# Management regime and survey timing influence restored urban meadow seedbank composition

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## The State of the Field:

Urban Greenspaces such as meadows and parks are increasingly **important** for preserving **ecosystem services, connecting habitats, and supporting human health and mental wellbeing**[1]

Restored Greenspaces are often managed through a variety of practices, such as **maintenance mowing, seed tilling, and undisturbed**[2].



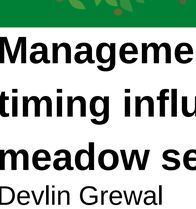



## Our Goals:

The **individual effects** of management regimes have been well established, but their **overall effect** across landscapes are **not well defined**[3]

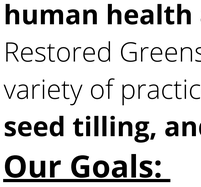
We will examine the **effect that each restoration technique has** on the **seed bank**, as well as the **differences in seed bank composition** between Fall and Spring Sampling

## Methods

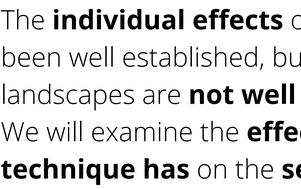


**Plot Locations:**
9 locations representing 3 management types: **Tilled**, **Mown** and **Undisturbed**, were located across **Toronto's Meadoway Urban Park**

**Soil Preparation:**
9 cores were collected from each location. After freezing to simulate winter dormancy, roots and debris were removed.



**Growth Conditions:**
The soil samples were transplanted into growth chambers, and allowed to germinate under constant light, humidity, and watering for 100 days.



**Species Sampling:**
Plants were identified as they emerged, and removed in order to allow other germinants room and nutrients to grow.

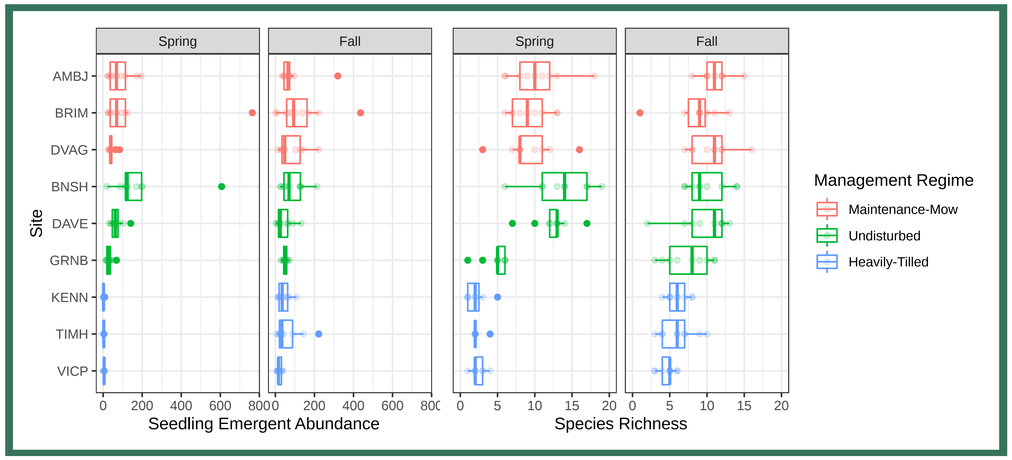
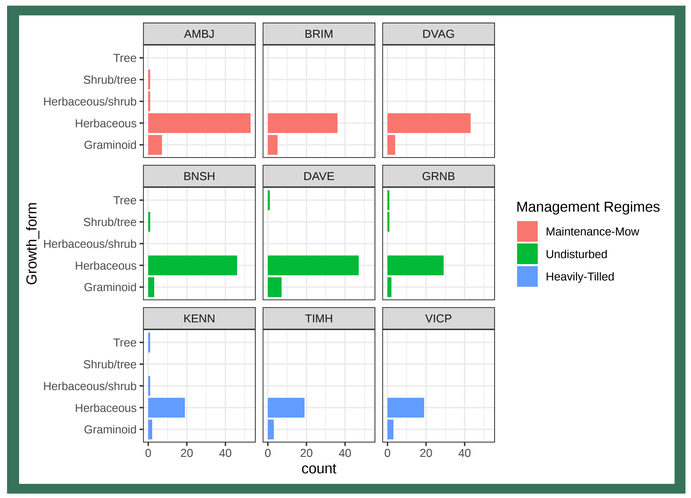



**Figure 1.** Comparisons of the abundances of seedlings emerging over 100 day periods, as well as the richness of species within managed plots. Managed treatments undergoing **tilling showed a significantly lower abundance** of germinating seedlings, as well as lower species richness overall. Noticeably, **mown plots did not differ noticeably** from **undisturbed** in **abundance** and **richness**, but both showed high variability in richness.

**Figure 2.** The growth forms of emergent seedlings, as organized by plot and management treatment. **Tilled sites** exhibit **lower overall diversity in growth form**, primarily expressing **grasses and non-woody herbs**. Across all treatments, **herbaceous forbs dominated**, with composing the primary growth form in each plot.

Herbaceous forbs are **vital** for **biomass production**, as well as provisioning **resources for pollinators**, **small mammals**, **birds**, and **insects**. In addition, Undisturbed sites showed increased tree and woody shrub germination, possibly indicating successional pressure. Woody plants showed fewer emergences in mown sites. For managers and practitioners seeking to **preserve** the **ecosystem structure** of urban meadows and fields, **mowing treatments may prevent encroachment** by tree and shrub species that would otherwise transform the open habitat space.



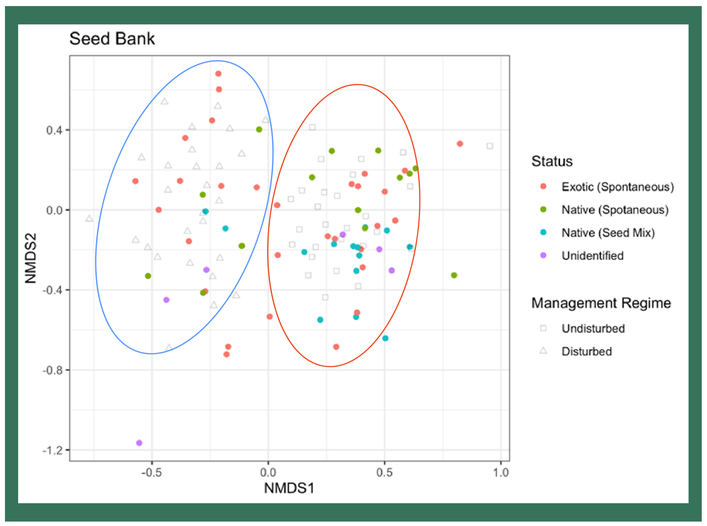




**Figure 3.** Non-metric Multi-dimensional scaling (NMDS) plot **comparing similarities in community structures** between **Undisturbed** (square) and **Tilled** (triangle) sites. Species were quantified based on **native or exotic status**, as well as their provenance either through directed seed mix application, or spontaneous emergence. Tilled and Undisturbed sites exhibited **distinct community structures** as depicted by blue and red ellipses, respectively.

**Tilled sites** exhibited not only **lower abundances** of herb and grasses but **greater proportions of spontaneous exotic species**. These can often be **undesirable** plant species, requiring **additional resources** for practitioners to **remove or mitigate**. **Undisturbed plots** were able to support a **greater variety** and abundance of species from both **native and exotic origins**, as well as directed seed mix applications. For restoration initiatives seeking to **promote pollinator habitats, aesthetic views, and ecosystem functioning**, this may improve project success as compared to other methods

## Conclusions

**Tilled sites** showed significantly lower emergence rates, and lower overall diversity of plant species compared to their Mown and Undisturbed counterparts. While this may be **useful for exhausting** the **seed bank** to be **re-sown with desirable species**[4], as an ongoing management technique, **tillage does not facilitate** the persistence of **plant species** selected for their **aesthetic or ecological desirability**.

**Mown and Undisturbed** plots showed variability in their species compositions but were both able to **support high abundances** of germinating seedlings. However, they **differed** greatly in their species **compositions**. There is **growing evidence** within scientific literature suggesting that **intermittent mowing** may **promote greater species diversity compared to annual or no mowing** alone.[5,6] As such, conservation practitioners may **choose to mow urban meadows less frequently** in order to **promote native wildflower and grass** abundances, while preventing encroachment by undesirable woody species.

Overall, **differences in community composition** between Tilled and Mown or Undisturbed sites were **significant**, indicating that **above-ground management can impact the seed bank** below the surface. Practitioners should thus tailor the application of management techniques to best achieve the goals of urban meadow restoration projects. [7]

## Citations:

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