clippings are returned; after that all clippings (and any fertilizer) would be removed.

The results of the nitrogen carrier study on the bentgrass green at East Lansing are shown in Table 2. The soil is 2 parts coarse sand, 1 part peat and 1 part fine sandy loam. The ratings taken June 12 were not used to calculate the averages for the year, but it is interesting to note that within 5 days after application in early June the urea and sulfur-coated urea treatments gave significant responses. The extended period between the August 5 treatment and the October 2 rating resulted in poorer ratings in October for those materials containing more water soluble nitrogen. The cooler soil temperatures at the time of the October 5 treatment caused the poorer ratings observed for the organic carriers, Milorganite and 27-0-0 (the latter an experimental fertilizer from Lakeshore-LESCO) while those treatments with the most water soluble nitrogen gave the best ratings on the November 1 evaluation date. There was some phytotoxicity evident on the urea-Terrazole treated plots during late summer apparently from the July 15 treatment. This injury was not observed on any of the other studies either on bentgrass or Kentucky bluegrass during 1977.

Four pounds of nitrogen per 1000 square feet was applied during the year on predominantly red fescue turf at Traverse City (Table 3). Most carriers performed more uniformly when applied as 1 pound of N on 4 dates than when applied as 2 pounds of N on 2 dates. The only exception was on the first date of evaluation (June 4), 3 weeks after the first application when the lower application rates in May gave poorer ratings. The response to carriers with more water soluble nitrogen tended to be depleted between the May 12 and August 4 application dates when 2 pounds N was applied in May as would be expected. The heavy rainfall at Traverse City during late August and early September apparently tended to leach the nitrogen from the plots receiving the more water soluble carriers as reflected in the poorer ratings on the September 27 evaluation date.

In a second study at Traverse City on Kentucky bluegrass (Table 4) there was little difference in the response observed between sulfur coated urea from CIL (Canadian Industries, Limited) and TVA (provided by LESCO). As in other studies this year IBDU gave slow responses in the spring and early summer when there was more limited rainfall but performed well in late summer and early fall where there was more rainfall.

In Table 5 the results are summarized from the 1977 nitrogen carrier study at East Lansing on Merion Kentucky bluegrass. At some times during the season there was no difference among any of the treatments. No ratings were taken at these times for this reason, especially in late August when all carriers were giving good response. Then with the extensive rainfall in early September the nitrogen from all treatments seemed to be depleted. Again there were essentially no differences apparent among treatments. The late application in October did not give differential responses by November 1. Clippings are returned to these plots grown on a very good soil. This reduced the relative response predicted since the nitrogen in the clippings is recycled. The residual response in the spring of 1978 will be evaluated.

In summary most of the carriers performed well if applied at rates and times appropriate for the conditions and the carrier. These data help up to understand the relative response rate so we can predict how a given carrier will respond under a given set of conditions.

Effect of Mowing, Traffic and Clipping Return on Nitrogen Release from Sulfur Coated Ureas

When applying slow release nitrogen carriers which have a relatively large particle size to a green there is a good possibility of the fertilizer being picked up with the clippings. For this reason the clippings are often returned for one or two mowings after application to a green. In addition there is concern for the effect of mowing and traffic on the coating of coated fertilizers. If the coating is broken the soluble fertilizer on the inside is readily available and the fertilizer loses its slow release characteristic.

A study was designed to evaluate the effect of traffic and clipping removal from a green on the nitrogen response from sulfur coated ureas. Treatments were applied September 26, 1977. The traffic treatments applied were none; 25 passes over every spot on the plot by golf shoe traffic; and 3 passes with a water weighted Ryan vibrating roller to which golf shoe soles have been attached. The fertilizer was applied, followed by the traffic treatments. Then the plots were irrigated. The next day the plots were mowed with clipping removal or return.

Three weeks after application the quality ratings shown in Table 6 were taken. The reader is cautioned that this is a preliminary report and the study should be repeated. But from these data it is apparent that intense traffic on the turf causes some breaking of the coatings. This allows the nitrogen contained in the particle to be watered into the turf and leads to the turf response. Thus the quality ratings were better when the plots received traffic after application, especially the intense roller traffic. Also, returning clippings resulted in a greater turf improvement for the coarser particles from TVA and CIL-standard size fertilizer than for the fine grade CIL sulfur coated urea. This is reasonable since the smaller particles would not be as susceptible to mower pickup and probably to traffic damage. The reader is reminded that the coarser particle materials are not designed for use on greens and the manufacturers do not recommend the use of the coarse particle grades on greens.

Low Soil Potassium Effects on Seedhead Formation

After 13 years of clipping removal from Merion Kentucky bluegrass plots which were treated with a wide range of nitrogen rates, a significant depletion of soil potassium occurred. In the past greater moisture stress and wilting was observed on the low potassium plots which was reported at previous conferences. In June of 1977 it was observed that there was greater seedhead formation on the plots with lower soil potassium levels (less 100 pounds per acre exchangeable potassium with neutral normal ammonium acetate). We do not have evidence that this response holds true for other grasses but it is suggested that the turf manager should keep soil potassium levels adequate if seedhead formation is considered undesirable. The level of available soil potassium can best be determined by soil testing.

Wetting Agents Effects on Hydrophobic Sands

A study of wetting agent treatment effects on rewetting of the hydrophobic sand condition was initiated at Boyne Highlands on June 9. The results are summarized in Table 7. Hydro-Wet and Aqua-Gro gave the best improvement in re-wetting as evidenced by quality ratings and percent soil moisture. These results are consistent with those from previous years. Amway and Wex wetting agents also provided some improvement in quality ratings compared to the untreated check for some treatments on some dates. Higher rates and more frequent applications of the Amway and Wex materials will be needed apparently for the same degree of response compared to Hydro-Wet and Aqua-Gro. Variability among plots reduced the level of significance among treatments as had been observed in the past.

A similar study was established on the Bay Pointe Golf Course where hydrophobic spots had developed in late May and early June. However, the hydrophobic condition disappeared before any treatment differences occurred. Appreciation is expressed to Mert Nye of Boyne Highlands and Don LaFond of Bay Pointe for use of these plot areas.

Table 6. Effect of Traffic and Clipping Removal on Nitrogen Response to Sulfur-Coated Urea applied September 26, 1977 on a Toronto Bentgrass Green at East Lansing. Averages for 3 replications.

CARRIER	TRAFFIC	CLIPPINGS	Quality Ratings (1=Ideal) DATE OF RATING	
			Oct 11	Nov 4
32-0-0 (Fine) (CIL)	None	Remove	2.7 a-d	2.0 b-e
		Leave	2.7 a-d	1.3 a-b
	Foot	Remove	2.5 a-d	2.2 b-f
		Leave	2.5 a-d	1.8 a-d
	Compacter	Remove	2.0 a-b	1.7 a-c
		Leave	2.2 a-b	1.0 a
32-0-0 (Standard) (CIL)	None	Remove	3.7 e-f	3.0 f-h
		Leave	3.2 d-e	3.0 f-h
	Foot	Remove	3.2 d-e	2.3 c-f
		Leave	2.7 a-d	1.7 a-c
	Compacter	Remove	2.8 b-d	2.3 c-f
		Leave	2.5 a-d	1.3 a-b
36-0-0	None	Remove	4.2 f	4.8 i
		Leave	3.5 e-f	2.7 d-f
	Foot	Remove	3.7 e-f	3.7 g-h
		Leave	3.0 c-e	2.5 c-f
	Compacter	Remove	3.2 d-e	2.8 e-g
		Leave	2.3 a-c	1.7 a-c