Linking Landscape Scale Conservation Planning to Effective Ecological Restoration

Credit Valley Conservation
inspired by nature

Landscape scale conservation plans provide guidance to restoration practitioners on where to restore. Practitioners carry out restoration actions based on these plans, but capacity for long term monitoring and assessment of cumulative project success is limited. The challenge for watershed management agencies lies in assessing success in translating their landscape-scale conservation plans into on-the-ground restored ecosystems. We present ways in which our agency, managing an urban-rural watershed, facilitates collaboration between science staff and restoration practitioners to assess cumulative outcomes of restoration projects over time. Such collaboration can help improve long term success rates of restoration projects and close the loop on adaptive environmental management.

Design

Coastal Wetland Restoration Dredging and Restoration

practice

Responsible for project plan, consultation, permitting; extensive stakeholder consultation and coordination across multiple levels of government to ensure project buy-in and secure project financing.

Objectives
- Remove inorganic sediment build-up
- Remove and exclude invasive species
- Remediate existing habitat

Two years of pre-construction abiotic and biotic monitoring 2012-2013

science

- Provincial and local inventories and monitoring data provided information on timing windows for restoration and target species for preservation
- Sedimentology studies provided depth of sediment to organic soils
- Contaminant testing dictated disposal options
- Archaeology surveys identified cultural heritage areas of concern

Marsh pre-dredging – lack of submerged aquatic vegetation due to sedimentation and carp disturbance

Grassland Restoration Biodiversity Offsetting

practice

Oversaw creation of monitoring plan that incorporated thresholds for management

Objectives
- Increase native grassland vegetation
- Create an arthropod community that has a greater abundance of primary species (Coleoptera, Orthoptera, Lepidoptera, and Araneae)
- Support grassland birds at risk, specifically Bobolink and Eastern Meadowlark

science

- Vegetation, arthropod and bird monitoring protocols developed to compare results with organization's long-term environmental monitoring program
- Pre-restoration inventories: breeding birds, vegetation and arthropods

Old field, pre-restoration – dominated by forbs such as goldenrod

Natural Channel Creation Stream Daylighting

practice

- Continue monitoring to ensure goals and objectives are met
- Document lessons learned to inform implementation of future projects

science

- Research has shown water temperatures can be elevated for first few years post construction of new channels due to lack of shade and need for vegetation to establish
- Water temperature monitoring has shown elevated temperatures during year one project, so additional shrub plantings adjacent to the stream will be implemented in 2018 to provide additional shading
- Survey of vegetation shows that some non-native species have established. Action being developed to remove invasive Phragmites
- Mowing of riparian vegetation to help maintain grassland species was not deemed necessary in 2018
- Mowing is typically recommended to allow grassland vegetation to outcompete non-natives

Natural channel with stabilising floodplain: instream flows with fish use and aquatic vegetation

Coastal Wetland Restoration Dredging and Restoration

practice

- Document lessons learned to inform implementation of future projects

science

- Compare monitoring results from this project to other Great Lakes coastal wetlands
- Identify best attainable conditions and assess restoration sites for success

Greatly increased coverage of submerged aquatic vegetation post-dredging

Grassland Restoration Biodiversity Offsetting

practice

- Determine further management actions
- Continue evaluation and invasive vegetation management

science

- Compare monitoring results from this project and other grassland restoration sites at 10 year mark (~2024) to representative analogues in watershed
- Identify best attainable conditions and assess restoration sites for success

Longer term monitoring of a set of grasslands will help determine rate and pattern of grassland succession and inform future restoration projects

Natural Channel Creation Stream Daylighting

practice

- Nine species of fish captured and found in the stream, within 6 months of channel construction
- Buffer grassland vegetation grew quickly and resulted in use by grassland birds
- Stream was colonized by benthic insects and thousands of tadpoles were found in stream and wetland

science

- Monitoring is scheduled for years one, five and ten post construction
- Parameters include fluvial geomorphology, flow, fisheries, vegetation assessment and survival and water temperature

Rapid colonization of fish, fauna and plants post-construction

Implementation

Natural Channel Creation Stream Daylighting

practice

- Construction during winter to match with fisheries and bird construction timing windows
- Flows pumped around construction site during construction
- Site stabilized with erosion and sediment control measures and nurse crop planted to stabilize and allow natural vegetation to re-establish
- Created 500 m of stream with new valley and 1500 m² of wetland

science

- Stream and wetland designed based on the projected flow, drainage area and slope of the stream
- Grassland bird recovery strategy and locally native species information used to determine seed mix for the newly created valley

Construction in February/March 2017. New channel and wetland excavation. Water flows from pipe were pumped around the construction site

Grassland Restoration Biodiversity Offsetting

practice

- Carp barriers were maintained and installed over the longer term
- Sediment deposition monitoring has not shown any significant accumulation of sediment post dredging
- Cattail extent has been mapped to ensure no further encroachment into dredged areas

science

- Binational monitoring initiative led by Environment Canada's Canadian Wildlife Service
- Post-construction monitoring occurred during 2014-2015, included percent submerged aquatic vegetation monitoring to ensure EA targets were met
- Marsh was declared a federal benchmark site, ensuring continued future monitoring over the long term

Science staff provided reporting in ways that would guide further management of grassland

Coastal Wetland Restoration Dredging and Restoration

practice

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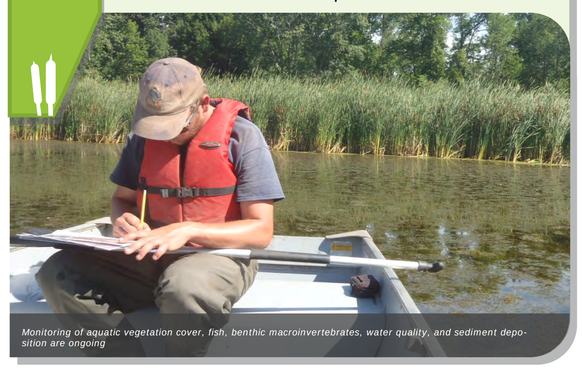

Monitoring of aquatic vegetation cover, fish, benthic macroinvertebrates, water quality, and sediment deposition are ongoing

Evaluate and Adjust

PRACTICE

- Identify reference sites to match project
- Identify best attainable ecosystem for watershed based on long term ecological monitoring program data
- Develop plan to monitor project effectiveness
- Develop or recommend monitoring protocols
- Use lessons learned to develop monitoring plan

SCIENCE

- Identify target ecosystem
- Set goals to describe status of ecosystem within monitoring timeframe
- Set specific, measurable, achievable, realistic and time-bound objectives
- Plan project
- Use lessons learned to develop project plan

PRACTICE

- Implement project
- Adjust as appropriate

SCIENCE

- Research issues as raised by practitioners

PRACTICE

- Evaluate and report on project at the 1, 3, 5, 10 and 20 year mark to ensure ecosystem is following desired trajectory
- Implement corrective measures to support ecosystem development

SCIENCE

- Analyze data from multiple similar projects to assess overall success of restoration practices
- Mine long term ecosystem monitoring data to detect whether restoration projects have cumulatively resulted in desired direction of landscape scale change

PRACTICE

- Monitor project to ensure goals and objectives are being met
- Implement corrective measures to keep project on track
- Document success of techniques used

SCIENCE

- Provide monitoring protocols including management triggers
- Provide expert support in monitoring – e.g. plant inventories, benthic identification, geomorphology assessments

Monitor

Grassland Restoration Biodiversity Offsetting

practice

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Metric	Good	Caution	Significant Concern
Abundance (no. of birds/point)			
Edge generalist species	<15.0	15.0 - 30.0	>30.0
Shrub-dependant species	<1.0	1.0 - 5.0	>5.0
Grassland obligate species	>4.0	1.5 - 4.0	<1.5
Proportional Species Richness (%)			
Edge generalist species	<35	35 - 70	>70
Shrub-dependant species	<10	10 - 25	>25
Grassland obligate species	>10	5 - 10	<5

Mix of meadow generalist species and grassland species at two year mark

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