RUTGERS
New Jersey Agricultural Experiment Station

Rutgers Soil Testing and Plant Diagnostic Services

2007/2008 Fiscal Year Report

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2007/2008 Fiscal Year
Rutgers Soil Testing and Plant Diagnostic Services
Annual Report

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Introduction

Rutgers Soil Testing and Plant Diagnostic Services are provided by Rutgers Cooperative Extension (RCE), the outreach component of the New Jersey Agricultural Experiment Station (NJAES) and School of Environmental and Biological Sciences (SEBS). Located on the Cook 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 2007/2008 fiscal 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 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 90,000 soil samples for nutrient analysis and continues to serve an integral role in soil nutrient management for the public and for RCE programs. In January 2006, the laboratory moved into the Administrative Services Building II on US Route 1 in New Brunswick.

The Rutgers Plant Diagnostic Laboratory and Nematode Detection Service

The Rutgers Plant Diagnostic Laboratory (PDL) was established in 1991 by the dedicated efforts of RCE 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 31,700 samples submitted for plant problem diagnosis, nematode analysis, or identification. The laboratory has become an integral part of RCE and SEBS/NJAES programs by providing diagnostic and educational services and by assisting with research.

The RCE Resource Center

In 1998, the RCE 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 has guided the administrative functions of the program until 2006. In 2006, the RCE Resource Center was renamed the Office of Communications and transferred to SEBS. Soil Testing and Plant Diagnostic Services was subsequently assigned to the NJAES under the administration of Jack Rabin.

Staff and Cooperators

PDL

Mr. Richard Buckley is the director of Soil Testing and Plant Diagnostic Services. He has been the manager of the PDL since 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 the PDL.

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, an 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 structure with plant roots. Dr. Murphy is responsible for the day-to-day operations of the STL.

Mr. Steve Griglak, Principal 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.

Ms. Terriann DiLalo has been a part-time administrative assistant for the STL since 2002 and also assists the PDL with its administrative functions.

Ms. Loren Muldowney, Laboratory Assistant, began working in the STL in the spring of 2007. She earned a B.A. in Biochemistry from Rutgers University and an M.S. in Environmental Sciences under the program option Soils and Water, also at Rutgers. Following several years of clinical laboratory experience in biochemistry, she worked as a field soil scientist responsible for site evaluations, laboratory and on-site permeability testing, wetland identification, and permit applications. She performs routine testing and is working to document laboratory methods as adapted to the needs of STL clientele.

Other Support

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 SEBS 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 Rutgers Office of Continuing Professional Education for their support and assistance with our educational programming, and we cannot forget the other members of the SEBS/NJAES Office of Communications 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 RCE 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 served" 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 RCE website. Soil samples can be submitted in soil test kits available for purchase from RCE County 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 the 2007/2008 fiscal year (FY08), the PDL examined 2093 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 25% decrease (or 702 samples) from FY07. The decrease in sample submissions was an across-the-board decrease in samples of all types. Good weather for turfgrass, a mild winter, ample rainfall, and a slowing economy can all be counted as contributing factors. 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 despite the slow down, 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 (1284 or 61%) were plant samples submitted for diagnosis. Twenty-eight percent (576) of the samples were for nematode analysis, and 11% or 233 samples were insect, mold, or plant identifications.

In Table 3. samples submitted to the laboratory are presented by origin. In FY08, 80% of the plant submissions were from commercial growers, 9% were from residential clientele, and 11% were submitted by research faculty at Rutgers University. This distribution is roughly consistent with other years; however, residential and research sample submissions declined significantly as a percentage of the total. Again, we feel these declines reflect the current state of the economy as research dollars shrink and disposable income disappears. Commercial plant managers benefit most from our services and are willing to pay the fees, thus they submit the most samples to the laboratory.

In FY08, 68% of samples requesting identification were from commercial clients, and 30% 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, 54% were requested by commercial clients and 45% were from research. We expect that the number of nematode samples submitted from residential clients (2) will remain low since much of this clientele is not familiar with nematode pests.

Table 1. PDL sample submissions by month, Fiscal 2004 to- Fiscal 2008.

Month	FY04	FY05	FY06	FY07	FY08
July	442	355	418	489	320
August	347	260	362	622	494
September	417	353	288	404	265
October	211	520	157	280	276
November	233	80	90	86	123
December	15	54	107	184	51
January	31	30	41	36	29
February	24	25	23	13	40
March	76	64	75	84	20
April	582	120	235	72	105
May	374	182	279	241	124
June	430	317	317	284	246
Total	3182	2360	2392	2795	2093

Table 2. PDL sample submissions by sample type, Fiscal 2008.

Sample Type	Number of samples	%
Plant samples	1284	61
Nematode assay	576	28
Insect, weed, and fungus identification	233	11
Total	2093	100

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 (88%) 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 who 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 RCE 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 that sample submissions from traditional agricultural crops will continue to increase in future years.

Traditionally, 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. A great majority of the nematode samples in FY08 were submitted to the laboratory through the Fruit IPM

Table 3. PDL sample submissions by origin, Fiscal 2008.

	Plant		Nematode		Identification	
Origin	number	%	number	%	number	%
Commercial	1025	80	309	54	159	68
Residential	120	9	9	2	71	30
Research	139	11	258	45	3	1
Total	1284	100	576	100	233	100

Table 4. PDL sample submissions by crop category, Fiscal 2008.

	Plant samples		Nematode samples	
Crop	Number	%	Number	%
Turf	587	46	134	23
Ornamentals	539	42	1	0
Field crops	8	1	5	1
Vegetable	135	10	4	1
Fruit	15	1	432	75
Total	1284	100	576	100

program from peach, apple, and blueberry growers. Dr. Peter Oudemans also submitted several hundred samples from blueberry crops for NJAES and USDA sponsored research programs. We hope to see several hundred more in the coming seasons. Golf turf represents all of the nematode samples from turfgrass clientele. Although the numbers are significant, there has been a waning interest in nematode detection on golf turf that started in 2002. Problems in golf turf, particularly with nematodes, are more severe during seasons with considerable heat and drought stress, which was not the case last season.

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. The probable explanation for this tis that 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. 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 staff in those offices. To some degree, the profile also identifies county faculty and programs that promote and utilize PDL services.

Approximately 17% of the samples submitted for diagnosis to the laboratory were from out-of-state. Nearly all of these samples were turf. In fact, nearly 60% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 17 states. Several turf samples were from states as far away as Florida, Washington, Arizona, and California. New York, Pennsylvania, and Connecticut provide the largest totals. Because of his national reputation and

Table 5. PDL samples submitted by county, Fiscal 2004 to- Fiscal 2008.

In-state	FY04	FY05	FY06	FY07	FY08
Atlantic	177	84	196	181	186
Bergen	197	72	90	94	74
Burlington	166	106	214	454	232
Camden	53	39	38	74	41
Cape May	64	33	26	37	26
Cumberland	191	41	73	27	66
Essex	59	48	40	50	43
Gloucester	82	25	47	56	41
Hudson	10	7	10	6	11
Hunterdon	42	49	36	117	143
Mercer	105	349	103	244	76
Middlesex	351	327	193	258	148
Monmouth	325	151	179	110	88
Morris	131	124	169	199	176
Ocean	95	60	90	69	37
Passaic	49	21	34	23	12
Salem	27	21	31	12	7
Somerset	294	200	112	91	73
Sussex	18	18	14	60	34
Union	85	40	73	65	39
Warren	54	35	28	133	101
RU research	175	146	105	69	79
In-state total	2750	1996	1901	2429	1733
Out-of-state	432	364	491	366	360
Total	3182	2360	2392	2795	2093

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 potential 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, 33% 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 24% of the laboratory diagnoses. Insect pest damage was diagnosed on 5% of the submissions. Identifications comprised 10% of the total number of samples submitted; of these, 8% were arthropods, 1% were fungi, and 1% were weeds. Nematode detection was the other 28% 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 several 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 identifications decreased; however, in FY08, which is in stride with the overall trend of declining sample submissions in the lab. Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses decreased in FY08 as well. 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, Fiscal 2008.

Diagnosis	Number of samples	%
Disease (biotic)	682	33
Disease (abiotic)	490	24
Insect pest	112	5
Nematode	576	28
Arthropod identification	168	8
Fungus identification	29	1
Plant identification	36	1
Total	2093	100

Table 7. PDL sample response time, Fiscal 2008.

Response Time	Number of samples	%
0 to 3 days	1861	89
4 to 6 days	169	8
7 to 10 days	40	2
11 to 21 days	16	0.5
>21 days	7	0.5
Total	2093	100

In Fiscal 2008, a laboratory response was prepared in less than three days for most (89%) 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 9,206 samples for soil fertility and physical analysis in Fiscal 2008 (Table 8). The total laboratory output increased 6% from FY07 (8590 samples). Sample submission totals were highest in early spring in anticipation of the growing season and again in August when laboratory clientele are preparing for fall lawn fertilization. During the rest of the year, sample submissions remained relatively steady, except for the sharp decrease 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 Fiscale 2008 (Table 9), 72% were for the standard soil analysis (level 1) only and 28% included requests for additional special tests.

In Fiscal 2008, soil samples from residential clientele represented 38% 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,

Table 8. STL soil sample submissions by month, Fiscal 2005 to- Fiscal 2008.

Month	FY05	FY06	FY07	FY08
July	561	886	672	699
August	768	1275	725	1148
September	786	854	776	798
October	761	640	802	767
November	621	994	587	363
December	392	538	366	247
January	241	556	680	349
February	395	508	317	358
March	831	1451	987	1053
April	1543	1296	1154	1817
May	840	873	946	934
June	1253	762	578	673
Total	8992	10633	8590	9206

represented 31% of the total. Samples from engineering firms comprised 11% of the workload, another 14% of the samples were from research programs at Rutgers, and 3% were from local school districts and 3% from reference samples, respectively. In the past, samples from residential clientele largely dominated laboratory submissions; however, recent growth in samples from commercial growers indicates a turn toward a professional client base.

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 RCE 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

Table 9. STL soil sample submissions by test type, Fiscal 2008.

Test type	Number of samples	%
Standard level 1	6631	72
Special tests	2575	28
Total	9206	100

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.

Figures 1 and 2 indicate the relative phosphorus and potassium content of the soil samples submitted for fertility analysis in FY08. High or very high levels of phosphorus were measured in 76% of the samples

Table 10. STL soil sample submissions by origin, Fiscal 2008.

Origin	Number of samples	%
Residential	3513	38
Engineering	1028	11
Commercial	2799	31
Research	1312	14
Government/school	239	3
Reference	315	3
Total	9206	100

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 products without benefit of soil tests. Turfgrass products vary in 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 less common in the market. It has become difficult to apply adequate nitrogen on turfgrass or residential gardens without over-application of phosphorus and potassium. More low-phosphorus fertilizers are becoming available; however, as new environmental regulations are enacted.

Table 11. STL soil sample submissions by county, Fiscal 2008.

County	Samples
Atlantic	262
Bergen	466
Burlington	429
Camden	204
Cape May	173
Cumberland	254
Essex	261
Gloucester	301
Hudson	45
Hunterdon	255
Mercer	522
Middlesex	912
Monmouth	655
Morris	438
Ocean	502
Passaic	165
Salem	7
Somerset	511
Sussex	170
Union	269
Warren	111
Reference	315
Unidentified	1979
Total	9206

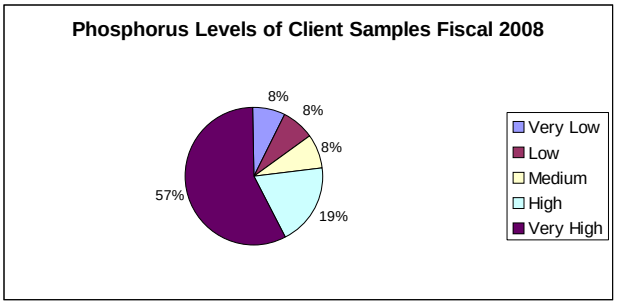

Figure 1. Phosphorus content in soil samples submitted in Fiscal 2008.

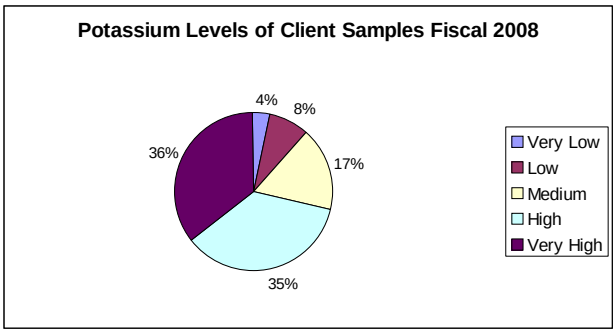

Figure 2. Potassium content in soil samples submitted in Fiscal 2008.

In Figure 3, the soil pH of soil samples submitted to the STL in FY08 is summarized in functional classes (based on plant suitability and recommendations). Percentages are based on the number of samples that were analyzed for pH (n=8928). The optimum pH range for most plants includes the moderately acidic class (pH 6.05 to 6.50) with 19% of samples, as well as the slightly acidic class (pH 6.55 to 6.95) with 15% of samples. The moderately acidic soils (pH 5.55 to 6.00) represented 17% 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 27% of samples in the very acidic class, pH 4.50 to 5.50, are well-suited for acid-loving plants; for other species, the soil must be limed. Extremely acidic samples (7%), pH <4.50, are not suitable for most plants; limestone application may have been recommended for these unless they were 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 analyzed soils were pH 7.0 to 7.50 (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

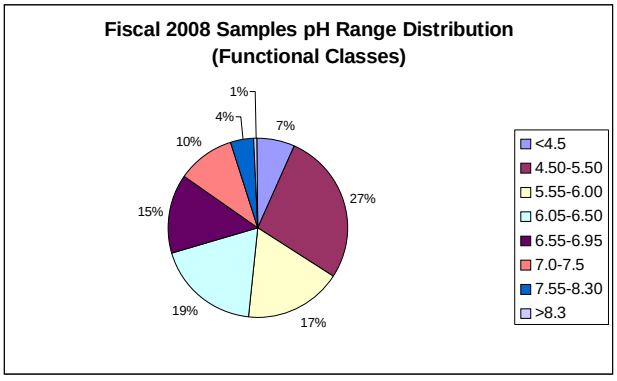

Figure 3. Soil pH of samples submitted in Fiscal 2008.

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 over time and with ammoniacal-nitrogen fertilizer application, no amendment for adjusting pH is given in this pH range unless for acid-loving plants. Samples with soil pH 7.55 to 8.30 (4%) 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 8.30, which can be explained only by high soluble salt content. Remediation is a longer term prospect with these situations, since the recommended acidification can temporarily exacerbate the salt problem.

In Fiscal 2008, the average response time for soil samples was 6.3 working days. On average 6.3 days is an improvement over Fiscal 2007 by 1.7 days. The overall improvement in response time is due primariy to the addition of Loren Muldowney as a full-time technician. 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 3.6 days in August to 12.2 during March. 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 direct current plasma spectrophotomether (DCP)used for nutritional analyses can only do so many samples in a given time, so the responses slow as the number of samples increase. The DCP was broken in March, which slowed us down more than usual this year. 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.

Table 12. STL sample response times by month and test type, Fiscal 2008.

Month	Number of standard (level 1) tests	Response time days	Number of special tests
July	418	4.4	257
August	942	3.6	206
September	576	5.5	222
October	511	6.3	256
November	267	5.0	96
December	190	4.8	57
January	240	4.3	109
February	264	4.3	94
March	802	12.2	251
April	1407	10.1	410
May	584	8.2	350
June	406	7.0	276
Total	6631	6.3	2575

Teaching

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

In Fiscal 2008, the laboratory staff participated in a number of short courses offered by the Office of Continuing Professional Education (OCPE). 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 and client developement source is essential for the success of the laboratory.

Mr. Buckley participated in several other OCPE short courses in FY08. These courses included: the Golf Turf Management School: Three Week Preparatory Course; Landscape Integrated Pest Management: An Intelligent Approach; Athletic Field Management School; the Emergency Pesticide Credit Recertification Short Course; and the FMC Corporate Training Program.

Dr. Murphy participated in the OCPE Home Gardeners School;Water Management and Drainage

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 15th 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 ninth time he coordinated that short course.

Mr. Buckley was an invited speaker in several RCE programs. The following programs were included: North Jersey Ornamental Horticulture Conference – Turf Day and Landscape Day and the Central Jersey Turf and Ornamentals Institute. Lectures in support of the Atlantic/Cape May, Camden, Cumberland, Gloucester, Essex, Mercer, Monmouth, Middlesex, Morris, Ocean, Somerset/Hunterdon, Union, and Passaic County Master Gardener Programs were also given. Ms. Tirpak presented programs in support of the Hudson, Essex, Monmouth, and Ocean County Master Gardeners. Dr. Murphy presented programs in support of the Ocean County Master Gardeners and the Environmental Stewardship programs in Burlington, Essex, and Somerset Counties, as well as, the Master Composters training in Monmouth County.

Mr. Buckley earned income as an invited speaker for the Tappan Zee Rhododendron Society, the Garden Club of New Jersey; the Brooklyn Landscape Gardeners Association Winter Meeting; Reed and Perrine Turf and Ornamentals Seminar; Pocono Turf Spring Turf Conference; South Jersey Landscape Association; the New Jersey Certified Tree Expert Training Program; NJAISA Tree Care Conference; Long Island Golf Course Superintendents Association; Northern Nurseries Open House; and the New Jersey Green Industry (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 the Plant Disease Clinic. Dr. Murphy was a guest lecturer in the undergraduate course Soils and Society.

Extension Publications

During FY08, 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 RCE and the NJAES. In 2007 and 2008, the articles submitted to the PPA were also submitted for publication in the Cornell University Short CUTT turfgrass newsletter. Mr. Buckley also contributed articles to the New Jersey Turfgrass Association quarterly newsletter, Greenerside.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in FY08. 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. She also participated the New Jersey Association of Conservation Districts Conference. Dr. Murphy proctored the FFA student land judging competition and the NJ Envirothon. Mr. Buckley and Ms. Tirpak are members of the Cooperative Agricultural Pest Survey (CAPS) team.

Competitive External Grants

Mr. Buckley participated as principle or a co-principal investigator in two external grants: Sudden Oak Death and Asian Longhorn Beetle Educational CD-Rom; and Regional Center Plant Diagnostic Facility.

Marketing

To help advertise laboratory services at grower meetings or other activities, a mobile display unit was developed as part of the University-wide brand identification initiative. Two sets of table-top and banner display units using the new Rutgers identity format were purchased, one of which serves as part of the SEBS/NJAES Office of Communications mobile marketing unit. This display briefly describes the services of the laboratories and how to access them. A set of folders and information cards match the displays. These display units are available on loan to anyone who wishes to advertise STPDL services. The laboratory staff is also willing to attend and staff a an exibit to explain laboratory services and sell soil test kits.

In FY08, this marketing initiative brought the display to the following programs: New Jersey Master Gardeners Association Fall Event; the New Jersey

Shade Tree Federation Annual Conference; the New Jersey Golf Course Superintendents Association Crystal Conference; the New Jersey Agribusiness Association Conference; the South Jersey Nursery and Landscape Conference; the New Jersey Green Industry (turf) Expo; North Jersey Ornamental Horticulture Symposium; New Jersey Vegetable Growers Association Meeting; the Northeast Organic Farming Association Annual Winter Meeting; Brooklyn Botanical Garden Plant O Rama, New Jersey Landscape Conference; New Jersey Flower Show; Sussex Flower Show; OCPE Home Gardeners School; Ag Field Day; the Rutgers Gardens Open House; Turf Field Day; and the NJTA Turf Research Classic. We are also attending the Rutgers Farmers Market each Friday this summer (2008).

In 2006, 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. Income is generated by charging clientele for diagnostic services and educational activities. Grant activity and cost-sharing arrangements also provide some degree of funding. Laboratory fees increased on July 1, 2006. Current fee schedules are reported in Appendix 1. In FY08, $417,928.74 was generated from all Soil and Plant Testing Laboratory activities. This figure represents a decrease of $537 from calender year 2006. Income generated from all laboratory activities easily covered 100% of the non-salary expenses incurred in FY08. When all expenses and real revenues are considered, the Soil and Plant Testing Services recovered 71% of all costs for the FY08.

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 soil test kits 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 vague address. These requests for information eventually find their way to the appropriate laboratory. The PDL processed 27 "no charge" samples in FY08 (Table 13). 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 $7,740.00 for FY08.

If response time is not a concern, STL policy indicates research samples can receive discounted testing. Large batches of research samples may be set aside during busy periods with public samples. The discount is 50%. In FY08, researchers received $13,733.75 in sample discounts. This policy has been discontinued in FY09.

Table 13. PDL no-charge samples, Fiscal 2008.

Client	Number of samples
RCE County faculty/staff	9
RCE specialist	8
Non-RCE faculty/staff	1
Direct mail/walk-ins	9
Total	27

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 75% of their total operational costs in FY08. A complete breakout 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 FY09 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. Laboratory staff will be participating in several cost-sharing grant activities in FY09. 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 may be necessary to increase some testing fees in FY09 to cover the increasing costs of business.

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 RCE 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 FY08 to pay salaries, participate in professional training programs and meetings, and to purchase equipment and supplies to upgrade the laboratory's capability for accurate and timely diagnosis of plant problems. Continuing to upgrade laboratory technology allows 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 FY09 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.

In July of 2007, the NEPDN published a five year accomplishments summary. Table 14 summarizes sample submission to each participating state laboratory. The New York State laboratory at Cornell handled the most samples in the region with 121,364. New Jersey was second in the region with 13,087. New York's data is exceptionally high because the Cornell laboratory serves as the Experiment Station and the State Department of Agriculture lab. Several other northeast states also combine their Experiment Station laboratories with their State Department of Agriculture laboratories. In New Jersey, our State Department of Agriculture laboratory is separate and does not report sample numbers to the NEPDN. During the period New York processed over 110,000 plum pox samples for the State Department of Agriculture. Removing those samples from the New York total makes the laboratory at Rutgers the busiest laboratory in the region, one that also serves more clientele than the combined Experiment Station and State Department laboratories for several surrounding states.

Table 14. Total samples processed by state NEPDN laboratories July 2002 to- July 2007.

State	Sample Numbers
Connecticut	6,223
Delaware	8,740
Maine	2,852
Massachusets	5,341
Maryland	5,794
New Hampshire	2,032
New Jersey	**13,087**
New York	121,364
Pennsylvania	9,738
Rhode Island	1,690
Vermont	450
West Virginia	721
Total	178,032

Ramapo Tomato Sale

In the spring of 2008, the New Jersey Agriculture Experiment Station revived the hybrid tomato variety "Ramapo." Retail sale of the seeds was conducted by Cindy Rovins and the staff of the STPDL. To date, we have processed 3,850 orders for 10,064 packets of seeds with a revenue of $43,147.00. Orders continue to trickle into the laboratory daily.

Appendix 1.

Plant Diagnostic Laboratory Fee Schedule effective July 1, 2006.

All fees are per sample.

Standard Sample (most samples except fine turf):

$40.00 in-state
$95.00 out-of-state

Fine and Sports Turf:

In-state:
$75.00 disease/insect diagnosis
$120.00 disease/insect diagnosis plus nematode assay*

Out-of state:
$95.00 disease/insect diagnosis
$170.00 disease/insect diagnosis plus nematode assay*

* Combination price applies only to samples from same green, field, etc.

Nematode Assay:

$30.00 in-state (except fine turf)
$60.00 in-state fine turf
$95.00 out-of-state

Fungus and Mold Identification:

$50.00 in-state microscope identification
$100.00 out-of-state microscope identification

Insect Identification:

$40.00 in-state
$95.00 out-of-state

Plant and Weed Identification:

$40.00 in-state
$95.00 out-of-state

Special Tests:

Fungicide resistance screening:
$350.00 per compound
- call ahead to discuss specifics

Virus screening:
$200.00 diagnostic screen
- individual test fee varies - call for pricing

Endophyte screening:
$75.00 in-state
$100.00 out-of-state

Other services negotiable. Contracts and volume discounts are available.
Fees are subject to change without notice.

Appendix 1. (continued).

Soil Testing Laboratory Fee Schedule effective July 1, 2006.

All fees are per sample.

Test or combination of tests	Fee	Description
Home Landscape & Garden		
Landscape Level 1, Soil Fertility	$15.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; interpretation and recommendations for limestone & fertilizer
Landscape Level 2, Enhanced Test	$35.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter, & texture by feel; interpretation and recommendations for limestone & fertilizer
Landscape Level 3, Topsoil Evaluation	$60.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter, textural analysis + gravel; interpretation and recommendations for limestone & fertilizer
Greenhouse/Organic media		
Growing Media Fertility	$35.00	*For all samples with >20% organic matter content* ; pH, phosphorus, potassium, calcium, magnesium, + 5 micronutrients by saturated media extract, soluble salts and inorganic nitrogen; interpretation
Commercial Growers' Fields		
Farm/Nursery Level 1, Soil Fertility	$15.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; estimated CEC and cation saturation; interpretation, recommendations from county agent
Farm/Nursery Level 2, Pre-sidedress nitrate test	$10.00	Nitrate only, *time-sensitive*
Farm/Nursery Level 3, Enhanced Test	$35.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients, inorganic nitrogen, organic matter; estimated CEC and cation saturation; interpretation, recommendations from county agent
Sports Turf		
Sports Turf Level 1, Soil Fertility	$15.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; estimated CEC and cation saturation; interpretation and recommendations for limestone & fertilizer
Sports Turf Level 2, Complete	$35.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter, texture by feel; estimated CEC & cation saturation; interpretation and recommendations for limestone & fertilizer
Sports Turf Level 3, Sand Root Zone	$40.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter by LOI, %fines; estimated CEC & cation saturation; interpretation and recommendations for limestone & fertilizer

Appendix 1. (continued).

Test or combination of tests	Fee	Description
Engineering Applications		
Engineering Level 1, Permeability Class Rating	$80.00	Textural analysis + Sieve analysis of sands, K value estimation
Engineering Level 2, Acid sulfide/Acid-producing potential	$20.00	pH before & after oxidation, qualitative sulfate evaluation, interpretation
Engineering Level 3, Topsoil Evaluation	$60.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter, textural analysis + gravel; interpretation and recommendations for limestone & fertilizer
Engineering Level 4, Ecological Research	$90.00	pH, Mehlich-3 extraction of phosphorus, potassium, calcium, magnesium, + 5 micronutrients; soluble salts, organic matter, textural analysis, inorganic nitrogen, total Kjeldahl nitrogen; estimated CEC & cation saturation; interpretation and recommendations
Individual soil tests		
pH only	$7.50	Acidity/alkalinity; interpretation & recommendation
Soluble salt level	$7.50	Electrical conductivity, interpretation
Soil organic matter (OM)	$12.50	Dichromate oxidation method for samples <10% OM
Loss-on-ignition OM (LOI)	$10.00	For samples >10% OM, or by spec
Soil textural (mechanical) analysis	$30.00	Sand, silt, & clay percentages; textural class
USDA Sieve Analysis	$50.00	Very coarse, coarse, medium, fine, & very fine fractions + gravel
Inorganic Nitrogen	$15.00	Nitrate-N and ammonium-N; immediately available fraction of N
Total Kjeldahl Nitrogen (TKN)	$15.00	Nitrogen predominantly in organic matter fraction; long term release of N
Cation Exchange Capacity (CEC)	$40.00	Cationic nutrient-holding capacity; function of clay + organic matter
CEC + Exchangeable Cations	$50.00	Cationic nutrient-holding capacity and cation saturation/distribution
Lead (Pb) Screening	$15.00	Mehlich-3 extraction of lead, estimated EPA value, interpretation
Other		
Water for irrigation analysis	$20.00	pH, soluble salts, nitrate-N, + phosphorus
Plant tissue analysis	$40.00	Total Kjeldahl Nitrogen, phosphorus, potassium, calcium, magnesium, copper, manganese, zinc, molybdenum, boron, iron
Plant tissue analysis, pre-ground samples	$35.00	$5 credit per sample for grinding
Fee Adjustments		
Express Processing	$50.00	per sample, turnaround will depend on tests and number of samples, includes FAXing of results
Rutgers University research	50% discount	Conditions: Research samples, non-priority turnaround status

Appendix 2. Plant and Soil Testing Budgets

Table A2.1. Approximate expenses, Fiscal 2008.

Salaries and benefits	
(full and part time staff)	$465,994.09
Supplies and services	
Diagnostic and testing supplies	
Printing and advertising	
Marketing banners	
References	
Rentals	
Equipment maintenance	
Office supplies	
Ramapo tomato seed	
Credit card fees	88,037.50
Capital equipment	
Block digestion system	
Computers	17,576.04
Communications	
Telephone/fax	
Postage	8,818.24
Travel	
Paid talks and professional meetings	3,208.87
Total operating costs	$583,634.74

Table A2.2. Approximate income, Fiscal 2008.

Sample fees	
PDL	$70,572.30
STL	228,462.05
Lecture fees	
OCPE and other honoraria	19,953.00
Grants and contracts	
RCE Fruit IPM	3,285.00
Ramapo Tomato Seed Sales	44,819.99
CAPS Survey	2,485.00
NEPDN	47,751.40
Phantom Income	
PDL No-charge request	<1,080.00>
PDL discounts	<6,660.00>
STL research discount	<13,733.75>
Total potential income	$439,402.49
Total actual income	$417,928.74

Table A2.3. Estimated expenses, Fiscal 2009.

Salary and benefit costs	$460,000.00
Operating costs	50,000.00
Communications, marketing and travel	15,000.00
Total potential cost FY09	$525,000.00

Table A2.4. Estimated income, Fiscal 2009.

Plant Health Samples	
2000 @ $50 average fee per sample	$100,000.00
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
Ramapo tomato sales	20,000.00
Total potential income FY09	$425,000.00

Appendix 3.

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, STPDS Director, fiscal 2007/2008.

Date	Title	Audience	Location	Partici-pants[1]
09/26/07	Soil Borne Diseases of Crop Plants (6h)	FMC Coorporate Training	Mercer County	I
09/29/07	Disease and Insects of the Ericaceae (1h)	Tappan Zee Rhododendron Society	Bergen County	H
10-12/07	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/07	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/07	IPM on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/07	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10/10/07	Diseases of Turf and Ornamentals (2h)	Emergency Pesticide Recert. Short Course	Cook Campus	A,T,L
10/18/07	Understanding Plant Disease and Garden Pests (2h)	Garden Club of New Jersey	Cook Campus	H
10/19/07	Diagnostics and Nematode Detection (3h)	General Plant Pathology (11:770:311)	Cook Campus	C
10/25/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Hunterdon County	H
10/26/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Middlesex County	H
10/30/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Union County	H
11/01/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Passaic County	H
12/04/07	Insects that Suck (1h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/04/07	Turfgrass Scouting Tools and Techniques (0.5h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/05/07	How I Spent My Summer Vacation (0.5h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/06/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Middlesex County	H
12/10/07	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Morris County	H
01-03/08	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/08	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/08	IPM on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/08	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01/08/08	Tips for Diagnosing Turf Disease (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/10/08	Insects That Suck (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/11/08	The Complete Turf Disease for Golf Courses (3h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/15/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Cumberland County	H
01/17/08	Diagnostic Tips for the Problem Lawn (1h)	Central Jersey Turf and Ornamentals Institute	Somerset County	A,L,T
01/18/08	The Complete Turf Disease for Golf Courses (3h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/22/08	Basic Turf Diseases: Pick Your Best Defense (1.5h)	Landscape IPM Short Course	Cook Campus	L,T

Appendix 3. (Continued)

Table A3.1. Complete listing of lectures presented by Richard J Buckley, STPDS Director, fiscal 2007/2008.

Date	Title	Audience	Location	Partici-pants[1]
01/22/08	Turfgrass IPM Practice (1.5h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
02/01/08	Basic Turf Diseases: Pick Your Best Defense (2h)	Pest Mgmt. Landscape Turf Short Course	Cook Campus	L,T
02/07/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Camden County	H
02/14/08	Basic Turf Diseases: Pick Your Best Defense (1.5h)	South Jersey Landscape Association	Atlantic County	A,L,T
02/19/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Atlantic County	H
02/20/08	Landscape Disease Update (1h)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
02/20/08	Basic Turf Diseases: Pick Your Best Defense (1h)	Athletic Field Construction Short Course	Cook Campus	T
02/27/08	Tips for Field Diagnosis of Turf Problems (2h)	Pocono Turf Conference	Horsham, PA	L,T
03/03/08	Problem Solving Tips for Turf Areas (2h)	Brooklyn Landscape Gardeners Assn. Meeting	New York, NY	A,L,T
03/06/08	Wee Beasties for 2008 (1h)	Garden State Tree Conference	Cook Campus	A
03/13/08	Tips for Field Diagnosis of Turf Problems (1h)	New Jersey Sod Growers Association	Middlesex County	L,T
03/18/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Monmouth County	H
03/12/08	The Complete Turf Disease (6h)	Advanced Turf Disease Mgmt. Short Course	Cook Campus	I,L,T
03/19/08	Common Diseases in NJ Landscapes (1h)	Master Gardener Training	Somerset County	H
03/20/08	Patch Disease Update (1.5h)	Long Island Golf Course Superintendents Assoc.	Oyster Bay, NY	T
04/02/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Essex County	H
04/07/08	Key Diseases in Landscape Plants (1h)	Interstate Ornamental Plant Management Conf.	Linthicum Heights, MD	A,L,T
04/12/08	Tree Disease Basics (1h)	Certified Tree Expert Training Program	Cook Campus	A,L
04/15/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Ocean County	H
04/17/08	Insect Pests in NJ Landscapes (3h)	Master Gardener Training	Ocean County	H
04/21/08	Insects That Suck (1h)	Master Gardener Training	Monmouth County	H
04/22/08	Common Diseases and Insects in NJ Landscapes (2h)	Northern Nurseries Open House	Burlington County	A,L
04/23/08	Common Diseases and Insects in NJ Landscapes (2h)	Northern Nurseries Open House	Somerset County	A,L
04/24/08	Insect Pests in New Jersey Landscapes (3h)	Master Gardener Training	Monmouth County	H
05/07/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Gloucester County	H
05/14/08	Insects are our Friends (4h)	Riverside Elementary School Science Day	Mercer County	H
05/15/08	Insects That Suck (1h)	Master Gardener Training	Ocean County	H
05/30/08	Insects That Suck (1h)	Master Gardener Training	Morris County	H

[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

Appendix 3. (continued).

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, fiscal 2007/2008.

Date	Title	Audience	Location	Partici-pants[1]
10-12/07	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/07	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
12/10/07	Household Insects (3h)	Master Gardener Training	Essex County	H
01/11/08	Insect Orders (3h)	Master Gardener Training	Essex County	H
01-03/08	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/08	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
03/06/08	Household Insects (3h)	Master Gardener Training	Monmouth County	H
04/21/08	Bees, Wasps, and Ground Nesting Bees, Oh My! (1h)	Master Gardener Training	Monmouth County	H
04/22/08	Household Insects (3h)	Master Gardener Training	Ocean County	H
05/14/08	Insects are Our Friends (4h)	Riverside Elementary School Science Day	Mercer County	H
05/15/08	Bees, Wasps, and Ground Nesting Bees, Oh My! (1h)	Master Gardener Training	Ocean County	H
05/30/08	Bees, Wasps, and Ground Nesting Bees, Oh My! (1h)	Master Gardener Training	Morris County	H

[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, fiscal 2007/2008.

Date	Title	Audience	Location	Partici-pants[1]
09-12/07	Soil Chemistry and Analysis	Advanced Special Problems in Env. Science (16:375:22366)	Cook Campus	C
10/09/07	Soil Texture and the Textural Triangle (.75 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/09/07	Coarse Fragments and Consistence (.5 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/09/07	Field Exercises: Soil Pit Descriptions (2h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/10/07	Soil Morphology and Treatment of Septic Effluent (.75 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf

Appendix 3. (continued).
Table A3.3. (continued).

Date	Title	Audience	Location	Partici-pants[1]
10/10/07	How Water Moves in Soil (.5 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/10/07	Field Exercises: Soil Pit Descriptions (2.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/16/07	Field Exercises: Soil Pit Descriptions (4 h)	Soil and Site Evaluation for Septic Systems Short Course	Burlington County	E,Co,Hf
10/17/07	Field Exercises: Soil Pit Descriptions (4 h)	Soil and Site Evaluation for Septic Systems Short Course	Morris County	E,Co,Hf
10/23/07	Soil Chemistry and Analysis (1.5 h)	Soil Fertility (11:776:440)	Cook Campus	C
11/08/07	Managing Soil Nutrients (1.5 h) -	Soils and Society (11:375:102)	Cook Campus	C
01/17/08	Exercises in Soil Sampling (1.5 h)	Soil and Plant Relationships Short Course	Cook Campus	L, N, T
01/28/08	Soils and the Environment (3 h)	Environmental Stewardship Training	Somerset County	H
01/31/08	Soils and the Environment (3 h)	Environmental Stewardship Training	Essex County	H
02/01/08	Soils and the Environment (3 h)	Environmental Stewardship Training	Burlington County	H
02/28/08	Understanding Soils for Best Management (3 h)	Master Gardener Training	Ocean County	H
03/15/08	Understanding Soil and Plant Relationships (1 h)	Home Gardeners School	Douglas Campus	H
03/25/08	How Water Moves in Soil (1h)	Water Management and Drainage Short Course	Cook Campus	E,Co,Hf
04/08/08	Soil Testing	Backyard Gardener with Tom Castronova	Cook Campus	H
05/29/08	Soils and Organic Matter (2.5h)	Master Composters Training	Monmouth County	H
06/24/08	Characterizing Soil in the Pits (1h)	Environment and Public Health Short Course	Cook Campus	Hf

[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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Revised: August 2008

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