Project Type: Research & Development Project

Title: Evaluation of Non-Chemical Re-Grassing Methods to Transition Lawns to Low Maintenance Turfgrass Species and Reduce Weed Populations

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Abstract:
Lawns comprise the greatest single land use other than forests in New York State. While lawns are clearly valued for their visual appeal as well as their function in urban areas, many now desire a lawn that takes less time and money, and uses less fertilizer and pesticides. The most effective means of achieving this shift to lower maintenance strategies is to re-grass a lawn with lower input turf species. This project compared chemical and non-chemical methods of doing so with equipment and materials that are reasonable, affordable, and readily available in the consumer market. In this study, the most effective method of re-grassing was to seed in early September, following treatment with Round-Up to kill existing vegetation. Establishment was equally effective whether seed was introduced by slit seeding or broadcasting, which suggests specialized equipment is not necessary for successful establishment. Scalping did not provide adequate weed control, most likely because it was not severe enough. The clove oil product was not effective against perennial weeds present in the study area, and weeds returned before grass could establish. Multiple applications may be necessary for adequate control.

Background and Justification:
There are over three million acres of turfgrass in New York State, with 82% growing in home lawns maintained by homeowners/residents. In fact, do-it-yourself New Yorkers spend more than $3 billion annually on the care of lawns, over $125 million on fertilizer and pesticides. The use of lower maintenance turfgrass species such as fine-leaf fescues and tall fescue, can lead to reductions in fertilizer and pesticide use, irrigation, as well as less time mowing.

Previous research at Cornell showed that scalping (very low mowing) provided an effective alternative to glyphosate for establishing fine-leaf fescue from seed in the spring. The study also showed significantly less broadleaf weed invasion in these plots than plots established in the fall using glyphosate. A similar evaluation with tall fescue could lead to more options for re-grassing. However, duplication of these establishment methods in a home lawn situation is limited by access to specialized equipment, such as fraise mower, commercial slit seeder and CO_2 sprayer. A key consideration of this study was to use materials and equipment that are readily available in the home lawn retail/rental market.

Objectives:

1. Determine products and equipment that are readily available in the home lawn consumer market.
2. Develop protocol for assessing mechanical and chemical means of re-grassing

3. Compare mechanical and chemical re-grassing methods at two timings.
4. Develop educational module and conduct field days for Industry and Consumer audiences.

Procedures:

Objective 1. It was assumed consumers interested in a lawn renovation project would already have a mower. Scalping and routine mowing in this trial was done using a Toro Personal Pace home lawnmower (Figure 1). Materials purchased or rented include Round-Up and BurnOut II for weed control, tall fescue seed blend and slit seeder. Similar inventory and prices were found at Lowe's and Home Depot retail stores. With the exception of rental equipment, visits to stores in Ithaca and Syracuse and on-line searches for stores in Buffalo and Albany revealed no significant differences in lawn care equipment or products.

Figure 1

Rental equipment varied from store to store, and although Ithaca Home Depot had a slit seeder, other stores did not. Round-Up is readily available in stores and on-line. Organic alternatives to traditional chemical herbicides are not standard at big box outlets, but smaller retail stores such as Agway often carry organic products for lawn and garden use. Many sources of BurnOut II are available on-line. Seed selection at Lowe's and Home Depot was similar and included mostly mixes containing various combinations of Kentucky bluegrass, perennial ryegrass and fine fescues. A few mixes contained some tall fescue, but there were no blends of 100% tall fescue.

Round-Up and BurnOut II, both in ready-to-use formulations and containers, were used for traditional and organic chemical weed control options (Figures 2 and 3). A tall fescue seed blend of three cultivars ('Bullseye', 'Mustang 4' and 'Hemi') was purchased at www.seedsuperstore.com, an on-line source for high quality home lawn grass seed (Figure 4). The slit seeder was rented from Home Depot (Figure 5).

Figure 2

Figure 3

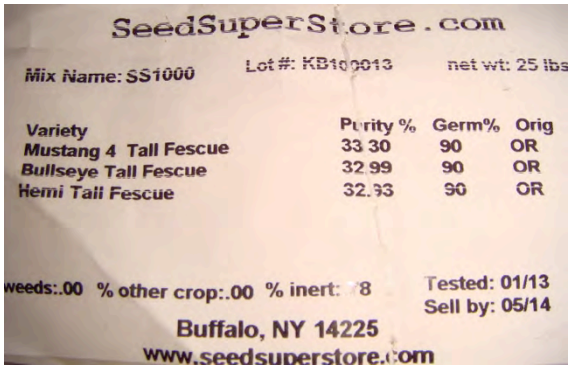

Figure 4

Figure 5

Item	Source	Cost
Round-Up: 1.3-gallon pump container, ready-to-use formulation Active ingredients: 2% glyphosate, 2% pelargonic acid	Home Depot	$18.00
BurnOut II: 1-gallon pump container, ready-to-use formulation Active ingredients: 2% clove oil, 6% citric acid	Amazon.com	$35.00
Tall Fescue Seed Blend (5 lbs)	SeedSuperStore.com	$45.00
Classen Slit Seeder (half-day rental)	Home Depot	$60.00
Total Supplies Cost		$158.00

Objective 2. Trials were conducted at the Cornell University Turfgrass Research and Landscape Research Center, Ithaca, NY. Experimental site was an open lawn area in full sun that had been mowed as pasture for more than 30 years and in the last 10 years received only occasional mowing (Figure 6). Soil type was silt loam with pH 5.9 and organic matter content of 4.4%, characteristics generally considered adequate for establishing a home lawn. Available phosphorus was very high, at 117 lb/acre, and no supplemental fertilizer was applied.

Figure 6

Existing vegetation for the spring timing was quantified on 3-Jun by visual estimates of predominant species. Population consisted of approximately 40% broadleaf weeds (mostly dandelion and ground ivy), 10% weedy grasses (mostly creeping bentgrass and annual bluegrass) and 50% lawn grasses (perennial ryegrass/fine fescue/Kentucky bluegrass).

A similar assessment was made for the fall timing on 3-Sep. Existing vegetation consisted of approximately 75% broadleaf weeds (mostly dandelion and ground ivy), 10% weedy grasses (mostly creeping bentgrass and annual bluegrass) and 15% lawn grasses (perennial ryegrass/fine fescue/Kentucky bluegrass).

Experimental plots were 4' x 4' arranged in a strip split plot design with three replications. Split plots received pre-seed applications of Round-Up or BurnOut II on 4-Jun, were scalped on 5-Jun, as close as the mower would permit, down to approximately 1-inch (Figure 7), and were seeded on 7-Jun, using either the slit seed or broadcast method (Figure 8). Control plots received no pre-seed vegetation control except scalping. Protocol was the same for the fall timing, starting with Round-Up/BurnOut applications on 3-Sep, scalping on 4-Sep and seeding on 6-Sep. Plots were irrigated following application of seed. Subsequent rainfall was sufficient, however, such that no supplemental irrigation was required during establishment. Plots were scalped weekly for four weeks after seeding to maximize mechanical weed control.

Figure 7. Scalping on 5-Jun, one day after Round-Up/BurnOut apps.

Figure 8. Slit seeding on 7-Jun, two days after scalping.

Objective 3. Project evaluation consisted of assessing different methods of establishment and timing to transition a home lawn from existing vegetation to tall fescue. Plots were photographed weekly and data collected for percent grass establishment and weed populations as necessary to evaluate re-vegetation progression. General turfgrass quality was assessed when plots were fully established (fall only).

Treatment differences at individual measurement events were compared using analysis of variance and Fisher's protected least significant difference (LSD). The MIXED and GLM

procedures of SAS/STAT software version 9.3 (SAS, Cary, NC) were used to perform the analyses.

Objective 4. Project implementation and results are documented in a PowerPoint presentation. A time-lapse camera was used to record the process. However, since it had to be placed at quite a distance to capture entire experimental area, the video provided no additional clarification of the process or results. In future trials where time-lapse photography is desired, it would be better to use multiple cameras mounted close to individual plots of interest. Trial plots will be mowed and evaluated through 2014 to assess long-term quality of establishment.

Results:

Timing. Establishment of cool-season grasses is generally more successful when seeded in late summer/early fall rather than early spring, and this study was no exception. There was a significant main effect of timing on establishment. Plots seeded on 7-Jun were eventually dominated by weed populations and had significantly less tall fescue establishment than the 3-Sep seeding, regardless of pre-seed weed control or seeding method.

Weed Control Method (Spring). There was a significant main effect of weed control method one month after seeding, but the effect was temporary. Two months after seeding, all plots were about 90% weeds, mainly dandelion and ground ivy (Table 1).

Table 1. Main effect of pre-seed weed control method on subsequent weed populations.

	% Weeds		
Method	3-Jun (Pre-seed)	12-Jul	16-Aug
RoundUp	48.3	41.7	87.5
BurnOut II	48.3	73.3	89.2
Scalp Only	48.3	74.2	90.8
LSD (p = 0.05)	NS	22.8	NS

RoundUp/16-Aug

BurnOut II/16-Aug

Scalp/16Aug

Seeding Method (Spring). Seeding method had no effect on weed populations (Table 2).

Table 2. Main effect of seeding method on subsequent weed populations.

% Weeds			
Method	3-Jun (Pre-seed)	12-Jul	16-Aug
Slit Seed	48.9	66.1	89.4
Broadcast	47.8	60.0	88.9
LSD (p = 0.05)	NS	NS	NS

Weed Control Method (Fall). There was a significant main effect for pre-seed weed control method on subsequent weed populations and tall fescue establishment (Tables 3 and 4). Six weeks after seeding, Round-Up plots were approximately 75% tall fescue, while BurnOut and scalped plots averaged between 23 and 35% tall fescue. By 15-Nov, Round-Up plots were nearly 100% tall fescue while BurnOut and scalped plots were only 25 – 33% tall fescue.

Table 3. Main effect of pre-seed weed control method on subsequent weed populations

% Weeds		
Method	3-Sep (Pre-seed)	20-Sep
RoundUp	85.0	1.0
BurnOut II	82.5	40.0
Scalp Only	81.7	48.3
LSD (p = 0.05)	NS	22.8

Table 4. Main effect of pre-seed weed control method on tall fescue establishment

% Tall Fescue		
Method	11-Oct	15-Nov
RoundUp	77.5	97.5
BurnOut II	23.3	33.3
Scalp Only	35.0	25.8
LSD (p = 0.05)	35.8	8.5

Seeding Method (Fall). Seeding method had no effect on weed populations or tall fescue establishment (Tables 5 & 6).

Table 5. Main effect of seeding method on subsequent weed populations

% Weeds		
Method	3-Sep (Pre-seed)	20-Sep
Slit Seed	83.3	29.1
Broadcast	82.8	30.4
LSD (p = 0.05)	NS	NS

Table 6. Main effect of seeding method on tall fescue establishment

% Tall Fescue		
Method	11-Oct	15-Nov
Slit Seed	43.3	51.2
Broadcast	47.2	53.2
LSD (p = 0.05)	NS	NS

Turfgrass Quality (Fall). Plots were rated on 15-Nov for visual turfgrass quality on a scale of 1 to 9, where 1 = poor quality, 9 = excellent quality and 6 = acceptable quality. Round-Up plots had significantly higher turfgrass quality ratings than BurnOut or scalped plots at the end of the trial (Table 7). Seeding method had no significant effect on turfgrass quality (Table 8).

Table 7. Main effect of pre-seed weed control method on final turfgrass quality

Turfgrass Quality	
Method	15-Nov
RoundUp	7.5
BurnOut II	4.5
Scalp Only	4.4
LSD (p = 0.05)	0.5

Table 8. Main effect of seeding method on turfgrass quality

Turfgrass Quality	
Method	15-Nov
Slit Seed	5.6
Broadcast	5.3
LSD (p = 0.05)	NS

Discussion:

The clear "winner" for establishment of tall fescue in this study was to broadcast seed in early September following removal of existing vegetation with glyphosate. Depending on size of the area and existing site conditions, it is a simple strategy that could be implemented successfully by many homeowners with a modest investment for Round-Up and grass seed. We did not identify a strategy using organic or mechanical methods for weed control, an important consideration for those who do not want to use traditional chemical herbicides and as an alternative approach to encourage overall pesticide reduction in lawn care.

Previous research at Cornell demonstrated that weed populations could be significantly reduced during spring establishment when existing vegetation was scalped to the ground prior to seeding, with no other weed control necessary. In this project, scalping had no effect on weed populations during establishment for either timing. However, we were not able to scalp lower than approximately one inch with the mower used in these studies. This suggests that more drastic scalping, as practiced in the previous study, is required to obtain an acceptable level of weed control without the pre-seed application of glyphosate. Other methods for mechanical

removal of existing vegetation, such as weed-eater or garden tiller, could be investigated in future studies.

Glyphosate provided significantly better weed control than BurnOut, an organic clove oil product. BurnOut plots had significant regrowth of weeds 18 days after treatment compared with Round-Up plots (Figures 9 and 10) and suggests multiple applications may be necessary to achieve the same level of control provided by a single application of glyphosate. Other non-chemical methods for vegetation control before seeding could include solarization by covering with plastic or cardboard.

Figure 9. Typical BurnOut plot 18 days after application.

Figure 10. Typical Round-Up plot 18 days after application.

Further research is necessary to investigate alternative scalping methods and non-chemical ways to control existing vegetation. Alternative weed control methods, in combination with monthly timings from May through October, could identify a longer window of opportunity for successful seeding of home lawns.