Synthesizing research on the ecological opportunities for grazing in Iowa

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"Prairie is a very complex community. In one's early study it seems somewhat elusive…This vagueness of understanding can be overcome, once the species are known, by visiting the prairie several times through the growing season, examining it closely…and always with a definite purpose in mind."

- **-Naturalist J.E. Weaver (1958), in reference to Guthrie County, Iowa's remnant prairies.**

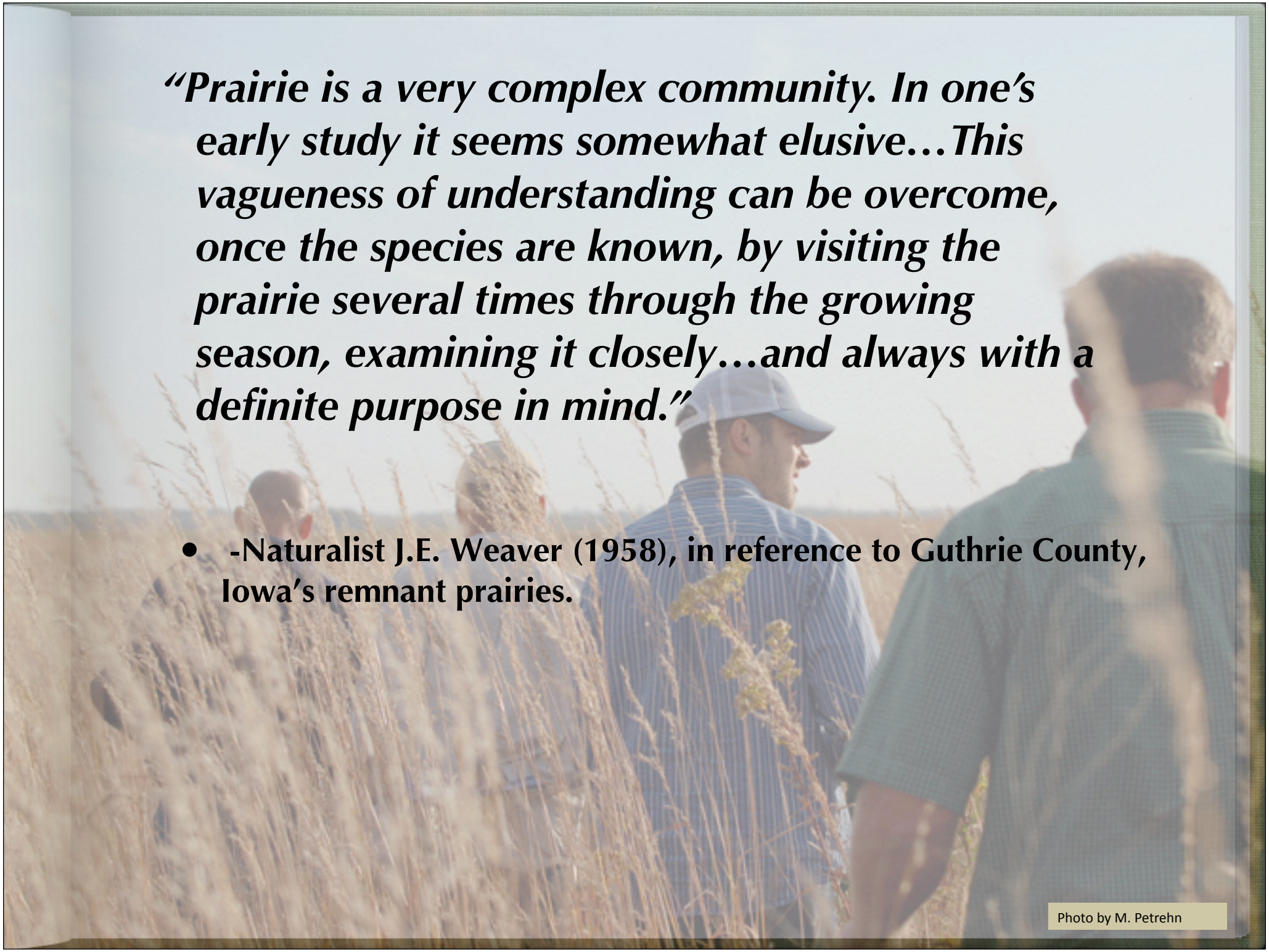


Photo by M. Petrehn

Finding our ‘definite purpose’

- Literature Review
  - Outcomes of Ecological Research Reviewed
  - Types of Ecological Services
  - How these ideas were synthesized
- Implications and suggestions for this group based on these outcomes

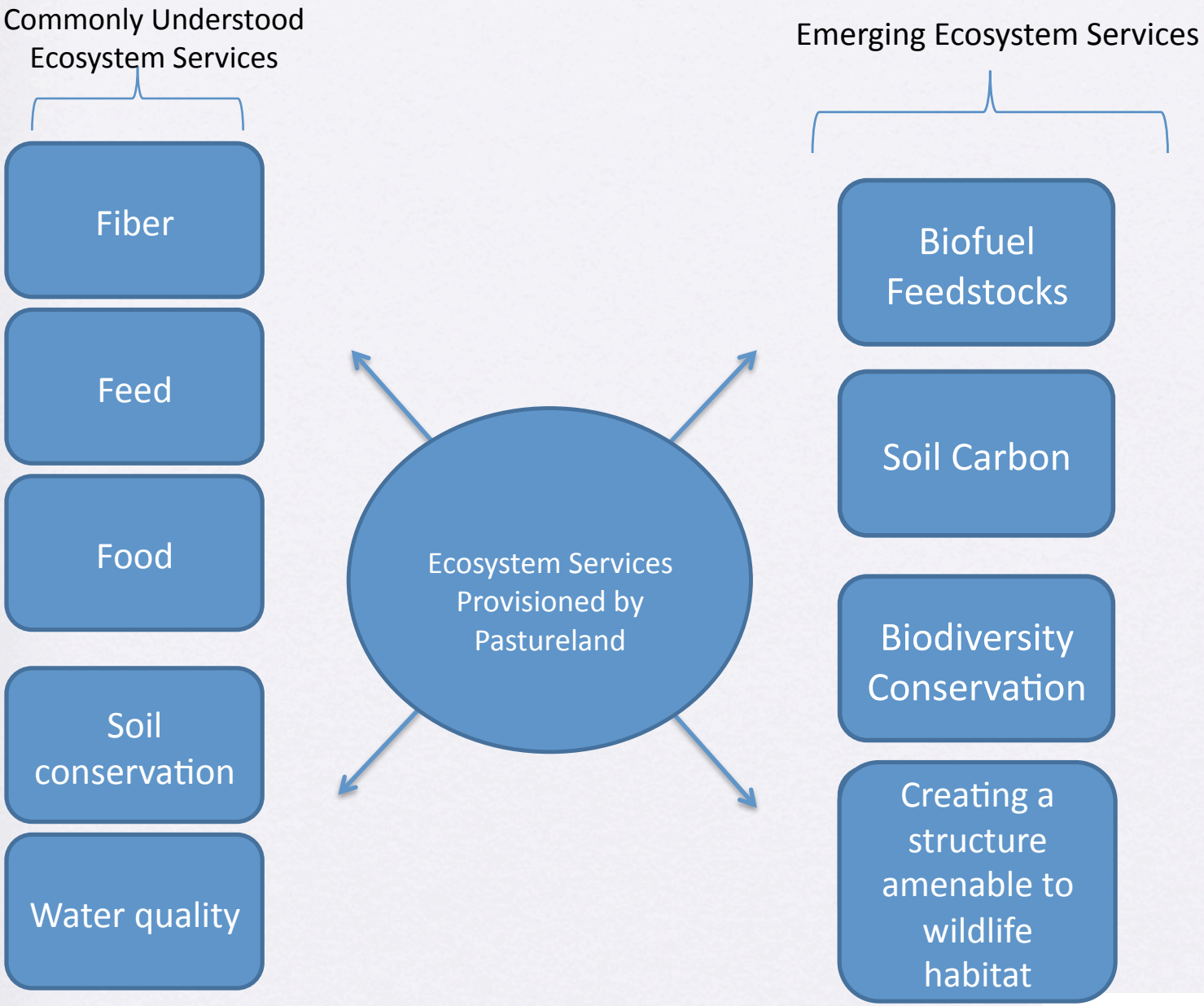
Goals of this literature review

- Acquired research-based resources, and interfaced them with current topics in grazing systems relevant to Iowa and the broader Corn Belt region.
- Organized according to themes that fit the interest areas of production and ecology, as identified by the Grass Based Livestock Working Group.
- To be made available online for free download May 2011:
  - http://www.valuechains.org/livestock

Ecosystem Services commonly understood to be provisioned by grazing systems tend to...

- ... manage for a diversity in vegetation heights that tend to be higher than many grazing scenarios in Iowa would create.
- ... provision *multiple* functions...

Multifunctional Grazing



Adapted from Wallis DeVries et al. 1998

Conceptualizing the mechanics of an ecological disturbance

★ Grazing FIT (Frequency, Intensity and Timing)

- FREQUENCY

- This reflects *how* animals move over the land base over a season and *how often*, temporally. Stocking rate is the relationship between the number of animals and the unit of land to be grazed over a specific period of time. Stocking rate does not imply how often or how densely animals are moved and grouped.

- INTENSITY

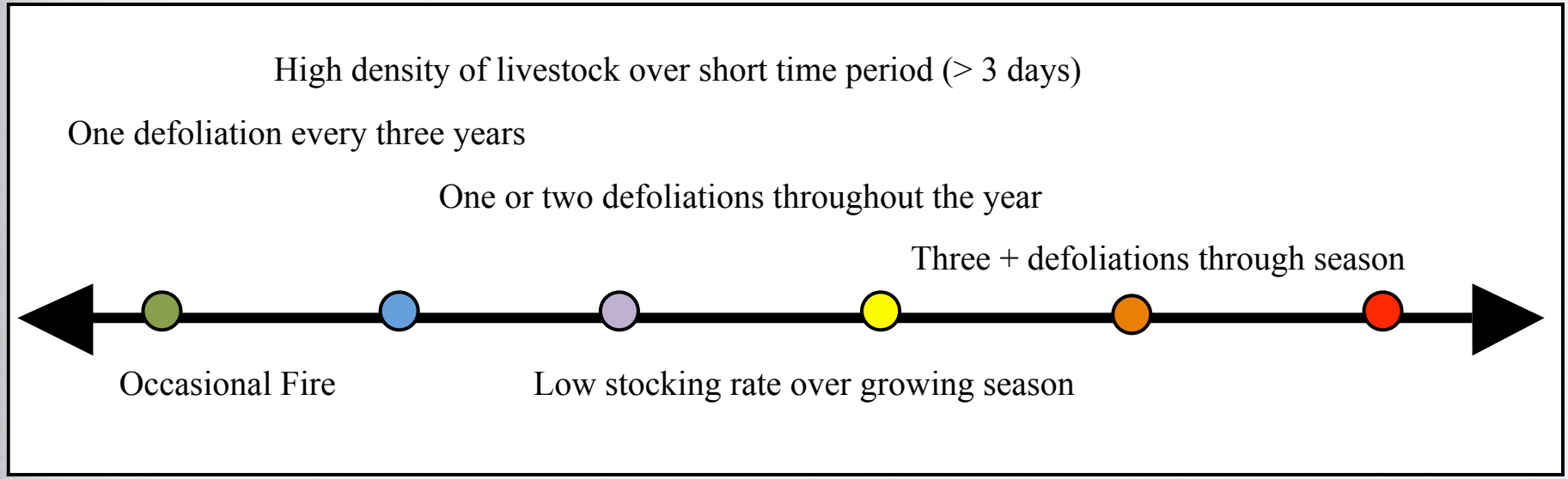
- Intensity typically refers to the effects of stock density. Stock density describes where animals are on a given part of land, spatially. It quantifies the relationship between the space they are allowed to move in and the size of the animal group in volume.

- TIMING

- Timing of grazing, or *how long* an animal has access to a given area of land *at which part of a season*, can influence many production variables. Like grazing and fire, the use of rest or recovery time through the season can also be considered a land management tool. Grazing *deferment* refers to a specific type of nongrazing.

- (adapted from Vallentine 2001)

A visual representation of practices that are associated with ‘light’ grazing (on the left side in green) as a gradation towards ‘heavy or ‘chronic’ overgrazing (on the right side in red) as utilized in literature reviewed.



Two main factors shape the response grasslands have to grazing

- **Our Management**
- We control the FIT
- Warm-season grass is a good example of this
- Many studies show it decreases in persistence dramatically with multiple defoliations in a season, and when grazed short.

- **Nutrient Cycling**
- Grazing has huge benefit of the majority of nutrients removed are replaced, which tends to accelerate rates of nutrient cycling.
- Where those are deposited and in what concentrations is what we can control to influence both the structure and function of a grassland area

Heterogeneity via Diversity in Structure and Function

- Grazing modulates the *structure* of:
- The physical sward/ pasture area via grazing, which alters plant allocation, litter quality, and light.
- And the *function* of:
    - Nutrient cycling via microbial interactions and the availability of N and P.

Species Richness: for Flora and Fauna

- Recommendations for wildlife revolve around providing, as one researcher described ‘a course grained mosaic of grazed, mowed, burned and undisturbed habitat’

Photo by Lynn Betts

Paine et al. 1996, Walk et al. 2010, Vickery et al. 1995

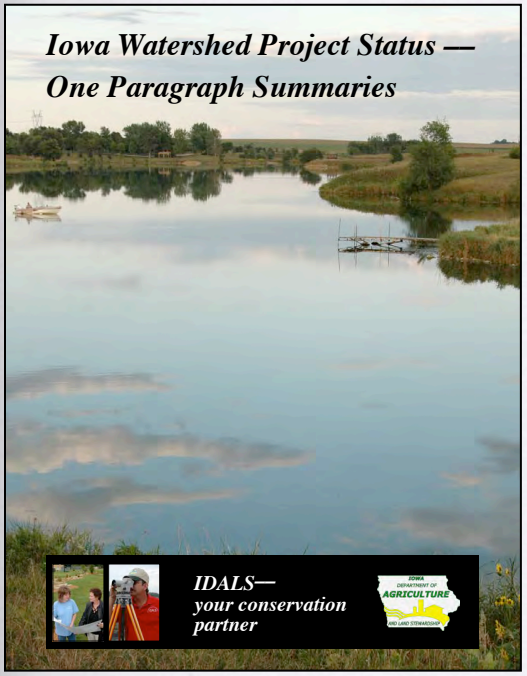
Nutrient Cycling

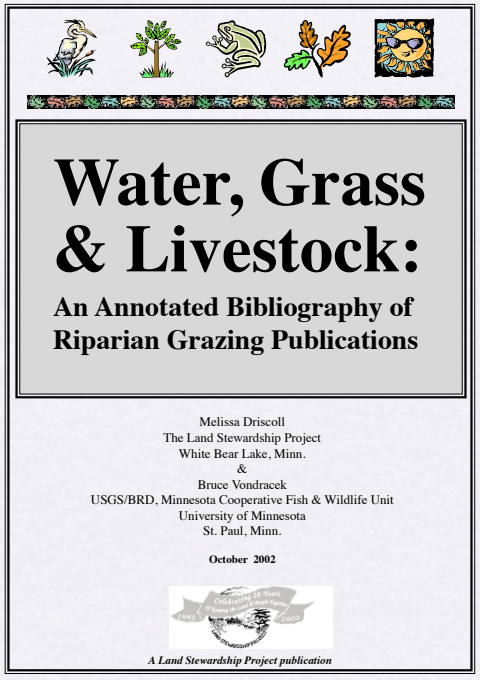
- Nutrient contents in grazed plants, when allowed to recover, is generally higher.

- Nutrient cycling is generally accelerated by grazing, but in a different way than burning, which is why ecologists have tended to favor the synergy of them.

Possibilities to Enhance Water Quality

- Strong link between sward height and improvements in infiltration.
- Soil moisture (infiltration) major factor also.





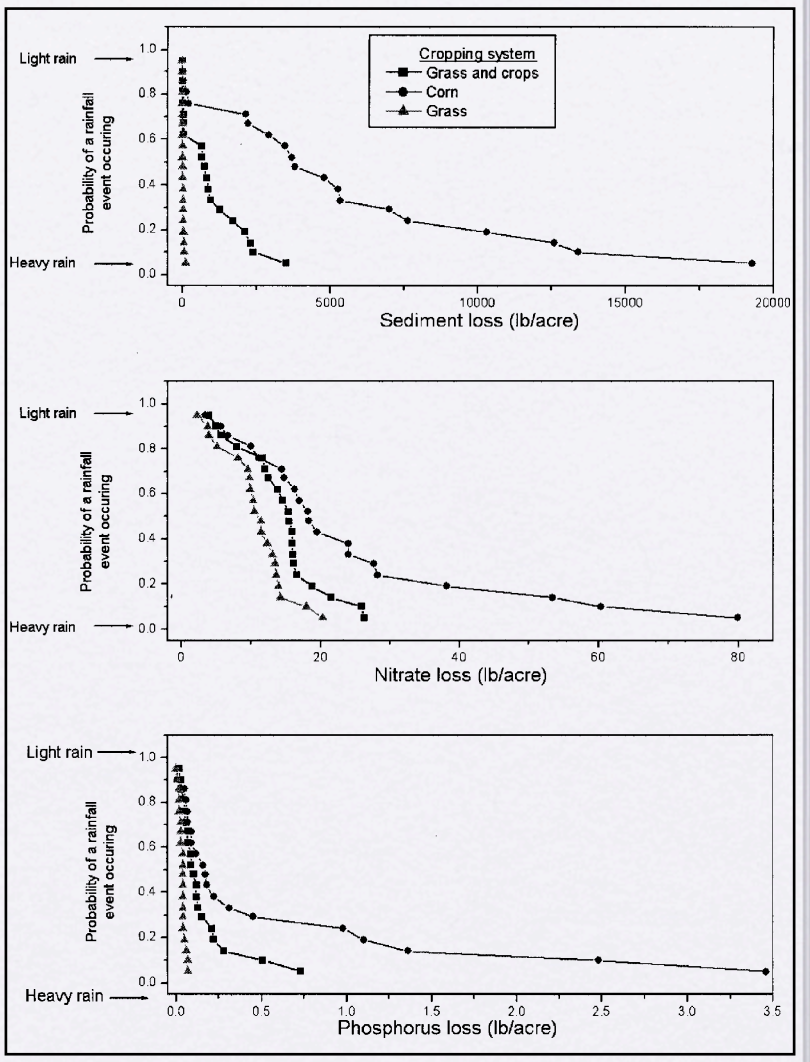
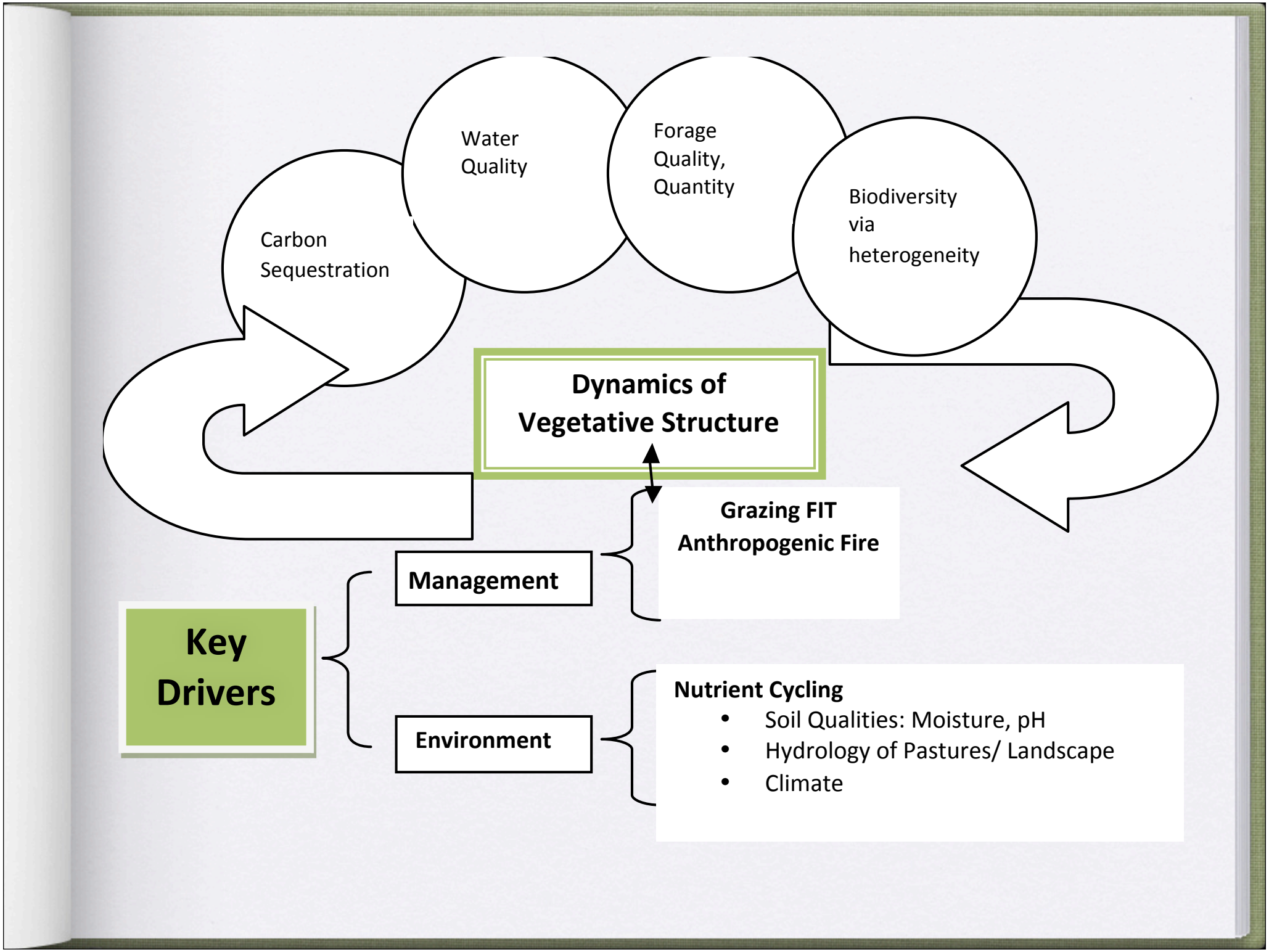


Figure 9. Results from the ADAPT computer model long-term (20-year) simulation. Predicted losses of sediment, nitrate, and phosphorus from three cropping systems at the Farm Two monitoring site.


Water Quality
Forage Quality, Quantity
Carbon Sequestration
Biodiversity via heterogeneity
Dynamics of Vegetative Structure
Grazing FIT
Anthropogenic Fire
Management
Key Drivers
Environment
Nutrient Cycling
Soil Qualities: Moisture, pH
Hydrology of Pastures/ Landscape
Climate

Benefiting monetarily from managing landscapes for multiple benefits at the private scale is difficult

- Information and management intensive
- Iowans own relatively small tracts of land
- Difficult to see benefits at the landscape scale without substantial landowner cooperation and incentives

How do we factor in scale?

- Many of these outcomes are only effective if produced on a landscape scale; fragmentation is our limitation.
- CRP is an example of this; bigger benefits of grazing other than soil are constrained by its size and location on landscapes.
- How can we make conservation programming that includes the use of multifunctional grazing *and* is subject to scales appropriate for the services desired?

Social and political scales need to be re-shaped/ re-worked

- to provision ecosystem services in non-pasture grasslands, and expect any compensation for them, may need to scale up human infrastructure in the grazing world in order to scale up the benefits

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Incorporating native plants into multifunctional prairie pastures for organic cow–calf operations

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Abstract

The multifunctional agronomic, ecological, economic and social uses of grass-based agricultural systems in peri-urban Marion County, Iowa, were the subject of investigation from 2003 to 2005. Following a sociocultural analysis that identified diverse motivations of cow–calf operators, an on-farm, agroecological experiment was established with a member of the study group. The objective of the experiment was to investigate the feasibility of establishing a multifunctional prairie pasture in response to the operator's interest in certified organic, warm-season plant species paddocks. At the field level, the implementation of native grasses and legumes into fallow pasture without the use of herbicides under flash grazing, mowing and unmanaged control treatments showed differences in species establishment and pasture composition. After three growing seasons, native species were evident in all treatments, with no significant differences between grazing and mowing in total native species establishment. There was a trend toward greater native legume establishment in the control over the managed treatments. Thus, total species abundance was greatest in control plots, suggesting this treatment for maximum prairie pasture establishment without herbicides. Concurrence was observed between motivations expressed by cow–calf operators in the sociocultural study (i.e. biodiversity preservation and sustainable management of natural resources) and outcomes from the prairie pasture experimental system. Support for grass-based systems from local institutions at the community level is necessary for the expansion of prairie pastures in Iowa and throughout the tallgrass prairie region.

Key words: organic, agroecology, burning, tilling, mowing, grazing, competition, native species, plant interactions

Take time to contemplate the bigger picture...even if you have to wrestle with it a little!