RUTGERS
New Jersey Agricultural Experiment Station

Rutgers Soil Testing and Plant Diagnostic Services

2006 Annual Report

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2006
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 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 2006 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 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 87,000 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 newly renovated Administrative Services Building II 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 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 29,000 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 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 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, 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, 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.

After her retirement from a successful career as a county agricultural agent in RCE, Ms. Clare Liptak has spent countless hours in a part-time role for the STL. Ms. Liptak primarily serves as a horticultural consultant to laboratory clients and promotes the laboratories at conferences and trade shows.

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 local RCE 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 2006, the PDL examined 3,035 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 40% increase (or 875 samples) from 2005. This increase in samples can be attributed to across-the-board increases in samples of all types with nematode samples showing the greatest percentage increase. 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 above the capacity of the laboratory to function efficiently.

The specimens submitted to the PDL by sample type are presented in Table 2. Most samples (1966 or 65%) were plant samples submitted for diagnosis. Twenty four percent (722) of the samples were for nematode analysis, and 11% or 347 samples were insect, mold, or plant identifications.

In Table 3 samples submitted to the laboratory are presented by origin. In 2006, 67% of the plant submissions were from commercial growers, 16% were from residential clientele, and 18% 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.

In 2006, sixty-one percent of samples requesting identification were from commercial clients, and 39% 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, 57% were requested by commercial clients and 42% 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.

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 (89%) were

Table 1. PDL sample submissions by month, 2002 to 2006.

Month	2002	2003	2004	2005	2006
January	47	26	31	30	41
February	55	33	24	25	23
March	70	56	76	64	75
April	230	75	582	120	235
May	183	179	374	182	279
June	261	276	430	317	317
July	415	442	355	418	489
August	369	347	260	362	622
September	300	417	353	288	404
October	245	211	520	157	280
November	196	233	80	90	86
December	99	15	54	107	184
Total	2470	2310	3139	2160	3035

Table 2. PDL sample submissions by sample type, 2006.

Sample Type	Number of samples	%
Plant samples	1966	65
Nematode assay	722	24
Insect, weed, and fungus identification	347	11
Total	3035	100

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 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 2006 were submitted to the laboratory through the Fruit IPM program from peach, apple, and blueberry growers. At this point blueberry appears to be generating the greatest interest for nematode submissions in that program. Blueberry sampling was also higher in 2006, because Dr. Peter Oudemans 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

Table 3. PDL sample submission by origin, 2006.

	Plant		Nematode		Identification	
Origin	number	%	number	%	number	%
Commercial	1297	67	411	57	212	61
Residential	305	16	2	1	135	39
Research	364	18	309	42	0	0
Total	1966	100	722	100	347	100

Table 4. PDL sample submissions by crop category, 2006.

	Plant samples		Nematode samples	
Crop	Number	%	Number	%
Turf	683	35	161	22
Ornamentals	1080	54	12	2
Field crops	8	1	3	1
Vegetable	163	8	13	2
Fruit	32	2	533	73
Total	1966	100	722	100

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

Approximately 13% of the samples submitted for diagnosis to the laboratory were from out-of-state. Nearly all of these samples were turf. In fact, 39% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 25 states and two provinces in Canada. Several turf samples were from states as far away as Florida, Hawaii, Washington, Texas, 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

Table 5. PDL samples submitted by county, 2002 to 2006.

In-state	2002	2003	2004	2005	2006
Atlantic	83	118	153	167	167
Bergen	136	64	197	80	80
Burlington	79	118	146	124	124
Camden	242	56	31	40	40
Cape May	26	32	69	27	27
Cumberland	31	77	139	80	80
Essex	29	57	35	46	46
Gloucester	52	49	79	29	29
Hudson	14	11	5	6	6
Hunterdon	40	35	53	32	32
Mercer	238	135	348	98	98
Middlesex	240	317	345	187	187
Monmouth	204	225	237	156	156
Morris	161	109	128	163	163
Ocean	106	93	63	86	86
Passaic	38	32	38	39	39
Salem	18	12	32	30	30
Somerset	89	138	361	94	94
Sussex	24	14	12	21	21
Union	43	66	60	57	57
Warren	47	43	34	41	41
RU research	67	112	214	73	73
In-state total	2037	1913	2779	1675	2648
Out-of-state	433	397	360	484	387
Total	2479	2310	3139	2160	3035

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, 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 27% of the laboratory diagnoses. Insect pest damage was diagnosed on 5% of the submissions. Identifications comprised 11% of the total number of samples submitted; of these, 8% were arthropods, 2% were fungi, and 1% were weeds. Nematode detection was the other 24% 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 2006 from the 2005 total. Bedbugs have become a popular attraction. Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses increased slightly, however, in 2006 from 2005. 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.

In 2006, a laboratory response was prepared in less than three days for most (89%) of the samples submitted (Table 7), and 96% 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.

Table 6. PDL samples submission by diagnosis, 2006.

Diagnosis	Number of samples	%
Disease (biotic)	995	33
Disease (abiotic)	825	27
Insect pest	146	5
Nematode	722	24
Arthropod identification	257	8
Fungus identification	61	2
Plant identification	29	1
Total	3035	100

Table 7. PDL sample response time, 2006.

Response Time	Number of samples	%
0 to 3 days	2708	89
4 to 6 days	216	7
7 to 10 days	85	3
11 to 21 days	15	0.5
>21 days	11	0.5
Total	3035	100

STL

The STL processed 9,374 samples for soil chemical and physical analysis in 2006 (Table 8). The total laboratory output decreased 9% from 2005 (10,290 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, 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 2006 (Table 9), 64% were for the standard soil analysis (level 1) and 36% included requests for additional special tests.

In 2006, soil samples from residential clientele represented 37% 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 31% of the total. Samples from engineering firms comprised 18% of the workload, another 8% of the samples were from research programs at Rutgers, and 3% were from local school districts and 2% from reference samples, respectively. In the past, samples from residential clientele largely dominated laboratory submissions; however, recent growth in samples from commercial growers indicate a turn toward a professional client base.

Table 8. STL soil sample submissions by month, 2004 to 2006.

Month	2004	2005	2006
January	423	241	556
February	248	395	508
March	1216	831	1451
April	1156	1543	1296
May	784	840	873
June	1043	1253	762
July	561	886	672
August	768	1275	725
September	786	854	776
October	761	640	802
November	621	994	587
December	392	538	366
Total	8759	10290	9374

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 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 phosphorus and potassium content of the soil samples submitted for analysis in 2006. High or very high levels of phosphorus were measured in 72% of the samples tested, and potassium levels were high or very high in 72% 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 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.

Table 9. STL soil sample submissions by test type, 2006.

Test type	Number of samples	%
Standard level 1	5999	64
Special tests	3351	36
Total	9374	100

Table 10. STL soil sample submissions by origin, 2006.

Origin	Number of samples	%
Residential	3486	37
Engineering	1697	18
Commercial	2948	31
Research	737	8
Government/school	279	3
Reference	227	2
Total	9374	100

In Figure 3, the soil pH of soil samples submitted to the STL in 2006 is summarized in functional classes (based on plant suitability and recommendations). The optimum range for most plants includes the largest class (24%) of samples, 6.0-6.5 (moderately acidic), as well as the 17% in the slightly acidic class, pH 6.55 to 6.95. The moderately acidic soils (pH 5.55 to 5.95) represent 21% 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

Table 11. STL soil sample submissions by county, 2006.

County	Samples
Atlantic	249
Bergen	387
Burlington	493
Camden	353
Cape May	146
Cumberland	339
Essex	229
Gloucester	252
Hudson	28
Hunterdon	426
Mercer	680
Middlesex	659
Monmouth	548
Morris	459
Ocean	423
Passaic	146
Salem	19
Somerset	466
Sussex	150
Union	272
Warren	179
Reference	227
Unidentified	2244
Total	9374

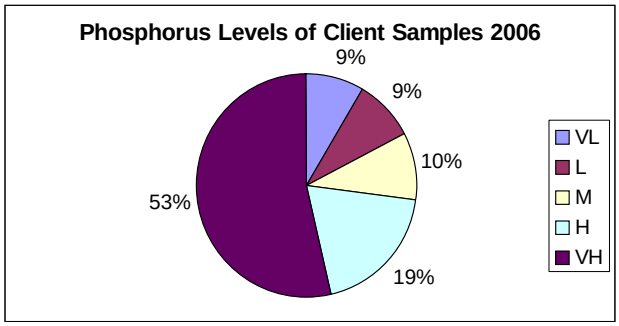

Figure 1. Phosphorus content in soil samples submitted in 2006.

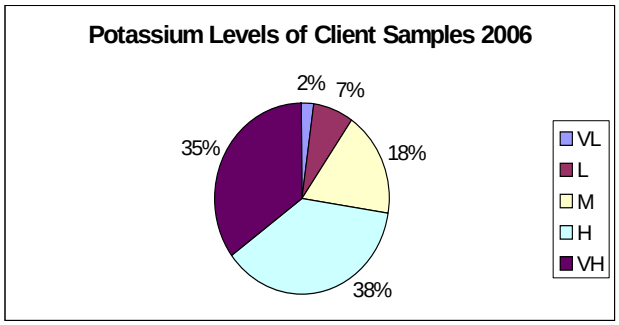

Figure 2. Potassium content in soil samples submitted in 2006.

the latter case, acidifying recommendations would be made. The 20% 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 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 (5%) 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

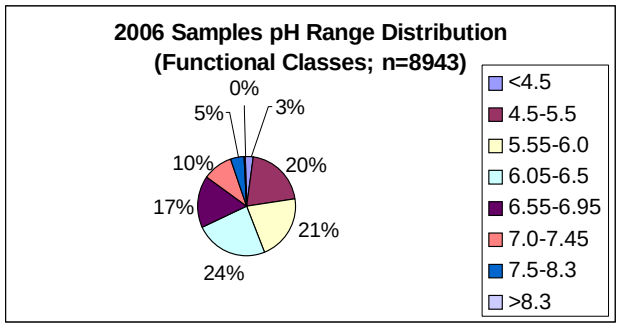

Figure 3. Soil pH of samples submitted in 2006.

with these situations, since the recommended acidification can temporarily exacerbate the salt problem.

In 2006, the average response time for soil samples was 8 working 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 4.4 days in July to 10.7 during April. 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 moved during December 2005, which significantly slowed our response into January 2006.

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.

Table 12. STL sample response times by month and test type, 2006.

Month	Number of standard (level 1) tests	Response time days	Number of special tests
January	267	10.2	289
February	317	6.2	190
March	1088	7.0	361
April	978	10.7	316
May	539	9.7	335
June	330	4.8	431
July	393	5.3	265
August	427	4.4	295
September	574	5.9	203
October	413	8.9	365
November	400	6.7	209
December	273	6.5	92
Total	5999	8.0	3351

In 2006, 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 2006. These courses included: 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 14th 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 eighth 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: RCE Annual Conference; the Cream Ridge Nursery

Growers Twilight Meeting in Burlington County; North Jersey Ornamental Horticulture Conference – Tree Day and Landscape Day; Central Jersey Turf and Ornamentals Institute; the South Jersey Nursery Conference; and the Union County Golf Employees Training Program. Lectures in support of the Atlantic/ Cape May, Essex, 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 Hudson, Essex, Monmouth, and Ocean County Master Gardeners. Dr. Murphy presented programs in support of the Camden County Master Gardeners and the Environmental Stewardship programs in Burlington and Somerset 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; Lesco, Inc. Winter Turf Seminar; Reed and Perrine Turf and Ornamentals Seminar; Penn State Northeast Turf Conference and the Turf Managers Short Course; the New Jersey Certified Tree Expert Training Program; NJAISA Tree Care Conference; GIE 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 the Plant Disease Clinic. Dr. Murphy was a guest lecturer in the undergraduate course Soils and Society.

Extension Publications

During 2006, 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 2006, the articles submitted to the PPA were also submitted for publication in the Cornell University Short CUTT turfgrass newsletter. Mr. Buckley was a co-author on the following RCE factsheets.

Polanin, N., R.J. Buckley, and M. Maletta. 2006. Tree Decline in New Jersey Landscapes. FS1961. Rutgers Cooperative Extension Publications.

Zinati, G., A.B. Gould, R.J. Buckley, and R. Obal. 2006. Landscape and Ornamental Plant Stress: Factors, Symptoms, Diagnosis, and Management. E309. Rutgers Cooperative Extension Publications.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in 2006. 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 in the USDA Northeast Regional Coordinating Committee on Soil Testing and the NRCS Northeast Regional Cooperative Soil Survey. Dr. Murphy proctored the FFA student land judging competition. Mr. Buckley and Ms. Tirpak are members of the Cooperative Agricultural Pest Survey (CAPS) team.

Competitive External Grants

Dr. Murphy participated as a co-principal investigator 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-principal investigator 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 SEBS/NJAES Office of Communications 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 Office of Communications 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 , Spring Flower Fair and Fall Foliage Festival, Turf Field Day, The NJTA Turf Research Classic, and the NJ Turf Expo.

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. 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. Laboratory fees increased on July 1, 2006. Current fee schedules are reported in Appendix 1. For fiscal year 2007-2008, we expect to see considerable increases in submission fees. In 2006, over $418,465.00 was generated from all Soil and Plant Testing Laboratory activities. This figure represents an increase of $57,794.00 or 16% in total revenues from 2005. The increase in total revenues was largely due to price increases instituted on July 1. Income generated from all laboratory activities easily covered 100% of the non-salary expenses incurred in 2006. When all expenses and real revenues are considered, the Soil and Plant Testing Services recovered 96% 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 108 "no charge" samples in 2006 (Table 13). These samples accounted for 4% 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 $4,320.00 for 2006.

Table 13. PDL no-charge samples, 2006.

Client	Number of samples
RCRE County faculty/staff	51
RCRE specialist	11
Non-RCE faculty/staff	22
Inadequate sample	18
Direct mail/walk-ins	4
Total	108

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 2006, researchers received $13,324.50 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 100% of their total operational costs in 2006. 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 2007 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 2007. 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 2007 to cover the increasing costs of business. The new fee schedule went into 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 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 2006 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 2007 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 RCE field stations in Gloucester County on June 9, 2005, which trained 37 Master Gardeners, and in 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. In 2006, programs were held at RCE field stations in Camden County on May 4, 2006, in Somerset County on May 30, 2006, and on campus at the Geiger Turfgrass Education Center on May 24, 2006. A total of 65 Master Gardeners were trained in 2006. Several training programs are scheduled for 2007.

In addition to a regular schedule of First Detector Trainings, most New Jersey Master Gardeners are trained in the Art and Science of Disease Diagnosis. Laboratory staff has also conducted advanced training in the identification of significant pests to New Jersey Master Gardeners. The first such program was completed in Somerset County in March.

Scenario Exercises

On July 7, 2006 staff from the Rutgers Plant Diagnostic Laboratory, New Jersey Department of Agriculture, NPDN, NEPDN, United States Department of Agriculture, and Animal and Plant Health Inspection Service - Plant Protection and Quarantine, and Cornell University shared a scenario exercise to practice first detection and the subsequent regulatory responses to an introduced pest of consequence to New Jersey. This exercise consisted of pre and post conference calls to discuss each party's actions, outcomes, and possible problems and solutions. This valuable exercise helps to define our role in the regulatory process.

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, 2006.

Salaries and benefits	
(full and part time staff)	$353,214.46
Supplies and services	
Diagnostic and testing supplies	
Printing and advertising	
References	
Rentals	
Equipment maintenance	
Office supplies	
Credit card fees	55,957.69
Capital equipment	
Dishwasher	
Computers	
Soil sample rack	12,467.37
Communications	
Telephone/fax	
Postage	8,356.58
Travel	
Paid talks and professional meetings	2,632.12
Total operating costs	$432,628.22

Table A2.2. Approximate income, 2006.

Sample fees	
PDL	$98,221.00
STL	255,877.00
Lecture fees	
OCPE and other honoraria	18,852.00
Grants and contracts	
RCE Fruit IPM	3,285.00
Blueberry research	4,290.00
CAPS Survey	2,190.00
NEPDN	35,750.00
Phantom Income	
PDL No-charge request	<4,320.00>
PDL discounts	<11,955.00>
STL research discount	<13,324.00>
Total potential income	$448,064.00
Total actual income	$418,465.00

Table A2.3. Estimated expenses, 2007.

Salary and benefit costs	$365,000.00
Operating costs	70,000.00
Communications, marketing and travel	15,000.00
Total potential cost 2007	$450,000.00

Table A2.4. Estimated income, 2007.

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 2007	$435,000.00

Appendix 3.

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Coordinator, 2006.

Date	Title	Audience	Location	Partici-pants[1]
1-3/06	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
1-3/06	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
1-3/06	Principles of Pest Control on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
1-3/06	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
1/17/06	Basic Turf Diseases: Pick Your Best Defense (1.5 h)	Landscape IPM Short Course	Cook Campus	L,T
1/17/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	North Jersey Ornamental Horticulture Conf.	Morris County	A,L
1/18/06	Basic Turf Diseases: Pick Your Best Defense (2 h)	Pest Mgmt. Landscape Turf Short Course	Cook Campus	L,T
1/19/06	Landscape Disease Update (1 h)	North Jersey Ornamental Horticulture Conf.	Morris County	A,L
1/20/06	Turfgrass IPM Practice (3 h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
1/25/06	Diagnosing Diseases of Ornamental Plants (1.5 h)	Pest Mgmt. Ornamental Landscape Plants	Cook Campus	A,L,T
1/26/06	Basic Turf Disease: Pick Your Best Defense (.5 h)	Northeast Pennsylvania Turf Conference	Wilkes-Barre, PA	A,L,T
1/26/06	Double Trouble on the Golf Green (.5 h)	Northeast Pennsylvania Turf Conference	Wilkes-Barre, PA	A,L,T
1/24/06	The Complete Turf Disease for Golf Courses (3 h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
1/27/06	The Complete Turf Disease for Golf Courses (3 h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
2/16/06	Landscape Disease Update (1 h)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
2/17/06	Plant Disease and Pest Show and Tell (1 h)	New Jersey Flower Show	Middlesex County	H
2/22/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	Athletic Field Construction Short Course	Cook Campus	T
2/23/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	Lesco, Inc. Winter Turf Seminar	Monmouth County	L,T
2/23/06	Landscape Disease Update (1 h)	Lesco, Inc. Winter Turf Seminar	Monmouth County	L,T
2/28/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Atlantic County	H
2/28/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	Central Jersey Turf and Ornamentals Institute	Mercer County	A,L,T
3/1/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	Brooklyn Landscape Gardeners Assn. Meeting	New York, NY	A,L,T
3/01/06	Basic Turf Diseases: Pick Your Best Defense (1 h)	Central Jersey Turf and Ornamentals Institute	Monmouth County	A,L,T
3/02/06	Double Trouble on the Golf Green (2 h)	Union County Golf Course Employee Training	Union County	T
3/09/06	The Complete Turf Disease (6 h)	Advanced Turf Disease Mgmt. Short Course	Cook Campus	I,L,T
3/21/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Monmouth County	H
3/22/06	New Kids on the Block: NJ Significant Agents (3 h)	Master Gardener Training	Somerset County	H
3/30/06	Ramorum Blight (1 h)	2006 Garden State Tree Conference	Cook Campus	A
4/06/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Camden County	H
4/08/06	Diseases of Shade Trees (2 h)	Certified Tree Expert Training Program	Cook Campus	A,L

Appendix 3. (continued).
Table A3.1. (continued).

Date	Title	Audience	Location	Partici-pants[1]
4/18/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Ocean County	H
4/20/06	Key Pests of Landscape Plants (3 h)	Master Gardener Training	Ocean County	H
4/25/06	Diseases of Trees and Shrubs (3 h)	Master Gardener Training	Ocean County	H
4/26/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Gloucester County	H
4/27/06	Key Pests of Landscape Plants (3 h)	Master Gardener Training	Monmouth County	H
5/4/06	NPDN: First Detector Training (3 h)	Master Gardener Training	Camden County	H
5/24/06	NPDN: First Detector Training (3 h)	Master Gardener Training	Cook Campus	H
5/31/06	NPDN: First Detector Training (3 h)	Master Gardener Training	Somerset County	H
7/11/06	Basic Disease Diagnostic Practice (2 h)	Plant Disease Clinic (16:765:536)	Cook Campus	C
8/17/06	Nursery Disease and Pest Diagnostic Clinic (0.5 h)	Cream Ridge Nursery Growers Meeting	Burlington County	N
9/13/06	Cost Recover and the PDL-STL (.5 h)	RCE Annual Conference	Cook Campus	C
9/18/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Morris County	H
10/5/06	Ornamental Diseases (1 h)	Emergency Pesticide Recert. Short Course	Cook Campus	A,T,L
10/5/06	Reducing Turf Disease Through Culture (1 h)	Emergency Pesticide Recert. Short Course	Cook Campus	A,T,L
10/12/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Passaic County	H
10/18/06	Fungicide Trends in Trees and Shrubs (2 h)	GIE 2006 Lawn Care Seminar	Passaic County	A,T,L
10/24/06	Basic Turf Diseases: Pick Your Best Defense (3 h)	Penn State Turfgrass Managers Short Course	Collegeville, PA	T,L
11/1/06	Nursery Disease Update (1 h)	South Jersey Nursery Meeting	Cumberland County	N
11/2/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Hunterdon County	H
11/8/06	Diagnosing Plant Problems (1.5 h)	General Plant Pathology (11:770:301)	Cook Campus	C
11/10/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Middlesex County	H
11/21/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Union County	H
11/30/06	Diagnosing Plant Problems (3 h)	Master Gardener Training	Mercer County	H
12/5/06	Total Ornamental Disease Management Program (1 h)	New Jersey Turf Expo	Atlantic County	I,L,T
12/6/06	Basic Turf Diseases: Athletic Field Version (.5 h)	New Jersey Turf Expo	Atlantic County	I,L,T
12/6/06	Diagnosis Turf Diseases (.5 h)	New Jersey Turf Expo	Atlantic County	I,L,T
10-12/06	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/06	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/06	Principles of Pest Control on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/06	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	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

Appendix 3. (continued).

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, 2006.

Date	Title	Audience	Location	Partici-pants[1]
1-3/06	Turf Disease Laboratory (10 lectures)	Professional Golf Turf Management School	Cook Campus	T
1-3/06	Turf Insect Laboratory (10 lectures)	Professional Golf Turf Management School	Cook Campus	T
1/10/06	Household Insects (3 h)	Master Gardener Training	Hudson County	H
1/11/06	Household Insects (3 h)	Master Gardener Training	Essex County	H
1/25/06	Key Pests of Landscape Plants (1.5 h)	Professional Parks Management School	Cook Campus	L,T
2/1/06	Laboratory Tour (.5 h)	Professional Golf Turf Management School: Three Week Course	Cook College	T
2/28/06	Household Insects (3 h)	Master Gardener Training	Monmouth County	H
4/14/06	Household Insects (3 h)	Master Gardener Training	Ocean County	H
10-12/06	Turf Disease Laboratory (10 lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/06	Turf Insect Laboratory (10 lectures)	Professional Golf Turf Management School	Cook Campus	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, 2006.

Date	Title	Audience	Location	Partici-pants[1]
1/4/06	Exercises in Soil Sampling (1.5 h)	Soil and Plant Relationships Short Course	Cook Campus	L, N, T
1/31/06	Soils and the Environment (3 h)	Environmental Stewardship Training	Somerset County	H
2/1/06	Soils and the Environment (3 h)	Environmental Stewardship Training	Burlington County	H
2/7/06	Understanding Soils for Best Management (3 h)	Master Gardener Training	Camden County	H
3/7/06	Physical Properties of Soils for Infield Skins (1 h)	Athletic Field Maintenance and Construction SC	Cook Campus	T
3/18/06	Understanding Soil and Plant Relationships (1 h)	Home Gardeners School	Cook Campus	H
9/16/06	Understanding Soil and Plant Relationships (1 h)	Home Gardeners School	Cook Campus	H
10/16/06	Soil Texture and the Textural Triangle (.75 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/16/06	Coarse Fragments and Consistence (.5 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/17/06	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]
10/17/06	How Water Moves in Soil (.5 h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/23/06	Field Exercises: Soil Pit Descriptions (4 h)	Soil and Site Evaluation for Septic Systems Short Course	Burlington County	E,Co,Hf
10/24/06	Field Exercises: Soil Pit Descriptions (4 h)	Soil and Site Evaluation for Septic Systems Short Course	Morris County	E,Co,Hf
11/9/06	Soil Testing (1.5 h)	Soils and Society (11:375:102)	Cook Campus	C

[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

Plant Diagnostic Laboratory
New Jersey Agricultural Experiment Station
Rutgers, The State University of New Jersey
Ralph Geiger Turfgrass Education Center
20 Indyk-Engel Way
North Brunswick, NJ 08902

Soil Testing Laboratory
New Jersey Agricultural Experiment Station
Rutgers, The State University of New Jersey
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NEW BRUNSWICK

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