

# Native forb planting in land reclamation

## *HITCHHIKING PAPER BIRCH WITH SHOWY ASTER, CANADA GOLDENROD OR CREEPING DOGBANE.*

### CONTEXT

Planting tree seedlings is among the most effective methods for efficient re-establishment of forests after disturbance and is often the only revegetation done. The re-establishment of understory vegetation is beneficial to reclamation but is often left to occur naturally, which is not guaranteed to be effective, spatially consistent, or temporally efficient. The rarity of intentional herbaceous plant regeneration is due to the lack of available seed sources and the ineffectiveness of direct seeding such species (Schoonmaker et al. 2014). An alternative to natural regeneration or direct seeding of understory species is to plant nursery grown stock, however planting herbaceous species separately from trees is not common due to the significant added cost/complexity. A new approach to increasing forest biodiversity is multi-species production - growing two species in the same container or plug, also described as "companion planting" or "hitchhiking". This technical note describes key findings and recommendations following a 3-year field trial, established in a recently reclaimed industrial site, that investigated the efficacy of growing a deciduous tree species (paper birch *Betula papyrifera*) with three different native forb species in the same container.

### KEY FINDINGS

- Birch survival was high (>90%) and did not differ between stock types (forb species x sow date). Aster and goldenrod hitchhiker stock types had similar survival rates to the singly grown plants, while dogbane survival was reduced when it was hitchhiked with birch.
- All sow dates of aster and dogbane allowed for reasonable birch height growth (~120 cm), while only birch grown with the 4-week goldenrod sow date resulted in comparable growth.
- When comparing the birch grown with the 2-week sow date of each forb to the singly grown birch, those grown with aster or dogbane were comparable to the singly grown plants, while those grown with goldenrod were significantly shorter (Figure 2).
- Percent cover of all sow dates of aster were comparable to the singly grown asters, while for dogbane and goldenrod the 4-week sow date produced significantly less cover compared with other hitchhiker types and singly grown plants.

### STUDY DESIGN

Paper birch was chosen due to its rapid growth and tolerance of a variety of soil, moisture, and light conditions (Wang et al. 1997). Three native forb species - showy aster (*Eurybia conspicua*), Canada goldenrod (*Solidago canadensis*), and creeping dogbane (*Apocynum androsaemifolium*) - were chosen as they are all rhizomatous and can develop rapidly following disturbance. Birch seed was sown into 340 mL nursery containers and seed of one of the three native forbs was sown concurrently (0 week), or 2 or 4 weeks after sowing the birch seeds. Birch and all three forb species were also grown as a single species plug which were produced in smaller cavities (220mL). All seedlings were produced under standard nursery conditions at the Centre for Boreal Research greenhouse in Peace River, Alberta, after which they were stored frozen until planting the following June. Refer to Technical Note #28 Hitchhiker Planting in Reclamation: Protocols for Developing Nursery Stock of Woody and Herbaceous Species for more information relating to general principles regarding propagation of mixed-species stock types. Field measurements were conducted annually in August for three years between 2021-2023.





**Figure 1.** Greenhouse images to illustrate the progression of the nursery production process for hitchhiker stock types with birch and the 2-week stock type of each hitchhiked forb species over time. Blue arrows denote the hitchhiked forb species, which was often smaller or hidden under the birch seedlings, with the exception of goldenrod in the August 20th time period, which had out-grown the birch seedlings in many cases.



**Figure 2.** Examples of paper birch with a forb hitchhiker: (a) showy aster, (b) dogbane, (c) goldenrod, and (d) singly grown birch after 3 growing seasons.

## CONCLUSIONS

### PRACTICAL RECOMMENDATIONS

- The results indicate that sowing the hitchhiked forbs 2 weeks after the birch seed for aster and dogbane is a reasonable balance between tree growth and forb cover.
- Ultimately, the choice of aster or dogbane stock type will depend on the goal of reclamation – to rapidly establish closed canopy cover or to establish high cover of understory vegetation.
- In situations where the goal is to speed tree canopy cover with adequate cover of native herbaceous vegetation, then using the 2-week sow date would be most sensible.
- Alternatively, when the primary goal is to maximize native herbaceous plant cover while also developing tree cover (though at a reduced rate), then utilizing the 0-week sow date is recommended.
- Considering the evidence of high competition potential in goldenrod and observed growth suppression of birch, goldenrod is not an appropriate species in a hitchhiking mixture though it most certainly can provide valuable understory plant cover in a land reclamation context.

## WORKS CITED

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