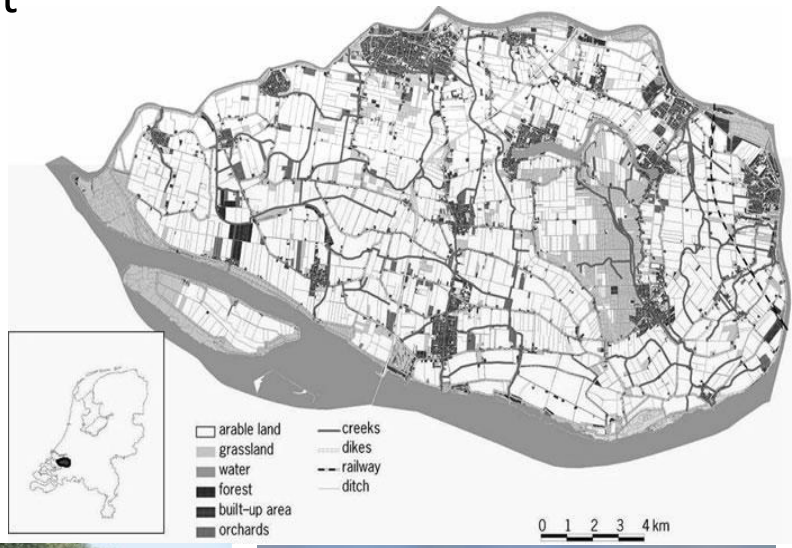
- Successful models exist and can be extended to address the needs of varying landscapes

Hoeksche Waard, The Netherlands

Steingröver et al. 2010



- Agriculture and tourism
- Reduction in soil and water quality, bird habitat
- Threatened by urban development



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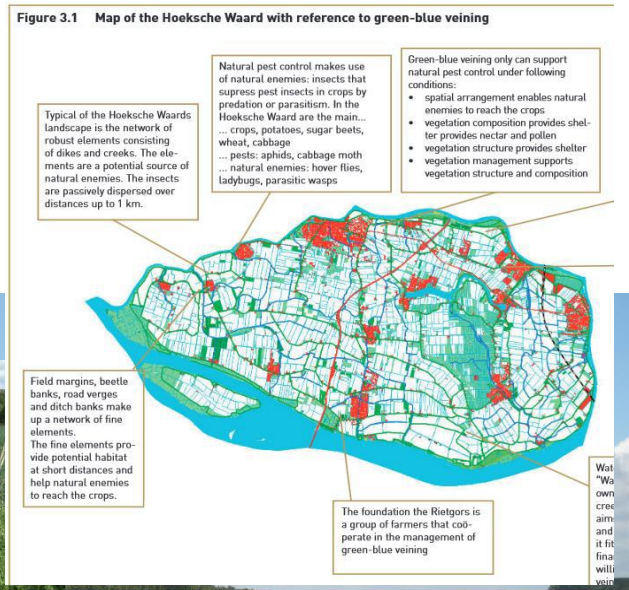
Hoeksche Waard cont.

- Engaged multi-stakeholder group
- “Robust and fine elements”
- “Green-blue veining network”



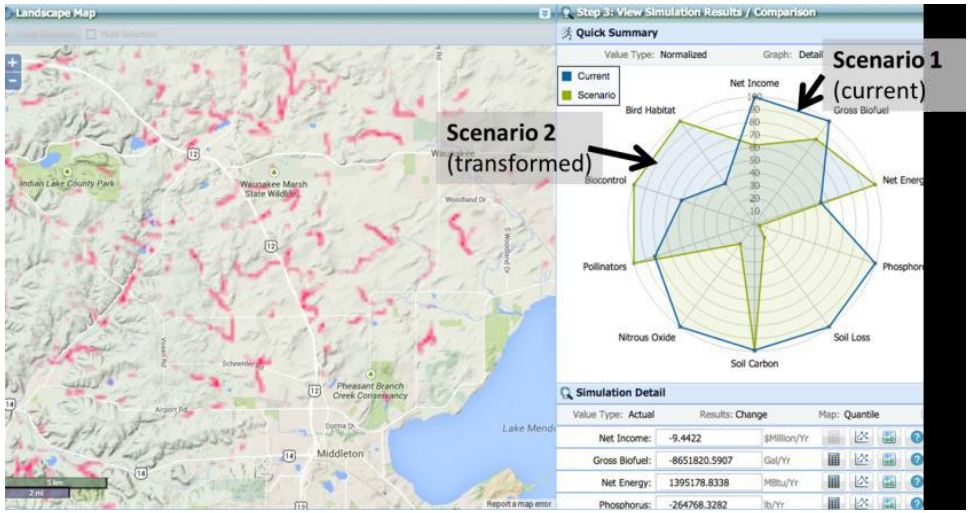
Steingröver et al. 2010, Landscape Ecology

Examples cont.

- Midwest US (Iowa, Minnesota and Wisconsin)
  - Water quality and biodiversity
  - Landscape-Scale Learning Laboratories “Landlabs”

    Jordan et al. 2013
- Research on sustainability of bioenergy crop choices
- Develop decision support tools

  -Smartscape http://dss.wei.wisc.edu
- Pilot stakeholder engagement



Conclusions

- Re-design of agricultural landscapes is needed to mitigate negative impacts of intensification on arthropod-mediated ecosystems

- Collectively, we already know a lot
  -But need additional studies at longer temporal and greater spatial scales

- While research gaps remain, the time is right for ecologists to engage with other disciplines, stakeholders and policymakers to foster agricultural landscape design for sustainable and resilient biodiversity services