NOVEL ECOSYSTEMS

Practical recommendations for wetland restoration planning

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Does the novel ecosystem concept have the potential to advance wetland restoration practice?

Ecological restoration

The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. *SER 2004*

--Restoration site planning decisions--

Novel ecosystems (Hobbs et al. 2006): Key characteristics are novelty, in the form of new species combinations and the potential for changes in ecosystem functioning, which are the result of human action.

Assessing current conditions

Key questions:

Which stressors (and associated drivers) are responsible for degradation?

NE: Pertinent where there multiple stressors

NE: Invasive species, climate change, landscape conversion, highly modified sites

To what extent is the degraded ecosystem resilient?

NE: Ecosystem cannot recover to “historical state”

Is the ecosystem potentially in an alternative stable state?

NE: Where invasive species dominate, yes (Biotic thresholds-Hobbs et al. 2006)

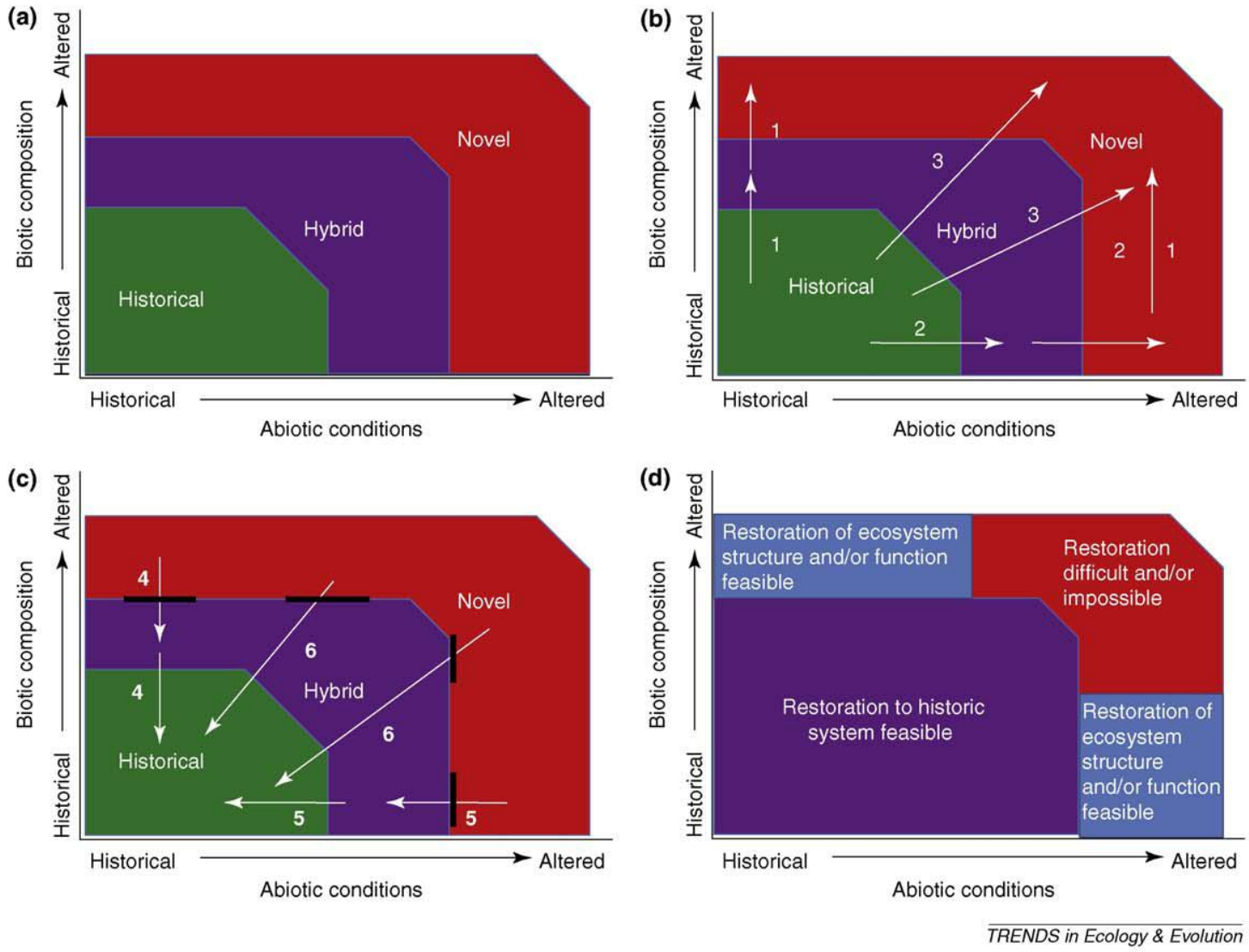
Issues for implementing NE in wetland restoration planning:

-- At what point in the planning process is a site deemed a NE?

-- Current (most intact sites), not historic states are a more typical benchmark

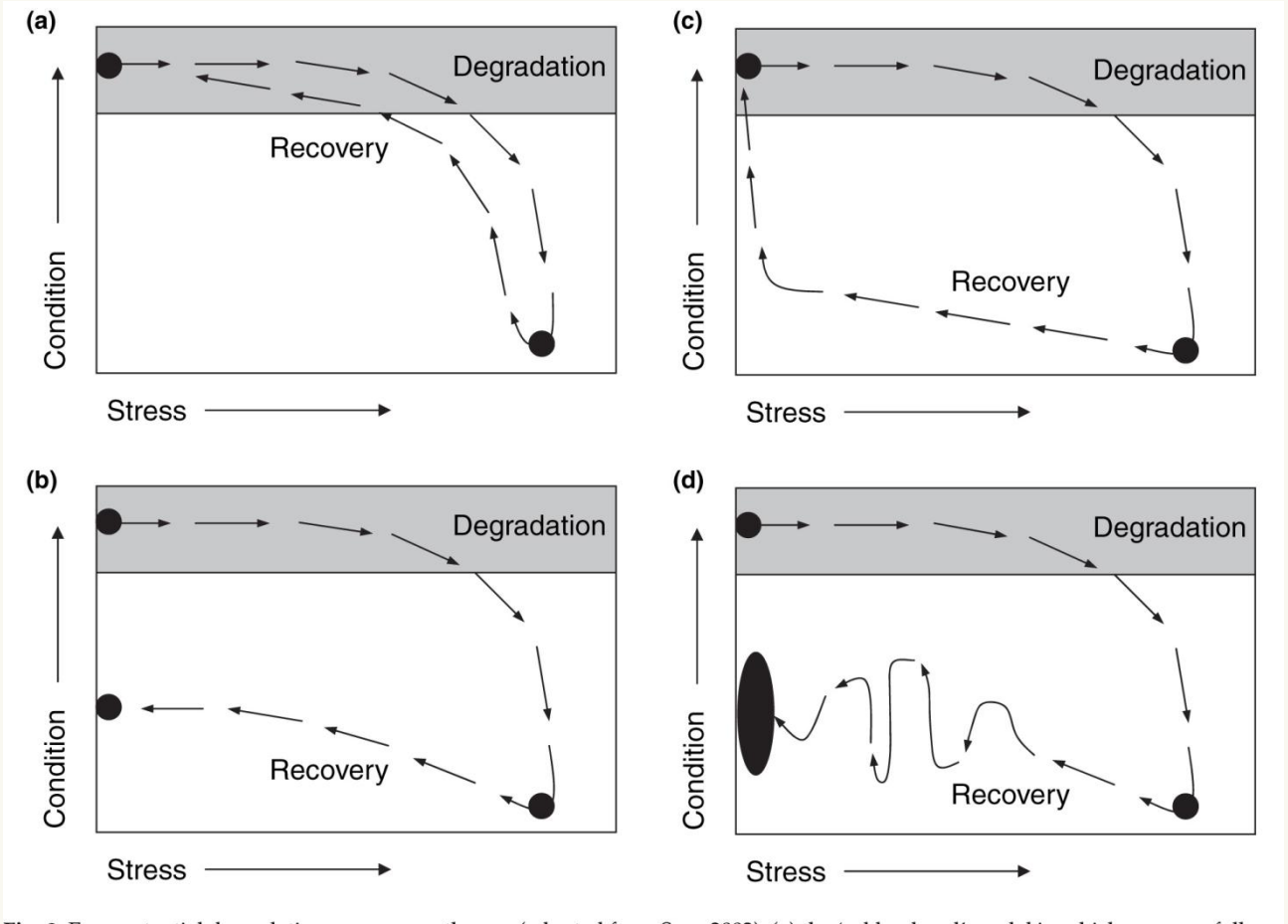
Assessing current conditions (cont.)

From Hobbs et al. 2009 TREE



Assessing current conditions (cont.)

Critical research need:
Development of tools for synoptic assessments of resilience
-- empirically tested



From: Lake et al. 2007

Older restorations are critical for development of predictive tools

Selecting restoration targets

Key questions for wetland restoration planning:

What is the geomorphic setting of the site?
What are fixed constraints on water inputs, storage, or outputs?
What are possible hydropatterns given water budget constraints?
What kinds of vegetation are suited to potential hydropattern and water chemistry conditions?

Criteria proposed for determining whether a novel ecosystem is an appropriate target for restoration (Hobbs et al. 2009):

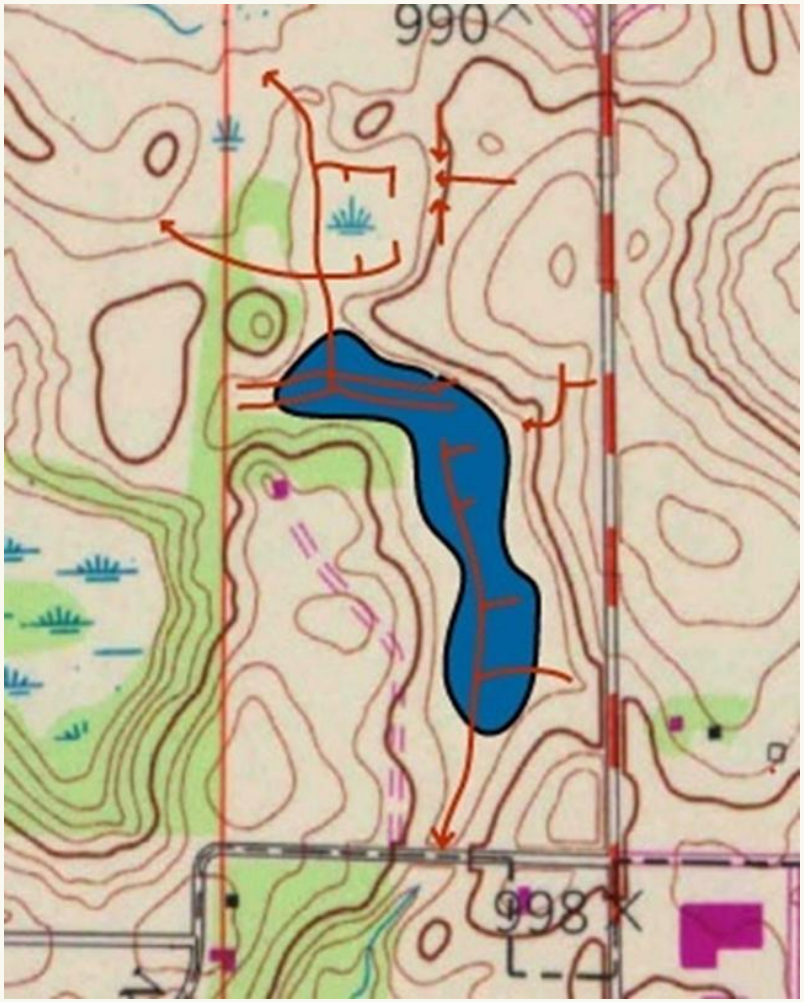
-- Is the system maturing, or capable of maturing, along a stable trajectory?
-- Is the system resistant and resilient?
-- Is the system thermodynamically efficient?
-- Is the system providing ecosystem goods and services?
-- Is the system providing opportunities for individual or community engagement

Issues for implementing NE in wetland restoration planning:

Targets are often types of wetlands rather than specific sites
Target selection for wetlands is more analytical and based on system "drivers"
NE criteria mixes target selection and goal-setting

Selecting restoration targets (cont.)

Example: Spring Peeper Meadow
Minnesota



Establishing project goals

Overarching question: What do we intend to achieve?

Key considerations for developing a SET of goals for a project:

-- Ensure goals address problems identified during assessment

-- Ensure goals are broadly viewed as worthwhile by stakeholders

-- Establish goals that are capable of keeping restoration efforts on-track

Goal quality	Definition
Specific	A goal that focuses on a particular attribute, such as a species, group of species, or function
Measurable	A goal that describes the necessary level of change or desired outcome
Achievable	A goal based on realistic assumptions about the effectiveness of available methods under current conditions
Reasonable	A goal that is possible given constraints of funding, labor, time and other resources.
Time-bound	Committing to achieving a goal within a specified period of time

How NE fits in to goal-setting for wetland restoration planning

-- Addresses social values –i.e., ecosystem services

-- Emphasizes Achievability—i.e., invasive species focus

-- Creates confusion by creating a dichotomy of historic vs NE

Establishing project goals – social values

Long history of ecosystem service goal-setting in wetland restoration planning

-- wetland "functions and values"

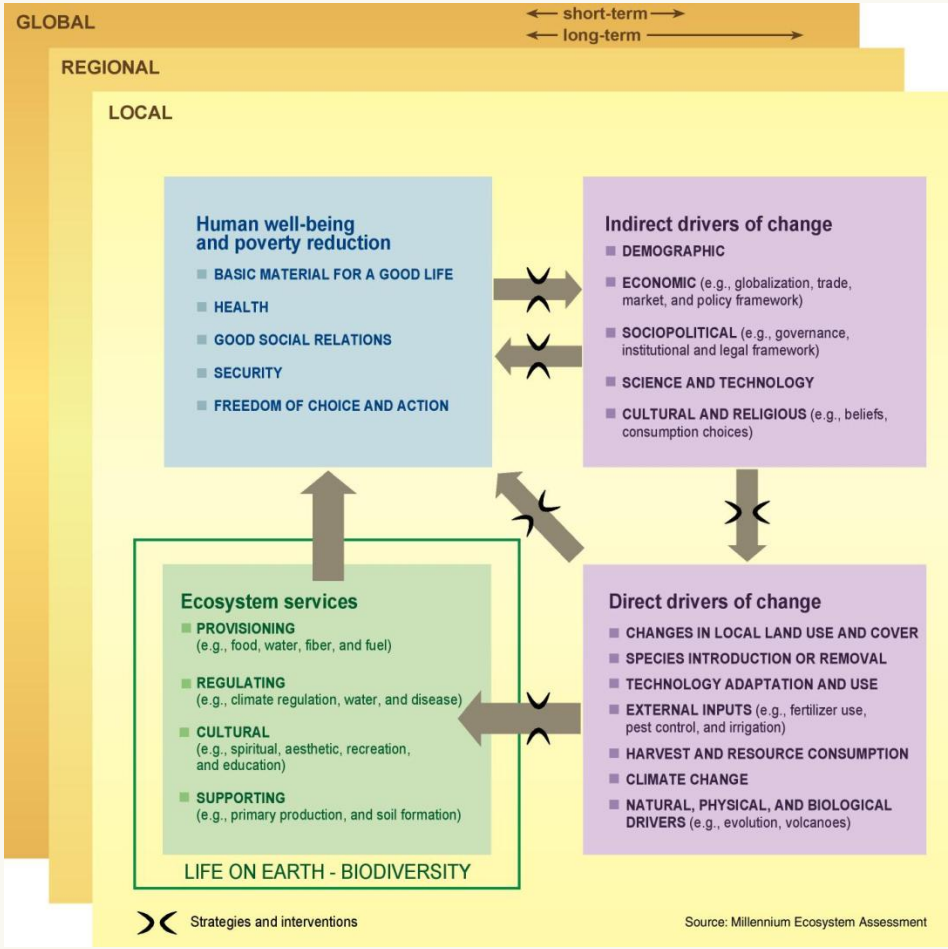
-- see Ehrenfeld 2000 RE and many others

-- Large literature on goal-setting for wetland restoration

-- much less attention for terrestrial ecosystem restoration

Millennium Ecosystem Assessment (2005) offers comprehensive analysis of ecosystem services.

-- Relevant framework for restoration planning



Establishing project goals - Achievability

Goal-setting schemes need to distinguish between…

Achievability – related to assumptions about effectiveness of methods

Reasonableness –related to project-based constraints of funding, labor, time, etc.

NE doesn't make this distinction.

Achievability—Is an invasive species controllable?

NE's focus on generalizations less informative than mechanistic analyses based on advances in invasion biology

Drivers vs passengers --MacDougall, A. S. and R. Turkington. 2005. Ecology 86:42-55.

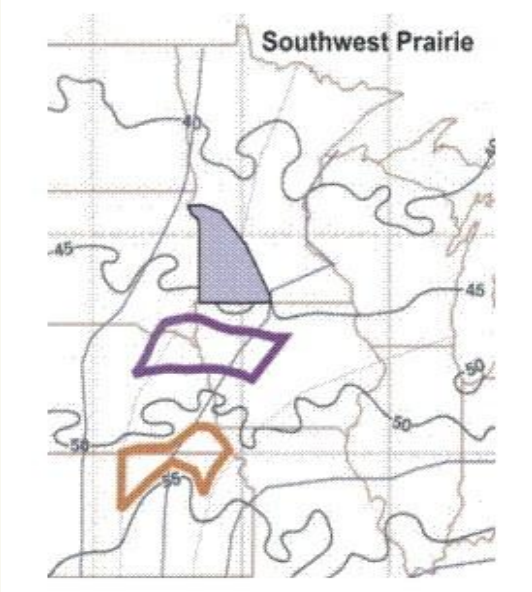
Is low wetland mitigation success evidence there are systematic problems related to achievability? (e.g., Hobbs et al. 2011)

Cannot ignore….

- Short-term mitigation time-frames
- Issues related to funding, labor constraints –
- Variability in practitioner competence, in compliance, in enforcement
- Most analyses report early efforts with more recent efforts.

Establishing project goals – NE's false dichotomy

Restoration planning for climate change adaptation in Minnesota's Prairie Pothole Region



Landscape-scale and site-based planning
Millar's 2007 framework: resistance
resilience
facilitation
Strategic consideration of using high-quality remnants as "references" in some cases

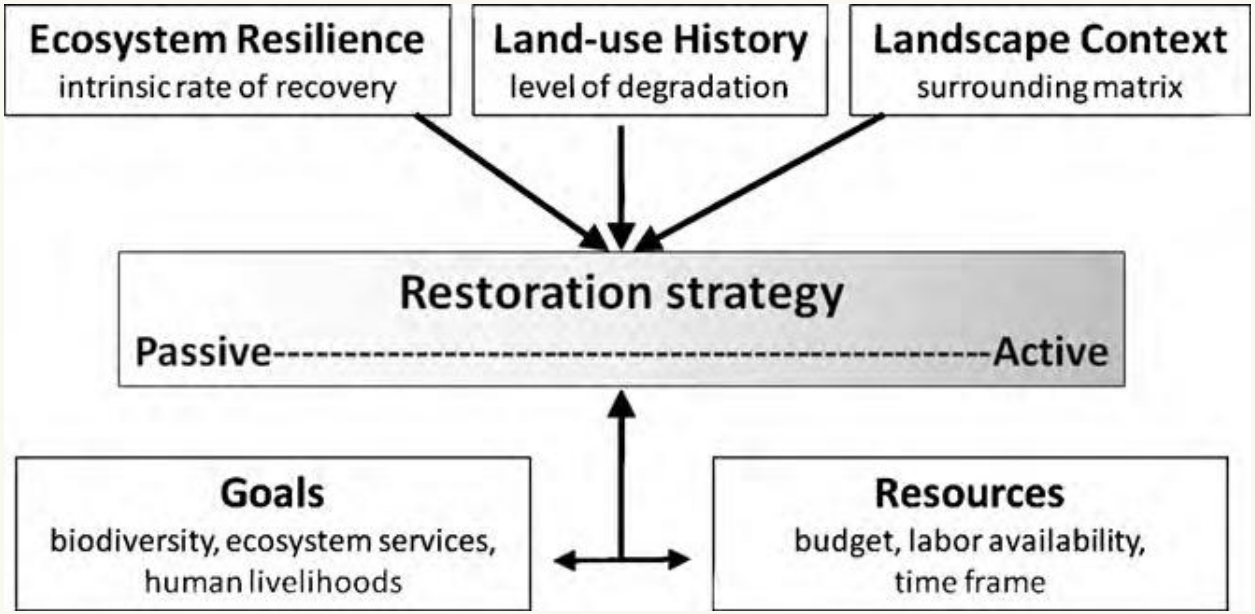
Establishing project goals (cont.)

Efficient CCA strategies must address: landscape-scale resilience
functional connectivity
changing frequency of extreme events

Zedler 2010:
--Analyzed effects of multiple extreme Events- 1978-1998
-- Observed 6 types of climate-change effects on vegetation:
sequential (event-order dependent) caused greatest species losses
-- Use this information for restoration planning at the landscape-scale.
-- IPCC 2012—"low regrets" strategies

Developing actions plans

From Holl and Aide 2010:



NE emphasizes: Revisiting assumptions about invasive species control
Potential for climatically unsustainable resource management
Need to avoid inefficient use of restoration resources
Old approaches –bad; new approaches – good.

Does the novel ecosystem concept have the potential to advance wetland restoration practice?

--Restoration site planning decisions--

NE is drawing attention to issues of timely importance:

-- the need to develop restoration approaches that make sense for increasing influence of stressors

-- the need to broadly consider social values in restoration planning

NE is less of an advance for restoration of wetland than terrestrial systems

NE takes an overly simplistic view of restoration planning – other ideas, concepts, theories have more potential to advance wetland restoration practice

NE basis includes many outmoded assumptions about practice.