

A close-up photograph of several purple flowers with prominent yellow stamens. The flowers are in various stages of bloom, and the background is a soft, out-of-focus green. The text is overlaid on a semi-transparent white rounded rectangle in the center of the image.

Considering Connectivity in Ecological Restoration

Heather Cray, Michael McTavish & Stephen Murphy
Environment and Resource Studies
University of Waterloo

Restoration as a Step in the Right Direction

- Society places considerable strain on global ecosystems
- Restoration is a relatively new tool to address these challenges



Ecological Restoration: the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (SERI 2004).

Conservation = Reservation + Restoration

Restoration as a Step in the Right Direction

Attributes of Restored Ecosystems (SER International)

6. The restored ecosystem is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.



Restoration as a Step in the Right Direction

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7. Potential threats to the health and integrity of the restored ecosystem from the surrounding landscape have been eliminated or reduced as much as possible.

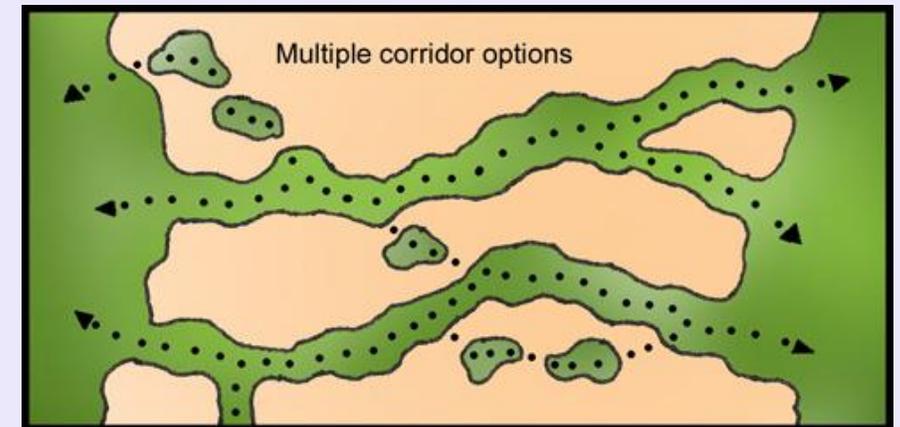
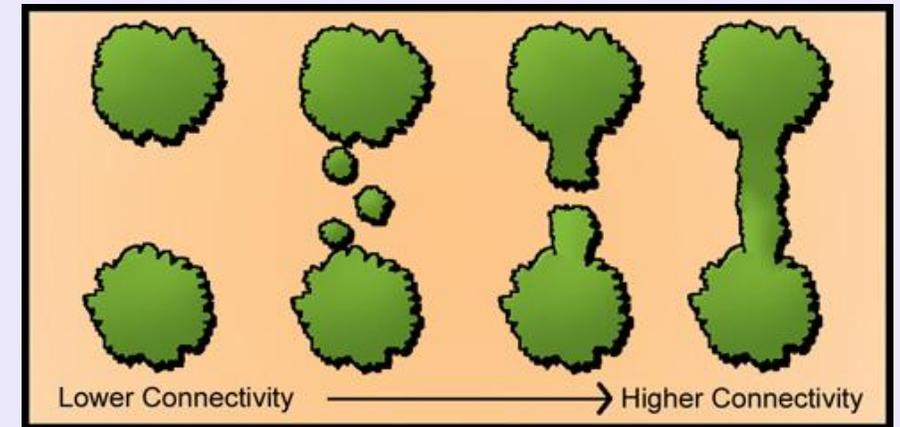


Benefits of Restoring for Connectivity

Restoration can increase connectivity by altering the composition and spatial arrangement of habitat patches on the landscape.

Restoration of connectivity may positively impact:

- Available habitat area
- Niche diversity
- Gene flow
- Biodiversity



Drawbacks & Considerations



However...despite the many benefits of restoring for ecological connectivity, there are key drawbacks & considerations:

- 1) Costs and Maintenance*
- 2) Containment and Vulnerability*
- 3) Contextuality of Connectivity*

Drawbacks & Considerations

1) Costs and Maintenance

“We can never buy, own, possess, or totally control enough land to preserve everything.”
(Harris 1985)

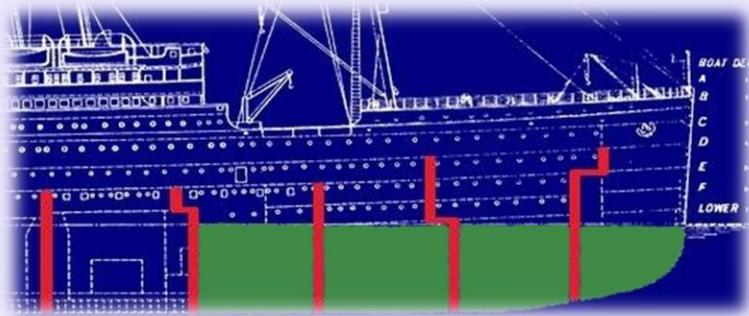


Restoring ecological connectivity can be constrained by:

- High initial and/or ongoing maintenance costs
- Limited ecological understanding (minimum corridor width, habitat requirements, lack of monitoring, etc.)
- Pragmatic restrictions on restoration planning (legislative, physical, etc.)

Drawbacks & Considerations

2) Containment and Vulnerability



For all of their other drawbacks, less connected landscapes may better contain various threats.

A more highly connected landscape can facilitate the spread of undesirable features as readily as it can for desirable ones.

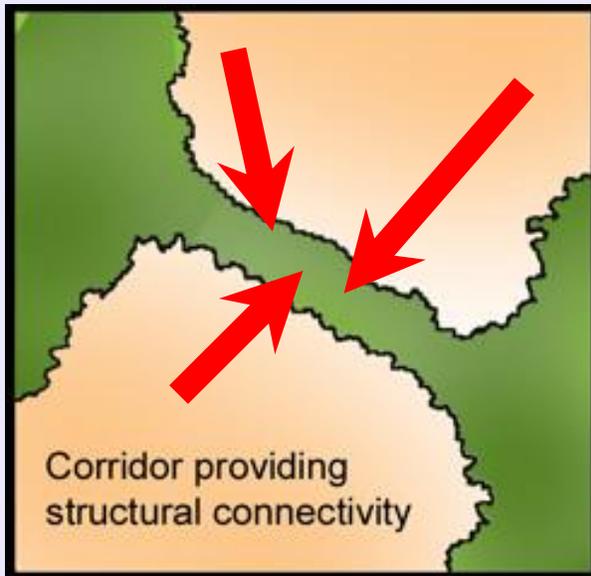
- Fire
- Undesirable species (e.g. exotics, invasives)
- Disease



Drawbacks & Considerations

2) Containment and Vulnerability

Narrow habitat corridors can concentrate and intensify deleterious ecosystem impacts.



Examples:

- Organisms passing through obligate corridors can be exposed to increased predation or hunting
- Different habitat conditions (e.g. edge effects) can increase risk of invasion

Drawbacks & Considerations

3) Contextuality of Connectivity

“Connectivity” can be very species-specific (i.e. one species’ barrier is another species’ highway).

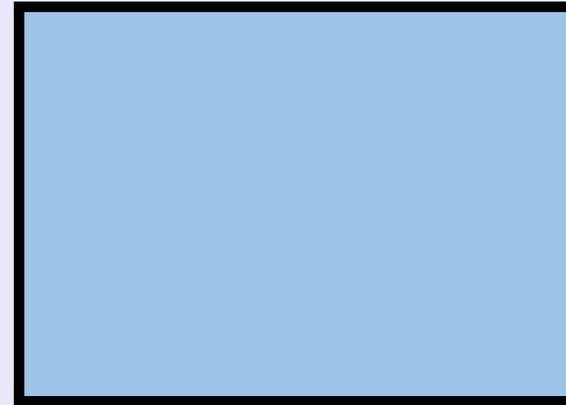
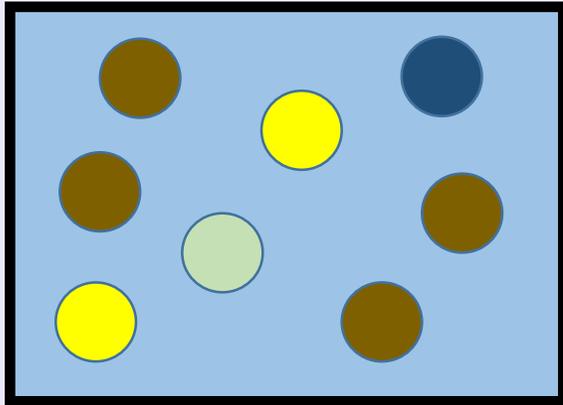


A given landscape feature may simultaneously increase connectivity for one species and decrease it for another.

Drawbacks & Considerations

3) Contextuality of Connectivity

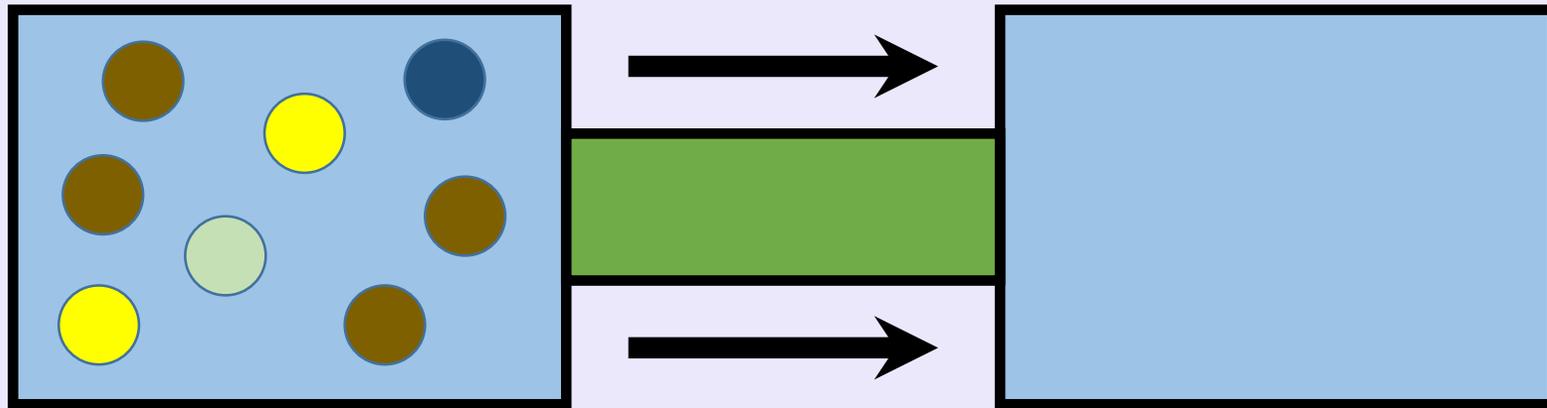
Attempting to increase connectivity to re-populate an isolated habitat patch:



Drawbacks & Considerations

3) Contextuality of Connectivity

Attempting to increase connectivity to re-populate an isolated habitat patch:

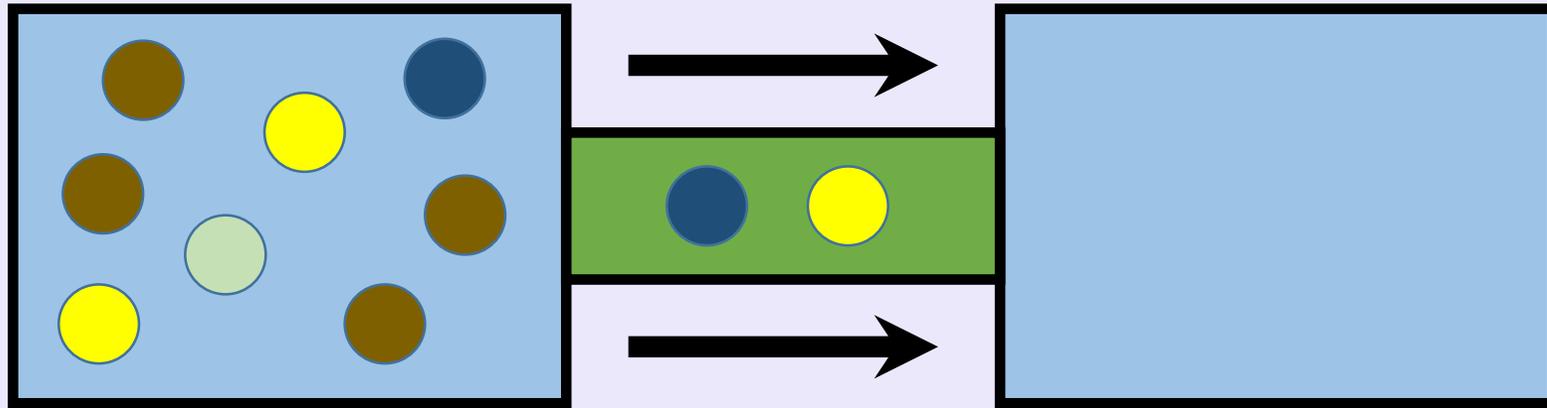


...corridor conditions will differ from the main habitat patches...

Drawbacks & Considerations

3) Contextuality of Connectivity

Attempting to increase connectivity to re-populate an isolated habitat patch:

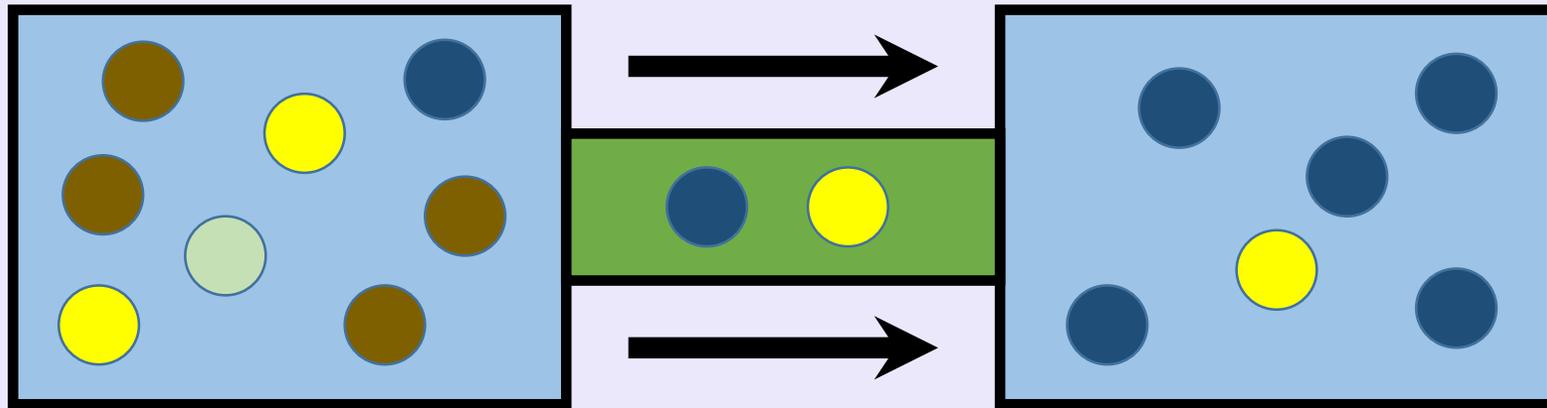


...suitability of a given corridor will likely vary between species...

Drawbacks & Considerations

3) Contextuality of Connectivity

Attempting to increase connectivity to re-populate an isolated habitat patch:

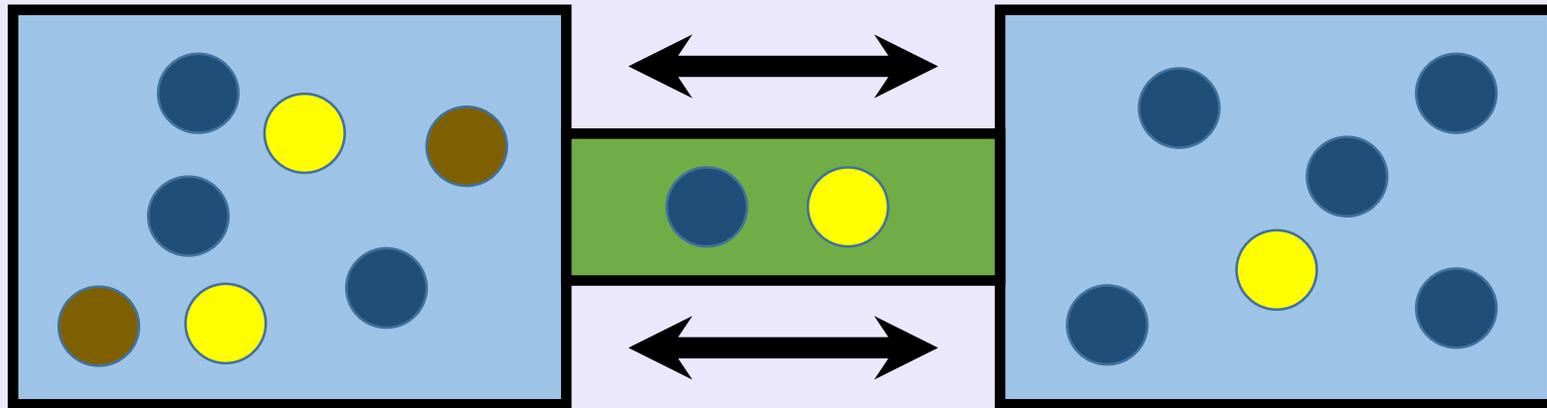


...resulting in differences in the newly connected patch habitat...

Drawbacks & Considerations

3) Contextuality of Connectivity

Attempting to increase connectivity to re-populate an isolated habitat patch:



...complex demographic interactions may result in unexpected consequences.



Restoration and Connectivity

6. The restored ecosystem is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges
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To connect or not to connect?

In restoration, we are actively making decisions about connectivity

- Need to weigh the benefits and risks

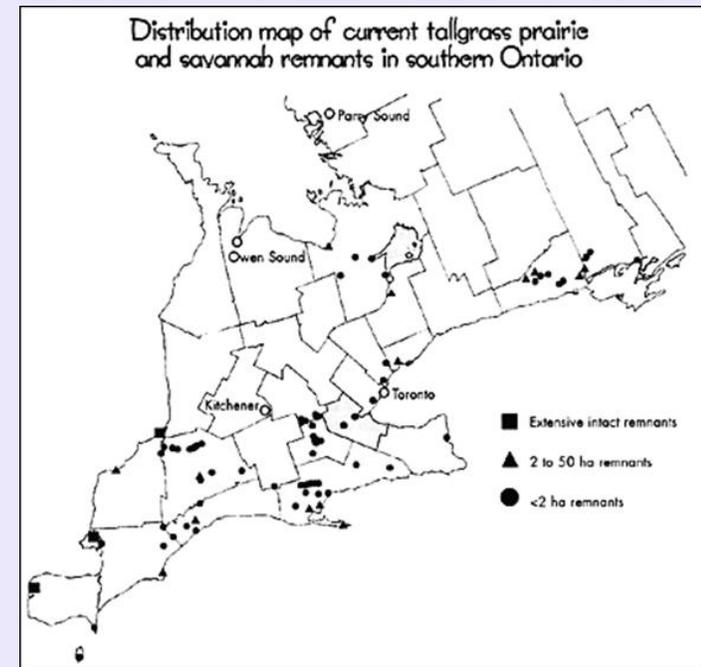
Case Study: Prairie as Connected Habitat

Connectivity has important benefits for grassland ecosystems

- Seed bank
- Habitat
- Biodiversity

But...Connectivity to other ecosystems also poses particular challenges for grassland ecosystems

- Maintenance
- Encroachment
- Fire management



Case Study: Encroachment

Year 0



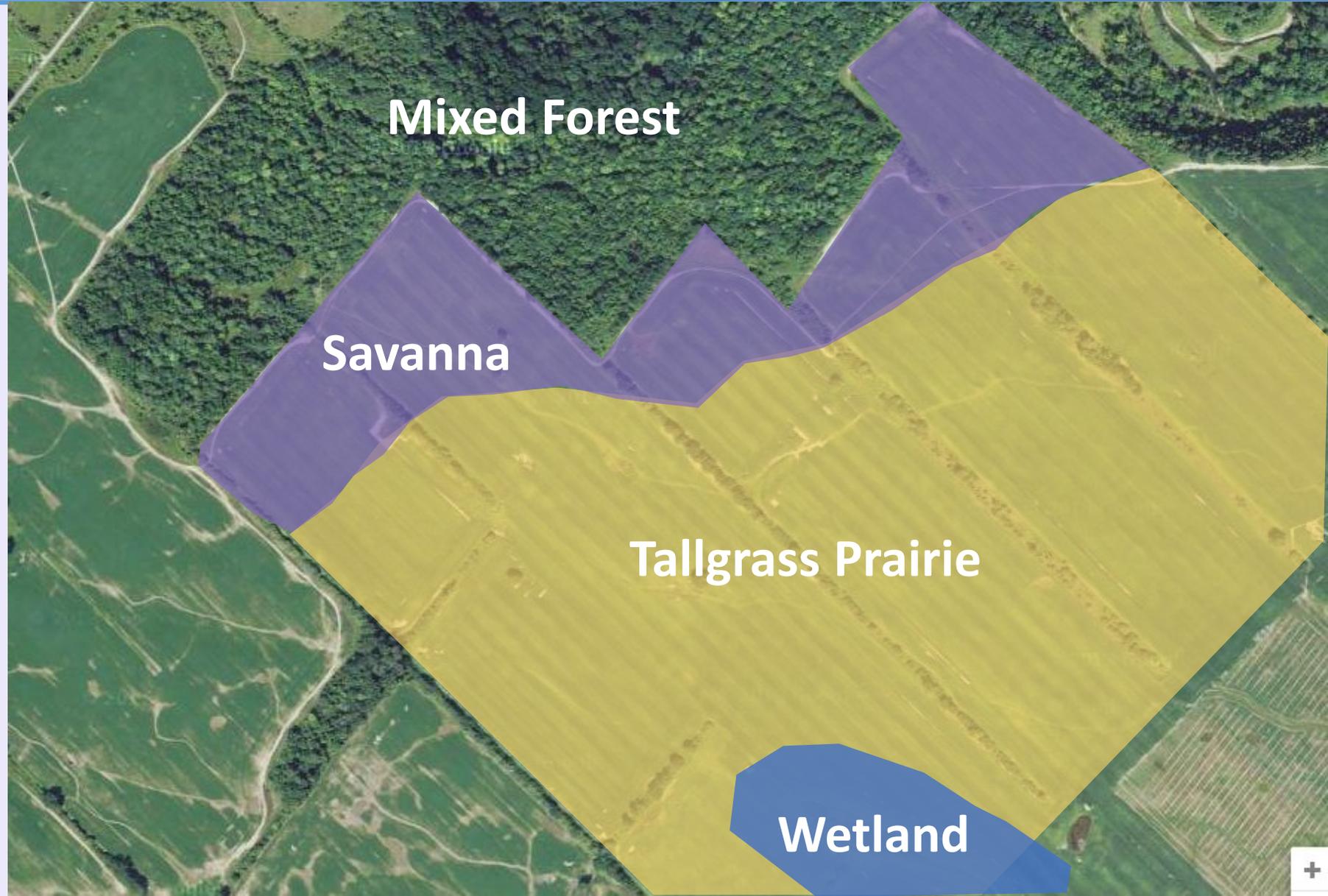
Case Study: Encroachment

Year 10

Sites established

Edges clear

Plan achieved



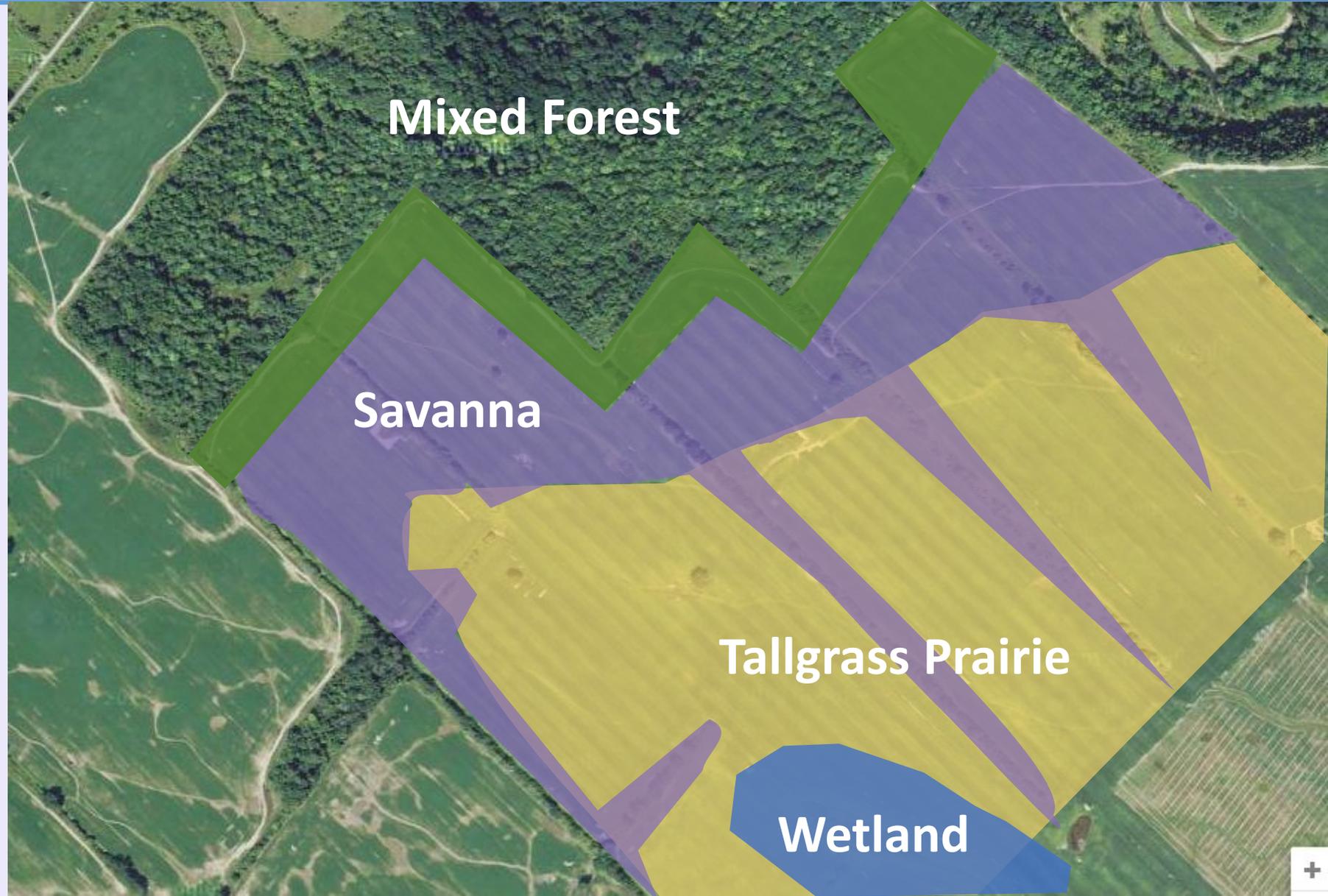
Case Study: Encroachment

Year 25

Hedgerows expand

Trees seed

Edge species proliferate



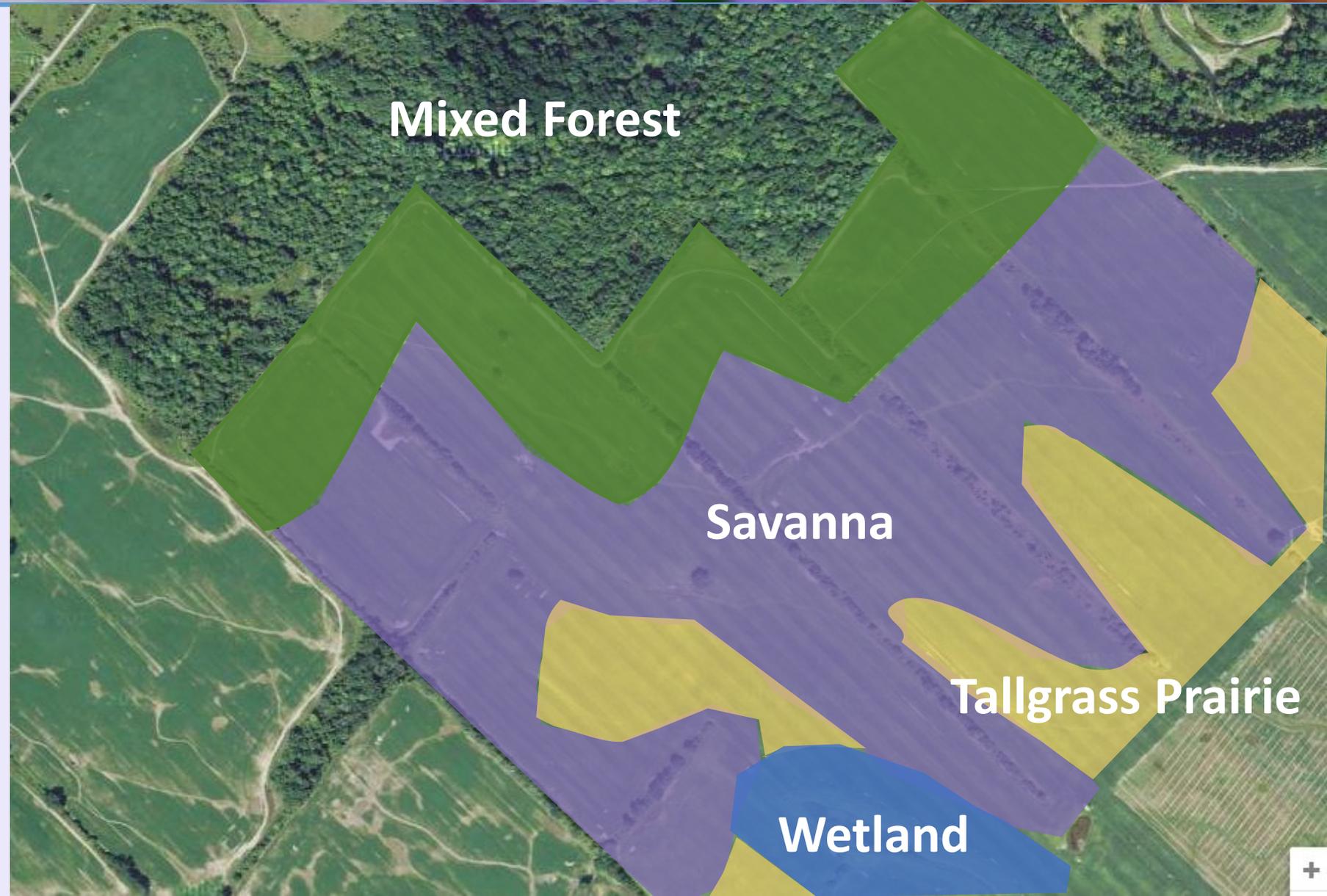
Case Study: Encroachment

Year 40

Trees seed

Edges expand further

Prairie disappears



Case Study: Maintenance

Preventing encroachment at 'edges' of connected ecosystems can be laborious and time-consuming

For prairie, tasks may include:

- Mowing
- Hand removal of woody species
- Prescribed burning

...and maintenance needs to be undertaken at regular intervals



Case Study: Maintenance

Connectivity can also be especially problematic when it comes time to burn grasslands...

- Regular, controlled prescribed burns are required for long-term prairie health
- Adjacent ecosystem types affect the viable window for safe burning
- Challenging in urbanized areas, under hydro lines, near adjoining agricultural lands



Summary



Ecological restoration involves human intervention and decision-making.



Restoring connectivity has many benefits, but also drawbacks and challenges.



Necessary to consider the relative trade-offs of connectivity in the context of a given scenario.

A close-up photograph of several purple flowers. The petals are a vibrant purple with visible veins. The centers of the flowers are a bright yellow-orange color, featuring several prominent stamens with yellowish tips. The background is a soft, out-of-focus green, suggesting foliage.

Thank you