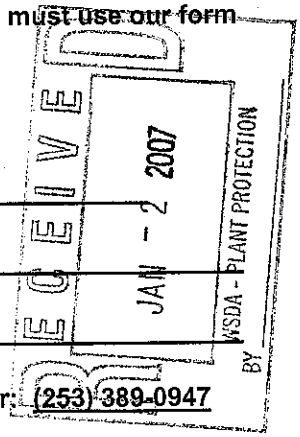
07-003

FY08 Application for Nursery Research Funding
Washington State Department of Agriculture - Nursery License Surcharge

(Please use one application packet including the Progress Report page for each proposal. You must use our form - failure to do so may result in not funding your project.)



Project Title: Natural Organic Lawn Fertilizers May Impact Weed Growth in Turfgrass

Project Leader: Eric Miltner and Gwen Stahnke

Institution (if any): Washington State University, Puyallup REC

Mailing Address: 7612 Pioneer Way East, Puyallup, WA 98371

Project Phone Number: (253) 389-0947 **FAX Number:** (253) 445-4569 **Cellular/Pager Number:** (253) 389-0947

Note: Project leader or his/her designee must be available at above project phone number on March 2, 2007 between the hours of 10:00-12:00 and 1:00-3:00.

Amount Requested for (FY08) July 1, 2007 to June 30, 2008: $ 7,690.00

Start Date: July 1, 2006 **Completion Date:** June 30, 2009

(Check One) New Project _____ ***Continuing*** X

If this is a multiple year project, please estimate and list the following information for each July 1 - June 30 period listed below through project completion:

Fiscal Years (FY)	July 1, 2008 to June 30, 2009	July 1, 2009 to June 30, 2010	July 1, 2010 to June 30, 2011	July 1, 2011 to June 30, 2012	July 1, 2012 to June 30, 2013
$ Amount Needed	8915				

If you are increasing the above amounts since your last application, please explain why:

*Please list **all** other sources and amounts of funding for this project: **(Please notify us by February 15 if other funding has been approved and from where.)**

Source	$ Amount Applied For	Approved	Pending Date of Notification

Total Amount Needed to Fund Project (Include all sources) $ 27,105 ($10,500 was provided in FY 07 under this program)

If total amount form all sources is not granted, will you be able to complete the project? No

Explain: At this time, we have only requested funding from the WSDA. Funding is for the partial support of personnel to complete the project, as well as the costs of sample analysis and supplies. The funding requested does not cover the full cost of the personnel time invested in the project. We are considering seeking additional funding from another source for the third year of the project, to complete some additional laboratory work, including quantifying N mineralization rates from the fertilizers.

Submit 15 copies of this proposal to: Tom Wessels, Plant Services Program Manager, P.O. Box 42560, Olympia, WA 98504-2560. All applications must be postmarked by December 31, 2006.

Please summarize the purpose of this research: (you may attach additional sheets if necessary or submit this summary in your own format)

The popularity of organically-based fertilizer products has increased in recent years due to public interest in environmental stewardship. These products are perceived as being less likely to result in nutrient loss through either leaching or runoff. Products of this type are used widely by both homeowners and professional applicators. From 1999 through 2002, we conducted research at the WSU Puyallup turfgrass research facility evaluating the effects of mowing height, annual nitrogen (N) fertilizer rate, and fertilizer source (organic or synthetic) on turfgrass quality and weed and disease incidence. The most surprising result of this research was the finding that the natural organic fertilizer resulted in higher populations of non-legume broadleaf weeds than the synthetic organic fertilizer [polymer coated sulfur coated urea (PCSCU)]. There were three possible explanations for this result. The first was pH depression caused by both sulfur and the acidifying effect of urea in PCSCU. This product reduced soil pH by up to 0.5 pH units compared to the natural organic fertilizer. However, we were unable to find any evidence in the literature to confirm that soil pH could suppress populations of the weeds that we observed. The second possible explanation was the potential limited availability of nitrogen from the natural organic product. Some of the N in these products can be difficult to mineralize and release for plant use. If this amount was significant, it could have resulted in an effectively lower N rate, even though the fertilizers were applied at the same apparent N rate. The increased weeds could also be due to some other effect related directly to fertilizer content. It is inappropriate to extrapolate the results of this previous research to all natural organic fertilizer products. We included only one fertilizer product of each type in our research, and different products may produce different results.

Research objectives:

The objectives of the proposed research are:

1. to evaluate a range of natural organic turfgrass fertilizer products in comparison with synthetic fertilizers and determine their impacts on weed populations under home lawn conditions
2. to evaluate total N availability of each product through measuring mass N uptake under field conditions.

Methods of research:

The study is being conducted at the WSU Puyallup turfgrass research facility, on perennial ryegrass (*Lolium perenne* L.) turf grown on Puyallup fine sandy loam soil (the same site as the previous research). This is maintained similarly to home lawn turf, mowed at a height of two inches and irrigated to prevent severe moisture stress. Eight fertilizer treatments, plus a no-nitrogen control were applied on September 22 and November 17, 2006. The fertilizer treatments were comprised of five natural organic products, one synthetic organic slow-release product, and two synthetic inorganic products. The synthetic products included coated urea and ammonium sulfate, which will both decrease soil pH, as well as calcium nitrate, which should not affect soil pH. Product details are provided in the attached Progress Report. Each fertilizer was applied to individual plots measuring 5 feet by 5 feet, with four replications arranged in a randomized complete block design. The annual N application rate is 4 lb N per 1000 ft^2, applied in four equal applications of 1 lb N per 1000 ft^2 each. (A total of 2 lb N per 1000 ft^2 was applied during 2006). Because the N-P_2O_5-K_2O analysis of the fertilizers is different, P and K levels are equalized among treatments with additional single-nutrient fertilizers (including the no-N control plots). Plots are mowed approximately weekly with a mulching rotary mower, with clippings returned to the turf as is recommended for home lawns.

Prior to the start of the experiment, soil samples were collected from each plot and will be analyzed for total N and pH during the upcoming winter. The pH analysis will be repeated each year at approximately the same time of year. This will quantify fertilizer impacts on soil acidity, assisting in data interpretation for acidifying versus non-acidifying fertilizers. The total soil N measurement will be repeated again after three years, and may help to determine if some products result in large amounts of fertilizer N that are not made plant available and instead remain in the soil. It is unlikely that yearly analysis of total N would reveal differences due to the small amount of N added from fertilizer relative to native soil N. Over three years, however, the cumulative additions may result in measurable differences. Plots will be rated visually for turfgrass color and quality monthly throughout the study period. In addition, populations of four common broadleaf weeds [white clover (*Trifolium repens*), dandelion (*Taraxacum officinale*), false dandelion (also known as cat's ear) (*Hypochaeris radicata*), and broadleaf plantain (*Plantago major*)] were counted, and this will be repeated in the spring and

In order to determine N availability from the various fertilizer treatments, a second set of plots was arranged in an adjacent turf area. These plots are fertilized identically to the first set. Instead of weekly mowing however, the grass is allowed to grow between subsequent fertilizer applications. Plots are mowed only immediately before a fertilizer application, resulting in four mowings per year. At the time of cutting, all removed leaf tissue will be dried and weighed, and a subsample will be analyzed for tissue N content. Total N uptake for each plot will then be calculated. By comparing tissue N uptake, differences in N availability between the various fertilizer products can be determined.

The study will continue for a period of three years (summer 2006 – summer 2009). Over this time, we will collect data on fertilizer impact on weed population, total plant available N from fertilizer, potential contributions from fertilizer to total soil N, and impact of fertilizers on overall turf quality.

Expenditure Breakdown:
(Please include salaries, supplies, travel, etc.)

Salaries and benefits	
Ag Research Tech II (0.10 FTE)	5090
Time slip labor	800
Goods and services	
Fertilizer, soil and tissue analysis	1500
Supplies	
Fertilizers, sampling bags, etc.	300
Total, Year 2 (07 – 08)	**$7,690**

The information requested on this page will have a direct bearing on whether your research request is approved or denied.

Note: Funding is not available for general overhead cost.

Progress Report on Funded Nursery Projects
Washington State Department of Agriculture

Date: December 20, 2006

Project Title: Natural Organic Lawn Fertilizers May Impact Weed Growth in Turfgrass

Project Leader: Eric Miltner and Gwen Stahnke

Progress: To be submitted for all projects funded in FY07 (July 1, 2006 to June 30, 2007); and FY 08 (July 1, 2007 to June 30, 2008).

Both plot areas described in the Methods section were established in the late summer of 2006. Prior to the start of the experiment, soil samples were collected from each plot. Populations of four common broadleaf weeds [white clover (*Trifolium repens*), dandelion (*Taraxacum officinale*), false dandelion (also known as cat's ear) (*Hypochaeris radicata*), and broadleaf plantain (*Plantago major*)] were counted. Two fertilizer applications were made: one on September 22 and the second on November 17. The fertilizer products used are described in Table 1. Products were selected so that a variety of organic nutrient sources would be included among the treatments. Synthetic fertilizers included urea and ammonium-based products, which should decrease soil pH over time, and a nitrate source that should not affect pH.

Visual color and quality ratings were recorded in October, November, and December 2006. Clippings were collected from the "N availability" plots on November 16, just prior to the second fertilizer application. These plots had not been mowed since the initial fertilizer application on Sep 22, and so clipping weights reflect the cumulative growth response to that application. Clippings will be analyzed for N content during winter 2007. Color ratings and clipping weights are shown in Table 2. All fertilized plots displayed improved color compared to the unfertilized control. In general, natural organic fertilizers did not influence color as much as the inorganic (ammonium sulfate, calcium nitrate) or synthetic organic (Best Turf K) sources. The same trends were observed in the clipping weight response. This would be expected due to the relatively small proportion of water soluble N (quickly available) in the natural organic products, and the cooler fall temperatures that might limit soil microbial activity and release of organic N.

Soil samples collected in September will be analyzed this winter for pH and total N, and these will provide baseline measurements for the 3-year study. Clippings will be analyzed for N content. When combined with clipping weight, this will result in the total clipping N uptake during the fall months from the various fertilizer products.

Table 1. Fertilizer products and manufacturers, nutrient analyses, and nutrient sources for organic and inorganic fertilizer products. All information comes from product labels.

Product name and manufacturer	Guaranteed minimum analysis (percent by weight)	Nutrients derived from
Milorganite 6-2-0 Milwaukee Sewerage Commission Milwaukee, WI	6% N 0.5% WSN* 5.5% WIN** 2% P_2O_5 0% K_2O 4% Fe 1.2% Ca	Biosolids
Nature's Intent 9-3-4 Pacific Calcium Tonasket, WA	9% N 9% WIN 3% P_2O_5 4% K_2O 3% Ca 1% S	Feather meal, steamed bone meal, potassium sulfate, gypsum
Richlawn 5-3-2 Richlawn Turf Food Inc. Paltteville, CO	5% N 1.25% WSN 3.75% WIN 3% P_2O_5 2% K_2O 4% Ca	Dried poultry manure
Ringer Lawn Restore 10-2-6 Woodstream Lititz, PA	10% N 2.4% WSN 7.6% WIN 2% P_2O_5 6% K_2O	Hydrolyzed poultry feather meal, nitrate of soda, potassium sulfate, bone meal, soybean meal
Whitney Farms 8-2-4 Rod McLellan Company Independence, OR	8% N 2% WSN 6% WIN 2% P_2O_5 4% K_2O 4% Ca	Blood meal, dried poultry waste, feather meal, bone meal, sulfate of potash magnesia
Best Turf K 24-3-10 JR Simplot Company Lathrop, CA	24% N 8% quickly available N 16% slowly available N 3% P_2O_5 10% K_2O 12% S 1.6% Fe 0.25% Zn	Polymer coated sulfur coated urea, ammonium phosphate sulfate, potassium sulfate, iron and zinc oxides
Ammonium sulfate 21-0-0 Waupaca Northwoods LLC Waupaca, WI	21 % N 21% quickly available N	ammonium sulfate
Calcium nitrate Yara International Oslo, Norway	15.5 % N 15.5% quickly available N 19% Ca	calcium nitrate

* WSN = water soluble nitrogen, quickly available.
** WIN = water insoluble nitrogen, slowly available.

Table 2. Color ratings for Fall 2006, and dried clipping weight harvested on November 16.

	Turfgrass color 1 – 9 (1 = brown, 9 = ideal)			Clipping weight (g)
Treatment	October	November	December	Nov 16
Ammonium sulfate	6.5	6.0	6.0	86
Calcium nitrate	5.8	7.3	6.8	86
Best Turf K	5.3	6.8	7.0	91
Milorganite	5.3	5.8	5.3	65
Ringer	5.3	5.8	5.3	67
Whitney Farms	5.8	6.5	5.8	49
Nature's Intent	5.5	5.0	5.3	73
Rich Lawn	5.5	6.5	6.3	78
Unfertilized check	4.0	4.0	4.0	31