RUTGERS
New Jersey Agricultural Experiment Station

Rutgers Soil Testing and Plant Diagnostic Services

2012 Fiscal Year Report

(July 1, 2011 to June 30, 2012)

Mr. Richard J. Buckley
Director
Plant Diagnostic Laboratory

Dr. Stephanie Murphy
Director
Soil Testing Laboratory

Ms. Sabrina Tirpak
Principal Laboratory Technician
Plant Diagnostic Laboratory

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Rutgers Soil Testing and Plant Diagnostic Services
Annual Report

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CONTENTS **PAGE**

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 chemical and mechanical analyses of soil and diagnoses of plant problems. 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 2012 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 H. 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 Departments 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 123,000 soil samples for chemical and physical analysis and continues to play an integral role in soil nutrient management, engineering, and environmental assessments for the public and for RCE and SEBS/NJAES programs. In January 2006, the STL moved into the Administrative Services Building II on US Route 1 in New Brunswick, NJ.

The Rutgers Plant Diagnostic Laboratory and Nematode Detection Service

The Rutgers Plant Diagnostic Laboratory and Nematode Detection Service (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 Rutgers Cooperative Extension, and Dr. Karen Giroux, past Assistant Director of NJAES. The laboratory was housed in the former USDA post-harvest research laboratory and then Martin Hall on the Cook College campus until 2000 when it was relocated to the Ralph Geiger Turfgrass Education Center 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 accepted its first samples on June 26, 1991, and has since examined more than 41,000 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 in support of the teaching, research, and outreach efforts of SEBS/NJAES.

Staff and Cooperators

PDL

Mr. Richard Buckley is the director of the Plant Diagnostic Laboratory. He was hired as a program associate in 1991 and has been in his current position 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. He also participates in research, teaching, and outreach activities.

Ms. Sabrina Tirpak, Principal Laboratory Technician, has worked for the PDL since 1998. 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 also attended Clemson University 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. She also participates in research, teaching, and outreach activities.

STL

Dr. Stephanie Murphy is the director of the STL. She has served the University in this capacity since 1996 after several years as a post-doctoral research associate 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 University. She is a member of the American Society of Agronomy, the Soil Science Society of America, the Soil & Water Conservation Society, and the New Jersey Association of Professional Soil Scientists. Dr. Murphy is responsible for the day-to-day operations of the STL and participates in research, teaching, and outreach activities.

Mr. Steve Griglak, Principal Laboratory Technician, has worked in the STL since 1995. He received his B.S in Environmental Science from Rutgers University in May 1998. Mr. Griglak's primary duties include the extraction and analysis of soil nutrients and the coordination and performance of the various special 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. She is responsible for data entry, report generation, invoice processing, record keeping, and supply procurement.

Ms. Phyllis Berger was hired as a laboratory technician in 2011. Ms. Berger is a native of New Jersey and earned a B.S. in Geology from Richard Stockton University and an M.S. in soil science from the University of Arizona. She processes soil samples, performs soil tests, provides customer service, and participates in soil physics research.

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 departments, Centers, and Institutes at Rutgers University/School of Environmental and Biological Sciences (SEBS). We owe a great deal of our success to the expertise of faculty in the departments of Plant Biology and Pathology, Entomology, Ecology, Evolution and Natural Resources, and Agricultural and Resource Management Agents. 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 also acknowledge members of the SEBS/NJAES Office of Communications for their support and assistance.

Laboratory Policies

The PDL receives samples from a varied clientele. Sample submission forms, sampling instructions, and fee schedules are available on the NJAES website (www.njaes.rutgers.edu/services). Sample submission forms are also available in local County Agricultural offices and by FAX directly from the PDL. Samples are submitted either by mail to a post office box in Milltown or by private delivery service directly to the laboratory. Many PDL clients walk samples directly into the laboratory.

Samples are processed 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 email or FAX to the client.

Like the PDL, the STL receives samples from a varied clientele, and fee schedules, sampling instructions, and submission forms are available on the NJAES website www.njaes.rutgers.edu/services. 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 and paperwork. Standard soil fertility testing (defined as pH, P, K, Mg, Ca, Cu, Mn, Zn, Fe, 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 at additional cost. Samples may be submitted without the soil test kits as long as appropriate identifying information and pre-payment is included. Results for any tests not pre-paid will be withheld until payment has been received.

Soil samples are generally processed according to order of entry into the laboratory. Sample analysis can be prioritized, however, by paying a special express processing fee. Upon the completion of the tests, a report is generated and deliv-

ered by email or postal mail. General recommendations for limestone and fertilizer are provided on standard test reports for most New Jersey plantings. The client must supply appropriate planting information to receive fertility guidelines. The appropriate county RCE office receives a copy of soil test reports for farmer, homeowner, and landscaping clients for better service to the client and more outreach opportunities for RCE.

Fiscal Year 2012 Report

Operations

PDL

During the 2012 fiscal year (July 1, 2011 to June 30, 2012), the PDL examined 1983 specimens submitted for diagnosis, identification

Figure 1.

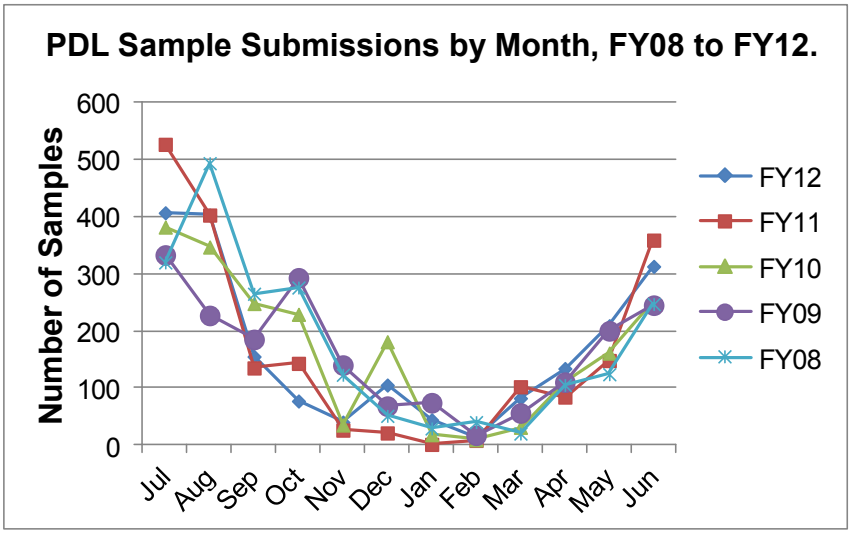
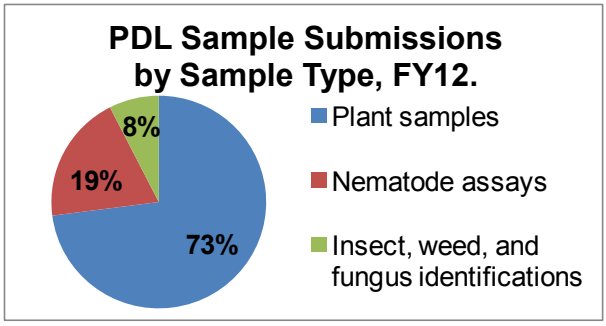


Table 1. PDL sample submissions by month, FY08 to FY12.

Month	FY08	FY09	FY10	FY11	FY12
July	320	333	382	527	407
August	494	227	347	403	403
September	265	185	248	135	155
October	276	293	229	143	77
November	123	140	35	26	40
December	51	68	181	21	105
January	29	74	18	1	44
February	40	17	9	8	14
March	20	56	31	102	82
April	105	110	112	84	134
May	124	200	161	148	209
June	247	245	249	359	313
Total	2094	1948	2002	1957	1983

Figure 2.



(insects, weeds, or fungus), or nematode assay (Table 1), representing a 1.3% increase (or 26 samples) from FY12. Samples (Figure 2) submitted for diagnosis (+81) and nematode analysis (+11) increased slightly in FY12. These increases were offset by a reduction in insect identifications (-66) from Cooperative Agricultural Pest Survey (CAPS) trap catches. 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 2000 to 2500 samples represent peak laboratory capacity, so despite the slow-down in our core sample submissions, the PDL was operating near the capacity of the laboratory to function efficiently.

The specimens submitted to the PDL by sample type are presented in Figure 2. Most samples, 73% (1447), were plant samples submitted for diagnosis, 19% (386) of the samples were for nematode analysis, and 8% (150) of the samples were insect, mold, or plant identifications.

In Figure 3, samples submitted to the laboratory are presented by origin. In FY12, 90% of the plant submissions were from commercial clientele, 7% were from residential clientele, and 3% were submitted from research faculty at Rutgers University. Commercial plant managers benefit more financially from our services, thus they submit the majority of samples to the laboratory. This distribution is consistent with other years.

In FY12, 54% of samples submitted for plant or insect identification were from commercial clients, and 43% were residential in origin (Table 2). Household or nuisance pests are the primary issues of concern for residential clients. Of the nematode assays submitted, 89% of the samples were from commercial clients, and 11% were from research. We expect that the number of nematode samples submitted from residential clients (1) will remain low or nonexistent, 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. However, research samples are an extremely important component of our submissions. Research samples allow the diagnosticians to cooperate with University faculty on problems of great importance to the State of New Jersey.

Turfgrass and ornamentals 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 (92%) were either turfgrass or ornamental plants (Figure 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 industries, 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 members in New Jersey's southern counties continue to

Figure 3.

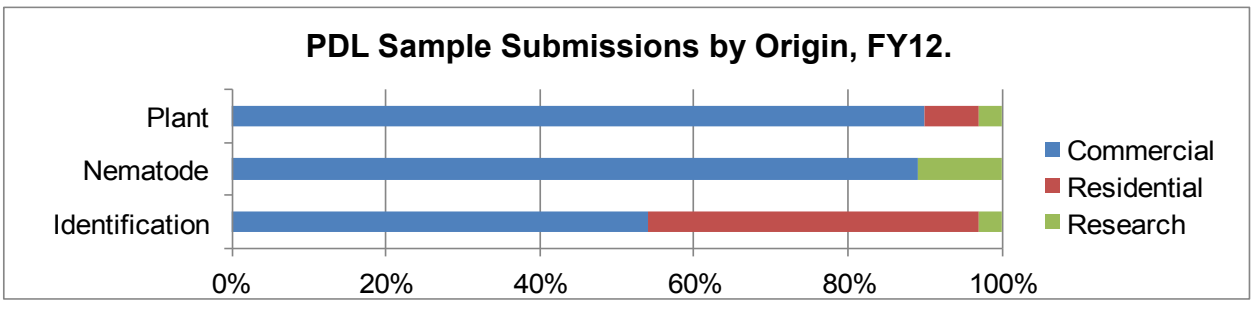


Figure 4.

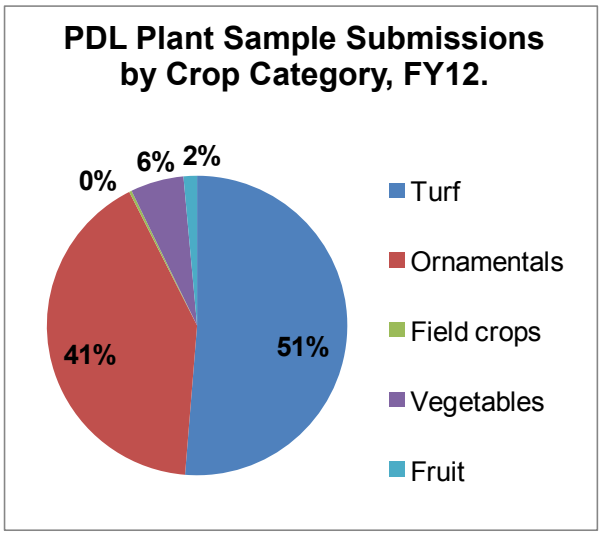
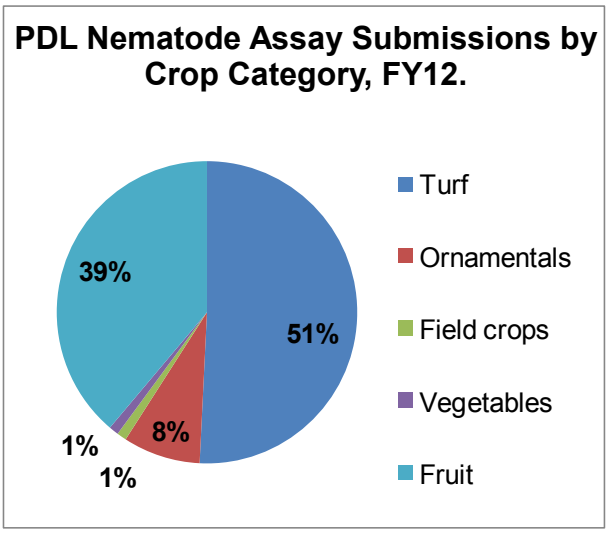


Figure 5.

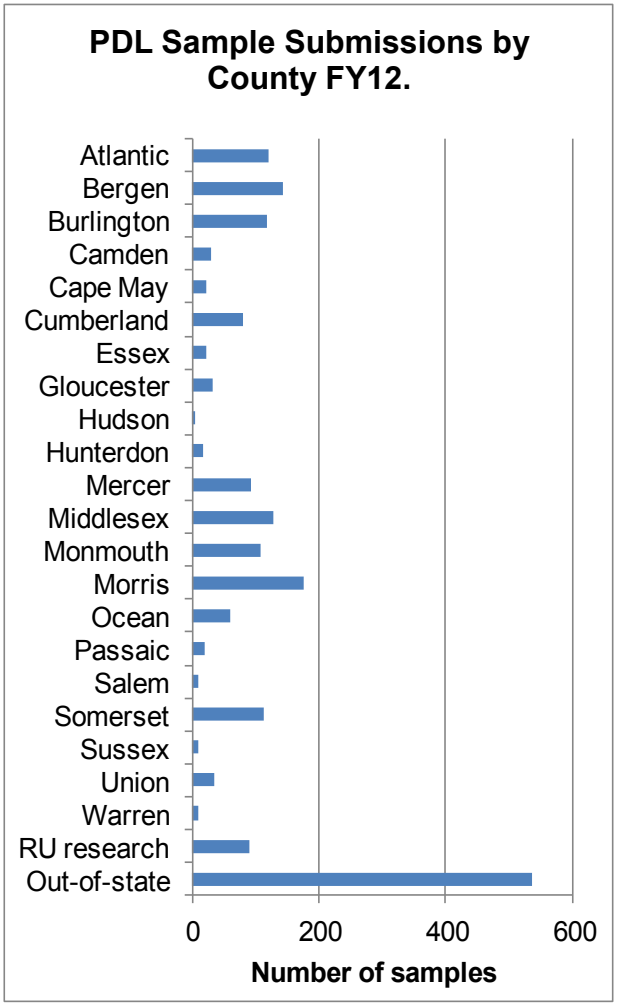


provide free diagnostic services and do not advertise laboratory services to these growers. Inroads are being made with these commodity groups through the Vegetable and Fruit IPM groups, and it is our hope that sample submissions from traditional agricultural crops will increase in future years.

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 large portion of the nematode samples in FY12 were submitted to the laboratory through the Fruit IPM program from blueberry growers. Another group of submissions originated with APHIS-PPQ and NJ Department of Agriculture Nursery Inspection Service for soybean cyst nematode detection. Samples free of these cysts receive phytosanitary certificates for nursery stock export to Canada. Golf turf represents most of the nematode samples from turfgrass clientele. Although the numbers are significant, interest in nematode detection on golf turf has waned as control options have been removed from the market. Problems in golf turf, particularly with nematodes, are more severe during seasons with considerable heat and drought stress, and it is those years that carry the highest submission totals.

Samples were submitted to the PDL from all counties in New Jersey (Figure 6). The majority of samples, however, were submitted from counties in close proximity to the laboratory. The probable ex-

Figure 6.



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

Approximately 27% of the samples submitted for diagnosis to the laboratory were from out-of-state. The percent of out-of-state samples is 1% lower than in FY11 and primarily reflects a shift of about 30 samples from out-of-state submitters to in-state submitters. Of particular note, nearly 50% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 21 states in FY12. Turf samples were received from states as far away as Arkansas, Washington, Texas, and California. New York, Pennsylvania, and Virginia provide the largest number of out-of-state samples. 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 contact Dr. Clarke for help, who always forwards them to the laboratory for diagnostic services. 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. Dr. John Inguagiato at the University of Connecticut and Dr.

Table 2. PDL sample submissions by county, FY08 to FY12.

In-state	FY08	FY09	FY10	FY11	FY12
Atlantic	186	168	147	90	121
Bergen	74	110	73	113	143
Burlington	232	110	57	61	118
Camden	41	28	20	41	29
Cape May	26	14	24	11	23
Cumberland	66	53	59	53	81
Essex	43	30	53	13	23
Gloucester	41	36	27	40	33
Hudson	11	21	10	22	5
Hunterdon	143	13	27	42	17
Mercer	76	77	323	169	94
Middlesex	148	104	109	191	127
Monmouth	88	74	74	117	107
Morris	176	131	247	160	176
Ocean	37	28	40	36	60
Passaic	12	36	32	18	21
Salem	7	62	58	11	10
Somerset	73	129	81	61	114
Sussex	34	19	14	21	10
Union	39	50	38	34	34
Warren	101	28	22	12	10
RU research	79	41	22	85	90
In-state total	1733	1623	1557	1401	1446
Out-of-state	360	586	445	556	537
Total	2093	1948	2002	1957	1983

Figure 7.

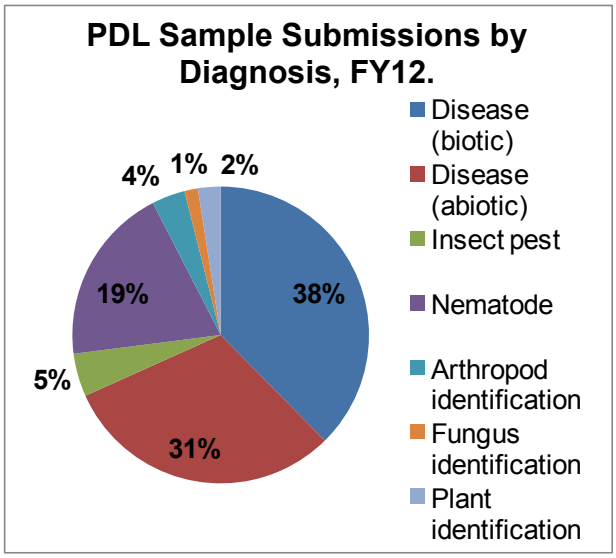
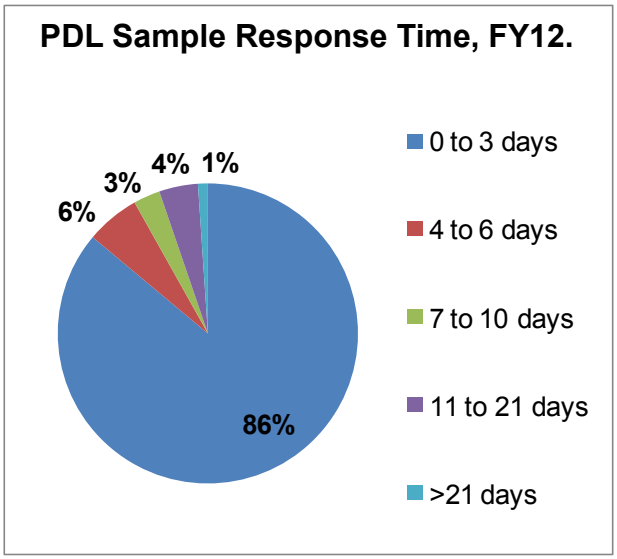


Figure 8.



Paul Vincelli at the University of Kentucky, both Rutgers graduates, refer clients to the PDL. Dr. Frank Rossi of Cornell University is also a great supporter of our program. He advocates and advertises laboratory services in his ShortCutt newsletter, which reaches more than 2700 turf managers in New York State. Lastly, 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, 38% were associated with biotic disease-causing agents (Figure 7). Abiotic disease-causing factors (e.g., environmental extremes, nutrient deficiencies, poor cultural practices, poor soil conditions, etc.) accounted for another 31% of the laboratory diagnoses. Insect pest damage was diagnosed on 5% of the submissions. Identifications comprised 7% of the total number of samples submitted; of these, 4% were arthropods, 1% fungi, and 2% were plants. Nematode detection accounted for the other 19% 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.

Insect samples 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. The number of these samples has declined as the Department of Entomology has added an urban entomologist who offers the service free-of-charge. Arthropod identifications also decreased in FY12 because the number of trap catch samples from the state's CAPS program declined.

Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses decreased in FY12. 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 FY12, a laboratory response was prepared in less than three days for most (86%) of the samples submitted (Figure 8), and 92% of our clients received a response in less than a week. A number of the samples (104) took longer than 10 days to diagnose. In these cases, special consultation (i.e. culturing or other lab tests) 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 expertise of our competent staff. Adequately trained staff is essential to the continued growth and efficient operation of the laboratory.

Figure 9.

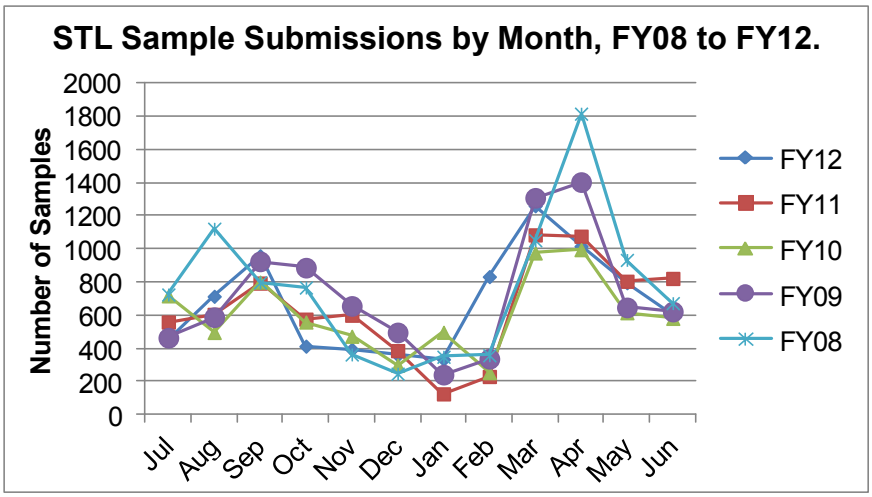


Table 3. STL sample submissions by month, FY08 to FY12.

Month	FY08	FY09	FY10	FY11	FY12
July	699	464	717	559	446
August	1148	588	496	605	714
September	798	925	800	794	959
October	767	887	559	576	413
November	363	656	473	600	394
December	247	496	298	386	360
January	349	241	497	125	334
February	358	337	253	230	833
March	1053	1309	976	1085	1261
April	1817	1404	996	1077	1017
May	934	647	615	805	796
June	673	622	581	822	598
Total	9206	8576	7261	7664	8125

STL

The STL processed 8125 samples for soil fertility and physical analysis in FY12 (Table 3). The total number of samples received increased slightly (6%) compared to FY11 (7664 samples). Of the soil samples submitted to the STL for analysis in FY12, 55% were for the standard soil analysis (only) and 45% included requests for additional special tests (Figure 10). The number of special tests indicates the additional work load, which is not simply related to sample numbers. Sample response time is influenced by many factors, including the total number of submissions and the number of special tests requested each month.

As usual (Figure 9, Table 3), sample submissions were greatest in early spring in preparation for the growing season. The typical secondary surge of samples arrived in August and September as many laboratory clientele were preparing for fall lawn fertilization. This secondary peak was similar to FY09, but sample numbers during July, October and November 2011 were low relative to the previous three years. The sample numbers for January through March 2012 were strong compared to previous years. The early spring soil testing may have been a result of implementation of New Jersey's turf fertilization regulation which prohibits application of phosphorus application without a soil test to

Figure 10.

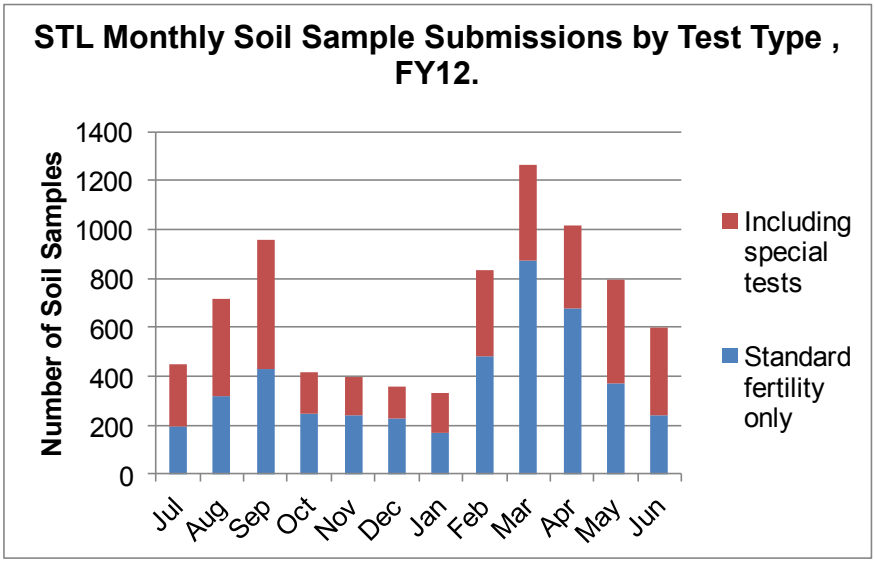
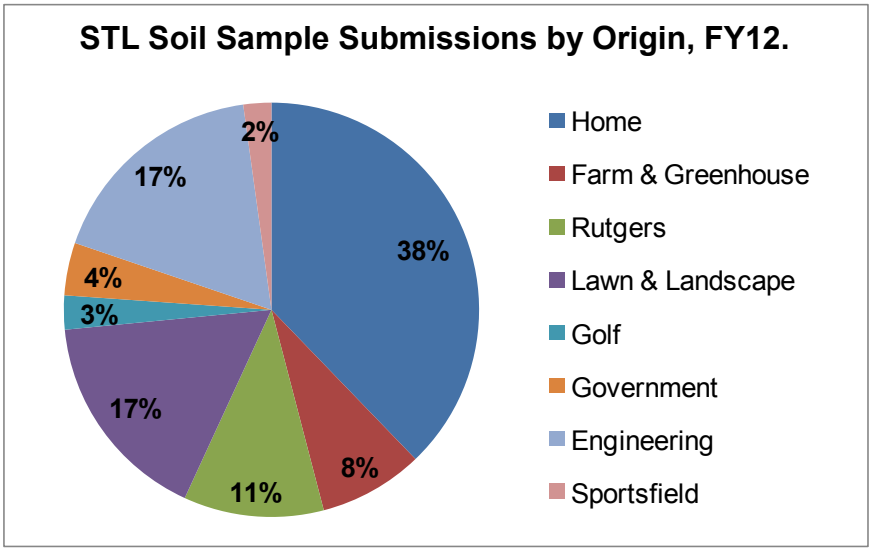


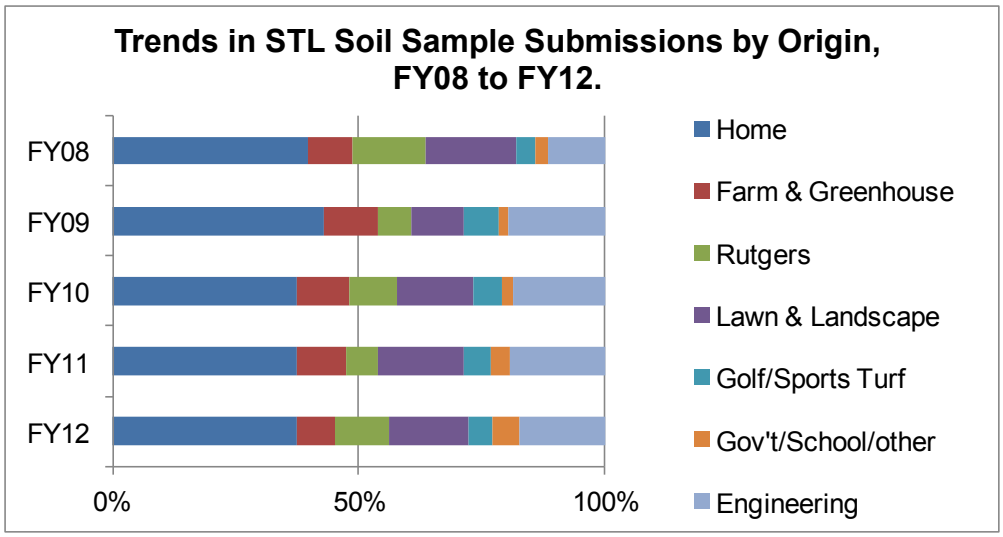
Figure 11.



prove need. However, the mild winter facilitated early sampling.

In FY12, soil samples from residential clientele represented 38% of the total number of soil samples (Figure 11). Commercial growers, including the producers of fruit and vegetables crops, submitted 8% of samples; samples from landscape professionals represented 17%; golf course samples represented 3%; and athletic field samples represented 2% of the total. Samples from engineering firms comprised 17% of the workload, 11% of the samples were from research or Cooperative Extension programs at Rutgers, and 4% were from government agencies, school districts and non-profits. Soil samples from residential clientele remain the majority of laboratory submissions. Samples from landscape professionals and environmental/ engineering companies are important due to large numbers of samples submitted and more frequent need for special tests. Special test requests provide clear financial benefit to the lab, helping to maintain necessary income. However, turnaround time is affected when laboratory staff workload is heavily laden with more labor-intensive special tests, with more time required to complete analyses and distribute soil test reports.

Figure 12.



Looking back five years, annual numbers of samples submitted by various clientele groups show no consistent trends as percentages of the total sample load (Figure 12).

Samples were submitted to the STL from all counties in New Jersey (Figure 13, Table 4). Many samples were submitted from counties in close proximity to the laboratory (Middlesex, Monmouth); however, because most samples for soil testing are delivered by mail (facilitated by soil testing kits sold by the county offices of RCE), public access to the laboratory is less of a factor for sample submissions than those destined for the PDL. County profiles, therefore, often reflect RCE county faculty with robust home horticulture programs that actively utilize and promote STL services or those with outreach events (fairs, field days) that provide opportunities to promote soil testing. To some degree, population centers also help describe the influx of samples. Landscapers (etc.) who work across several counties have the effect of inflating the sample numbers for their "home" county. Similarly, engineering or environmental firms submit samples from a central office that may not conform to the location where the soil was sampled, but in these cases a county affiliation is not usually identified. Such soil samples are usually submitted for "topsoil" quality control/assurance with required specifications, and recommendations are only occasionally requested. Notice that three New York county Cooperative Extension offices (Ulster, Westchester, and Sullivan Counties) have adopted Rutgers STL since Cornell University closed its public service laboratory.

Figure 13.

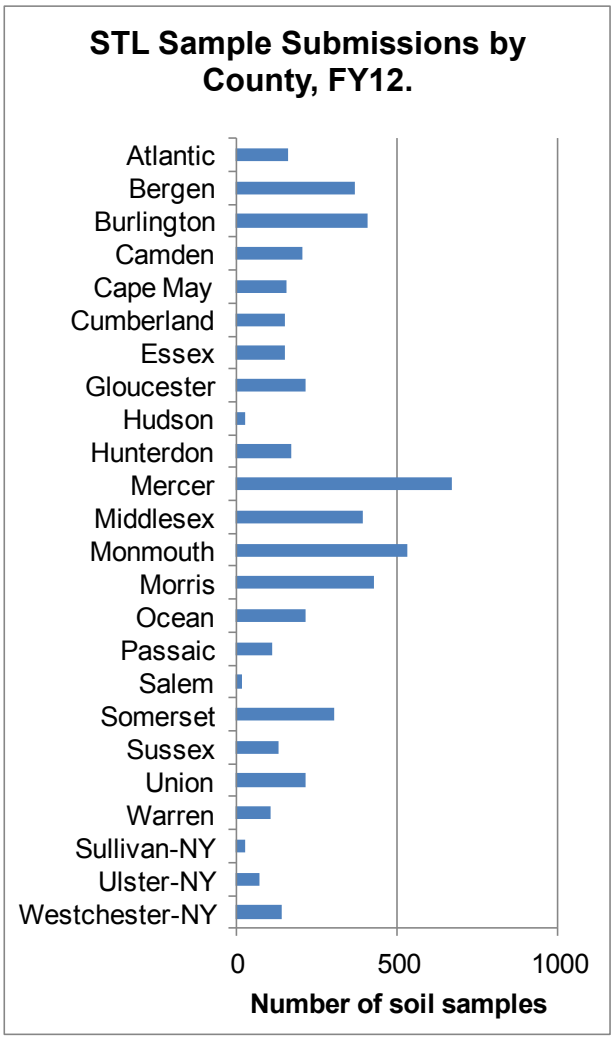


Table 4. STL soil sample submissions by county, FY08 to FY12.

In-state	FY08	FY09	FY10	FY11	FY12
Atlantic	262	168	129	154	159
Bergen	466	484	257	403	370
Burlington	429	487	392	290	409
Camden	204	271	218	213	207
Cape May	173	135	68	124	158
Cumberland	254	150	107	124	151
Essex	261	303	246	208	151
Gloucester	301	286	122	120	213
Hudson	45	108	27	41	25
Hunterdon	255	358	234	173	169
Mercer	522	570	531	562	669
Middlesex	912	513	439	484	394
Monmouth	655	1165	538	522	532
Morris	438	435	378	353	427
Ocean	502	473	338	273	215
Passaic	165	119	137	82	112
Salem	7	12	6	4	17
Somerset	511	557	664	325	305
Sussex	170	190	145	145	131
Union	269	386	268	224	217
Warren	111	79	64	70	108
New York State	0	0	35	132	237
Reference	315	212	134	111	128
Unspecified	1979	1327	1784	2527	2731
Total	9206	8576	7261	7664	8125

Figure 14. Percentages of soil samples within macronutrient classes.

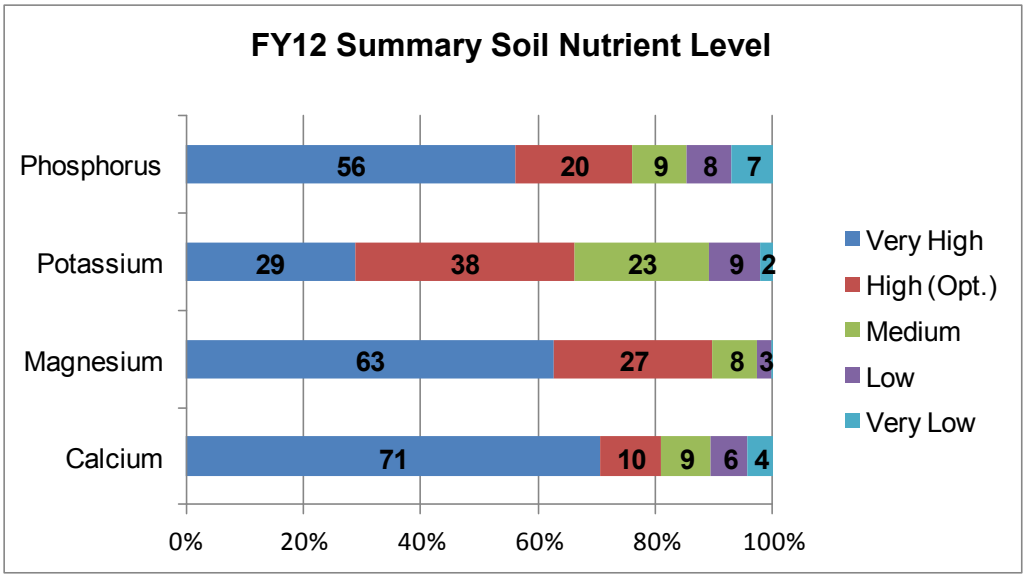
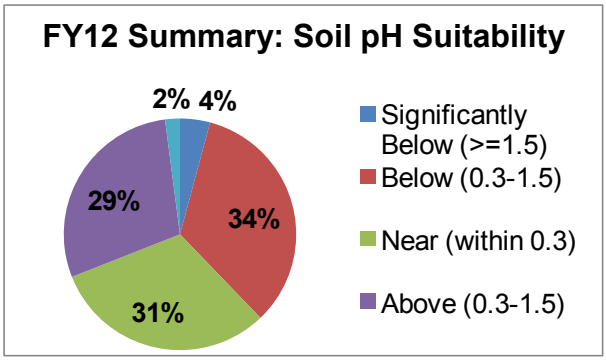


Figure 15. Soil pH of samples submitted in FY12.



For efficiency in accumulating laboratory data and generating reports for clients, an internet-based database was developed and customized for Rutgers STL by Robert Muldowney of the NJAES IT staff; he has spent countless hours revising and upgrading the system as well as responding to emergency help questions or issues. The database is designed to handle the multitude of various sample types in terms of test data and complex reporting requirements, including data summaries such as provided here for FY12.

"Standard" fertility analysis of soils includes soil pH and levels of nine nutrients. Samples must be dried, ground, and sieved (2mm) before further processing. The nutrients are extracted by a chemical solution called "Mehlich-3" and analyzed in the extractant solution by inductively coupled plasma, atomic emission spectrophotometry (ICP-AE).

Macronutrient data of soil samples received for fertility testing from July 2011 through June 2012 are summarized in Figure 14. Colored sections of bars indicate the proportion of samples that fell into the five categories of soil test levels, very low to very high. High or very high levels of phosphorus (P) were measured in 76% of the samples tested, and potassium (K) levels were high or very high in 67% of the samples tested.

These data suggest the historical overuse of fertilizers containing P and K on soils that do not need them. This may be the result of fertilizer manufacturers promoting routine applications of their products without benefit of soil tests. Turfgrass products vary in levels of %N-%P_2O_5-%K_2O (fertilizer grade) in their four- or five-step programs according to season, and manufacturers do not have a wide variety of products that address variations in soil test levels. Over time, this has led to the high percentage of samples with excess P and K levels. Recent recognition of negative impacts of excess P on water quality has led to increased environmental regulations, including New Jersey's turf fertilization law; fertilizer manufacturers have had to re-formulate products to provide zero- (or low-) P contents, and now more no/low-P fertilizers are becoming commercially available. At the same time, it has become more difficult to find appropriate fertilizer ratios for soil areas deficient in P. Turfgrass "starter" fertilizer is the exception to the zero-phosphate legislation, but only one fertilizer grade is typically available per manufacture, and grades differ between manufacturers. The limited availability in the retail fertilizer market of single nutrient materials, often recommended as a supplement to mixed, "complete" fertilizers (containing N, P, and K), is likely to exacerbate over-fertilization. That is, fertilizers with inappropriate analysis may be applied because the supplemental single-nutrient fertilizers cannot be found.

Calcium (Ca) and magnesium (Mg) are at high or very high levels in even greater percentages of the soil samples received in FY12, 81% and 90% respectively. The samples that these categories represent are often at or above the target soil pH because of limestone ($CaCO_3$ + various percentages of $MgCO_3$) applications. And yet there are samples that are deficient in one or both of those elements even when pH is optimum; gypsum ($CaSO_4$) or $MgSO_4$ are recommended amendments in those cases. Otherwise when soil pH is below optimum, limestone is recommended to address both soil pH and Ca or Mg deficiency.

While large percentages of samples received by the STL have high (optimum) or very high macronutrient levels, it would be unwise to conclude without benefit of soil test that fertilization is unnecessary for all NJ soils. Soil samples received represent a small percentage of actual land area, and the samples should not be assumed to accurately represent all areas (that is, these numbers do not represent random, unbiased sampling). Furthermore, for those soils that are deficient in any nutrient, proper fertilization would make a substantial improvement in production, quality, or health of the plant/crop.

Soil pH is another characteristic that is crucial to a soil's fertility. Soil pH that is too high or too low can cause nutrients to be unavailable (insoluble or otherwise "tied-up") even when present in sufficient amounts. The target pH is determined by the plant/crop being grown. While most plants "prefer" soil pH in the range 6.1 to 6.8, there are certain plants

that are adapted to more acidic soil, the "acid-loving" plants. Other plants have greater requirement for calcium and consequently perform better at slightly higher soil pH. Soil test recommendations are customized to account for these differences. Furthermore, overly acidic soils can increase solubility/availability of soluble aluminum, an element harmful to plant roots. Adjusting the soil pH benefits the plant by minimizing this stress as well.

Soil pH data of samples submitted to the STL in FY12 are in summarized Figure 15. The categories are based on the deviation from the target pH for the specified crop or planting. This demonstrates the need to optimize soil pH, either to apply limestone to raise pH or to acidify the soil. Therefore, it is clear that 31% of samples of those analyzed for pH during FY12 were "near" the target (within 0.3 pH units), and no amendment was recommended. Thirty-four percent of samples were below the optimum pH range, and appropriate limestone recommendations (various rates depending on deviation from the target and buffering capacity of the soil) were provided except in cases where acid-producing soil is suspected (pH<4.0). Four percent of samples were significantly below (>1.5 units) the optimum pH range. On the alkaline side of the scale, 29% pH samples were 0.3 to 1.5 units higher than the optimum range. If pH is above optimum by less than 0.5, the advice is to do nothing and allow the natural soil processes which occur in New Jersey's humid, temperate climate to acidify the soil over a season. Otherwise when pH is significantly higher than the target, acidification is recommended, with elemental sulfur being the preferred soil amendment. In extreme cases, such as the 2% of samples that were more than 1.5 units higher, it is advised that the cause of alkalinity be determined before recommendations are provided.

Another interesting analysis comes from lead (Pb) screening of soil to assess contamination from historical use of leaded paint, leaded gasoline, lead arsenate pesticides, etc. Of 231 soil samples analyzed and compared to US-EPA standards, 58% had background levels of Pb, 27% were elevated; 7% were considered contaminated, and 7% exceeded the Residential Cleanup Criteria. These assessments are estimates based on correlation between EPA methods and a screening method developed in part by Rutgers researchers.

Teaching and Outreach

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

Richard Buckley

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 a total of 140 hours of contact time per year. The teaching efforts by the PDL staff in the Professional Golf Turf Management School generate significant income for the laboratory. This income and client development source also helps support the PDL.

Mr. Buckley participated in several other OCPE short courses in FY12. These courses included: the Golf Turf Management School: Three Week Preparatory Course; Landscape Integrated Pest Management: An Intelligent Approach; Athletic Field Management School; and the Emergency Pesticide Credit Recertification Short Course.

Mr. Buckley served as the course coordinator and lecturer for the Pest Management in Landscape Turf Short Course. This was the 19th 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 13th time he planned and coordinated that short course.

Mr. Buckley participated as a guest speaker in one Rutgers University undergraduate course: General Plant Pathology Laboratory 11:776:311.

Mr. Buckley was an invited speaker in several RCE programs. The following programs were included: Central Jersey Turf and Ornamental Institute; North Jersey Ornamental Horticulture Conference – Turf Day, and Landscape Day; and the Department of Veterans Affairs New Jersey Heath Care System Landscaping Technologist Certification Course. Lectures in support of the Atlantic, Camden, Gloucester, Essex, Middlesex, Monmouth, Morris, Ocean, Passaic, Hunterdon, and Union County Master Gardener Programs were also given.

Mr. Buckley was also an invited speaker for:

John Deere University programs in Saratoga, Batavia, and Verona, NY; Upper Deerfield Environmental Commission Meeting; Valhalla Garden Club Meeting; New Jersey Shade Tree Federation Annual Meeting; Northeast Pennsylvania Turf Conference and Trade Show; New Jersey Landscape Contractors Association Annual Trade Show and Educational Conference; New Jersey Landscape Contractors Association South Jersey Meeting; Nassau Suffolk Landscape Gardeners Association Conference; Brooklyn Landscape Gardeners Association Conference; New Jersey Green Expo Turf and Landscape Conference; New Jersey Nursery and Landscape Association Plants Show; Shemin Landscape Supply Turf Days in Baltimore, and New York; Reed and Perrine Turf and Ornamentals Seminar; New York State Turfgrass and Landscape Association Westchester Conference; New York State Turf Association Adirondack Regional Conference; New Jersey Certified Tree Expert Training Program; and the Northeast Plant Diagnostic Network Regional Meeting.

Sabrina Tirpak

Ms. Sabrina Tirpak is responsible for teaching a laboratory practicum in the Rutgers Professional Golf Turf Management School. She has approximately 60 hours of contact time per year in the turf school. Other OCPE programs in which she participated include: Landscape Integrated Pest Management: An Intelligent Approach; and the Emergency Pesticide Recertification Short Course.

Ms. Tirpak was an invited speaker in several RCE programs. The following programs were included: Central Jersey Turf and Ornamentals Institute; Introduction to Organic Landcare Seminars; and the Department of Veterans Affairs New Jersey Heath Care System Landscaping Technologist Certification Course. She also presented programs in support of the Essex, Monmouth and Ocean County Master Gardener Programs.

Ms. Tirpak was also an invited speaker for the Brooklyn Landscape Gardeners Association Annual Seminar; New Jersey Green Expo Turf and Landscape Conference; New Jersey Chapter of the International Society of Arboriculture 2012 Garden State Tree Conference; and the Maplewood Community Gardening Workshop. She also presented a tour of the PDL to students of Mercer County Community College's Plant Pathology course.

Ms. Tirpak spent considerable time and effort in FY12 conducting review sessions for Rutgers Turf Club members participating in the Golf Course Superintendents Association of America Collegiate Turf Bowl. The Turf Bowl is held at the GCSAA annual meeting. Ms. Tirpak accompanied the teams to the competition in Las Vegas, NV.

Stephanie Murphy

Dr. Murphy participated in the Office of Continuing Professional Education's Turfgrass Establishment short course and the Soil and Site Evaluation for Septic Systems short course, a multi-day lecture and field course.

Dr. Murphy was an invited speaker at the Central Jersey Turf and Ornamental Institute. Dr. Murphy presented a lecture in support of the Environmental Stewardship programs in both Central Jersey (Duke Farms) and Warren County. She was requested to provide continuing education to the Master Gardeners of Morris County. She also presented at the Community Garden conference at Frelinghuysen Arboretum as well as to the East Brunswick Environmental Commission and Community Gardeners.

Dr. Murphy was an invited presenter at the NJ Soil Health Conference, sponsored primarily by the NJ Association of Conservation Districts but also with support from NJAES and other partners. She also participated as presenter at the Ag Water Issues Workshop organized by RCE of Burlington County.

Dr. Murphy was a guest lecturer in the undergraduate courses Soils & Society, Soil Fertility, and Soils & Water, and she hosted students from Soil Fertility and Soils and Water classes for tours of the STL along with detailed explanations of soil testing theory and practices. She also had opportunity to lead the Soils & Water students (two lab sections) out into the field to examine soil pits and explain their description and applications.

Extension Publications

During FY12, Mr. Buckley contributed regularly to the Plant & Pest Advisory. He 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. Since 2007, the articles submitted to the PPA were also submitted for publication in the Cornell University ShortCUTT turfgrass newsletter.

Mr. Buckley co-authored one RCE factsheet in FY12.

Daniels, G.H., N. Polanin, and R.J. Buckley. 2011. Birch Leafminer, *Fenusa pusilla* (Lepeletier) FS1164. Rutgers Cooperative Extension Publications.

Dr. Murphy authored, along with other contributors, three Extension publications about soil organic matter as a result of a grant from the Equine Science Center.

Murphy S., D. Giménez, L. Muldowney, and J.R. Heckman. 2012. Soil Organic Matter. FS1135, Rutgers Cooperative Extension Publications.

Murphy S., D. Giménez, L. Muldowney, and J.R. Heckman. 2012. Soil Organic Matter Level and Interpretation. FS1136, Rutgers Cooperative Extension Publications.

Murphy S., D. Giménez, L. Muldowney, and J.R. Heckman. 2012. Improving Soil Quality By Increasing Organic Matter Content. FS1137, 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 FY12. In addition, the STL staff also provided tours of their lab for several Master Gardener programs.

Dr. Murphy has represented the Executive Dean of Cook College/School of Environmental and Biological Sciences on the New Jersey Department of Agriculture's Soil Conservation Committee since 1998. In 2011, she participated in several subcommittees, including the Executive subcommittee, the Vegetative Standards Revision subcommittee to update the state's Soil Erosion & Sediment Control Standards, and the Soil Restoration subcommittee, which developed additional Standards to assure well-functioning soils after disturbance. There was continued involvement with the New Jersey Association of Conservation Districts soil health effort and the NJDEP initiative "Healthy Lawns, Clean Water". State legislation regulating turf fertilization, as well as legislation regarding soil management/restoration after land development, was enacted in January 2011, and Dr. Murphy is the point person for questions regarding the legislation.

Mr. Buckley and Ms. Tirpak are members of the Cooperative Agricultural Pest Survey (CAPS) team. The CAPS program is a pest surveillance program managed by USDA-APHIS and state departments of agriculture. Universities, natural resource protection organizations, and industry groups are also partners.

Research

Stephanie Murphy and Phyllis Berger of the Soil Testing Lab staff participated in research funded by NRCS.

Marketing

To help advertise laboratory services at grower meetings or other activities, two sets of table-top and banner display units are available on loan to anyone who wishes to advertise STL&PDL services. The laboratory staff is also willing to attend and staff an exhibit to explain laboratory services and sell soil test kits.

In FY12, this marketing initiative brought the display to the following programs: The 2011 Great Tomato Tasting; New Jersey Green Expo Turf and Landscape Conference; New Jersey Vegetable Growers Association Meeting; the Northeast Organic Farming Association Annual Winter Meeting; New Jersey Landscape Conference; New Jersey Flower and Garden Show; New Jersey Nursery and Landscape Association Meeting; Rutgers Day; and Turf Field Days.

To increase visibility and market the Soil Testing Lab services, a Facebook page was created in November 2011; see www.facebook.com/RutgersSoilTestingLab. Photos from the lab were posted, and a link to the website is provided there. More-or-less frequent posts include updates about work at the lab, presentations at other venues, photos related to these activities, and related news articles or opportunities. The advantage to having a presence on Facebook is that visitors can "like" or "share" the page or post, which informs their "friends" about their interest in STL's page, causing some degree of "virality". Every post is matched with a spike in "views", and a large percentage of those are from the viral nature of Facebook (compared to standard website). Very detailed statistics are available regarding the page's postings, likes, friends, and so forth.

Income

The PDL and STL are expected to recover all costs and be self-supporting. Laboratory clientele are charged a nominal fee for diagnostic and test-

ing services as well as educational activities. Grant activity and cost-sharing arrangements also provide some degree of funding. PDL fees were last adjusted on July 1, 2006, and the STL increased their fees at that time and partially again on November 1, 2008. Current fee schedules are reported in Appendix 1.

A sample submission form and the appropriate payment accompanied the majority of samples received by the PDL 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. Most soil testing laboratory samples require payment at submission or when the soil test kits are purchased in each county office, but invoicing of corporations or organizations has become common. In this case, soil test results are not released until invoices are paid. Monies collected in the county are passed to the laboratory accounts by check or internal transfer. Internal transfer of funds was used to pay for the plant and soil samples diagnosed or tested for research programs at Rutgers University.

In FY12, $235,932.53 was generated from all PDL activities. In FY12, $335,387.83 was generated from all STL activities. Income generated by each laboratory covered 100% of all costs in FY12. A complete breakout of all PDL and STL revenues and expenses is included in Appendix 2 of the unabridged copies of this report.

PDL policy permits 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 11 "no charge" samples in FY12. As per PDL policy, volume discounts are provided to companies submitting large numbers of samples as well as to grant-funded projects and those samples submitted from Federal and State agencies.

Future Directions

As in the past, the top priority for FY13 will be to increase revenue and reduce expenses. 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 FY13. 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 FY13 to cover increasing costs.

Further development of the soil testing database continues, particularly with regard to development of automated recommendations for additional crops. Targeted action to improve efficiency of Soil Testing operations will be implemented as additional funds become available. The newest soil test, soil CO_2 respiration, will be publicized to increase awareness of this valuable measure of "soil health" and potential N mineralization. Finally, building on attentiveness to State regulation for turf fertilizer application, efforts to recruit landscaping professionals into the STL clientele continue and will encourage sampling during non-peak periods to spread the annual workload. Dr. Murphy will contribute to State-mandated training programs resulting from NJ legislation.

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 in the US. The network provides 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 coordination 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 provides grant monies as incentive to participate. Mr. Buckley is the principle investigator in the Rutgers subcontract.

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 participates as a subcontractor to the regional center at Cornell. Grant monies provided by the USDA through the NEPDN were used in FY12 to pay salaries, participate in professional training programs and meetings, attend the NEPDN regional meeting in Westchester, NY, and to purchase equipment and supplies to upgrade the laboratory's capability for accurate and timely diagnosis of plant problems. Upgrades to laboratory technologies improve communication with our local stakeholders, cooperators, and experts in the northeast regional and national networks. The capacity for improved communication facilitates the rapid dissemination of information concerning current plant disease and insect pest activity. The new equipment and upgrades in technology also provide the means to create modern educational resources for use in local and regional training programs. Grant monies received for FY13 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.

Ramapo Tomato Sale

In the spring of 2008, the New Jersey Agriculture Experiment Station revived the hybrid tomato variety 'Ramapo'. The staff of the PDL conducted the retail sale of the seed with Cindy Rovins. The variety 'Moreton' was added for the 2009 season and a "Rediscover the Jersey Tomato" t-shirt for 2010. Through FY12, the PDL has processed 8,926 orders for 24,840 packets of seeds. The t-shirts are extremely popular also with over 1,000 sold. Orders continue to come into the laboratory almost daily.

Appendix 1.

PLANT DIAGNOSTIC LABORATORY - FEE SCHEDULE

All fees are per sample. Please visit **www.njaes.rutgers.edu/services** for sampling instructions.

STANDARD SAMPLE (most samples except fine turf)

In-state	$40
Out-of-state	$95

FINE AND SPORTS TURF

In-state	
Disease/insect diagnosis	$75
Disease/insect diagnosis & nematode assay*	$120
Out-of-state	
Disease/insect diagnosis	$95
Disease/insect diagnosis & nematode assay*	$170

*** Combination price applies only to samples from same location (ie. the same green, field, etc.)**

NEMATODE ASSAY

In-state (except fine turf)	$30
In-state fine turf	$60
Out-of-state	$95

FUNGUS AND MOLD IDENTIFICATION

In-state microscopic identification	$50
Out-of-state microscopic identification	$100

INSECT IDENTIFICATION

In-state	$40
Out-of-state	$95

PLANT AND WEED IDENTIFICATION

In-state	$40
Out-of-state	$95

SPECIAL TESTS

Fungicide resistance testing (per compound) $350
Call ahead to discuss specifics and multiple compound discounts.

Virus testing
Diagnostic screen $200
Individual test fee varies. Call ahead to discuss specifics.

Endophyte screening
In-state $75
Out-of-state $100

Pesticide residue and contaminant testing
Call ahead to discuss available tests and fees.

OTHER SERVICES NEGOTIABLE.
CONTRACTS AND VOLUME DISCOUNTS ARE AVAILABLE.
ALL FEES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Appendix 1. (continued).

SOIL TESTING LABORATORY - FEE SCHEDULE

All fees are per sample. Please visit **www.njaes.rutgers.edu/services** for sampling instructions.

LANDSCAPE

Level 1 - Fertility Test: $20 Nutrients, pH, recommendations

Level 2 - Problem Solver (soil/plant suitability test): $50 Nutrients, pH, soluble salt level, organic matter content, soil textural class, recommendations

Level 3 - Topsoil Evaluation: $80 Nutrients, pH, soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content, recommendations

FARM

Farm Fertility Test: $20 Nutrients, pH, estimated CEC & cation saturation, recommendations from RCE agent

Pre-sidedress Nitrate Test (only): $20 Nitrate-nitrogen soil to determine mid-season fertilizer requirement. Results within 3 working days (assuming dry sample when received), report FAXed.

Full Farm Test: $50 Nutrients, pH, estimated CEC & cation saturation, Inorganic-nitrogen, organic matter content, recommendations from RCE agent

GOLF & SPORTS TURF

Golf/Sports Turf Fertility Test: $20 Nutrients, pH, estimated CEC & cation saturation, recommendations

Golf/Sports Total Turf Soil Test: $50 Nutrients, pH, estimated CEC & cation saturation, soluble salt level, organic matter content, soil textural class, recommendations

Sand-based Root Zone Test: $50 Nutrients, pH, estimated CEC & cation saturation, recommendations, soluble salt level, organic matter content by loss-on-ignition, percentage fines, recommendations

ORGANIC MEDIA

Greenhouse (soilless) Potting Media: $50 Nutrients, pH, electrical conductivity, available nitrogen (nitrate and ammonium) by saturated media extract

Compost/Basic: $60 pH, electrical conductivity, nitrate-nitrogen by saturated media extract, maturity index

Compost/Technical: $125 pH, electrical conductivity, available nitrogen (nitrate and ammonium) by saturated media extract, organic matter content, total Kjeldahl nitrogen, C:N ratio, maturity index, moisture content, coarse/inert fragment content. Report FAXed.

Compost Available Nutrients: add $15 (add to either compost test above) Water-soluble P, K, Ca, Mg, Cu, Mn, Zn, B, Fe by saturated media extract

Compost Total Nutrients: add $50 (add to either compost test above) Total P, K, Ca, Mg, Cu, Mn, Zn, B, Mo in ashed compost sample

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

Appendix 1. (continued).

TECHNICAL TESTING

Permeability Class Rating: $100 Percentages sand/silt/clay, sieve analysis of sand, gravel content. Report FAXed.

Acid-producing Soil Test: $40 pH before and after oxidation, level of sulfate for determination of acid sulfide/sulfate soil or sediment. Report FAXed.

Technical Topsoil Evaluation: for blended/manufactured topsoil substitute $85 Fertility, pH, soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content, visual assessment. Report FAXed.

Ecological Research Test: $110 Nutrients, pH, estimated CEC & cation saturation, soluble salts, organic matter content, percentages of sand/silt/clay, soil textural class, TKN, Inorganic N. Report FAXed.

INDIVIDUAL SOIL TESTS

Soil pH and Lime Requirement Only: $10

Soluble Salt Test: $10

Soil Organic Matter Content: $15

Loss-on-ignition Organic Matter: $15 by ashing

Soil Texture/Particle Size: $30 sand/silt/clay %

USDA Sieve Analysis of Sand: $50 class percentages: very coarse, coarse, medium, fine, very fine; also gravel content

Custom Sieve Analysis: $15/sieve client specified

Gravel (>2mm) Size Distribution: $10

Inorganic Nitrogen: $20 nitrate- and ammonium-nitrogen

Total (Kjeldahl) Nitrogen: $20

Cation Exchange Capacity or Exchangeable Cations: $50 Ca, Mg, K, & Na

Cation Exchange Capacity & Exchangeable Cations: $75 percentages of Ca, Mg, K, & Na on exchange sites

Lead Screening by Mehlich 3: $20 extractable lead (Pb) and estimated total lead; interpretation of relative risk

Soil Water Content, as received: $10

OTHER ANALYSES

Water Analysis for Irrigation: $20 pH; soluble salt content; soluble P, nitrate-nitrogen, & Fe

Plant Tissue Analysis: call for estimate Kjeldahl N; P, K, Ca, Mg, Cu, Mn, Zn, B, Fe, Mo

FEE ADJUSTMENTS

Express Processing: $50 charge per sample. Turnaround time will depend on tests required and total number of samples in batch. Includes FAXing of report.

Special Reporting Requirements: $180/hour calculated in 15 minute increments for example percent passing format for sieve analysis, calculation of coefficient of uniformity, particle size distribution graph, compliance of results to specifications, recommendations to meet specifications, critique of specifications

Appendix 2. Plant Diagnostic and Soil Testing Budgets

Table A2.1. Expenses, PDL-FY12.

Salaries and benefits	
(full and part time staff)	$207,061.29
Supplies and services	
Diagnostic and testing supplies	
Printing and marketing	
References	
Equipment maintenance	
Office supplies	
Credit card fees	$23,968.74
Communications	
Telephone/fax	
Postage	$1,890.21
Travel	
Paid talks and professional meetings	$4,305.84
Total operating costs	$237,226.08

Table A2.2. Income, PDL-FY12.

Sample fees	$106,871.62
Lecture fees	
OCPE and other honorarium	$25,922.50
Grants and contracts	
NPDN	$26,000.00
Other	
Salaries (NJAES/SEBS)	$77,138.41
Total actual income	$235,932.53

Table A2.3. Estimated expenses, PDL-FY13.

Salary and benefit costs	$210,000.00
Supplies and services	$15,000.00
Communications, marketing and travel	$10,000.00
Total potential cost FY12	$235,000.00

Table A2.4. Estimated income, PDL-FY13.

Plant Health Samples	
2000 @ $55 average fee per sample	$110,000.00
Lecture fees	
OCPE and other honoraria	$25,000.00
Cost recovery	
Grant and contracts	$20,000.00
Salaries (NJAES/SEBS)	$80,000.00
Total potential income FY12	$235,000.00

Appendix 2. Plant Diagnostic and Soil Testing Budgets (continued).

Table A2.5. Expenses, STL-FY112

Salaries and benefits (full and part time staff)	$255,064.21
Supplies and services	
Testing supplies	
Chemicals	
Equipment repair and maintenance	
Printing and marketing	
Office supplies	
Credit card fees	$53,311.11
Communications	
Telephone/fax	
Postage	$4,113.30
Travel	
Paid talks and professional meetings	$771.32
NJ Soil Health Conference	$1,500.00
Payment to NJAES ICP purchase reimbursement	$20,000.00
Total operating costs	$334,759.94

Table A2.6. Income, STL-FY12.

Sample fees STL	$306,967.90
Lecture fees OCPE and other honoraria	$600.00
Other	
Salaries (NJAES/SEBS)	$26,319.93
NJAES support of NJ Soil Health Conference	$1,500.00
Total actual income	$335,387.83

Table A2.7. Estimated expenses, STL-FY13.

Salary and benefit costs	$262,000.00
Supplies and services	$52,000.00
Communications, marketing and travel	$6,000
Payment to NJAES ICP purchase reimbursement	$20,000.00
Total potential cost FY12	$340,000.00

Table A2.8. Estimated income, STL-FY13.

Soil Analysis 9,000 @ $35 average fee per sample	$315,000.00
Lecture fees OCPE and other honoraria	$1,000.00
Cost recovery Salaries (NJAES/SEBS)	$27,000.00
Total potential income FY12	$343,000.00

Appendix 3.

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Director, FY12.

Date	Title	Audience	Location	Par-ticipants[1]
08/18/11	Understanding White Grubs in Turfgrass (1.5hr)	Master Gardeners Training Program	Ocean County	H
09/22/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Passaic County	H
09/27/11	What is Killing Our Trees (1.5hr)	Upper Deerfield Environmental Commission	Cumberland County	H
10/05/11	What is That on Our Plant (1.5hr)	Valhalla Garden Club	Bergen County	H
10-12/11	Insects of Turfgrass (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/11	Diseases of Turfgrass (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/11	Diseases of Ornamentals (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/11	Principles of Pest Control on the Golf Course (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10/20/11	Diseases of Turf (1hr)	Emergency Pesticide Recertification Short Course	Cook Campus	A,T,L
10/22/11	Top 10 Diseases in NJ Shade Trees (1.5hr)	New Jersey Shade Tree Federation Annual Mtg.	Camden County	A,H,I,L,T
10/27/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Middlesex County	H
10/28/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Middlesex County	H
11/18/11	Nematodes and Nematode Extraction (3hr)	General Plant Pathology Lab (11:770:311)	Cook Campus	C
11/22/11	The Art and Science of Disease Diagnosis (2hr)	Master Gardeners Training Program	Union County	H
11/29/11	Recognizing Abiotic Plant Disorders (1hr)	New Jersey Nursery and Landscape Association	Gloucester County	A,I,L,T
12/06/11	Observations from a Difficult Year on the Golf Course (0.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/07/11	Recognizing Abiotic Plant Disorders (0.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/08/11	Buckley's Boot Camp: Basic Training in Diseases of Turf and Ornamentals (2hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/20/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Morris County	H
01-03/12	Diseases of Turfgrass (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/12	Diseases of Ornamentals (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/12	Principles of Pest Control on the Golf Course (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/12	Insects of Turfgrass (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01/03/12	Molds, Mildews, and other Mild Mannered Diseases of Turfgrasses (1hr)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/05/12	2011 Year in Review (1hr)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/11/12	Understanding White Grubs in Turf (1hr)	New York State Turf and Landscape Association: Westchester Conference	Westchester, NY	A,L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
01/11/12	The Leaf Feeding Menace and the Miracle Cure (1hr)	New York State Turf and Landscape Association: Westchester Conference	Westchester, NY	A,L,T
01/13/12	The Complete Turf Disease for Golf Courses (3hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/17/12	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Atlantic County	H
01/18/12	The Art and Science of Disease Diagnosis (1.5hr)	Landscape IPM Short Course	Cook Campus	L,T
01/20/12	The Complete Turf Disease for Golf Courses (3hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/24/12	Recognizing Abiotic Stresses in Turfgrass (1hr)	NJ Nursery & Landscape Association: Plants Show	Middlesex County	A,L,T
01/26/12	Common Landscape Plants We All Love and the Diseases that will Break Your Heart (0.5hr)	Northeast Pennsylvania Turf Conference and Trade Show	Wilkesbarre, PA	L,T
01/26/12	Insects that Suck: Hard and Soft Scale (0.5hr)	Northeast Pennsylvania Turf Conference and Trade Show	Wilkesbarre, PA	L,T
01/31/12	Hands on Diagnostics Training (3hr)	Master Gardeners Training Program	Hunterdon County	H
02/02/12	Basic Turf Diseases: Pick Your Best Defense (2hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/02/12	Insect Pests of Turfgrass (2hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/10/12	Scouting Tips for Turf Managers (1hr)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/10/12	The Art of the Diagnosis: Steps to Solving Turf Problems in the Field (1hr)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/14/12	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Camden County	H
02/15/12	Basic Turf Diseases: Pick Your Best Defense (1hr)	Athletic Field Construction Short Course	Cook Campus	T
02/21/12	2011 Year in Review (1hr)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
02/29/12	2011 Year in Review (1hr)	New Jersey Landscape Contractors Association	Bergen County	A,L,T
03/08/12	Recognizing Abiotic Stress in the Landscape (0.5hr)	Central Jersey Turf and Ornamental Institute	Monmouth County	A,L,T
03/06/12	Basic Turf Disease: Pick Your Best Defense (1hr)	Nassau Suffolk Landscape Gardeners Association	Hempstead, NY	A,L,T
03/09/12	The Complete Turf Disease (6hr)	Advanced Turf Disease Short Course	Cook Campus	L,T
03/12/12	Recognizing Abiotic Stresses in Turfgrass (1hr)	Brooklyn Landscape Gardeners Association	New York, NY	A,L,T
03/14/12	Root-Infecting Patch Diseases (1hr)	John Deere University: Saratoga New York	Saratoga, NY	A,L,T
03/15/12	Root-Infecting Patch Diseases (1hr)	John Deere University: Turning Stone Resort	Verona, NY	A,L,T
03/16/12	Root-Infecting Patch Diseases (1hr)	John Deere University: Batavia New York	Batavia, NY	A,L,T
03/20/12	Scouting Tips for Turf Managers (1hr)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
03/20/12	Key Diseases in the Landscape: Plants I Love To Hate (1hr)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L,T
03/21/12	Scouting Tips for Turf Managers (1hr)	New York State Turf Association: Adirondack Regional Conference	Lake Placid, NY	A,L,T
03/21/12	Dollar Spot: The Most Important Turf Disease (1hr)	New York State Turf Association: Adirondack Regional Conference	Lake Placid, NY	A,L,T
03/21/12	Basic Turf Disease: Pick Your Best Defense (1.5hr)	New York State Turf Association: Adirondack Regional Conference	Lake Placid, NY	A,L,T
03/29/12	Key Diseases in the Landscape: Plants I Love to Hate (2hr)	Master Gardeners Training Program	Morris County	H
04/05/12	A Summer of Turf Disease at Rutgers PDL (0.5hr)	Northeast Plant Diagnostic Network Regional Mtg.	White Plains, NY	I
04/11/12	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Gloucester County	A,L
04/17/12	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Ocean County	H
04/18/12	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Essex County	H
04/19/12	Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program	Ocean County	H
04/21/12	Tree Disease Basics (2hr)	Certified Tree Expert Training Program	Cook Campus	A,L
04/26/12	Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program	Monmouth County	H
04/30/12	The Art and Science of Disease Diagnosis (3hr)	Department of Veterans Affairs New Jersey Health Care System Landscaping Technologist Certification Course	Essex County	L,T

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, FY12.

Date	Title	Audience	Location	Par-ticipants[1]
10-12/11	Turf Insect Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/11	Turf Disease Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10/26/11	Turf Grass Insects Pests (3hr)	Emergency Pesticide Recertification Short Course	Cook Campus	A,T,L
11-12/11	review session for GCSAA collegiate Turf Bowl competition (2 1.5hr sessions)	GCSAA Turf Bowl Review Session	Cook Campus	C
11/22/11	Plant Diagnostic Laboratory Tour (1hr)	Plant Pathology Course, Mercer County Community College	Cook Campus	C

Appendix 3. (Continued)
Table A3.2. (Continued)

Date	Title	Audience	Location	Par-ticipants[1]
12/08/11	Buckley's Boot Camp: Basic Training in Insects Pests of Turf and Ornamentals (2hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
01/11/12	Household Insect Pests (3hr)	Master Gardeners Training Program	Essex County	H
10-12/11	Turf Insect Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/11	Turf Disease Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01/19/12	Key Insect Pests of Ornamentals (1.5hr)	Landscape IPM Short Course	Cook Campus	L,T
01-02/12	review session for GCSAA collegiate Turf Bowl competition (6 1.5 sessions)	GCSAA Turf Bowl Review Session	Cook Campus	C
03/08/12	Identification & Control of Key Scale Insect Pests in the Landscape (0.5hr)	Central Jersey Turf and Ornamental Institute	Monmouth County	A,L,T
03/12/12	Sawfly, Don't Bother Me (1hr)	Brooklyn Landscape Gardeners Association	New York, NY	A,L,T
03/15/12	Sawfly, Don't Bother Me (1hr)	NJISA 2012 Garden State Tree Conference	Cook Campus	A,L
03/20/12	Key Insect Pests of Ornamentals (1.25hr)	RCE Introduction to Organic Landcare Seminar	Middlesex County	A,L,T
03/26/12	Key Insect Pests of Ornamentals (1.25hr)	RCE Introduction to Organic Landcare Seminar	Essex County	A,L,T
03/31/12	Common Insect Pests and Their Control in the Organic Vegetable Garden (1hr)	Maplewood Community Gardening Workshop	Maplewood, NJ	H
04/10/12	Introduction to Entomology (3hr)	Department of Veterans Affairs New Jersey Health Care System Landscaping Technologist Certification Course	Essex County	L,T
04/12/12	Household Insect Pests (3hr)	Master Gardeners Training Program	Ocean County	H
05/01/12	Household Insect Pests (3hr)	Master Gardeners Training Program	Monmouth County	H

Table A3.3. Complete listing of lectures presented by Dr. Stephanie Murphy, STL Director, FY11.

Date	Title	Audience	Location	Par-ticipants[1]
09/19/11	Soil Testing at Rutgers Lab Tour: Procedures, Theory, Results and Recommendations (1.5hr)	Soil Fertility (11:776:440)	Cook Campus	C
09/21/11	Understanding Soil for Best Management (2hr)	Master Gardeners Training Program	Essex County	H
10/3-5/11	Soil Physical Properties and Field Exercises (10.5hr)	Soils and Site Evaluation For Septic Disposal Systems and Stormwater BMP's Short Course	Cook Campus	Co,E,Hf

Appendix 3. (Continued)
Table A3.3. (Continued)

Date	Title	Audience	Location	Par-ticipants[1]
10/18/11	Agricultural Best Management Practice #1: Soil Testing (1.3hr)	Soils and Water (11:375:360)	Cook Campus	C
12/06/11	The Importance of Soil Testing (0.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/16/11	Characteristics of Native Topsoil and "Manufactured Topsoils" for Landscape Use (0.75hr)	Turfgrass Establishment Short Course	Cook Campus	L,T
01/17/12	Restoring Soil Quality In Fields of Agriculture (0.5hr)	Vegetable Growers Association of New Jersey Convention	Atlantic County	F
01/24/12	Soils and the Environment (2hr)	Environmental Stewards Training	Somerset County	H
01/26/12	Soils and the Environment (2hr)	Environmental Stewards Training	Warren County	H
02/08/12	Turf Fertilizer Legislation in New Jersey (0.3hr)	MidAtlantic Soil Testing and Plant Analysis Working Group Annual Meeting	Virginia	I
02/28/12	Soil Restoration - Laws and Standards in New Jersey (2hr)	Master Gardeners Training Program	Morris County	H
03/03/12	Soil Quality for Community Gardens (0.5hr)	Frelinghuysen Arboretum's Community Gardening Conference	Morris County	H
03/21/12	Water Quality and Soil Testing (0.3hr)	Agricultural Water Issues Workshop	Burlington County	F
04/03/12	Soil Profile Descriptions and Evaluation for Suitability/Limitations (2hr)	Soils and Water (11:375:360)	Cook Campus	C
04/06/12	Soil Testing at Rutgers Lab Tour: Procedures, Theory, Results and Recommendations (2hr)	Soils and Water (11:375:360)	Cook Campus	C
04/10/12	Soil Profile Descriptions and Evaluation for Suitability/Limitations (2hr)	Soils and Water (11:375:360)	Cook Campus	C
04/13/12	Soil Testing at Rutgers Lab Tour: Procedures, Theory, Results and Recommendations (2hr)	Soils and Water (11:375:360)	Cook Campus	C
05/15/12	Soil Quality for Community Gardens (0.75hr)	East Brunswick Community Gardeners	Middlesex County	H
05/30/12	The Grass Grows Greener When Planted in Healthy Soil (0.25hr)	Soil Health Conference	Ocean County	F,H,L,T

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

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