

RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

**Rutgers Plant Diagnostic Laboratory
and
Nematode Detection Service**



1997 Annual Report

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*Mr. Richard Buckley
Laboratory Coordinator*

Introduction

The mission of the Rutgers Plant Diagnostic Laboratory and Nematode Detection Service (RPDL-NDS), a service of the New Jersey Agricultural Experiment Station (NJAES), is to provide the citizens of New Jersey with accurate and timely diagnoses of plant problems. These goals are achieved in cooperation with Rutgers Cooperative Extension (RCE) and research faculty at Cook College/NJAES. Since its establishment in April of 1991, the Plant Diagnostic Laboratory has examined over 7,152 samples submitted for plant problem diagnosis, nematode analysis, or identification. The laboratory has become an integral part of Rutgers Cooperative Extension and Cook College/NJAES programs by providing diagnostic and educational services and by assisting with research. This report summarizes the activities of the RPDL-NDS during the calendar year 1997, the laboratory's sixth full year of operation and the fifth full year of operation for the nematode service.

History

The Rutgers Plant Diagnostic Laboratory was established in 1991 with an internal loan and is projected to become self-supporting. The laboratory was established by the dedicated efforts of RCE faculty members Dr. Ann B. Gould and Dr. Bruce B. Clarke, specialists in plant pathology, Dr. Zane Helsel, director of extension, and Dr. Karen Giroux, past assistant director of NJAES. Without their vision and persistence, this program would not exist.

On April 1, 1991, a laboratory coordinator was hired on a consultant basis to renovate laboratory

space and order equipment. The laboratory is currently located in Building 6020, Old Dudley Road, on the Cook College campus. This space belongs to the department of plant pathology, who paid for renovations to the facility. We acknowledge the department's generosity and thank them for their monetary support.

The Rutgers Plant Diagnostic Laboratory began accepting samples on June 26, 1991. At that time, the majority of equipment and supplies were in place. A full-time diagnostician (program associate) was hired September 1, 1991, and the laboratory coordinator was hired on a permanent basis on November 1, 1991.

Staff and Cooperators

Richard J. Buckley is the coordinator of the RPDL-NDS. He was promoted to this position from program associate in October of 1993. Mr. Buckley received his M.S. in turfgrass pathology from Rutgers University in 1991. He has a B.S. in entomology and plant pathology from the University of Delaware. He also received special training in nematode detection and identification from Clemson University. Mr. Buckley has work experience in diagnostics, soil testing, and field research. Mr. Buckley is responsible for sample diagnosis, soil analysis for nematodes, and the day-to-day operation of the laboratory. Mr. Buckley's former position of program associate remains unfilled.

The laboratory is also staffed, part time, by an undergraduate student, Ms. Sophie Penkrat. Ms. Penkrat has worked for the laboratory for four years and has become an integral part of the daily activities

of the laboratory. The laboratory was also fortunate to receive the help of several graduate students from the department of plant pathology during the summer.

The laboratory benefits from the assistance of faculty in the departments of entomology, plant pathology, and plant science. In the department of plant pathology, Dr. Ann B. Gould (laboratory faculty coordinator) and Dr. Bruce B. Clarke have devoted hundreds of hours to laboratory business from the inception of the diagnostic laboratory concept through its eventual set-up and operation. Additional faculty and staff in this department who have provided substantial assistance during 1997 include: Dr. James White, mycology; Dr. Donald Kobayashi, phytobacteriology; Dr. Steve Johnston, vegetable pathology; Dr. Brad Hillman, virology; Dr. T. A. Chen, chair, plant pathology, for administrative assistance; and Pradip Majumdar, and Marshal Bergen for general assistance.

We would also like to thank Dr. John Meade, and Dr. Richard Ilnicki of plant science for assistance in weed identification and diagnosis of herbicide injury, Dr. George Wulster of plant science for assistance with problems on horticultural crops, Dr. Raul Cabrera for assistance with problems in nursery production, and Dr. Paula Shrewsbury of entomology for consultation on insect identifications. Our sincere gratitude goes to Ms. Ethel M. Dutky of the University of Maryland Plant Diagnostic Laboratory. Her advice and assistance has been instrumental in the set-up and operation of the RPDL-NDS.

Laboratory Policy

The RPDL-NDS receives samples from a varied clientele. According to laboratory policy, samples for diagnosis from residential clients may be submitted only after screening by appropriate county faculty or staff. If the sample requires more than a cursory diagnosis, it may be submitted, along with the appropriate payment, to the laboratory for evaluation. The county office provides the appropriate form, including instructions for proper sample selection and submission. Samples from professional clientele may be handled as above or may be submitted directly to the laboratory.

Detailed records are kept on all samples. A written response including the sample diagnosis, management and control recommendations, and other pertinent information is mailed or sent by fax to the client. Additionally, the client is billed if payment does not accompany the sample. Copies are forwarded to appropriate county faculty for their records. Commercial growers are contacted by telephone or fax to help them avoid delay in pest treatments.

Operations

Diagnosics

During 1997, the RPDL-NDS examined 1269 specimens submitted for diagnosis or identification (Table 1A) and assayed 147 soil samples for nematodes (Table 2). Compared to 1996 levels, this represents a 10% increase in plant samples and a 60% decrease in nematode samples. As expected, the majority of samples were submitted during the summer months and diminished in the fall and winter.

For comparison purposes, a listing of 1993 through 1997 sample submissions from the University of Maryland Plant Diagnostic Laboratory is included in Table 1B. From an agricultural perspective, New Jersey and Maryland are quite similar. Both states have similar demographics (a mix of major urban centers with surrounding suburban and rural areas), geographies, and agricultural crops. The University of Maryland Plant Diagnostic Laboratory has been in operation since 1979 and should serve as a predictive model for future sample submission to the RPDL-NDS. The University of Maryland Plant Diagnostic Laboratory does not assay soils for nematodes because the University has a separate Nematology Laboratory; therefore, these data are not presented.

For the fourth year, the RPDL-NDS received more samples than the University of Maryland laboratory. Although more plant samples were submitted to the Rutgers Diagnostic Laboratory, they were submitted in a seasonal pattern similar to that of the University of Maryland. The large increase in the

Table 1A. RPD-L-NDS plant sample submissions by month - Rutgers University, 1993 to 1997.

Month	1993	1994	1995	1996	1997
January	17	11	22	27	27
February	21	14	22	21	24
March	22	31	51	50	51
April	47	56	59	60	121
May	77	70	137	84	125
June	70	146	161	206	202
July	244	172	147	271	221
August	110	135	246	192	178
September	92	75	106	155	173
October	43	55	61	82	95
November	34	28	49	36	22
December	15	29	7	22	30
Totals	792	822	1068	1206	1269

Table 1B. RPD-L-NDS plant sample submissions by month - the University of Maryland, 1993 to 1997.

Month	1993	1994	1995	1996	1997
January	20	19	27	14	10
February	14	27	31	32	7
March	46	50	82	29	60
April	74	67	115	48	72
May	78	71	117	114	83
June	134	112	157	148	136
July	134	101	141	101	122
August	121	143	177	133	114
September	89	84	96	115	72
October	53	46	71	66	57
November	27	49	16	40	16
December	15	16	9	9	14
Totals	805	785	1039	849	763

sample load at the Rutgers laboratory in the summer reflects the large number of golf turf samples sent to the laboratory at that time. Maryland does not process turf samples in their laboratory. We expect that the number of samples submitted to Rutgers will continue to increase as we continue to advertise the laboratory and as more growers become aware of our services.

The Nematode Detection Service began accepting soil samples on July 1, 1992 after the retirement of Dr. Jack Springer. In 1997, the Nematode Detection Service processed 147 soil samples for nematode assays. The decrease in nematode samples is due in part to the success with nematode detection on golf courses. Many of the golf turf clients have identified nematodes as potential problems on golf greens and have begun to sample greens for nematodes as they develop integrated management programs. This active management by golf course superintendents, using laboratory services as part of their integrated pest management programs, initially resulted in an increase in sample submissions. As

problem areas were identified and controlled, sample submissions subsequently dropped. Regular monitoring of the "hot spots" will be required, but large scale sampling may not be necessary for these clients.

Of the specimens submitted to the RPDL-NDS for diagnosis or identification in 1997, 67% were from commercial growers, 30% were from residential clientele, and 3% were submitted from research faculty at Rutgers University (Table 3). Of the samples submitted to the Nematode Detection Service, 88% were from commercial growers, 11% were from Rutgers research projects, and 1% were from residential clients. We expect that the number of nematode samples submitted from residential clients will remain low or be non-existent since much of this clientele is not familiar with nematode pests.

Whereas samples from research programs represent a relatively small percentage of the total number of plant and soil samples received, they are

Table 2. RPDL-NDS nematode sample submissions by month, 1993 to 1997.

Month	1992	1993	1994	1995	1996
January	0	0	6	0	0
February	5	0	0	0	1
March	0	14	1	35	6
April	22	41	24	16	22
May	1	3	6	17	14
June	16	9	14	37	33
July	18	55	18	80	30
August	24	25	19	21	25
September	18	11	11	4	9
October	8	14	10	9	7
November	10	40	13	11	0
December	45	7	7	12	0
Total:	167	219	129	242	147

an extremely important component. Research samples allow the diagnosticians to cooperate with University faculty on problems often of great importance to the State of New Jersey. The problems associated with these samples are challenging and occasionally lead to the diagnosis of a new disease.

Since turfgrass and ornamentals represent the largest agricultural commodities in New Jersey, it follows that the vast majority of samples submitted for diagnosis (82%) were either turfgrass or ornamental plants (Table 4). The wide variety of turf and ornamental species grown under diverse environ-

mental conditions results in a large number of problems not readily identifiable by growers or county faculty. In addition, pest diagnosis and plant identification for commercial growers of other crops are still handled by extension specialists and county agents in other parts of the state at no charge. Soil samples submitted to the laboratory for nematode analysis were roughly split between golf turf and from production agriculture. The majority of the samples from production agriculture were from several growers in southern New Jersey who specialize in small grains, potatoes, peaches, and carrots. Special thanks to the IPM agents in vegetable and field

Table 3. RPDL-NDS sample submissions by origin, 1997.

Sample Origin	Number of Plant Samples	Percent of Total	Number of Nematode Samples	Percent of Total
Commercial Growers	852	67%	129	88%
Residential	385	30%	2	1%
Research Programs (Rutgers University)	32	3%	16	11%
Totals	1269	100%	147	100%

Table 4. RPDL-NDS sample submissions by crop category, 1997.

Crop	Number of Plant Samples	Percent of Total	Number of Nematode Samples	Percent of Total
Turf	478	48%	104	71%
Ornamentals	569	45%	4	3%
Field Crops	5	0.5%	19	13%
Vegetable	55	4%	16	10%
Fruit	29	2%	4	3%
Insect ID	74	6%	0	0
Plant ID	50	4%	0	0
Fungus ID	9	0.5%	0	0
Totals	1269	100%	147	100%

crops for their support. It is hoped that, in the future, other state IPM programs will submit samples to the RPDL-NDS.

Samples were submitted to the RPDL-NDS from all of the counties in New Jersey (Tables 5A and 5B). The majority of samples, however, were submitted from counties in close proximity to the laboratory or from counties with dense populations that have disease problems associated with turf and ornamentals in residential landscapes or on golf courses. Disease problems on these commodities are difficult

to diagnose and are subsequently submitted to the laboratory. In addition, many citizens in central New Jersey contact Rutgers University directly for assistance with plant-related problems and are referred to the laboratory. This county profile also identifies the county faculty that are familiar with the RPDL-NDS and utilize its services.

Approximately 20% of the samples submitted for diagnosis to the laboratory were from out-of-state (Table 5A and 5B). Nearly all of these samples were turf. Because of his national reputation and his

Table 5A. RPDL-NDS sample submissions by county, 1993 to 1997.

In-State	1993	1994	1995	1996	1997
Atlantic	8	20	40	42	57
Bergen	59	60	62	71	85
Burlington	51	31	54	67	97
Camden	28	25	37	42	37
Cape May	16	10	9	16	25
Cumberland	6	14	7	8	15
Essex	20	30	22	20	22
Gloucester	22	26	61	19	21
Hudson	5	0	6	1	16
Hunterdon	19	37	31	22	27
Mercer	36	65	47	44	28
Middlesex	66	85	119	129	157
Monmouth	79	59	77	58	87
Morris	22	34	53	90	56
Ocean	22	17	56	63	37
Passaic	34	19	44	69	68
Salem	0	9	11	12	6
Somerset	52	51	52	54	91
Sussex	18	6	13	15	13
Union	45	20	56	27	63
Warren	24	33	29	30	30
Rutgers Research	51	74	67	81	32
In-State Totals	683	725	953	981	1070
Out-of-State	109	97	115	225	199
Totals	792	822	1068	1206	1269

strong support for the laboratory, Dr. Bruce Clarke has helped the Rutgers laboratory develop into one of the premier golf turf diagnostic facilities in the country. Many golf course superintendents send samples to Dr. Clarke, who always forwards them to the laboratory for diagnosis. Golf turf samples were submitted to the laboratory from 18 states, several from states as far away as Arizona, New Mexico, and California. Because there are very few laboratories in the country that diagnose turfgrass diseases, these superintendents have continued to submit samples to

the RPDL-NDS. Furthermore, many golf turf professionals at other universities often refer their clients to Rutgers for second opinions or when they are on leave. The charge for out-of-state samples is substantially higher to help defray the cost of in-state samples. This area of client development is the fastest growing area in the laboratory.

Of the plant specimens submitted to the RPDL-NDS for diagnosis or identification, 41% were associated with biotic disease-causing agents (Table 6).

Table 5B. RPDL-NDS nematode submissions by county, 1993 to 1997.

In-State	Number of nematode samples				
	1993	1994	1995	1996	1997
Atlantic	3	1	2	16	7
Bergen	4	13	3	2	0
Burlington	31	58	38	40	35
Camden	1	9	15	37	14
Cape May	2	1	0	2	1
Cumberland	8	23	10	2	2
Essex	3	4	4	1	2
Gloucester	24	7	10	22	10
Hudson	0	0	0	0	0
Hunterdon	1	1	2	1	2
Mercer	17	15	0	21	0
Middlesex	6	4	7	5	1
Monmouth	4	7	1	0	0
Morris	4	7	5	3	4
Ocean	0	0	0	0	0
Passaic	0	3	0	3	2
Salem	14	23	3	9	0
Somerset	1	3	0	0	0
Sussex	0	1	0	2	0
Union	0	0	0	0	0
Warren	0	0	0	0	0
Rutgers Research	27	0	0	18	1
In-State Totals	150	180	100	184	81
Out-of-State	17	39	29	58	66
Totals	167	219	129	242	147

Injury to 11% of the samples was caused by insects and related arthropods, and 38% were associated with abiotic injuries and stresses (e.g., environmental extremes, nutrient deficiencies, poor cultural practices, poor soil conditions, etc.). Another 10% included insect, plant, fungal, and substance identification. The overall breakdown in sample submissions is typical of that reported by other diagnostic laboratories in the United States.

In 1997, the mean response time for samples diagnosed in less than 21 days was 2.04 days. This is a slight decrease in response time from the 1996 mean response time of 2.25 days. The rapid response time is attributed largely to the presence of Ms. Sophie Penkrat, an exceptionally competent helper who worked tirelessly in the laboratory during the summer months. Ms. Penkrat has developed into an assistant who can easily fulfill most of the responsibilities of a program associate or horticultural consultant. Adequately trained staff is essential to the efficient operation of the laboratory. The University of Maryland laboratory's response time increased by approximately one full day when a summer position went unfilled.

A laboratory response was prepared in less than three days for most (85%) of the samples submitted (Table 7), and 92% of our clients received a response in less than a week. A number of the samples took longer than 10 days to diagnose. In these cases, special consultation was required for an accurate diagnosis, and the clients were advised of progress throughout the period. Since nematode samples deteriorate rapidly in storage, virtually all of the nematode processing was finished in less than three days.

Other Laboratory Activities

Teaching. In addition to providing diagnostic services, the staff of the RPDL-NDS provides educational services to Cook College/NJAES, Rutgers Cooperative Extension, and other agencies (Appendix II). Many of these educational activities generated additional income for the laboratory.

In 1997, Mr. Buckley participated in a number of short courses offered by the Office of Continuing Professional Education. Mr. Buckley is an instructor in the Rutgers Professional Golf Turf Management School. He teaches three courses, Diseases of Turf and Diseases of Ornamental Plants, as well as, Insect Pests in Fine Turf in both the spring and fall sessions. This teaching commitment consisted of one two-hour lecture in each class per week for ten weeks. In 1997, Mr. Buckley also provided several other lectures on insect related topics and assisted in the development of a laboratory exercise for the students. Mr. Buckley's efforts in the Professional Golf Turf Management School generated \$12,345 in income for the laboratory in 1997.

Mr. Buckley participated in several other Office of Continuing Professional Education short courses in 1997. These courses include; the Professional Grounds Maintenance Short Course; Golf Turf Management School: Three Week Preparatory Course; the Home Gardeners School; Introduction to Golf Turf Management; Landscape Integrated Pest Management; An Intelligent Approach; Athletic Field Maintenance; Pest Management in Ornamental Landscape Plants; and the Home Depot Garden Center Management Workshop. The income gener-

Table 6. RPDL-NDS plant sample submissions by diagnosis, 1997.

Diagnosis	Number of Samples	Percent of Total
Disease (biotic)	517	41%
Insect	138	11%
Identification	133	10%
Other	481	38%
Totals	1269	100%

Table 7. Sample response times, 1997.

Response time	Number of samples	Percent of total
0 to 3 days	1080	85%
4 to 6 days	88	7%
7 to 10 days	41	3%
11 to 21 days	55	4%
>21 days	5	1%
Totals	1269	100

ated by these activities with the Office of Continuing Professional Education was \$1,950.

Mr. Buckley also served as the course coordinator for the Pest Management in Landscape Turf Short Course. This was the fourth year for this one-day program. He also served as the coordinator for the Advanced Turf Management Symposium. A two-day program dedicated to current problems in fine turf under his direction for the third year. The income generated by these programs with the Office of Continuing Professional Education was \$2,625.

Mr. Buckley was an invited speaker in several Rutgers Cooperative Extension programs. The following programs were included: the North Jersey Ornamental Horticulture Conference, landscape and tree days; the Central Jersey Turf and Ornamentals Institute, Monmouth, Middlesex, and Somerset Counties; the Insect Identification Inservice; Landscape IPM; Ornamental Insect and Disease Clinic; Christmas Tree Growers Twilight Meeting; and Basics of Landscape IPM in Union County. Lectures in support of the and the Mercer, Middlesex, Ocean, and Somerset County Master Gardener Programs were also given. The laboratory received compensation of \$725 for these efforts.

Mr. Buckley also earned income for the RPDL-NDS as an invited speaker for the New Jersey Turf Expo, Prolawn Turf Products Golf Turf Care Clinic, the Michael Fisher and Sons Golf Turf Seminar, the Certified Tree Experts Educational Program, and in a life science class at Herbert Hoover Middle School

in Edison, N.J. The income from these talks was \$650.

Other educational services provided by the staff of the RPDL-NDS, for which the laboratory received no compensation, included lectures in several undergraduate and graduate courses including Fine and Sports Turf, and Principles of Plant Pathology. Mr. Buckley participated in the filming of "The Greener Thumb" video, and was also featured in several television shows developed by extension faculty in Middlesex County. Short presentations describing how to utilize RPDL-NDS services were given to several groups and at several Office of Continuing Professional Education short courses.

Extension Publications. During 1997, the RPDL-NDS staff contributed regularly to the *Plant & Pest Advisory*. The laboratory staff wrote a brief article on laboratory activities for each issue of the newsletter, which was bi-weekly from March to September and monthly from September to December by Rutgers Cooperative Extension and the New Jersey Agricultural Experiment Station.

Three extension fact sheets were co-authored in 1997. Several other extension fact sheets were also written during the year and are currently under review.

Buckley, R. J., and Gould, A. B. 1997. *An Integrated Approach to the Control of Canker Diseases in Woody Ornamentals. II. Black Knot of Prunus*. Rutgers Cooperative

Extension fact sheet FS876.

Buckley, R. J., and Gould, A. B. 1997. *An Integrated Approach to the Control of Canker Diseases in Woody Ornamentals. III. Perennial Nectria Canker*. Rutgers Cooperative Extension fact sheet FS877.

Buckley, R. J., and Gould, A. B. 1997. *Foliar Nematodes in Ornamental Plants*. Rutgers Cooperative Extension fact sheet FS878.

Other Publications. Mr. Buckley published articles in two trade journals in 1997.

Buckley, R. J. 1997. "Tree Disease Update." *Shade Tree, The New Jersey Shade Tree Federation Bulletin*. 70:68-73.

Buckley, R. J. 1997. "Management Strategies for Winter Turf Diseases." *Groundwork*, Landscape Contractors Association, MD-DC-VA. Jan:13-18.

Service. Mr. Buckley served as a member of the Rutgers Cooperative Extension Home Horticulture Working Group. At Ag Field Day, he organized and staffed a well-attended "Plant Problem Question and Answer Booth." He also volunteered to staff an information booth at the Display Gardens Open House.

Marketing

The RPDL-NDS developed a 15 minute slide presentation to help advertise laboratory services to various grower groups. Copies of this presentation are available on loan to anyone who wishes to advertise the laboratory's services. Numerous presentations of this program were made throughout 1997 by the staff of the Plant Diagnostic Laboratory.

An advertising brochure was developed in 1992 for general distribution at county offices, grower meetings, and other activities. This brochure briefly describes the services of the RPDL-NDS and how to access them. To date, over 20,000 copies of this brochure have been distributed. The brochure is

currently being reviewed and revised. Once again, special thanks goes to the Office of Continuing Professional Education, who placed a copy of the advertising brochure in each short course educational packet that was distributed.

To help advertise laboratory services at grower meetings or other activities, a mobile display unit was developed and utilized. This display unit briefly describes the services of the RPDL-NDS and how to access them, and is available on loan to anyone who wishes to advertise the laboratory services. The events at which the display was utilized included Ag Field Day, the Rutgers Gardens Open House, and Turf Field Day. Funding for the display unit was provided by Dr. G. David Lewis of the department of plant pathology. We wish to acknowledge his generosity and support.

Funding

The Plant Diagnostic Laboratory is expected to be self-supporting within five years of its establishment. Funding for the laboratory is generated by charging clientele for diagnostic services and educational activities (Table 8).

Over \$51,935 was generated from diagnostic services and nematode assays during 1997, representing a 1% increase in income over 1996.

A sample submission form and the appropriate payment accompanied the majority of samples received from residential clientele. Most commercial samples were accompanied by a submission form:

Table 8. Fee schedule for diagnostic services and nematode assays, 1997.

Client	Fee
Residential Clients	\$20.00/sample
Commercial Growers:	
Fine turf	\$50.00/sample
All others	\$20.00/sample
Out-of-State Growers	\$75.00/sample

however, the majority of these submissions did not include payment. In most cases, commercial growers preferred to be sent a bill. Over 95% of the clients billed have remitted payment. The laboratory staff continues to collect outstanding accounts from previous years. Almost all of the samples diagnosed for research programs at Rutgers University were paid for by transfer of funds.

Laboratory policy allows Rutgers employees, government agencies, county faculty, extension specialists, and selected government agencies to submit a small number of samples "free of charge." These samples are to be used for educational development and government service. The laboratory processed 182 of these "no charge" samples in 1997 (Table 9). These samples accounted for 13% of the samples processed. The value of these no charge requests was \$3780.

Income generated from all laboratory activities covered 100% of the non-salary expenses incurred in 1997, 93% of salaries, or 82% of the laboratory's total expenditures (including salaries and one-time costs for equipment. For more detailed budget information see Appendix I.

Future Directions

As in the past, the top priority for 1998 will be to generate more income. To accomplish this, we will continue to advertise laboratory services to increase

sample number. Continued cooperation with the Office of Continuing Professional Education and other educational activities are expected to generate additional funds.

Other priorities in 1998 include: the development of additional educational materials in the form of bulletins, fact sheets, and slide sets in cooperation with extension faculty; focusing on ways to add and train labor for the laboratory during its busiest periods; finding and moving into suitable permanent facilities as soon as possible; and professional improvement (which includes participation in professional societies).

We are constantly evaluating the immediate and future needs of the State for additional services. Possibilities for additional services include assays for determining pest tolerance (apple scab, brown rot, and European red mite) for the Fruit IPM program, and expanded nematode, insect, and weed identification services.

Since the retirement of Dr. Louis Vasvary in 1995, there has been an increased need for insect identification services, particularly in the area of household and structural pests. In cooperation with the department of entomology the Plant Diagnostic Laboratory has added a graduate student to the staff to assist in this capacity. The student, as a condition of his funding, will dedicated 15 hours a week to the laboratory. It is hoped that with the added staffing,

Table 9. Plant Diagnostic Laboratory sample submissions, no charge requests, 1997.

Client Category	Number of Samples
RCE County Faculty/Program Associates	70
RCE Specialists	20
Rutgers Research Programs (not RCE)	15
Rutgers Non-Research Faculty/Staff	18
Direct Mail/Walk-ins	63
Other Government Agencies/University	3
Total	182

the laboratory will be able to effectively improve the insect identification function traditionally offered by the lab. Tick identification and Lyme disease testing may also be added as services.

Plant Disease Highlights

The occurrence and severity of plant diseases are strongly influenced by environmental conditions. The 1997 growing season was greatly affected by a year with a cool, wet spring, a dry summer, and a wet fall. Diseases favored or enhanced by these conditions were especially prevalent.

Ornamentals

As usual, a vast majority of ornamental plants submitted to the laboratory were affected by abiotic agents. The symptoms of these problems appeared as leaf scorch, premature defoliations, branch die-back, or early and late fall color, and an overall decline in plant vigor. Planting problems and poor site conditions were a primary cause of many plant failures. The cumulative effects of several seasons of erratic and extreme weather also strongly contributed to many plant failures.

Of the diseases that were caused by biotic agents, several leaf spots, anthracnose, needlecasts, and rusts were diagnosed. These leaf diseases are enhanced by frequent spring rains. Cankers caused by the fungi *Botryosphaeria*, *Atropellis*, and *Cytospora*, were prevalent in trees and shrubs injured during the drought of 1995. Root-infecting pathogens detected this year on a variety of ornamental plants included *Phytophthora*, *Pythium*, *Fusarium*, and *Rhizoctonia*.

The insect problems most commonly diagnosed were caused by spruce mites and various scales; however, many samples also had evidence of bark beetle or borer activity. Like the cankers, borer problems originated with drought conditions in

1995. White pine had a particularly tough season with borers. Presumably these trees were predisposed by excess moisture in the root zone from spring rains.

In the greenhouse, *Pythium* and *Rhizoctonia* root rots continue to be the most common problem. *Botrytis* gray mold is always a problem. Nutrient and salt problems are also prevalent. Several growers submitted samples to the laboratory of a variety of plants that tested positive for the tospoviruses, impatiens necrotic spot or tomato spotted wilt

Turf

It was an easy year for fine turf in New Jersey and the mid-Atlantic region. Cool, wet conditions in the spring held up the normal spring green-up. Many impatient superintendents sampled their turf for fear of pathogen activity at that time. Once the temperatures stabilized the turf responded nicely. Heat and drought stress were not a problem this summer so most turf did quite well. The height of cut on the greens of many courses has crept below .25 inch. This is an extremely stressful situation for turfgrasses and should make for an interesting 1998 if there are heat and drought stress problems. Anthracnose continues to increase in the state and may be the most common golf turf disease. As usual, red thread, brown patch, and *Pythium* diseases were also very prevalent.

Vegetables

In vegetables, root knot nematode in carrot and lesion nematode in potato continue to be primary problems. Nematodes have also been problematic for several small grain growers in south jersey. The cooler, wet weather early in the season enhanced bacterial activity in the tomato and pepper crops in 1997. Bacterial spot and canker were the most common submissions.

APPENDIX I. Rutgers Plant Diagnostic Laboratory and Nematode Detection Service Budget.

Table 10. RPDL-NDS expenditures in 1997.

Salaries & Benefits:	\$ 75,272.28
Supplies and Services: (includes)	7803.84
Diagnostic supplies	
Printing/advertising	
References/publications	
Equipment maintenance	
Office supplies	
Photographic services	
Communications:	
Telephone/Fax	
Postage	1424.00
Travel: (includes)	
Travel to give paid talks	
Travel to professional meetings	
Travel for training	1101.06
<hr/> Total Expenditures:	<hr/> \$ 85,601.18

Table 11. RPDL-NDS income in 1997.

Sample fees:	\$ 46,910.00
Unpaid sample fees:	1245.00
Lecture fees:	
Professional Golf Turf School	12,345.00
O.C.P.E. Short Course Coordinator	2,625.00
O.C.P.E. Short Course Instructor	1,950.00
Other	1,375.00
Value of no-charge samples	<\$3780.00>
<hr/> Potential Total Income	<hr/> <\$ 70,230.00>
 <hr/> Actual Total Income:	 <hr/> \$ 66,450.00

Table 12. RPDL-NDS estimated expenditures for 1998.

Salaries and benefits:	\$ 68,600
Seasonal labor:	10,000
General operating:	7,500
One-time equipment cost:	15,000
Educational development and travel:	1,500
New facility renovation?	?
<hr/> Total Estimated Expenditures 1998:	<hr/> \$ 102,600

Table 13. RPDL-NDS estimated income for 1998¹.

Estimated Turf Sample Income:	
40% @ \$50	\$ 30,000
Estimated Out-of-State Sample Income:	
20% @ \$75	22,500
Estimated All Other Sample Income:	
40% @ \$20	12,000
Estimated Lecture Fee Income:	20,000
<hr/> Total Estimated Income 1998:	<hr/> \$ 84,500

¹ based on 1500 samples submitted in 1998.


Appendix II. Complete Listing of Lectures Presented During 1997.

Richard J. Buckley, Laboratory Coordinator, Plant Diagnostic Laboratory

Date	Title of Presentation	Audience	Location	Number of handouts	Type of participants ¹
1-3/97	Diseases of Turfgrass (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T
1-3/97	Diseases of Ornamentals (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T
1-3/97	Insects of Turfgrass (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T
1/9/97	Managing Diseases in Landscape Turf	Professional Grounds Maintenance Short Course	Cook College	2	T,L
1/30/97	Diseases of Turfgrass	Golf Turf Management School: Three Week Preparatory Course	Cook College	2	T,L
2/4/97	Diagnosis of Plant/Pest Disorders	Landscape IPM: An Intelligent Approach	Cook College	2	A,T,L
2/12/97	Plant Diagnostic Laboratory Landscape Disease Update	North Jersey Ornamental Horticulture Conference	Bergen County	2	A,I,L,T
2/26/97	Turf Disease Problems and Their Control	Athletic Field Maintenance Short Course	Cook College	3	L,T
2/27/97	Turf Disease Diagnosis	Lesco North Jersey Golf Turf Seminar	Bergen County	3	I,T
3/4/97	Effective Use of the Plant Diagnostic Laboratory	Introduction to Golf Turf Management Short Course	Cook College	2	T
3/4/97	Common Spring Diseases in the Landscape	Central Jersey Turf and Ornamentals Workshop	Monmouth Co.	2	A,T,L
3/5/97	Common Spring Diseases in the Landscape	Central Jersey Turf and Ornamentals Workshop	Mercer Co.	2	A,T,L
3/6/97	Common Spring Diseases in the Landscape	Central Jersey Turf and Ornamentals Workshop	Somerset Co.	2	A,T,L
3/11/97	Fungicide Use of Shade Trees	North Jersey Ornamental Horticulture Conference	Morris Co.	2	A,L
3/15/97	Managing Diseases in Landscape Turf	Home Gardeners School	Cook College	3	H
3/20/97	What is a Plant Disease	Herbert Hoover Middle School	Middlesex Co.	1	H
3/31/97	Diagnosing Plant Disease	Home Depot Management Training Program	Cook College	3	I
4/7/97	Insect Problems in Sports Turf	Fine and Sports Turf 11:776:451	Cook College	4	C
4/14/97	Insect Problems in Sports Turf	Fine and Sports Turf 11:776:451	Cook College	4	C
4/17/97	Plant Pest Diagnosis	Master Gardener Training	Ocean Co.	3	H
5/6/97	Plant Diagnostic Lab Insect Identification Services	RCE Insect Identification Inservice	Cook College	1	J
5/9/97	Tree Diseases	ISA Training Program	Monmouth Co.	3	A
6/12/97	Diagnosing Plant Problems in the Landscape	Ornamental Insect & Disease Clinic	Monmouth Co.	1	A,T,L
6/12/97	Christmas Tree Disease Problems	Christmas Tree Growers Twilight Meeting	Cook College	2	A
9/20/97	Insect Problems in Landscape Turf	Home Gardeners School	Cook College	3	H
10/1/97	Nematodes	Principles of Plant Pathology 16:765:531	Cook College	10	C
10/21/97	Fungicide Use on Shade Trees	Basics of Landscape IPM	Union Co.	3	A,T,L
10/23/97	Diagnosing Plant Problems	Master Gardeners Training Program	Somerset Co.	3	H
11/7/97	Diagnosing Plant Problems	Master Gardeners Training Program	Middlesex Co.	3	H
11/20/97	Turf Disease Diagnosis in the Laboratory	Michael Fisher & Sons Golf Turf Seminar	West Chester, PA	3	T
12/3/97	Disease Management and Control in the Landscape	Pest Management of Ornamental Landscape Plants Short Course	Cook College	3	A,T,L
12/4/97	Turf Diseases	Pest Management in Landscape Turf	Cook College	3	T,L
12/9/97	Maintaining Tree Health on the Golf Course	NJTA Turf Expo '97	Atlantic Co.	3	I,T
12/10/97	Diagnosing Plant Problems	Ocean County Vocational School	Ocean Co.	3	H,L
12/17/97	Diagnosing Plant Problems	Master Gardener Training Program	Mercer Co.	2	H
10-12/96	Introduction to Entomology Diagnosis	Professional Golf Turf Management School	Cook College	2	T
10-12/96	Diseases of Turfgrass (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T
10-12/96	Diseases of Ornamentals (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T
10-12/96	Insects of Turfgrass (10 Lectures)	Professional Golf Turf Management School	Cook College	20	T

¹Audience Addressed: A=Arborists; C=College (Academic); H=Residential Clientele; I=Industry; L=Landscape Professionals; T=Turfgrass Managers.

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