Towards an Ecology of Environmental Education:

Feedback Loops, EE, and Resilience

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Resilience Attributes

- Adaptive and social learning
- Diversity
- Self-organization
- Ecosystem services
- Social capital

Civic Ecology Practice
Civic Ecology Education

Resilient Social-Ecological System

Folke et al. 2002
Walker & Salt 2006
Krasny & Tidball 2009
1. Civic ecology practice
2. Civic ecology education
3. Natural capital
4. Ecosystem services
5. Social capital

“VIRTUOUS”

Feedback “primes” cycle to repeat and expand
Feedbacks: Vicious

1. Urban community
2. Highway built
3. Natural capital eroded
4. Lack of ecosystems services
5. Depletion of social capital

Feedback “primes” cycle to repeat and expand

“VICIOUS”
Virtuous and Vicious Cycles Can be Resilient

Desired system
Virtuous cycle

Undesired system
Vicious cycle
How can EE Help in Managing a System for a Desirable Resilient State?
Virtuous and Vicious Cycles Can be Resilient

Desired system
Virtuous cycle

Undesired system
Vicious cycle
Bifurcation Zones and Resilient Cycles

Virtuous Cycle  Bifurcation Zone  Vicious Cycle
Can EE “shore up” the ridge and prevent the “marble” from crossing into the vicious state?
Can EE “diminish” the ridge and help the “marble” cross from the vicious into the virtuous state?
EE Role in Feedback Loop?

EXTERNAL DRIVERS

- Socio-cultural-economic Template
  - HUMAN BEHAVIOR
    - Regulation
    - Markets
    - Migration
    - Institutional

PULSES: Fire, drought, storm, agents, pests, pulsed, nutrients, fertility

PRESS: Climate change; nutrient loading; sea-level rise; increased human resource use

Q4b

HUMAN OUTCOMES
- Exposure risk
- Quality of life
- Human health
- Perception and value

EE

ECOSYSTEM SERVICES
- Regulating: Nutrient filtration, nutrient retention, C sequestration, disease regulation
- Provisioning: food and fiber production
- Cultural: aesthetics & recreation

Q3

ECOSYSTEM FUNCTION
- Flux, transport, storage, transformation, stoichiometry, productivity

Q1

COMMUNITY STRUCTURE
- Vegetation turnover time
- Trophic structure
- Microbial communities

Q2

Geophysical Template

Q0
Conclusions

• EE may become part of feedback loops in social-ecological systems.

• An “ecology of EE” explains how EE relates to other parts of the social-ecological system.

• An “ecology of EE” helps us:
  ▪ to theorize the role of EE in fostering desirable resilience.
  ▪ eventually to better manage social-ecological systems for resilience.
Recap

- Resilience: capacity of system to respond to and to grow from disturbance.
- Civic ecology practices can help confer resilience.
- EE can be situated in and enhance civic ecology practices.
- Thus, EE may help confer resilience.