FINAL REPORT
FOREST SERVICE GRANT NO. NA-98-0400

Period covered by this report: September 9, 1998 through October 31, 2000

NOTE: Please review the following information and revise/complete as necessary.

Issued to: University of Wisconsin - Stevens Point
Address: College of Natural Resources, 1900 Franklin Street, Stevens Point, WI 54481

Congressional District Number: 7

Project Name: Nitrogen Relationships of Ornamental Trees in Urban Settings: A First Look

Contact Person/Principal Investigator:

Name: Dr. Robert Miller
Mailing Address: Same as above
Phone Number: (715) 346-4189
Fax Number: (715) 346-3624
E-Mail Address: rmiller@uwsp.edu

Your Organization's internet home page address:

Date of Award: September 9, 1998

Grant Modifications: N/A

Date of Expiration: October 31, 2000

Funding: Federal Share: $19,503 plus Grantee Share: $19,525 = Total Project: $39,028

FS Grant Manager: Phil Rodbell
Address: USDA Forest Service - NA, 11 Campus Blvd, Suite 200, Newtown Square, PA 19073
Phone Number: (610) 557-4133
Fax Number: (610) 557-4136

Please provide an abstract on your project and its results. This abstract will be posted on the NUCFAC internet site. (approximately 200 words or less).

Standards for fertilizer application rates of ornamental trees have historically been based upon tree growth responses. Little data exists on the fate of exogenous N applied to tree/turf complexes in urban landscapes. The objective of this study was to determine the effect of N input on i.) soil solution concentration below the tree rooting zone, ii.) on estimated N losses via soil solution, and iii.) the potential N contribution from tree litter, for four common ornamental trees in urban landscapes. We found that low level rates (< 2 lbs N/1000 ft^2) of slow release fertilizer N significantly increased soil solution [N] at or below the effective tree rooting depth ($p = .01$). Furthermore, we determined that during periods of surplus soil moisture there were significant increases in NO_3^- leaching, particularly in coarse textured soils. We observed a modest relationship ($r^2 = 0.49$) between total N input and total N output and concluded that fertilization using established standards (>2 lbs N/1000 ft^2) will produce even greater system N losses than those we encountered. We also determined that potential N contribution from tree litter was, in most instances, below or slightly above than the lower limit of the fertilization standards (2 lbs N/1000 ft^2). Furthermore, we observed a species:treatment interaction, suggesting fertilization aimed at litter N replacement should be species and site specific. Lastly, determination of landscape fertility programs often neglects the N contribution from atmospheric deposition. Atmospheric deposition typically exceeds the potential litter N contribution.

Project Objectives:

1. To determine (within acceptable confidence limits) what growing-season ranges of nitrogen inputs, fluxes, and pool magnitudes are associated with selected shade tree species growing under urban conditions in the greater Milwaukee and Stevens Point areas of Wisconsin.
2. To determine (within acceptable confidence limits) how different practices of property owners may be influencing the nitrogen budgets at (1) above; and
3. To determine (within acceptable confidence limits) whether urban trees under the conditions of (1) and (2) above may be in need of nutrient supplements.

Objectives met successfully:

All three objectives were met.

Objectives not met:

None

List the major policy findings of your project?

Current industry standards are likely too high for N fertilization of landscape trees.

If not apparent in the above, or if your project did not involve research, how did the project increase the knowledge we have about urban forestry? How did (will) the public benefit?

What recommendations might you make for community foresters or others who might benefit from your research?

In many instances we are over-fertilizing landscape trees with N, even when we follow accepted industry standards. We have failed to include contributions from atmospheric deposition in the tree site nutrient balance scheme and have largely ignored the potential impact on ground and surface water associated with chronic fertilization and irrigation. Lastly, ornamental tree fertilization should be species and site specific.

Attach copies of reports, publications or videos. If your work has been published (Journals, popular press, etc.) provide where they have been published or reported and how copies can be obtained.

An initial report on our research findings was presented to the Tree Shrub Fertilizer Conference, May 17 — 18, Akron, OH. The proceedings will be published in the near future.

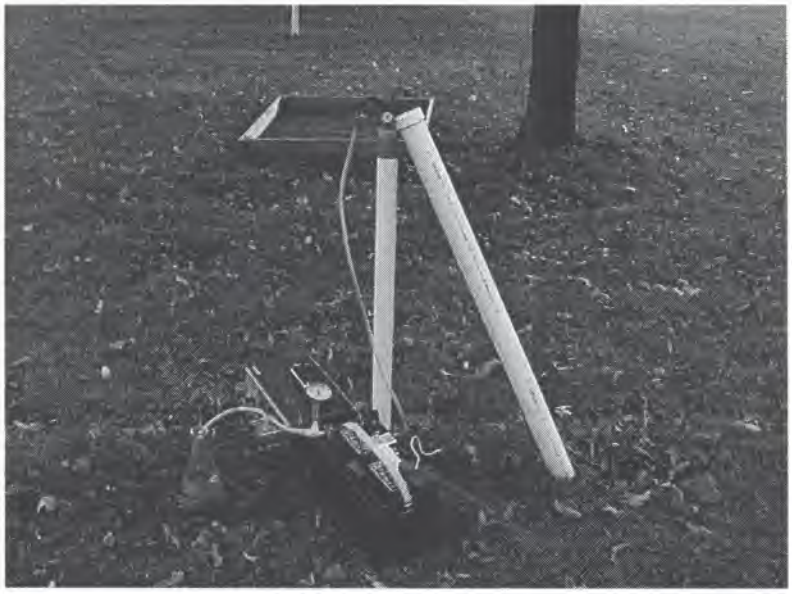
How were your results disseminated to the public?

We are in the process of preparing two papers for submission to the Journal of Arboriculture.

List the active partners (key individuals or organizations) involved in the project:

Stevens Point Country Club, Stevens Point, WI
Boerner Botanical Gardens, Waukesha, WI
City of Waukesha, WI
Sentry World Golf Course, Stevens Point, WI
Rosewood Center, Stevens Point, WI
Ozaukee Country Club, Waukesha, WI
Wisconsin Public Service, Plover, WI

Photo or Illustration: If possible, please provide a photo or illustration for our use that summarizes or represents the project. Indicate how this illustration should be credited.



Tension lysimeter used to collect soil water samples in the Fox River Sanctuary, Waukesha, WI as part of a pilot study conducted by the University of Wisconsin - Stevens Point that investigated the fate of fertilizer nitrogen applied to ornamental trees. Photo courtesy of Dr. Robert Miller and Les Werner.

If a no-cost time extension was granted for this project, why was it needed?

Not applicable

How would you evaluate the grant process? What changes, if any, would you recommend?

No recommendations

Comments considered important but not covered above:

None

This report prepared by:
Name: Robert W. Miller and Les P. Werner
Title: Professor of Urban Forestry and Graduate Student
Phone Number: 715 346 4189
Date: December 13, 2000