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Rutgers Soil Testing and Plant Diagnostic Services

2005 Annual Report

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THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS
COOK COLLEGE

2005
Rutgers Soil Testing and Plant Diagnostic Services Annual Report

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Introduction

Soil testing and plant diagnostic services are provided by Rutgers Cooperative Research and Extension (RCRE), the outreach component of the New Jersey Agricultural Experiment Station (NJAES) and Cook College. Located on the Cook College campus, these laboratories provide New Jersey citizens with diagnoses of plant problems and chemical and mechanical analyses of soil. Their mission is to provide such services in an accurate and timely manner to meet the increasing agricultural and environmental needs of the State. These goals are achieved in cooperation with extension and research faculty and staff at NJAES. This report summarizes the activities of these laboratories during the 2005 calendar year.

History

The Rutgers Soil Testing Laboratory

Soil testing at Rutgers has a history as long as the NJAES has been in existence. As early as the 1860s, George Cook was involved in the chemical analysis of soils and fertilizers. E.B. Voorhees followed Cook as director of the Experiment Station and became famous for applying chemistry to soil fertility issues. By 1940 when the academic unit supporting soil testing, the Department of Soils, was formed, soil testing for the public had begun in earnest as thousands of samples were analyzed for elemental deficiencies, acidity levels, and organic matter content. After the Department of Soils merged with Farm Crops to form the Department of Soils and Crops in 1963, Dr. Dennis Markus became director of the public soil testing laboratory in the new department. When Dr. Markus retired in 1984, Dr. Harry Motto guided laboratory operations until his own retirement in 1996. Under the subsequent leadership of Dr. Stephanie Murphy, the Rutgers Soil Testing Laboratory (STL) has processed over 68,000 soil samples for nutrient analysis and continues to serve an integral role in soil nutrient management for the public and for RCRE programs. The laboratory recently moved into the newly renovated Administrative Services Building II with the Resource Center, which is the former HIP building on US Route 1 in New Brunswick. We invite all to come and tour the new facility.

The Rutgers Plant Diagnostic Laboratory and Nematode Detection Service

The Rutgers Plant Diagnostic Laboratory (PDL) was established in 1991 by the dedicated efforts of RCRE faculty members Dr. Ann B. Gould and Dr. Bruce B. Clarke, Specialists in Plant Pathology, Dr. Zane Helsel, former Director of Extension and current Chair of the Department of Agricultural Extension Specialists, and Dr. Karen Giroux, past Assistant Director of NJAES. The laboratory was housed on the main campus of Cook College until 2000 when it was relocated to the Ralph Geiger Turfgrass Education Building at Horticultural Research Farm II in North Brunswick, NJ. The Geiger Center was made possible through the vision and financial backing of Mr. Ralph Geiger and a large group of University and turf industry cooperators.

The PDL began accepting samples on June 26, 1991, and has since examined more than 26,000 samples submitted for plant problem diagnosis, nematode analysis, or identification. The laboratory has become an integral part of RCRE and Cook College/NJAES programs by providing diagnostic and educational services and by assisting with research.

The RCRE Resource Center

In 1998, the Cook College Resource Center was formed, and the administrative functions of both the PDL and the STL were assigned to this unit. In 1999, Mr. Mike Green was appointed director of the Resource Center and since has guided the administrative functions of the program. In late 2004, Mr. Green and a committee of RCRE faculty facilitated the merger of the PDL and the STL into the Plant and Soil Testing Services. This newly formed administrative unit will be charged as a total cost recovery, user fee based service that is projected and expected to be self supporting.

Staff and Cooperators

PDL

Mr. Richard Buckley is the manager of the PDL. He was promoted to this position from program associate in October of 1994. 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, and is currently responsible for sample diagnosis, soil analysis for nematodes, and the day-to-day operation of PDL. Mr. Buckley will oversee the administrative functions of the combined plant diagnostic and soil testing laboratories.

Ms. Sabrina Tirpak is the Principal Laboratory Technician for the PDL. She received her B.S. in Plant

Science, with an emphasis in horticulture and turf industries as well as a minor in entomology, from Rutgers University in May 2000. She was hired as a part-time assistant in 1998 and was hired full-time upon the completion of her degree. She has also attended Clemson for special training in nematode detection and identification. Ms. Tirpak has primary responsibility for insect and weed identification, rapid screening of disease samples using enzyme-based test kits, and assisting in all other aspects of laboratory operations.

STL

Dr. Stephanie Murphy is the coordinator of the STL. She has served the University in this capacity since 1996 after several years as a post doctoral research technician and instructor within the Department of Environmental Sciences. Dr. Murphy has a Ph.D. in soil science from Michigan State University, a M.S. in soil management and conservation from Purdue University, and a B.S. in agronomy from Ohio State. Her interests include soil conservation, soil fertility, and the interaction of soil aggregation to plant root extracts. Dr. Murphy is responsible for the day-to-day operations of the STL and, under her direction, soil test reports have been computerized and streamlined for easier interpretation, and soil test policies have been improved to better serve clientele.

Mr. Steve Griglak, Senior Laboratory Technician, has worked in the STL since 1995. Mr. Griglak received his B.S in Environmental Science from Rutgers University in May 1998. Although his primary duty is the performance of various soil tests offered by the laboratory, he is also responsible for the maintenance and repair of laboratory equipment and testing devices.

Mr. Nick Tomasino began work in the STL in 1999 as an undergraduate assistant. He graduated from Cook College with a B.S. in Microbial Biotechnology in 2002 and was hired as a full-time technician the same year. Mr. Tomasino was responsible for the performance of various soil tests and other routine duties; however, he left this position in May of 2005. Efforts are currently underway to fill this position.

After her retirement from a successful career as a county agricultural agent in RCRE, Ms. Clare Liptak has spent countless hours in a part-time role for the STL. Ms. Liptak primarily serves to promote the laboratories as well as other Resource Center services at conferences and trade shows.

Cook College Resource Center and Other Support

Ms. Terriann DiLalo has been a part-time administrative assistant for the STL since 2002 and has recently begun to assist the PDL with its administrative functions.

Both the STL and the PDL employ several Rutgers undergraduate students each year to assist in sample preparation, data entry, and clean-up. As the students help with many of the basic day-to-day tasks, they also gain invaluable laboratory experience that will contribute to career success after graduation.

The laboratories also benefit from the assistance of faculty in several Cook College Departments. These include the Departments of Plant Biology and Pathology; Entomology; and Ecology, Evolution, and Natural Resources. We owe a great deal of our success to the expertise of many of the faculty in these departments. We would also like to thank the staff of the Cook College Office of Continuing Professional Education for their support and assistance with our educational programming, and we cannot forget the other members of the Rutgers Resource Center for their support and assistance.

Laboratory Policies

The PDL receives samples (plant samples for problem diagnosis; soil samples for nematode assays; and insects, weeds, and molds for identification) from a varied clientele. Sample submission forms, sampling instructions, and fee schedules are available on the RCRE website. Sample submission forms are available in local County Agricultural offices and by FAX directly from the PDL. Most samples are submitted by mail to a post office box in Milltown or by private delivery service directly to the laboratory. Residential clientele are encouraged to use the postal service or a commercial delivery service to submit samples, which must be accompanied by the appropriate form and payment. Professional clientele may deliver samples directly to the laboratory as a "walk in" and be billed for the service.

Samples are considered in consecutive order on a "first come, first serve" basis. Detailed records are kept on all samples. A written response including the sample diagnosis, management and control recommendations, and other pertinent information is mailed and/or sent by FAX to the client. Copies are forwarded to appropriate county faculty for their records. Commercial growers are often contacted by telephone or FAX to help them avoid delay in pest treatments.

Like the PDL, the STL receives samples from a varied clientele, and fee schedules as well as sampling and submission instructions are also available on the RCRE website. Soil samples are submitted in soil test kits available for purchase from local RCRE County Extension Offices, which include a submission form, sampling instructions, and a mailing bag to contain the soil sample. Standard soil fertility testing ("level 1" testing defined as pH, P, K, Mg, Ca, Cu, Mn, Zn, and B) is included with the purchase of the kit. Additional special tests not included in the standard assay can be requested on the submission form but must be paid for in advance. Samples may be submitted without the soil test kits as long as appropriate identifying information and pre-payment is included.

Although soil samples are processed in consecutive order according to entry into the laboratory system, analysis can be prioritized by paying a special express processing fee. Upon the completion of the tests, general lime and fertilizer recommendations are provided for most New Jersey plantings. The client must supply appropriate planting information to receive fertility guidelines. Responses are sent by mail to the client and to the appropriate county agricultural office.

Operations

PDL

During 2005, the PDL examined 2,160 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 31% decrease (or 979 samples) from 2004. This decrease in samples can be attributed to a lack of samples submitted by State and Federal regulatory agencies conducting disease surveys. In 2004 nearly 1,100 samples were submitted through grants and contracts with state agencies. In general, sample submissions remained steady for most of the year, peaking in the summer and declining during the winter. It is our view that 2,000 to 2,500 samples represent peak laboratory capacity, so at this level we were well within the capacity of the laboratory to function efficiently.

The specimens submitted to the PDL by sample type are presented in Table 2. Most samples (1680 or 78%) were plant samples submitted for diagnosis. Twelve percent (264) of the samples were for nematode analysis, and 10% or 216 samples were insect, mold, or plant identifications.

In Table 3 samples submitted to the laboratory by origin are presented. In 2005, 81% of the plant submissions were from commercial growers, 10% were from residential clientele, and 9% were submitted by research faculty at Rutgers University. This distribution is consistent with other years. Commercial plant managers benefit most from our services and are willing to pay the fees, thus they submit the most samples to the laboratory.

Although the number of plant samples decreased in 2005 by 1,050 from 2004, the total number of nematode assays (264) and insect, plant, or fungus identifications (216) increased marginally in 2005 from 214 and 195 in 2004, respectively. Thirty-one percent of samples requesting identification were from

Table 1. PDL sample submissions by month, 2001 to 2005.

Month	2001	2002	2003	2004	2005
January	17	47	26	31	30
February	46	55	33	24	25
March	85	70	56	76	64
April	137	230	75	582	120
May	226	183	179	374	182
June	317	261	276	430	317
July	459	415	442	355	418
August	421	369	347	260	362
September	921	300	417	353	288
October	876	245	211	520	157
November	172	196	233	80	90
December	169	99	15	54	107
Total	3846	2470	2310	3139	2160

Table 2. PDL sample submissions by sample type, 2005.

Sample Type	Number of samples	%
Plant samples	1680	78
Nematode assay	264	12
Insect, weed, and fungus identification	216	10
Total	2160	100

commercial clients, 1% was submitted by research faculty, and 68% were residential in origin. Most of these samples were household or nuisance pests, which are largely issues of concern for residential clients. Of the nematode assays submitted, 98% were requested by commercial clients. We expect that the number of nematode samples submitted from residential clients (0) will remain low since much of this clientele is not familiar with nematode pests.

In general, samples from research programs represent a relatively small percentage of the total number of plant and soil samples received. Research samples are an extremely important component of our case load. Research samples allow the diagnosticians to cooperate with University faculty on problems often of great importance to the State of New Jersey.

Turfgrass and ornamentals may represent the largest agricultural commodities in New Jersey. In support of New Jersey as an urban agriculture state, it follows that the vast majority of samples (91%) were either turfgrass or ornamental plants (Table 4). The wide variety of turf and ornamental species grown under diverse environmental conditions in our state results in a large number of problems not readily identifiable by growers or county faculty with these crops. Furthermore, extension faculty and staff that deal primarily with turfgrass and ornamental plants as commodities, as well as plant managers in the turf and ornamentals industry, readily adopted the user fee-based delivery of service.

Alternatively, commercial growers of traditional agricultural crops have been slow to adopt a fee-for-service system. Certain RCRE faculty continue to provide free diagnostic services and fail to advertise diagnostic laboratory services to these growers. Inroads are being made with these commodity groups through the Vegetable and Fruit IPM groups, and it is our hope

Table 3. PDL sample submission by origin, 2005.

	Plant		Nematode		Identification	
Origin	number	%	number	%	number	%
Commercial	1351	81	258	98	66	31
Residential	171	10	0	0	148	68
Research	158	9	6	2	2	1
Total	1680	100	264	100	216	100

Table 4. PDL sample submissions by crop category, 2005.

	Plant samples		Nematode samples	
Crop	Number	%	Number	%
Turf	813	48	127	48
Ornamentals	724	43	0	0
Field crops	3	1	7	3
Vegetable	120	7	0	0
Fruit	20	1	130	49
Total	1680	100	264	100

that sample submissions from traditional agricultural crops will continue to increase in future years.

Most of the soil samples submitted to the laboratory for nematode analysis were from golf turf managers; however, nematode samples from growers establishing vineyards were also very common. In the past, a great majority of the nematode samples were submitted to the laboratory through the Fruit IPM program from peach, apple, and blueberry growers; however, the trend from that program continues to reflect a lack of grower interest in the pest. With the exception of blueberry, samples continue to decrease from most of these growers. Blueberry sampling, however, was much higher in 2005, which increased overall submissions from the Fruit IPM program. Although golf turf represented the highest percentage of nematode samples, the overall number of samples submitted from golf turf stabilized a recent trend of waning interest in nematode detection that started in 2002. Problems in golf turf, particularly with nematodes, are more severe during seasons with considerable heat and drought stress. August and September of 2005 were particularly problematic for golf turf managers.

Samples were submitted to the PDL from all of counties in New Jersey (Table 5). The majority of samples, however, were submitted from counties in close proximity 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 by the campus information service and through various academic departments. These samples are normally from counties in close proximity to New Brunswick. Samples were also abundant from counties with dense populations that have disease problems associated with turf and ornamentals in residential landscapes or on golf courses. In addition, county profiles are also influenced by the presence or absence of adequate

Table 5. PDL samples submitted by county, 2001 to 2005.

In-state	2001	2002	2003	2004	2005
Atlantic	148	113	118	153	167
Bergen	212	136	64	197	80
Burlington	239	79	118	146	124
Camden	264	242	56	31	40
Cape May	50	26	32	69	27
Cumberland	150	31	77	139	80
Essex	58	29	57	35	46
Gloucester	152	52	49	79	29
Hudson	5	14	11	5	6
Hunterdon	128	40	35	53	32
Mercer	231	238	135	348	98
Middlesex	257	240	317	345	187
Monmouth	239	204	225	237	156
Morris	234	161	109	128	163
Ocean	176	106	93	63	86
Passaic	80	38	32	38	39
Salem	82	18	12	32	30
Somerset	195	89	138	361	94
Sussex	99	24	14	12	21
Union	130	43	66	60	57
Warren	52	47	43	34	41
RU research	200	67	112	214	73
In-state total	3382	2037	1913	2779	1675
Out-of-state	464	433	397	360	484
Total	3846	2470	2310	3139	2160

staff in those offices. To some degree, the profile also identifies county faculty and programs that promote and utilize PDL services.

Approximately 22% of the samples submitted for diagnosis to the laboratory were from out-of-state. Nearly all of these samples were turf. In fact, 49% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 27 states and two provinces in Canada. Several turf samples were from states as far away as Florida, Arizona, Washington, Montana, and California. New York, Pennsylvania, and Connecticut provide the largest totals. Because of his national reputation and his 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. Because there are very few laboratories in the country that diagnose turfgrass diseases, these superintendents have continued to submit samples to the PDL. Many golf turf professionals at other universities often refer their clients to Rutgers for second opinions or when they are on leave. Furthermore, Mr. Buckley's association with the Professional Golf Turf Management School allows for contact with as many as 90 new clients each year. Many of the students turn into regular patrons of the laboratory services. The charge for out-of-state samples is substantially higher to help defray the cost of in-state samples.

Of the samples submitted to the PDL for diagnosis or identification, 44% were associated with biotic disease-causing agents (Table 6). Abiotic disease-causing factors (e.g., environmental extremes, nutrient deficiencies, poor cultural practices, poor soil conditions, etc.) accounted for another 28% of the laboratory diagnoses. Insect pest damage was diagnosed on 6% of the submissions. Identifications comprised 9% of the total number of samples submitted; of these, 5% were arthropods, 2% were fungi, and 2% were weeds. Nematode detection was the other 13% of submissions. The overall breakdown in sample submissions is typical of that reported by other diagnostic laboratories and reflects the normal seasonal totals for submissions to the Rutgers laboratory.

Insects account for most of the organisms identified by the laboratory. Many residential clients submit samples of stored product or nuisance pests that are found within the household. Over the last four years, the Department of Entomology has cooperated with the laboratory to forward clients with insect identification needs. Their cooperation has been invaluable in increasing the awareness of the laboratory to potential clients. Arthropod identification increased in 2005 from the 2004 total (94). Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses decreased slightly, however, in 2005 from 2004 (56). The submissions of samples for mold identification rise with media attention to the perceived health issues associated with mold infested homes and the incidence of local flooding.

Table 6. PDL samples submission by diagnosis, 2005.

Diagnosis	Number of samples	%
Disease (biotic)	952	44
Disease (abiotic)	604	28
Insect pest	124	6
Nematode	264	13
Arthropod identification	113	5
Fungus identification	52	2
Plant identification	51	2
Total	2160	100

In 2005, a laboratory response was prepared in less than three days for most (75%) of the samples submitted (Table 7), and 97% 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. The rapid response time is attributed largely to the presence of our competent staff. Adequately trained staff is essential to the continued growth and efficient operation of the laboratory.

STL

The STL processed 10,290 samples for soil chemical and physical analysis in 2005 (Table 8). The total laboratory output increased 17% from 2004 (8,759 samples). Sample submission totals were highest in early spring in anticipation of the growing season. During the rest of the year, sample submissions remained relatively steady, but they decreased sharply in the winter months when the ground is frozen and proper sampling becomes difficult.

Of the soil samples submitted to the STL for analysis in 2005 (Table 9), 57% were for the standard soil analysis (level 1) and 43% included requests for additional special tests.

In 2005, soil samples from residential clientele represented 32% of the submission total (Table 10). Commercial growers, including the producers of fruit and vegetables, as well as the managers of ornamental crops and turfgrass, represented 21% of the total. Samples from engineering firms comprised 21% of the workload, another 20% of the samples were from research programs at Rutgers, and 3% were from local school districts and reference samples, respectively. In the past, samples from residential clientele largely dominated laboratory submissions; however, recent growth in samples from commercial turf managers and in engineering work indicate a turn toward a professional client base.

Table 7. PDL sample response time, 2005.

Response Time	Number of samples	%
0 to 3 days	2349	75
4 to 6 days	689	22
7 to 10 days	55	1.75
11 to 21 days	40	1
>21 days	4	0.25
Total	2160	100

Table 8. STL sample submissions by month, 2003 to 2005.

Month	2003	2004	2005
January	271	423	241
February	114	248	395
March	797	1216	831
April	1253	1156	1543
May	663	784	840
June	736	1043	1253
July	584	561	886
August	449	768	1275
September	592	786	854
October	757	761	640
November	425	621	994
December	379	392	538
Total	7020	8759	10290

Table 9. STL sample submissions by test type, 2005.

Test type	Number of samples	%
Standard level 1	5840	57
Special tests	4450	43
Total	10290	100

Samples were submitted to the STL from all counties in New Jersey (Table 11). Many samples were submitted from counties in close proximity to the laboratory; however, because samples for soil testing are normally delivered in the mail, public access to the laboratory is less of a factor for sample submissions than those destined for the PDL. County profiles, therefore, reflect RCRE programs with active home horticulture programs or those with outreach events (fairs, field days) that provide opportunities to sell soil test kits. To some degree, the profile also identifies county faculty and programs that promote and utilize STL services to commercial clientele. A large number of county affiliations were unidentified on submission forms. Many of these samples were from engineering firms that submit soil from a central office that does not conform to the location where the soil was sampled.

Table 10. STL sample submissions by origin, 2005.

Origin	Number of samples	%
Residential	3300	32
Engineering	2148	21
Commercial	2151	21
Research	2080	20
Government/school	313	3
Reference	298	3
Total	10290	100

Figures 1 and 2 indicate the phosphorus and potassium content of the soil samples submitted for analysis in 2005. High or very high levels of phosphorus were measured in 66% of the samples tested, and potassium levels were high or very high in 71% of the samples tested. These data suggest the overuse of fertilizers containing potassium and phosphorus on soils that do not need them. Commercial fertilizer manufacturers promote routine applications of their

Table 11. STL sample submissions by county, 2005.

County	Samples
Atlantic	160
Bergen	438
Burlington	561
Camden	252
Cape May	120
Cumberland	224
Essex	183
Gloucester	235
Hudson	37
Hunterdon	281
Mercer	610
Middlesex	322
Monmouth	604
Morris	426
Ocean	313
Passaic	144
Salem	4
Somerset	322
Sussex	94
Union	209
Warren	50
Reference	298
Unidentified	4403
Total	10290

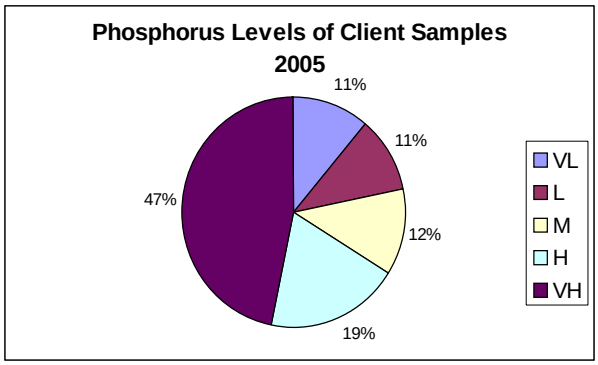

Figure 1. Phosphorus content in samples submitted in 2005.

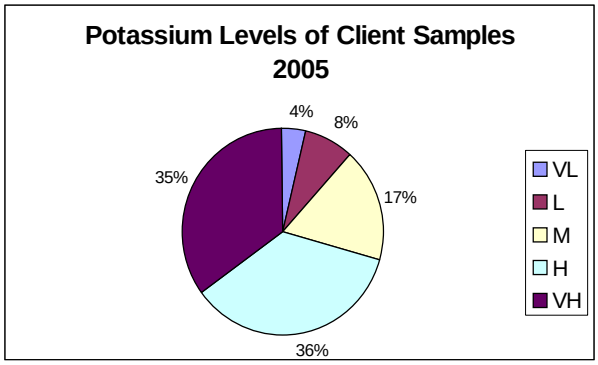

Figure 2. Potassium content in samples submitted in 2005.

products without benefit of soil tests. Turfgrass products vary levels of N-P_2O_5-K_2O in their four or five step programs according to season and without regard to soil test levels. Furthermore, most of the materials commercially available for residential use are combination products. Single nutrient materials are rare in the market. It is nearly impossible to apply adequate nitrogen on turfgrass or residential gardens without over-application of phosphorus and potassium.

In Figure 3, the soil pH of soil samples submitted to the STL in 2005 is summarized in functional classes (based on plant suitability and recommendations). Twelve percent (12%) of samples were not analyzed for pH. The optimum range for most plants includes the largest class (21%) of samples, 6.0-6.5 (moderately acidic), as well as the 15% in the slightly acidic class, pH 6.55 to 6.95. The moderately acidic soils (pH 5.55 to 5.95) represent 14% of samples. This group should be limed (are too acidic) for optimal growth of most plants but have higher than optimal pH for acid-loving plants. In the latter case, acidifying recommendations would be made. The 16% of samples in the very acidic class, pH 4.5 to 5.5, are well-suited for acid-loving plants; for other species, the soil must be limed. Extremely acidic samples (3%), pH <4.5, are not suitable for most plants; these may get lime recommendations unless they are suspected of being acid-sulfidic materials, which need to be remediated according to New Jersey's Soil Erosion & Sedimentation Act of 1975 (N.J.S.A. 4:24-39 et seq. and N.J.A.C. 2:90-1-1 et seq.). In the alkaline range, 10% of soils

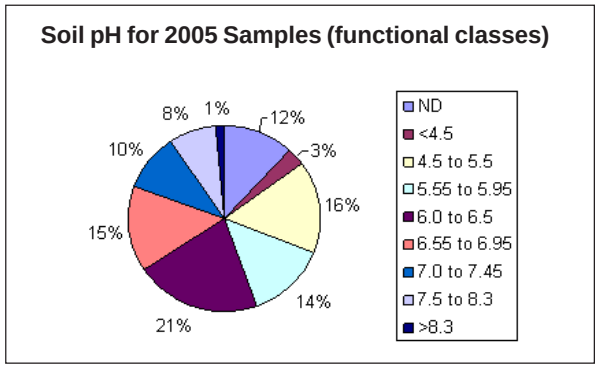

Figure 3. Soil pH of samples submitted in 2005.

are pH 7.0-7.45 (slightly alkaline); this range is generally high for soils of humid, temperate climates such as New Jersey. The exception would be soils derived from limestone, which would tend to be in this range. Slightly alkaline soils would be best suited for legume crops (for example, alfalfa and clover) and limited non-native plants but are considered to be above optimal pH for most other plants. The probable cause of high pH is overuse of limestone amendment. In some cases, excess soluble salts are responsible for high pH. Because of the tendency for NJ soils to acidify with time and fertilizer application, no amendment for adjusting pH is given in this pH range unless for acid-loving plants. Samples with soil pH 7.5 to 8.3 (8%) are moderately alkaline and will be recommended for acidification by application of elemental sulfur or aluminum sulfate. Again, over-application of limestone and/or high soluble salt content may be responsible for such high pH. There were 1% of samples in the pH range above 8.3, which can be explained only by high salt content. Remediation is a longer term prospect with these situations, since the recommended acidification can temporarily exacerbate the salt problem.

In 2005, the average response time for soil samples was 5.6 days. In Table 12 the average response time for standard level 1 tests is listed according to month. The number of special tests is also indicated to show the additional work load during the month. Response times varied from 3.2 days in January to 10.8 during December. Sample response time is influenced by the total number of submissions at the time and the number of special tests requested with those samples. Response time for standard tests is primarily influenced by volume. The equipment used for nutritional analyses (the DCP) can only do so many samples in a given time, so the responses slow as the number of samples increase. Special tests may be held by the laboratory until the number of samples accumulates enough to efficiently run the tests. Large numbers of special tests influence sample turn-around time because they take technician time away from the standard testing. Months with large numbers of standard tests and/or large numbers of special tests have the longest response times. The laboratory was packing to move during December, which significantly slowed our response.

Table 12. STL sample response times by month and test type, 2005.

Month	Number of standard (level 1) tests	Response time days	Number of special tests
January	131	3.2	110
February	133	4.6	262
March	327	5.9	504
April	1006	6.4	537
May	888	6.9	-48
June	735	4.3	518
July	311	4.4	575
August	430	4.4	845
September	685	5.2	169
October	485	3.6	155
November	446	5.7	548
December	263	10.8	275
Total	5840	5.6	4450

Teaching

In addition to providing diagnostic services and soil analysis, the staff of the PDL and STL provides educational services to Cook College/NJAES, RCRE, and other agencies (Appendix 3). Many of these educational activities generated additional income for the laboratory.

In 2005, the laboratory staff 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 taught four courses (Diseases of Turf; Diseases and Insect Pests of Ornamental Plants; Insect Pests in Fine Turf; and Principles of Pest Management on the Golf Course) in both the spring and fall sessions. This twice-a-year, 10-week teaching commitment consists of one two-hour lecture in each class per week for a total of 40 hours of contact time. Ms. Sabrina Tirpak is responsible for teaching a laboratory practicum in the Turf School. She has improved and expanded her role in the turf school to approximately 30 hours of contact time per session. The teaching efforts by the PDL staff in the Professional Golf Turf Management School generate significant income for the laboratory. This income source is essential for the success of the laboratory.

Mr. Buckley participated in several other Office of Continuing Professional Education short courses in 2005. These courses included the Professional Grounds Maintenance Short Course; the Golf Turf Management School: Three Week Preparatory Course; Landscape Integrated Pest Management: An Intelligent Approach; Athletic Field Management School; Pest Management in Ornamental Plants Short Course; and

the Emergency Pesticide Credit Recertification Short Course. Ms. Tirpak participated in the Golf Turf Management School: Three Week Preparatory Course, and Managing Diseases in Ornamental Plants. Dr. Murphy participated in the Home Gardeners School; Athletic Field Construction; Water Management and Drainage Short Course; Waste Water Treatment Short Course; Soil and Plant Relationships Short Course; and the Soil and Site Evaluation for Septic Systems Short Course.

Mr. Buckley served as the course coordinator for the Pest Management in Landscape Turf Short Course. This was the 13th year for this one-day program. Mr. Buckley also coordinated and taught the Advanced Topics in Professional Grounds Maintenance: Turf Disease Short Course. This was the seventh time he coordinated that short course.

Mr. Buckley was an invited speaker in several Rutgers Cooperative Research and Extension programs. The following programs were included: the Cream Ridge Nursery Growers Twilight Meeting in Burlington County; North Jersey Ornamental Horticulture Conference – Tree Day and Landscape Day; Master Gardener Annual Conference, and Master Gardener Helpline Training. Lectures in support of the Atlantic/Cape May, Mercer, Monmouth, Middlesex, Camden/Gloucester, Ocean, Somerset/Hunterdon, Union, and Passaic County Master Gardener Programs were also given. Ms. Tirpak presented programs in support of the Monmouth and Ocean County master gardeners. Dr. Murphy presented programs in support of the Camden County master gardeners and the Environmental Stewardship programs in Essex and Gloucester Counties.

Mr. Buckley earned income as an invited speaker for the New Jersey Flower and Outdoor Living Show; the Brooklyn Landscape Gardeners Association Winter Meeting; Fisher and Sons Winter Turf Seminar; Lesco, Inc. Winter Turf Seminar; Reed and Perrine Turf and Ornamentals Seminar; Cornell's Managing Landscapes Organically; the Professional Certified Applicators of Long Island Winter Educational Seminar; South Jersey Landscape Conference; PLANET Green Industry Seminar; and the New Jersey Turf Expo.

Other educational services provided by the laboratory staff members, for which the laboratory received no compensation, included lectures by Mr. Buckley in undergraduate and graduate courses including: Introduction to Plant Pathology and Greenhouse Management and Crop Production. Dr. Murphy was a guest lecturer in the undergraduate course Soils and Society. Ms. Tirpak visited Ethel McKnight Elementary School and Livingston Park Elementary School. Ethel McKnight is part of the East Windsor Regional School District and Livingston Park is in the North Brunswick District.

Extension Publications

During 2005, the PDL 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 published bi-weekly from March to September and monthly from September to December, by Rutgers Cooperative Research and Extension and the New Jersey Agricultural Experiment Station. In 2005, the articles submitted to the PPA were also submitted for publication in the Cornell University Short CUTT turfgrass newsletter.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in 2005. In addition, the STL staff also provided tours for several master gardener programs and for the fall and spring undergraduate soils courses. Dr. Murphy served as the dean's representative to the State Soil Conservation Committee. Mr. Buckley and Ms. Tirpak are members of the Cooperative Agricultural Pest Survey (CAPS) team.

Competitive External Grants

Dr. Murphy participated as a co-principle in two external grants: Longer Term Assessment of Putting Green Root Mixes Under Two Microenvironments, and Assessing the Quality of Selected Soils from the Piedmont and Coastal Plain Regions of New Jersey.

Mr. Buckley participated as a co-principle in three external grants: Long-term Evaluation and Improvement of Golf Turf Management Systems with Reduced Chemical Pesticide Inputs; Sudden Oak Death and Asian Longhorn Beetle Educational CD-Rom; and Regional Center Plant Diagnostic Facility.

Marketing

An advertising brochure was developed by the PDL in 1992 for general distribution at county offices, grower meetings, and other activities. This brochure briefly describes the services of the PDL and how to

access them. To date, well over 30,000 copies of this brochure have been distributed. Similar marketing media have been developed by the STL and extensively distributed. Once again, we give our special thanks to the Office of Continuing Professional Education, which 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. The display is part of the RCRE Resource Center mobile marketing unit. This display briefly describes the services of the laboratories and how to access them, and is available on loan to anyone who wishes to advertise these services. The Resource Center has taken over the responsibility of representing the laboratory with the display unit at fairs, trade shows, and other events. This initiative brought the display to many programs including Ag Field Day, the Rutgers Gardens Open House, Turf Field Day, and the NJ Turf Expo.

In 2005, the PDL and the New Jersey Turfgrass Association formed an advocacy alliance. The PDL and STL supply new members of NJTA with discount services in return for print ads in the NJTA publication "Greenerside."

Funding

The plant diagnostic and soil testing laboratories are expected to recover all costs and be self-supporting. For the PDL, income is generated by charging clientele for diagnostic services and educational activities. In the Soil Testing Laboratory, charging clientele for soil analysis and educational activities generates funding for the laboratory. Grant activity and cost sharing arrangements also provide some degree of funding. The current laboratory fee schedules are reported in Appendix 1. For fiscal year 2006-2007, we expect to see considerable increases in submission fees. In 2005, over $360,671.00 was generated from all Soil and Plant Testing Laboratory activities. This figure represents a slight decline in total revenues from 2004; however, income from sample submissions for both laboratories alone increased by 9% from 2004. The decline in total revenues was simply due to a loss of University support for the STL technician. Income generated from all laboratory activities easily covered 100% of the non-salary expenses incurred in 2005. When all expenses and real revenues are considered, the Soil and Plant Testing Services recovered 89% of all costs for the year.

A sample submission form and the appropriate payment accompanied the majority of samples received from residential clientele. A submission form accompanied most commercial samples; however, the majority of these submissions did not include payment. In most cases, commercial growers preferred to be sent a bill. Almost 100% of the clients billed have remitted payment. Furthermore, the laboratory continues to recover outstanding accounts from past years. Soil testing laboratory samples require payment at submission or when the submission bags are purchased in each county office. Monies collected in the county are passed to the laboratory accounts by check or internal transfer. Transfer of funds also paid for almost all of the plant and soil samples diagnosed or tested for research programs at Rutgers University.

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 also receives a number of direct requests for free service from the public. In many cases, letters are sent to the "Department of Agriculture" or to some other non-address. These requests for information eventually find their way to the appropriate laboratory. The PDL processed 133 "no charge" samples in 2005 (Table 13). These samples accounted for 6% of the samples processed. As per laboratory policy, volume discounts are provided to grant-funded projects and those samples submitted from Federal and State agencies. The "phantom income" generated from these discounts and the no-charge samples totals a modest $4,545.00 for 2005.

Table 13. PDL no-charge samples, 2005.

Client	Number of samples
RCRE County faculty/staff	73
RCRE specialist	8
Non-RCRE faculty/staff	11
Inadequate sample	18
Government agencies	4
Direct mail/walk-ins	19
Total	133

If response time is not a concern and there are more than ten samples, STL policy indicates research

samples can receive discounted testing. These samples are often set aside during busy periods with public samples. The discount is 50% for any test that regularly costs $6 or more. In 2005, researchers received $10,040.00 in sample discounts.

When research and volume discounts in the form of "phantom income" are added to the total revenue and expense picture, the combined service units generated 92% of their total operational costs in 2005. A complete break out of all PDL and STL revenues and expenses is included in Appendix 2 of the unabridged copies of this report.

Future Directions

As in the past, the top priority for 2006 will be to generate more income. To accomplish this, we will continue to advertise laboratory services at trade shows, field days, fairs, and educational programs. A multimedia advertising campaign is being developed to advertise laboratory services to various clientele by print, direct mail and flash marketing techniques. Print ads are being developed for publication in grower and professional journals. Laboratory staff will be participating in several cost sharing grant activities in 2006. These efforts and our continued cooperation with the Office of Continuing Professional Education are expected to generate additional funds.

Increasing advertising and awareness of laboratory services should bring increasing numbers of samples. Even with increased sample numbers, it will be necessary to increase most testing fees in 2006 to cover the increasing costs of business. The new fee schedule is scheduled to take effect on July 1, 2006.

We anticipate spending a considerable amount of time integrating soil testing operations with the PDL. The STL will continue to upgrade and evaluate the testing procedures and equipment needs. Reporting, sample submission policy, pricing, and test availability are being evaluated with input of a committee of interested RCRE faculty for both the PDL and the STL. We are constantly evaluating the immediate and future needs of the State for additional services. Your suggestions are welcome.

National Plant Diagnostic Network

In 2003, the PDL was invited to participate in the National Plant Diagnostic Network (NPDN). The NPDN is a coordinated network of plant diagnostic laboratories from land grant universities. The network will provide a cohesive distribution system to quickly detect pests and pathogens that have been deliberately or unintentionally introduced into agricultural and natural ecosystems. It is designed to be a key part of our homeland security effort to protect agriculture in the nation. Advantages of joining the system include rapid evaluation and reporting of potential bioterrorist threats and other high consequence diseases or pest problems; rapid response time for diagnosis; formal association of diagnostic labs within the NPDN; improved links with Federal and State regulatory agencies; and improved quality and uniformity of information associated with sample submission and reporting. The USDA provided grant monies as incentive to participate.

Northeast Plant Diagnostic Network

The Northeast Plant Diagnostic Network (NEPDN) is the regional part of the National Plant Diagnostic Network that focuses on regional concerns regarding plant diseases and insect pests. The regional center for the NEPDN is Cornell University. The Rutgers PDL has been identified as a cooperating institution and intends to participate as a subcontractor to the regional center at Cornell. Grant monies provided by the USDA through the NEPDN were used in 2005 to purchase equipment and supplies to upgrade the laboratory's capability for accurate and timely diagnosis of plant problems. A biohazard safety hood, computers, and a real time PCR machine were purchased with the funds. The equipment upgrades will allow for improved communication with our local stakeholders and those cooperators and experts in the northeast regional and national networks. The capacity for improved communication will facilitate the rapid dissemination of information concerning current plant disease and insect pest activity. The new equipment and upgrades in technology will also provide the means to create modern educational resources for use in local and regional training programs. Grant monies received for 2006 will be used to continue to upgrade laboratory capability to handle pathogens of consequence and other biohazards; attend training programs for insect and disease identification; hire labor to enter data into the National Plant Disease Information System; and train Master Gardeners as first detectors.

First Detector Training Program

Local implementation of NPDN programming is to inform various stakeholders with a series of First Detector training sessions. First Detector training involves three core modules of information that provide

a standard baseline of knowledge for all NPDN cooperators nationwide. First Detectors are those who may be the first to notice a pathogen of consequence, and the training exposes the attendees to the processes involved in the series of diagnostic events and notifications that trigger the regulatory responses necessary to contain and eradicate a target pest or pathogen. First detectors are defined as any person–private, commercial, university, or government–involved in plant growth and protection who has participated in the training program. The training modules include the following: Module 1. Mission of the NPDN; Module 2. Monitoring for high risk pests; and Module 3. Quality sample submission. There is a pre- and post-test to assess the quality of the information transfer. Trainees are then registered in a national repository.

Our initial First Detector training program was held May 10, 2005, as part of the yearly Master Gardener Helpline Training Program. The program was held at EcoComplex in Bordentown and was attended by 163 Master Gardeners. Subsequent programs followed at RCRE field stations in Gloucester County on June 9, 2005, which trained 37 Master Gardeners, and at Monmouth County on September 19, 2005, that was attended by 59 more Master Gardeners. A fourth program was held for 32 Master Gardeners on July 18, 2005, at Morris County College. The total number of volunteers trained as First Detectors was 291, which was the most of any state in the Northeast Plant Diagnostic Network. Several training programs are scheduled for 2006.

Appendix 1. Fees

Table A1.1 2005 PDL Fee Schedule:

Most samples (except fine turf):
- $30 instate
- $75 out-of-state

Fine and sports turf:

Instate:
- $65 per sample
- $100 disease and nematode assay

Out-of-state:
- $95 per sample
- $150 disease and nematode assay

Nematode assay:
- $20 instate (except fine turf)
- $50 instate (fine turf)
- $75 out-of-state fine turf

Fungus and mold identification:

Instate:
- $30 microscope identification
- $60 culture identification

Out-of-state:
- $75 microscope identification
- $100 culture identification

Insect identification:
- $30 instate residential
- $40 instate commercial
- $75 out-of-state

Plant and weed identification:
- $30 instate
- $75 out-of-state

Special tests:

Fungicide resistance screening:
- $100 instate
- $150 out-of-state

V*irus screening:*
- $75 instate
- $100 out-of-state

Endophyte screening:
- $75 instate
- $100 out-of-state

Other services negotiable. Contracts and volume discounts are available.

Table A1.2 2005 STL Fee Schedule:

Landscape

Level 1	Fertility Test: Nutrients, pH, recommendations	$10
Level 2	Problem Solver (soil/plant suitability test): Nutrients, pH, soluble salt level, organic matter content, soil textural class, recommendations	$25
Level 3	Topsoil Evaluation: Nutrients, pH, soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content, recommendations	$45

Greenhouse

	Saturated (Organic) Media Extract Analysis: Nutrients, pH, electrical conductivity, inorganic nitrogen	$20

Appendix 1, continued.

Sport Turf

Level 1	Fertility Test: Nutrients, pH, estimated CEC & cation saturation, recommendations	$10
Level 2	Complete Test: Nutrients, pH, estimated CEC & cation saturation, soluble salt level, organic matter* content, soil textural class, recommendations	$25
Level 3	Sand Root Zone Test: Nutrients, pH, estimated CEC & cation saturation, recommendations, soluble salt level, organic matter* content, percentage fines	$30

*Organic matter content would be determined by Loss-on-ignition for golf course greens, as described by USGA guidelines.

Engineering

Level 1	Permeability Class Rating: Percentages sand/silt/clay, sieve analysis of sand, gravel content	$50
Level 2	Topsoil Evaluation: Fertility, pH, soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content	$45
Level 3	Boring/Excavation Material Test: Acid-producing soil test	$10
Level 4	Ecological Research Test: Nutrients, pH, estimated CEC & cation saturation, soluble salts, organic matter content, percentages of sand/silt/clay, soil textural class, TKN, Inorganic N	$60

Individual Special Soil Tests ("ala carte")

Soil pH and Lime Requirement Only	$5
Soluble Salt Test	$5
Soil Organic Matter Content	$10
Soil Texture (sand/silt/clay %)	$20
USDA Sieve Analysis of Sand	$35
Inorganic Nitrogen	$10
Total (Kjeldahl) Nitrogen	$12
Cation Exchange Capacity	$30
CEC & Exchangeable Cations	$45
Lead Screening by Mehlich 3	$10

Other Analyses

Water Analysis for Irrigation: pH, soluble salt content, Nitrate, P	$12
Plant Tissue Analysis: N, P, K, Ca, Mg, Cu, Mn, Zn, B, Fe, Mo	$30

Notes:

- "Nutrients" refers to P, K, Ca, Mg, Cu, Mn, Zn, B, Fe.
- Cation saturation refers to calculated % of CEC for macronutrient cations: Ca, Mg, K.
- The pH test includes determination of lime requirement by Adams-Evans buffer.
- When not preceded by "percentages of sand/silt/clay," "soil textural class" refers to texture by feel (qualitative).

Appendix 2. Soil and Plant Testing Budgets

Table A2.1. Approximate expenses, 2005.

Salaries and benefits	
(full and part time staff)	$291,687.00
Supplies and services	
Diagnostic and testing supplies	
Printing and advertising	
References	
Rentals	
Equipment maintenance	
Office supplies	
Credit card fees	53,275.00
Capital equipment	
Real time PCR machine	
Computers	
Biohazard Safety Hood	
Sieve Shakers	50,925.00
Communications	
Telephone/fax	
Postage	7,231.00
Travel	
Paid talks and professional meetings	2,565.00
Total operating costs	$405,683.00

Table A2.2. Approximate income, 2005.

Sample fees	
PDL	$92,970.00
STL	190,240.00
Lecture fees	
OCPE and other honoraria	18,567.00
Grants and contracts	
RCRE Fruit IPM	1,665.00
NEPDN	30,500.00
Cost Recovery	
Technician salary and benefit	26,729.00
Phantom Income	
No-charge request	<3,990.00>
Fruit IPM discount	<555.00>
STL research discount	<10,040.00>
Total potential income	$375,256.00
Total actual income	$360,671.00

Table A2.3. Estimated expenses, 2006.

Salary and benefit costs	$350,000.00
Operating costs	70,000.00
Communications, marketing and travel	15,000.00
Total potential cost 2005	$435,000.00

Table A2.4. Estimated income, 2006.

Plant Health Samples	
2000 @ $65 average fee per sample	$130,000.00
Soil Analysis	
12,500 @ $20 average fee per sample	250,000.00
Lecture fees	
OCPE and other honoraria	20,000.00
Cost recovery	
Grant and contracts	35,000.00
Total potential income 2005	$435,000.00

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Coordinator, 2005.

Date	Title	Audience	Location	Partici-pants[1]
1-3/05	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook College	T
1-3/05	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook College	T
1-3/05	Principles of Pest Control on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook College	T
1-3/05	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook College	T
1/4/05	Leaf Feeding Insects of NJ Shade Trees (1 h)	North Jersey Ornamental Horticulture Conf.	Morris County	A,L
1/5/05	Diseases and Pests of Rhododendron (1 h)	North Jersey Ornamental Horticulture Conf.	Morris County	A,L
1/13/05	Basic Turf Disease: Pick Your Best Defense (1.5 h)	Prof. Landscape Grounds Mgmt. Short Course	Cook College	A,L,T
1/13/05	Leaf Feeding Insects in Turf (1 h)	Prof. Landscape Grounds Mgmt. Short Course	Cook College	A,L,T
1/18/05	Basic Turf Diseases (1.5 h)	Landscape IPM Short Course	Cook College	L,T
1/18/05	Diagnosing Plant Problems (1.5 h)	Landscape IPM Short Course	Cook College	L,T
1/20/05	Basic Turf Diseases (2 h)	Pest Mgmt. Landscape Turf Short Course	Cook College	L,T
1/21/05	Turfgrass IPM Practice (3 h)	Professional Golf Turf Management School: Three Week Course	Cook College	T
1/27/05	Diagnosing Diseases of Ornamental Plants (1.5 h)	Pest Mgmt. Ornamental Landscape Plants	Cook College	A,L,T
1/27/05	Basic Turf Disease: Pick Your Best Defense (1.5h)	Professional Certified Applicators of Long Island	Ronkonkama, NY	A,L,T
1/28/05	The Complete Turf Disease for Golf Courses (6 h)	Professional Golf Turf Management School: Three Week Course	Cook College	T
2/1/05	*Poa annua* and the Triumvirate of Evil (1 h)	Fisher and Sons, Inc. Winter Turf Seminar	Springfield, VA	I,T
2/2/05	*Poa annua* and the Triumvirate of Evil (1 h)	Fisher and Sons, Inc. Winter Turf Seminar	Milford, DE	I,T
2/3/05	Understanding White Grubs in Turfgrass (1 h)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
2/17/05	Molds, Mildews, and Rusts (1 h)	New Jersey Flower Show	Middlesex County	H
2/22/05	Basic Turf Diseases: Pick Your Best Defense (1 h)	Lesco, Inc. Winter Turf Seminar	Monmouth County	L,T
2/23/05	Basic Turf Diseases: Pick Your Best Defense (1 h)	Managing Landscapes Organically	Ronkonkama, NY	L,T
2/24/05	Basic Turf Diseases: Pick Your Best Defense (1 h)	Athletic Field Construction Short Course	Cook College	T
2/24/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Monmouth County	H
3/1/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Atlantic County	H
3/2/05	Understanding White Grubs in Turfgrass (1 h)	Brooklyn Landscape Gardeners Assn. Meeting	New York, NY	A,L,T
3/11/05	The Complete Turf Disease (6 h)	Advanced Turf Disease Mgmt. Short Course	Cook College	I,L,T
3/16/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Gloucester/ Camden County	H
3/17/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Ocean County	H
3/21/05	Key Pests of Landscape Plants (2 h)	Master Gardener Training	Morris County	H
3/23/05	Diagnosing Plant Problems (1.5 h)	Greenhouse Crop Production (11:776:321)	Cook College	C

Table A3.1. (continued).

Date	Title	Audience	Location	Partici-pant
3/24/05	Key Pests of Landscape Plants (3 h)	Master Gardener Training	Ocean County	H
3/30/05	Diagnosing Plant Problems (1.5 h)	General Plant Pathology (11:770:301)	Cook College	C
4/7/05	Diseases of Trees and Shrubs (3 h)	Master Gardener Training	Ocean County	H
4/9/05	Diseases of Shade Trees (2 h)	Certified Tree Expert Training Program	Cook College	A,L
4/14/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Passaic County	H
4/21/05	Key Pests of Landscape Plants (3 h)	Master Gardener Training	Monmouth County	H
5/10/05	NPDN: First Detector Training (3h)	Master Gardener Helpline Training	Burlington County	H
5/24/05	Hands On Disease and Insect Pest ID (2 h)	Master Gardener Training Essex County	Cook College	H
6/9/05	NPDN: First Detector Training (3h)	Master Gardener Helpline Training	Gloucester County	H
7/22/05	NPDN: First Detector Training (3h)	Master Gardener Helpline Training	Morris County	H
8/4/05	Trends in Turf Disease Control (1.5h)	Lawn & Landscape Weed and Insect Seminar	Cleveland, OH	L,T
8/24/05	Nursery Disease Diagnostic Clinic (0.5 h)	Cream Ridge Nursery Growers Meeting	Burlington County	N
9/19/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Morris County	H
10/1/05	Pests and Diseases in Greenhouse Crops (1 h)	Annual Master Gardeners Conference	Cook College	H
7/22/05	NPDN: First Detector Training (3h)	Master Gardener Helpline Training	Monmouth County	H
10/20/05	Ornamental Diseases (1 h)	Emergency Pesticide Recert. Short Course	Cook College	A,T,L
10/20/05	Reducing Turf Disease Through Culture (1 h)	Emergency Pesticide Recert. Short Course	Cook College	A,T,L
10/25/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Union County	H
10/28/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Middlesex County	H
11/4/05	Basic Turf Disease: Pick Your Best Defense (1.5 h)	PLANET Green Industry Conference	Orlando, FL	L,T
11/8/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Essex County	H
11/9/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Essex County	H
11/17/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Somerset County	H
12/1/05	2005 Landscape Disease Review (.5 h)	South Jersey Landscape Conference	Gloucester County	I,L,N
12/6/05	2005 Turf Disease and Insect Review (1.5 h)	New Jersey Turf Expo	Atlantic County	I,L,T
12/8/05	Diagnosing Plant Problems (3 h)	Master Gardener Training	Mercer County	H
10-12/05	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook College	T
10-12/05	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook College	T
10-12/05	Principles of Pest Control on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook College	T
10-12/05	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook College	T

[1]Audience Addressed: A=Arborists; C=College (Academic); G=Greenhouse; H=Residential Clientele; I=Industry; L=Landscape Professionals; N=Nursery Growers; T=Turfgrass Managers; X=Christmas Tree Growers

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, 2005.

Date	Title	Audience	Location	Partici-pants[1]
1-3/05	Turf Disease Laboratory (10 lectures)	Professional Golf Turf Management School	Cook College	T
1-3/05	Turf Insect Laboratory (10 lectures)	Professional Golf Turf Management School	Cook College	T
1/26/05	Key Pest of Landscape Plants (1.5 h)	Professional Parks Management School	Cook College	L,T
1/27/05	Disease Detection Techniques (0.25 h)	Managing Diseases of Orn. Landscape Plants	Cook College	A,L,G,N
2/1/05	Laboratory Tour (.5 h)	Professional Golf Turf Management School: Three Week Course	Cook College	T
3/11/05	Insects in the Classroom (2 h)	Livingston Park Elementary School	Middlesex County	H
3/24/05	Household Insects (3 h)	Master Gardener Training	Monmouth County	H
4/5/05	Household Insects (3 h)	Master Gardener Training	Ocean County	H
5/24/05	Insects in the Classroom (2 h)	Ethel McKnight Elementary School	Mercer County	H
10-12/05	Turf Disease Laboratory (10 lectures)	Professional Golf Turf Management School	Cook College	T
10-12/05	Turf Insect Laboratory (10 lectures)	Professional Golf Turf Management School	Cook College	T

[1]Audience Addressed: A=Arborists; C=College (Academic); G=Greenhouse; H=Residential Clientele; I=Industry; L=Landscape Professionals; N=Nursery Growers; T=Turfgrass Managers; X=Christmas Tree Growers; V=Vegetable Growers

Table A3.3. Complete listing of lectures presented by Dr. Stephanie Murphy, STL Coordinator, 2005.

Date	Title	Audience	Location	Partici-pants[1]
1/5/05	Exercises in Soil Testing (1.5 h)	Soil and Plant Relationships Short Course	Cook College	L, N, T
1/11/05	Soil Testing: Interpretations and Relationships to Productivity	Vegetable Growers Of NJ Annual Meeting	Atlantic County	I,V
2/1/05	Water Movement in Soil (1.5 h)	Water Mgmt. and Drainage Short Course	Cook College	I, L
2/3/05	Understanding Soils for Best Management (3 h)	Master Gardener Training	Camden County	H
2/15/05	Soils and the Environment (3 h)	Environmental Stewardship Training	Gloucester County	H
2/17/05	Soils and the Environment (3 h)	Environmental Stewardship Training	Essex County	H
3/29/05	Soil Physical Properties (1 h)	Athletic Field Maintenance and Construction SC	Cook College	T
5/11/05	Soil Physical Properties (1 h)	Wastewater Treatment Short Course	Cook College	T
9/17/05	Soil and Plant Relationships (1 h)	Home Gardeners School	Cook College	H

Table A3.3. (continued).

Date	Title	Audience	Location	Partici-pants[1]
10/17/05	Soil Physical Properties (3 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook College	E,Co,Hf
10/18/05	Water Movement in Soil (3 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook College	E,Co,Hf
10/24/05	Field Exercises: Writing a Soil Log (3 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook College	E,Co,Hf
10/25/05	Field Exercises: Writing a Soil Log (3 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook College	E,Co,Hf
11/10/05	Soil Testing (1 h)	Soils and Society (11:375:102)	Cook College	C
12/8/05	Understanding Your Soil Test Report (.5 h)	NJ Turf Association Expo	Atlantic County	I,L,T

[1]Audience Addressed: A=Arborists; C=College (Academic); Co=Construction; E=Engineers; G=Greenhouse; H=Residential Clientele; Hf=Health Officers; I=Industry; L=Landscape Professionals; N=Nursery Growers; T=Turfgrass Managers; X=Christmas Tree Growers

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