Missouri Land Reclamation Program Pollinator Initiative: Putting Ecological Theory into Practice

Missouri Waste Control Coalition Environmental Conference
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Overview

Land Reclamation
- What we do
- Process
- Progress

Pollinator Initiative
- Up and running
- Process
- Progress

Ecoacoustics
- New Approach
- Case studies
- Potential
Land Reclamation

Abandoned Mine Lands

- Returning historically mined land to the best possible usable condition
- Driven by public protection and environmental stewardship
- Funded by tax on coal
Facilitating Reclamation

- Absence of vegetation
- Soil skeleton
- Must be handled with ecological understanding
Facilitating Reclamation

Philosophy

- Systems approach
- Thinking beyond singular construction tasks
- Integrating system functions (above and below)
Facilitating Reclamation

Land reclamation is a litmus test for our ecological understanding

- Failures illustrate our lack of understanding
- Work to understand the ecosystem, damage, repairs

- Informing design with current ecological knowledge
- Quantitative assessment of responses
- Analysis to application: Results to inform subsequent efforts
Prairie Ecosystem

Historic native tallgrass prairie
- Covered one-third of the state
- Approx. 15 million acres

Photo Credits: MDC, Noppadol Paonthong
Prairie Ecosystem

Current remaining original prairie
- 58,000 acres
- +/- 20% allowance
- Converted to crop production
- Seeded with cool-season forage

Photo Credits: MDC
Biodiversity has declined in the past half century
Management goals favoring a narrow suite of species.
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Management goals favoring a narrow suite of species.

Theory into Practice
- Benefit by managing for heterogeneity
- There is no one goal for management
- Landscape-level planning is crucial
Progress

AML Project Areas

Historic Prairie

AML Project Areas

Historic Prairie
Progress

National Fish and Wildlife Foundation
Monarch Butterfly Conservation Fund 2017
Progress

National Fish and Wildlife Foundation
Monarch Butterfly Conservation Fund 2017

- Provide a north - south migration corridor
- Main spring breeding habitat areas
- Education opportunities for local communities

Batalden et al. (2007)
Progress

Planting NWSG and forbs
Progress

Success and “works in progress”
Soundscape ecology
New Approach to Assessing Impact or Recovery

Recording ambient soundscapes over time

- Computationally intensive and quantitative
- Monitoring abundance, behavior, and distributions
- Unique citizen-science opportunities
- Engaging landowners

Farina et al. (2013)
**Biophony**  
Biological Sources

**Geophony**  
Geophysical Processes

**Anthropophony**  
Human induced sounds

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Pijanowski et al. (2011)
Horticulture and Agroforestry Center (HARC)

- 700 ac working farm
- Loess Hills MO River
- Experimental fruit and nut
- Close proximity to row crop

4 Systems
1. Alley crop
2. Row crop
3. Forest
4. Silvopasture
Low-cost recorders (LCR)

- UR-09 USB
- Omnidirectional microphone
- 16 hours
- 8 Gb of storage space
- 0.5 – 7 kHz
Varying levels of soundscape components across four habitats

- **Alley**
  - Insect: 6
  - Avian: 1
  - Weather: 1
  - Anthropogenic: 1
  - Mammal: 1
  - Amphibian: 1

- **Crop**
  - Insect: 6
  - Avian: 1
  - Weather: 1
  - Anthropogenic: 1
  - Mammal: 1
  - Amphibian: 1

- **Forest**
  - Insect: 8
  - Avian: 1
  - Weather: 1
  - Anthropogenic: 1
  - Mammal: 1
  - Amphibian: 1

- **Silvopasture**
  - Insect: 6
  - Avian: 1
  - Weather: 1
  - Anthropogenic: 1
  - Mammal: 1
  - Amphibian: 1
- **+ relationship**
  - ACI and soundscape complexity
- **+ relationship**
  - composition and canopy height
1. Benefits of Ecoacoustic Metrics
   - Low-cost
   - Low-disturbance
   - Rapid deployment/retrieval
   - Reach sensitive areas
   - Efficient output
   - Easily interpreted

2. Constraints
   - Swankier units = more $$
   - Computationally intensive
   - Validation
   - Overlap @ low frequencies
Snapping Shrimp: *Synalpheus spp.*
Reclamation: an acid test of ecological understanding

- We have limited information and material to work with
- We have no way to guarantee vitality
  - Private lands
  - Greatest possible utility

Moving Forward

- Planning for success
  - Timeline
  - Cover crop
  - Maintenance
  - Attitude

Future

- Data collection
  - Success/failure
  - Adaptive
  - Changes over time
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Thank you
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