

Buckthorn Management

The Minnesota Experience

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Ph.D. Thesis Research



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Control methods

Control measures: burning, cutting, girdling, mowing, and herbicide application (Archibold et al. 1997, Heidorn 1991, Boudrea and Willson 1992, Kline 1981) + pulling

Control require follow-up treatments due to stump sprouting

Removal of seed bearing shrubs to reduce seed production and dispersal

Control methods

Herbicide treatment combined burning, girdling or cutting

Spring burning: early leaf emergence, natives dormant and low root reserves

Integrating control methods provide a more effective control strategy (Lym 1998, Mullin 1998, Tu et al. 2001)

Control methods

Timely management based on seasonal carbohydrate fluctuations in herbaceous plants (Becker and Fawcett 1998, Becker et al. 1990, Katovich et al. 1998)

Carbohydrate reserves influence growth and survival of woody species - are sensitive to late-season stress (Kozlowski 1992, Loescher et al. 1990)

Timing management based on seasonal carbohydrate trends = more efficacious management?

Materials and Methods

Experiments in 2002 and 2003 at
Eagle Lake and Battle Creek
Regional Park, MN

Experimental design: CRD with 4
replicates

Experimental unit: 1.5 by 2.0 m-
plots

Ten plants (1 to 4 cm diameter)
monitored

Materials and Methods

Four management seasons:

- **spring** (bud break and leaf emergence)
- **summer** (leaf expansion)
- **fall** (leaf senescence)
- **winter** (dormant stage)

Spring: **C, C+H, C+H+B, C+B**

Summer, fall and winter: **C, C+H**

C = cut-stump, H = triclopyr amine, B = spring burn, Controls

Materials and Methods

Spring prescribed burning in 2003 to evaluate effect of follow-up control on buckthorn survival and species diversity

- only in 2002 burned (C+H+B, C+B) plots

Materials and Methods

Litter treatments:

- no-litter (bare ground)
- 1.3-cm depth
- 2.5-cm depth
- 5.1-cm depth

Buckthorn Seed Longevity

Berries collected and processed

50 berries examined

- 4 seed per berry potential
 - 95.5% of that potential reached
(191 seed of 200 potential)

- Of seed produced:
 - Avg. 2.56 plump seed / berry
 - 67 % plump considered germinable
 - 33 % shrunken seeds
(non viable or at a minimum, low vigor)



Buckthorn Seed Longevity

Buried 50 seeds/bag on Nov 12, 2004

- Oak savannah
 - Enough bags buried for 9 samples through 2024
 - Baseline set of bags subjected to same procedures then assayed time 0
 - 33 % germination
- Buried at 2.5 and 12.7 cm
 - 2 locations (Hilltop and Sidehill)
 - Three reps per site



Buckthorn Seed Longevity

Bags collected May 6, 2005 and May 3, 2006

- **Detritus screened out under water flow**
- **Contents placed in petri dishes with 100 gm clean, fine sand**
- **Placed in germinator @ 70/60 F day/night, 14 hr daylength (incandescent fluorescent mix)**
- **Kept moist and examined weekly for 13 weeks**



Conclusions: Management study

- Cut-stump treatment with triclopyr controlled stump sprouting regardless of application timing
- Fall and winter cutting (no herbicide) controlled regrowth in buckthorn saplings ≤ 5 years in age (repeatable?)
- Integrating cut-stump treatment and prescribed burning
 - More effectively reduced buckthorn pop. density
 - Increased seedling emergence from soil seed bank of both buckthorn and native species
 - Increased species diversity
- Repeating prescribed burning reduced abundance of buckthorn - but also of other species reducing species richness and diversity



Recommendations From Mgt. Studies

Herbicide x CHO?

Apply triclopyr in the fall

Minimize costs and potential negative nontarget effects

- **Increased herbicide movement with carbohydrate storage**
- **buckthorn still actively growing while many native species dormant**

Effective at all timings! (foliar likely different)



Recommendations From Mgt. Studies

Non-chemical control?

- Pull anytime
- Cut buckthorn fall or winter
 - Limits stump sprouting
- Remove female seed-bearing plant
 - Reduce seed input
 - Delay to reduce carbohydrate, but before seed mature if no herbicide used
 - Retreatment of stump sprouts likely if no herbicide used (Oct. - Dec. exception?)



Recommendations From Mgt. Studies

Monitor after removal

- Prescribed burn targeting 2 years after removal
- Longevity study indicates seedbank quickly depleted
- Follow-up burn or spray one or two cycles should suffice
- Reseed / transplant desired species if needed



Establishment study: Conclusions and Recommendations

- Litter accumulation reduced but did not prevent buckthorn seedling recruitment
- Prescribed burns removed litter and increased buckthorn seedling emergence
- Prescribed burn must be integrated with foliar sprays of systemic herbicides or repeat burns to prevent BT seedlings from reestablishing



Questions?

