Benefits of Remnant Prairies Patches to Prairie Plant Restoration: The Effects of Land-Use History, Patch Size, and Proximity to Plant Success

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Why do Prairies Matter?
- Tallgrass prairies possess high soil function.
- Endangered ecosystem: Agricultural conversion and urbanization left only 5% of tallgrass prairies remains1.
- Restoration efforts fail to reproduce prairies to their original state due to changes in soil properties.
- Additions of native soil microbes can benefit many prairie plant species, but little research has explored if island additions of remnant prairies may serve a similar role.

Significance: Shows the importance of target plant species, land use history restoration sites, and the size and distance of remnant prairies.
- This research increases our understanding of the role remnant ecosystems can play in prairie restoration.
- These aspects link fundamental ecological theories (e.g. Island Biogeography Theory) and provide direct information to assist restoration practice.

Research Question
Q1. Does proximity and island size of remnant prairies patches (concentration) impact survival of plants from contrasting successional stages (early vs. late)?
Q2. Do any effects vary based on historical land use of the target site?

Methods
Prairie "monoliths," 1.5 m wide x 1.7 m deep were transplanted using a truck mounted tree spade.

SITE: Monoliths were transplanted into three recipient sites with different land use history.

TREATMENT: Monolith were placed in various concentrations.

LOCATION: Rudbeckia hirta (early succession) and Liatris pycnostachya (late succession) were planted at three different proximities to the monolith.

Results

Site: Land-Use History impacted survival. Excessive mortality was seen in restored site.

Location: Location impacted survival. Survival increased with distance from monolith.

Treatment: Treatment impacted survival. Survival decreased with decreasing monolith concentration.

Conclusions
Q1. Proximity and island size affect survival of both early and late successional plants. Rudbeckia hirta survived best when planted away from prairie monoliths, and with concentrated prairie patches. Liatris pycnostachya survived best at prairie monolith edges. Patch size (concentration) did not have an effect.
Q2. Historical land use impacted plant survival. While R. hirta had poor survival in restored sites without regard to other factors, site history modified survival differences in L. pycnostachya based on prairie proximity.

Future studies will explore mechanisms for these effects including light, soil properties and soil microbes.

Take Home Message: In a world of habitat fragmentation, successful restoration will depend on a site’s land use history, as well as the size and proximity of remnant prairie monoliths.