RUTGERS
New Jersey Agricultural Experiment Station

Rutgers Soil Testing and Plant Diagnostic Services

2010 Fiscal Year Report

(July 1, 2009 to June 30, 2010)

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Annual Report

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Introduction

Rutgers Soil Testing and Plant Diagnostic Services are provided by Rutgers Cooperative Extension (RCE), the outreach component of the New Jersey Agricultural Experiment Station (NJAES) and School of Environmental and Biological Sciences (SEBS). Located on the Cook Campus, these laboratories provide New Jersey citizens with diagnoses of plant problems and chemical and mechanical analyses of soil. Their mission is to provide such services in an accurate and timely manner to meet the increasing agricultural and environmental needs of the State. These goals are achieved in cooperation with extension and research faculty and staff at NJAES. This report summarizes the activities of these laboratories during the 2010 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 115,000 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 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 accepted its first samples on June 26, 1991, and has since examined more than 36,000 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. Loren Muldowney, Laboratory Assistant, began working in the STL in the spring of 2007. She earned a B.A. in Biochemistry from Rutgers University in 1983 and an M.S. in Environmental Sciences under the program option Soils and Water, also at Rutgers in 1994. She has clinical laboratory experience in biochemistry and has worked as a field soil scientist responsible for site evaluation, laboratory and on-site permeability testing, wetland identification, and NJDEP permit applications. Her professional affiliations include the American Society of Agronomy, the Soil Science Society of America, the Crop Science Society of America, the Soil and Water Conservation Association and the New Jersey Association of Professional Soil Scientists. She performs soil tests and documents laboratory methods as adapted to the needs of STL clientele, and provides customer service via telephone on a variety of soil and gardening-related queries.

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, Centers, and Institutes at Rutgers University. 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 cannot forget the other 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, and submission instructions are also 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. 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, 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.

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 delivered by email or postal mail. General recommendations for lime 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 2010 Report

Operations

PDL

During the 2010 fiscal year (July 1, 2009 to June 30, 2010), the PDL examined 2002 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 2.7% increase (or 54 samples) from FY09. Samples submitted for diagnosis (Table 2) actually declined by 241 samples (1538 in FY09 to 1297 in FY10), but were amply made up for by insect identifications for Cooperative Agricultural Pest Survey (CAPS) trap catches (114 in FY09 to 397 in FY10). 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 Table 2. Most samples (1297 or 65%) were plant samples submitted for diagnosis, 15% (308) of the samples were for nematode analysis, and 20% or 397 samples were insect, mold, or plant identifications.

In Table 3, samples submitted to the laboratory are presented by origin. In FY10, 79% of the plant submissions were from commercial growers, 9% were from residential clientele, and 12% were submitted from research faculty at Rutgers University. This distribution is consistent with other years; however, residential and research sample submissions did decline slightly as a percentage of the total. Again, we feel these declines reflect the current state of the economy. Commercial plant managers benefit more financially from our services, thus they submit the majority of samples to the laboratory.

In FY10, 79% of samples submitted for plant or insect identification were from commercial clients, and 21% were residential in origin (Table 3). Most of these samples were from larger State Department of Agriculture surveys. Household or nui-

Table 1. PDL sample submissions by month, FY06 to FY10.

Month	FY06	FY07	FY08	FY09	FY10
July	418	489	320	333	382
August	362	622	494	227	347
September	288	404	265	185	248
October	157	280	276	293	229
November	90	86	123	140	35
December	107	184	51	68	181
January	41	36	29	74	18
February	23	13	40	17	9
March	75	84	20	56	31
April	235	72	105	110	112
May	279	241	124	200	161
June	317	284	247	245	249
Total	2392	2795	2094	1948	2002

Table 2. PDL sample submissions by sample type, FY10.

Sample Type	Number of samples	%
Plant samples	1297	65
Nematode assay	308	15
Insect, weed, and fungus identification	397	20
Total	2002	100

sance pests, which are largely issues of concern for residential clients, make up the remaining submissions. Of the nematode assays submitted, 73% of the samples were from commercial clients, and 27% were from research. We expect that the number of nematode samples submitted from residential clients (1) 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. However, research samples are an extremely important component of our case-load. 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 (94%) were either turfgrass or ornamental plants (Table 4). The wide variety of turf and ornamental species grown under diverse environmental conditions in our state results in a large number of problems not readily identifiable by growers or county faculty with these crops. Furthermore, extension faculty and staff who deal primarily with turfgrass and ornamental plants as commodities, as well as plant managers in the turf and ornamentals industry, readily adopted the user fee-based delivery of service. Alternatively, commercial growers of traditional agricultural crops have been slow to adopt a fee-for-service system. Certain RCE faculty members in New Jersey's southern counties continue to 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

Table 3. PDL sample submissions by origin, FY10.

	Plant		Nematode		Identification	
Origin	number	%	number	%	number	%
Commercial	1027	79	224	73	312	79
Residential	113	9	1	0	83	21
Research	157	12	83	27	2	0
Total	1297	100	308	100	397	100

Table 4. PDL sample submissions by crop category, FY10.

	Plant samples		Nematode samples	
Crop	Number	%	Number	%
Turf	556	43	205	67
Ornamentals	658	51	1	0
Field crops	3	0	0	0
Vegetable	71	5	7	2
Fruit	9	1	95	31
Total	1297	100	308	100

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 FY10 were submitted to the laboratory through the Fruit IPM program from blueberry growers. 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 since 2002. Problems in golf turf, particularly with nematodes, are more severe during seasons with considerable heat and drought stress, and we have not had a major drought in New Jersey since 1999-2000.

Samples were submitted to the PDL from all of counties in New Jersey (Table 5). The majority of samples, however, were submitted from counties in close proximity to the laboratory. The probable explanation for this 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 22% of the samples submitted for diagnosis to the laboratory were from out-of-state. The percent of out-of-state samples is slightly lower than in FY09, which reflects a year to-year decrease in the numbers of samples the laboratory processed for a US Forest Service survey. Nearly all the rest of the out-of-state samples were turf. In fact, nearly 50% of all turf samples were from out-of-state. Golf turf samples were submitted

Table 5. PDL sample submissions by county, FY06 to FY10.

In-state	FY06	FY07	FY08	FY09	FY10
Atlantic	196	181	186	168	147
Bergen	90	94	74	110	73
Burlington	214	454	232	110	57
Camden	38	74	41	28	20
Cape May	26	37	26	14	24
Cumberland	73	27	66	53	59
Essex	40	50	43	30	53
Gloucester	47	56	41	36	27
Hudson	10	6	11	21	10
Hunterdon	36	117	143	13	27
Mercer	103	244	76	77	323
Middlesex	193	258	148	104	109
Monmouth	179	110	88	74	74
Morris	169	199	176	131	247
Ocean	90	69	37	28	40
Passaic	34	23	12	36	32
Salem	31	12	7	62	58
Somerset	112	91	73	129	81
Sussex	14	60	34	19	14
Union	73	65	39	50	38
Warren	28	133	101	28	22
RU research	105	69	79	41	22
In-state total	1901	2429	1733	1623	1557
Out-of-state	491	366	360	586	445
Total	2392	2795	2093	1948	2002

to the laboratory from 17 states in FY10. Turf samples were received from states as far away as Florida, Washington, Arizona, and California. New York, Pennsylvania, and Connecticut provide the largest number of 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 send samples to Dr. Clarke, who always forwards them to the laboratory for diagnosis. Because there are very few laboratories in the country that diagnose turfgrass diseases, these superintendents have continued to submit samples to the PDL. Many golf turf professionals at other universities often refer their clients to Rutgers for second opinions or when they are on leave. Furthermore, Mr. Buckley's association with the Professional Golf Turf Management School allows for contact with as many as 90 potential new clients each year. Many of the students turn into regular patrons of the laboratory services. The charge for out-of-state samples is substantially higher to help defray the cost of in-state samples.

Of the samples submitted to the PDL for diagnosis or identification, 34% 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 26% of the laboratory diagnoses. Insect pest damage was diagnosed on 5% of the submissions. Identifications comprised 20% of the total number of samples submitted; of these, 17% were arthropods, 1% were fungi, and 2% were plants. Nematode detection accounted for the other 15% 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 products or nuisance pests that are found within the household. Over the last several years, the Department of Entomology has cooperated with the laboratory to forward clients with insect identification needs. Their cooperation has been invaluable in increasing the awareness of the laboratory to potential clients. Arthropod identifications increased in FY10, which is due entirely by the laboratory's participation in the state's CAPS program.

Table 6. PDL sample submissions by diagnosis, FY10.

Diagnosis	Number of samples	%
Disease (biotic)	685	34
Disease (abiotic)	522	26
Insect pest	90	5
Nematode	308	15
Arthropod identification	337	17
Fungus identification	22	1
Plant identification	38	2
Total	2002	100

Table 7. PDL sample response time, FY10.

Response Time	Number of samples	%
0 to 3 days	1839	92
4 to 6 days	99	5
7 to 10 days	39	2
11 to 21 days	17	1
>21 days	8	0
Total	2002	100

Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses decreased in FY10. 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 FY10, a laboratory response was prepared in less than three days for most (92%) of the samples submitted (Table 7), and 99% of our clients received a response in less than a week. A number of the samples (25) 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.

Table 8. STL sample submissions by month, FY06 to FY10.

Month	FY06	FY07	FY08	FY09	FY10
July	886	672	699	464	717
August	1275	725	1148	588	496
September	854	776	798	925	800
October	640	802	767	887	559
November	994	587	363	656	473
December	538	366	247	496	298
January	556	680	349	241	497
February	508	317	358	337	253
March	1451	987	1053	1309	976
April	1296	1154	1817	1404	996
May	873	946	934	647	615
June	762	578	673	622	581
Total	10633	8590	9206	8576	7261

Table 9. STL soil sample submissions by test type, FY10.

Test type	Number of samples	%
Standard fertility only	4602	63
Special tests	2659	37
Total	7261	100

Table 10. STL soil sample submissions by origin, FY10.

Origin	Number of samples	%
Residential	2662	36.7
Engineering	1323	18.2
Commercial landscape	1097	15.1
Farm	753	10.4
Rutgers/research	702	9.7
Golf/Sports turf	431	5.9
Other	159	2.2
Reference	134	1.8
Total	7261	100

STL

The STL processed 7261 samples for soil fertility and physical analysis in FY10 (Table 8). The total laboratory output decreased 15% from FY09 (8576 samples). Sample submission totals were highest in early spring in anticipation of the growing season, but were fewer than in past years. The typical surge of samples in early fall when laboratory clientele are preparing for fall lawn fertilization arrived in September. This peak also was less than prior years, as were sample numbers during most other months. The only exceptions were unusually high numbers for the months of July and January. This helped even out the variability of intensity of laboratory work over the season. The overall decrease in sample numbers may be related to the struggling economy and possibly the weather.

Of the soil samples submitted to the STL for analysis in FY10 (Table 9), 63% were for the standard soil analysis (level 1) only and 37% included requests for additional special tests.

In FY10, soil samples from residential clientele represented 36.7% of the submission total, (Table 10). Commercial growers, including the producers of fruit and vegetables, as well as the managers of ornamental plants and turfgrass, represented 31.4% of the total. Samples from engineering firms comprised 18.2% of the workload, another 9.7% of the samples were from research programs at Rutgers, and 2.2% were from government agencies, school districts and non-profits, and 1.8% were reference samples for quality assurance. In the past, samples from residential clientele largely dominated laboratory submissions; however, recent growth in samples from engineering and commercial clientele indicates a continuing trend toward a professional client base. Samples from these clientele groups typically include special

Table 11. STL soil sample submissions by county, FY08 to FY10.

County	FY08	FY09	FY10
Atlantic	262	168	129
Bergen	466	484	257
Burlington	429	487	392
Camden	204	271	218
Cape May	173	135	68
Cumberland	254	150	107
Essex	261	303	246
Gloucester	301	286	122
Hudson	45	108	27
Hunterdon	255	358	234
Mercer	522	570	531
Middlesex	912	513	439
Monmouth	655	1165	538
Morris	438	435	378
Ocean	502	473	338
Passaic	165	119	137
Salem	7	12	6
Somerset	511	557	664
Sussex	170	190	145
Union	269	386	268
Warren	111	79	64
Ulster (NY)	0	0	35
Reference	315	212	134
Unidentified	1979	1327	1784
Total	9206	8576	7261

tests, which is a clear financial benefit.

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, 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, reflect RCE programs with active home horticulture programs or those with outreach events (fairs, field days) that provide opportunities to promote soil testing. The profile also identifies county faculty and programs that utilize and promote STL services. To some degree, population centers also help describe the influx of samples. Landscapers (etc.) who work across several counties may have skewed the numbers for their "home" county. A large number of county affiliations were unidentified on submission forms. Many of these samples were from engineering or environmental firms that submit soil from a central office that may not conform to the location where the soil was sampled. Such soil samples are usually submitted as quality control/ assurance with "topsoil" specifications, and recommendations are only occasionally requested.

For increased efficiency in collecting laboratory data and reporting to clients, a new internet-based database has been in development over the past year, and transition began in earnest in January. The new database is designed to handle the multitude of various sample types in terms of test data and complex reporting requirements. Robert Muldowney of NJAES IT staff developed the database and has spent countless hours revising and upgrading the system.

Nutrient data from the two databases, representing July to December 2009 and January to June 2010, were combined for summarization. Figures 1 and 2 indicate the relative phosphorus and potassium contents of the soil samples analyzed for fertility. High or very high levels of phosphorus were measured in 68% of the samples tested, and potassium levels were high or very high in 78% of

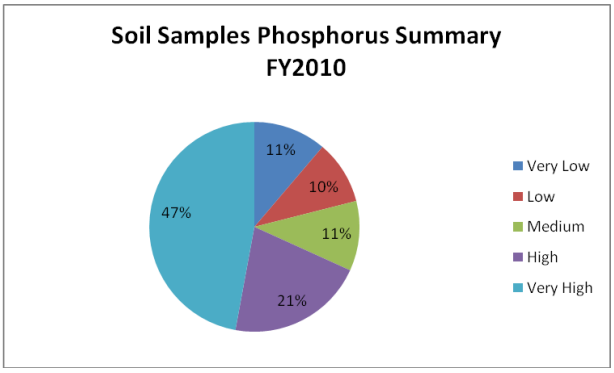

Figure 1. Phosphorus content in soil samples submitted in FY10.

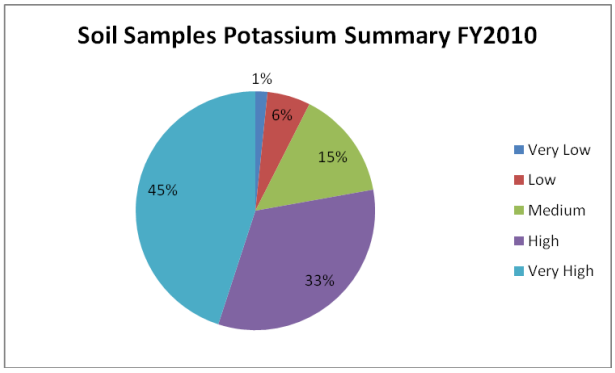

Figure 2. Potassium content in soil samples submitted in FY10.

the samples tested. These data suggest the historical overuse of fertilizers containing potassium and phosphorus 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 in their four or five step programs according to season and do not have a variety of products that address variations in soil test levels. Over time, this has led to the high percentage of samples with excess P. Recent recognition of negative impacts of excess P on water quality has led to increased environmental regulations; fertilizer producers have had to reformulate products to provide zero- (or low-) phosphorus content, and so more low-phosphorus fertilizers are becoming commercially available. At the same time, it has become more difficult to find appropriate fertilizer ratios for soil areas deficient in phosphorus. The limited availability in the residential 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. Fertilizers with inappropriate analysis may be applied because the supplemental single-nutrient fertilizers cannot be found.

Data summaries of soil pH for the period July to December 2009 and for January to June 2010 will be shown separately in slightly different format (due to enhanced capability of the database utilized in 2010). In Figure 3A, the soil pH data of soil samples submitted to the STL in FY10 is summarized in functional classes (based on plant suitability and recommendations). Percentages are based on the number of samples that were analyzed for pH in that time period. The optimum pH range for most plants includes the slightly acidic class (pH 6.05 to 6.95) with 41% of samples.

The moderately acidic soils (pH 5.55 to 6.00) represented 17% of samples. This group should be limed (are too acidic) for optimal growth of most plants but have higher than optimal pH for acid-loving plants. In the latter case, acidifying recommendations were made. The 15% of samples in the very acidic class, pH 4.50 to 5.50, are well-suited for acid-loving plants, but for other species, the soil must be limed. Extremely acidic samples (5%), pH <4.50, are not suitable for most plants; limestone application may have been recommended for these unless they were suspected of being acid-sulfidic materials, which need to be remediated according to New Jersey's Soil Erosion & Sedimentation Act of 1975 (N.J.S.A. 4:24-39 et seq. and N.J.A.C. 2:90-1-1 et seq.). In the alkaline range, 17% of analyzed soils were pH 7.00 to 7.50 (slightly alkaline); this range is generally high for soils of humid, temperate climates such as New Jersey. The exception would be soils derived from limestone, which would tend to be in this range. Slightly alkaline soils would be best suited for legume crops (for example, alfalfa and clover) and limited non-native plants, but are considered to be above optimal pH for most other plants. The most probable cause of high pH is overuse of limestone amendment, or in some cases, excess soluble salts. Because of the tendency for New Jersey soils to acidify over time, no amendment for adjusting pH was given in this pH range unless for acid-loving plants. Samples with soil pH 7.55 to 8.30 (5%) are moderately alkaline and are 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. Less than 1% of samples were in the pH range above 8.30, which can be explained only by high soluble salt content. Remediation is a long-term prospect with these situations, since the recommended acidification can temporarily exacerbate the salt problem.

In Figure 3B, pH data for the second half of FY10 is presented using different categories. The categories are based on the variation from the target pH for the specified crop or planting. This demonstrates more accurately the need for treatment. Therefore, it is clear that 29% of samples of those analyzed for pH during January to June 2010 were within 0.3 pH units of the target, and no amendment was recommended. Twenty-five percent of samples were below the optimum pH range (target ± 0.3), and appropriate limestone recommendations were provided. Two percent of samples were significantly below the optimum pH range (>1.5 units). On the alkaline side, 35% pH samples were 0.4 to 1.5 units higher than the optimum range, and 9% were more than 1.5 units higher. Acidification was recommended in these cases.

Table 12 shows the number of standard soil fertility tests done each month in FY10. The number of special tests is indicated to show the additional work load during the month. Sample response time is influenced by many factors including the total number of submissions and the number of special tests requested each month. The increase in "special" testing requires that most of the special test procedures be run every 2-3 days. The analytical instrument used for nutrient analysis caused several periods of minor delays in reporting due to

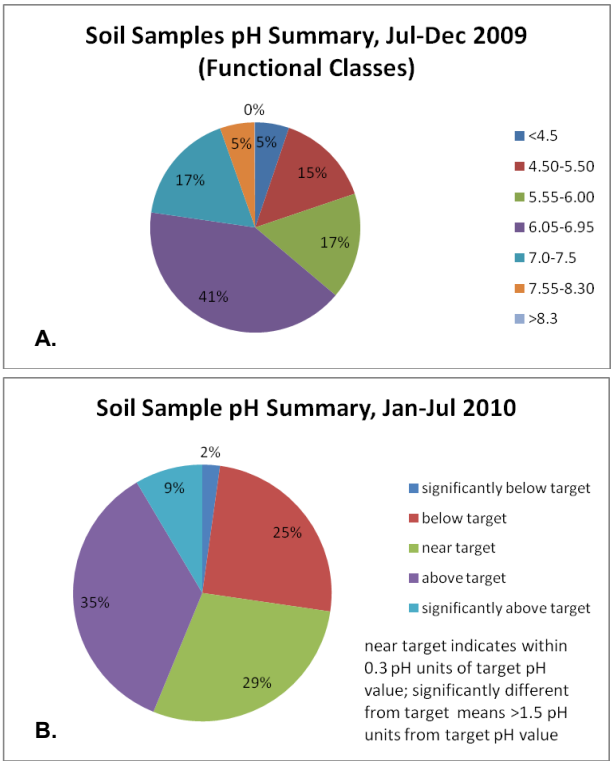

Figure 3. Soil pH of samples submitted in FY10: A) first six months of the fiscal year, presented as simple ranges B) second half of fiscal year in classes related to target pH for the desired crop.

Table 12. Number of STL samples by month and test type, FY10.

Month	Fertility test -only samples	Special test samples	Total
July	283	434	717
August	270	226	496
September	627	173	800
October	389	170	559
November	315	158	473
December	193	105	298
January	268	229	497
February	127	126	253
March	741	235	976
April	787	209	996
May	282	333	615
June	320	261	581
Total	4602	2659	7261

maintenance/repair needs. The installation of a new inductively coupled plasma spectrophotometer (ICP) occurred in July 2010, and more precise results and reliable operations are anticipated for improved reporting time.

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 FY10. 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 for the Pest Management in Landscape Turf Short Course. This was the 17th 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 11th time he planned and coordinated that short course.

Mr. Buckley was an invited speaker in several RCE programs. The following programs were included: North Jersey Ornamental Horticulture Conference – Turf Day, Tree Day, and Landscape Day. Lectures in support of the Atlantic, Camden, Cumberland, Gloucester, Essex, Monmouth, Middlesex, Morris, Passaic, Somerset, Hunterdon, and Union County Master Gardener Programs were also given.

Mr. Buckley was also an invited speaker for the Penn State Northeast Regional Grounds Seminar; the International Society of Arboriculture NJ/PA/DE Chapter Meeting; the Pennsylvania Community Forestry Conference; the New Jersey Shade Tree Federation Annual Conference; the South Jersey Landscape Conference and Nursery Growers Meeting; the National Plant Diagnostic Network National Meeting; John Deere University; the High Line Gardens Staff Training Program; Shemin Landscape Supply Turf Days in Philadelphia, Baltimore, and New York; the Reed and Perrine Turf and Ornamentals Seminar; the New York State Turfgrass and Landscape Association Southeast and Western Regional Conferences; and the New Jersey Certified Tree Expert Training Program.

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. Ms. Tirpak was an invited speaker for the Brooklyn Landscape Gardeners Association Annual Seminar. She also presented programs in support of the Essex, Middlesex, Monmouth and Ocean County Master Gardener programs, the Central Jersey Turf and Ornamentals Institute, and the Essex County Pest Control Operators and Health Officers Day.

Ms. Tirpak spent considerable time and effort in FY10 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 each year. Ms. Tirpak accompanied the team to the competition in San Diego, CA. The team placed 10th out of 67 teams from 31 schools.

Stephanie Murphy

Dr. Murphy participated in the OCPE Home Gardeners School, the Soil and Site Evaluation for Septic Systems Short Course, and the Turfgrass Establishment Short Course.

Dr. Murphy was an invited speaker at several RCE programs including: The New Jersey Water Monitoring Summit, New Jersey Shade Tree Federation, North Jersey Ornamental Horticulture Conference, and the Central Jersey Turf and Ornamental Institute. She also spoke at the Atlantic Coast Fruit and Vegetable Meetings and the New Jersey Nursery and Landscape Convention. Dr. Murphy presented programs in support of the Environmental Stewardship programs in Burlington, Essex, and Somerset Counties. She presented a lecture at the Statewide Master Gardener Association Meeting.

Dr. Murphy was a guest lecturer in the undergraduate courses Soils and Society, and Turf Management. She hosted students from the undergraduate courses Soil Fertility, and Soils and Water for tours of the STL along with detailed explanations of soil testing theory and practices.

Loren Muldowney

Ms. Muldowney participated in the OCPE Soil and Site Evaluation for Septic Systems Short Course, Turfgrass Establishment Short Course, and The Soil and Plant Relationships Short Course. She was also an invited speaker at the South Jersey Nursery and Landscape Conference, The Soil Health Conference, and in the undergraduate class Soils and Water.

In 2010 the STL staff arranged a seminar for the Department of Plant Biology and Pathology and other interested parties, hosting Dr. Will Brinton, Founder and President of Woods End Laboratories. The presentation "SOIL HEALTH, SOIL LIFE: Using Microbial CO_2-Burst to Predict Soil Nutrient (N, P) Potential" (06/02/10) related to applications of microbial respiration in soil for assessing soil and compost quality using an innovative rapid test for soil nitrogen mineralization potential. It offers growers a reliable and cost-effective test for expected soil N release from compost or soil organic matter, an agronomic factor historically left to guesswork based on general principles, assumptions, and typical data. The soil respiration test is now available at STL.

Extension Publications

During FY10, 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 Short CUTT turfgrass newsletter.

Dr. Murphy and Loren Muldowney also contributed several articles to the Plant & Pest Advisory and “What’s in Season from the Garden State” newsletters.

In the spring of 2010, Mr. Buckley and Ms. Tirpak reviewed and updated several RCE Factsheets with Dr. Albrecht Koppenhofer, Extension Specialist, Turfgrass Entomology.

FS1007 An Integrated Approach to Pest Management in Turfgrass: Sod Webworms

FS1013 An Integrated Approach to Pest Management in Turfgrass: Black Cutworm

FS1014 An Integrated Approach to Pest Management in Turfgrass: Nematodes

FS1015 An Integrated Approach to Pest Management in Turfgrass: Billbugs

FS1016 An Integrated Approach to Pest Management in Turfgrass: Annual Bluegrass Weevil

Dr. Murphy co-authored an Extension bulletin with RCE Turfgrass Specialist Dr. James Murphy: Best Management Practices for Nutrient Management of Turf in New Jersey (E327). The BMP document was developed to assist professionals and policy makers with information about proper use of fertilizers on turf.

Dr. Murphy and L. Muldowney co-authored (with D. Giménez of SEBS and D. Kluchinski of RCE) and presented a report to New Jersey Department of Agriculture's State Agriculture Development Committee: "Assessment of Soil Disturbance on Farmland", available at the NJDA-SADC website: http://www.state.nj.us/agriculture/sadc/farmpreserve/postpres/rutgerssoildisturbancereport.pdf

Dr. Murphy co-authored a publication by Robert Muldowney of SEBS/NJAES IT about development of the soil testing database: "RU-SLIMS: Development of Rutgers University's web-based soils laboratory information management system". Mr. Muldowney presented the paper at the XVIIth World Congress of the International Commission of Agricultural Engineering in Québec City, June 13-17, 2010.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in FY10. 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 2010 she participated in several subcommittees, including the Soil Health Conference committee (later delegated to Loren Muldowney of STL) and the Vegetative Standards committee for revision of the state's Soil Erosion & Sediment Control Standards. She also participated in the New Jersey Association of Conservation Districts Conference and the NJDEP initiative "Healthy Lawns, Clean Water", a program that received a Governor's Environmental Excellence Honorable Mention in December 2009. The latter involvement led to participation in stakeholder meetings addressing possible regulation of fertilizer products, fertilization practices, and certification of professional applicators, as well as proposed legislation regarding soil management/restoration after land development.

Dr. Murphy served on the advising committee of one graduate student, and she sponsored an Environmental Steward trainee in a soils education project. She also serves on the scholarship selection committee for the Soil & Water Conservation scholarships (Hanna, Hanna & Duell).

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 Loren Muldowney of the Soil Testing Laboratory continued participation in research related to two projects: "Assessing the Impact of Horse Manure and Composted Manure on Soil and Water Quality" (funded by Rutgers Equine Science Center) and "Assessing the NRCS-NJ Proposed Soil Management Standard" (funded by Conservation Innovation Grant from New Jersey's office of USDA-Natural Resources Conservation Service). Dr. Daniel Giménez, Rutgers Department of Environmental Sciences, is the principal investigator for both projects. The research required extensive soil analysis throughout, bringing in additional samples and income. Dr. Murphy is considered a member of both the Rutgers Equine Science Center and Rutgers Center for Turfgrass Science.

Ms. Muldowney performed validation experiments to correlate 24-hour soil respiration to measured soil organic matter and support interpretation of the new soil respiration test. This will potentially allow nitrogen fertility recommendations to be reduced quantitatively. We anticipate that demand for this will continue to rise given the recent attention to "soil health" and concern over reducing N & P input to coastal watersheds on regional, state, and federal levels.

Marketing

To help advertise laboratory services at grower meetings or other activities, a mobile display unit was developed by the PDL/STL as part of the University-wide brand identification initiative. Two sets of table-top and banner display units using the new Rutgers identity format were purchased, one of which serves as part of the SEBS/NJAES Office of Communications mobile marketing unit. This display briefly describes the services of the two laboratories and how to access them. A set of folders and information cards were developed to match the displays. These 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 FY10, this marketing initiative brought the display to the following programs: The 2009 Great Tomato Tasting; New Jersey Master Gardeners Association Fall Event; Fall and Spring sessions of Rutgers OCPE Home Gardeners School; GCSA-NJ Crystal Conference; League of Municipalities Conference; New Jersey Green Industry (Turf) Expo; New Jersey Vegetable Growers Association Meeting; the Northeast Organic Farming Association Annual Winter Meeting; New Jersey Landscape Conference; New Jersey Flower Show; New Jersey Nursery and Landscape Association Meeting; Ag Field Day; and Turf Field Days.

The presence of STL/PDL staff at other functions enhances the visibility and reputation of Rutgers, SEBS, and NJAES/RCE. Dr. Murphy attended NJ Agribusiness Association Meeting, NJ Turf Nutrient Management Summit, and a meeting intended to extend outreach to Rutgers' own grounds maintenance crews. Dr. Murphy and Ms. Muldowney each attended part of the Soils of Urban, Industrial, Traffic, Mining, and Military Areas (SUITMA 5) Conference, the annual conference of the Urban Soils Working Group of the International Union of Soil Sciences held in New York City in September 2009. Many of the topics were relevant to STL's testing of manufactured soils and the issue of soil quality or health.

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 testing 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 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. 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. Transfer of funds also paid for the plant and soil samples diagnosed or tested for research programs at Rutgers University.

In FY10, $288,963.53 was generated from all PDL activities. In FY10, $322,041.98 was generated from all STL activities. Income generated by each laboratory covered 100% of all costs in FY10. 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 48 "no charge" samples in FY10. As per PDL policy, vol-

ume 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 FY11 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 FY11. 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 FY11 to cover increasing costs.

As part of the current curriculum initiative for undergraduate education at SEBS, Mr. Buckley and Dr. Murphy will be expected to develop courses. Dr. Murphy has developed a new soils course "Soil Quality" (11:776:413) to be taught in the spring 2011 semester. Mr. Buckley has partnered with Dr. Ann Gould to offer the course "Diseases and Insect Pests of Ornamental Plants" (11:770:391) in the spring 2011 semester.

Specific efforts to improve PDL and STL services were initiated in FY09 with a survey of Agricultural and Resource Management Agents and other county-based Cooperative Extension staff. Some comments and suggestions have been taken into account in development of the latest version of the soil testing database, such as graphics and enhanced interpretations. A database upgrade with major impact is the ability to email soil test reports, which greatly speeds delivery and cuts total mailing costs. Further development is planned to add automated recommendations for more crops. Another targeted action to improve Soil Testing operations was a review by Ann Wolf, director of Penn State's Agricultural Analytical Services Laboratory. Recommendations from the review that have been implemented include purchase of large drying cabinets (convection ovens set to 36C) to speed processing of samples; other suggestions will be implemented as additional funds become available. Another equipment purchase that enhances the STL's capacity is an inductively coupled plasma (ICP) spectrophotometer to replace a direct-current plasma (DCP) instrument for more precise nutrient analysis, more reliable operation, and rapid throughput. The new instrument also enables STL to analyze additional elements, most importantly sulfur (S); further work to develop this capability will be a goal for the coming year. The new test that was introduced this year, 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 proposed State regulations for 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 any State-mandated training programs that may result from enacted 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 FY10 to pay salaries, participate in professional training programs and meetings, and to purchase equipment and supplies to upgrade the

laboratory's capability for accurate and timely diagnosis of plant problems. 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 FY10 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.

Extension Integrated Pest Management Coordination and Support Program

For FY10, the PDL received funding from this USDA CSREES program. Stakeholder input provided to CSREES acknowledged the critical nature of IPM support for diagnostic facilities and the PDL was awarded monies to cover existing salary expenses.

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. To date, the PDL has processed 7,745 orders for 21,686 packets of seeds. The t-shirts were extremely popular. Orders continue to trickle into the laboratory 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-FY10.

Salaries and benefits	
(full and part time staff)	$200,650.40
Supplies and services	
Diagnostic and testing supplies	
Printing and advertising	
References	
Equipment maintenance	
Office supplies	
Credit card fees	$16,007.09
Communications	
Telephone/fax	
Postage	$3,766.37
Travel	
Paid talks and professional meetings	$5,504.91
Total operating costs	$225,928.77

Table A2.2. Income, PDL-FY10.

Sample fees	$102,323.00
Lecture fees	
OCPE and other honorarium	$21,525.00
Grants and contracts	
USFS BLS Survey	$3,325.00
NPDN	$35,500.00
EIPMCSP	$42,397.39
Ramapo tomato seed sales	$5,000.00
Other	
Salaries (NJAES/SEBS)	$78,893.14
Total actual income	$288,963.53

Table A2.3. Estimated expenses, PDL-FY11.

Salary and benefit costs	$205,000.00
Supplies and services	$20,000.00
Communications, marketing and travel	$10,000.00
Total potential cost FY10	$235,000.00

Table A2.4. Estimated income, PDL-FY11.

Plant Health Samples	
2000 @ $50 average fee per sample	$100,000.00
Lecture fees	
OCPE and other honoraria	$20,000.00
Cost recovery	
Grant and contracts	$35,500.00
Salaries (NJAES/SEBS)	$80,000.00
Ramapo tomato seed sales	$4,500.00
Total potential income FY10	$240,000.00

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

Table A2.5. Expenses, STL-FY10.

Salaries and benefits	
(full and part time staff)	$258,949.41
Supplies and services	
Testing supplies	
Chemicals	
Equipment repair and maintenance	
Printing and advertising	
Office supplies	
Credit card fees	$29,681.69
Communications	
Telephone/fax	
Postage	$3,582.69
Travel	
Paid talks and professional meetings	$162.56
Total operating costs	$292,376.35

Table A2.6. Income, STL-FY10.

Sample fees	
STL	$269,708.02
Lecture fees	
OCPE and other honoraria	$1,190.00
Other	
Salaries (NJAES/SEBS)	$46,425.43
Research cost share	$3,218.53
Soil Health Conference Sponsor	$1,500.00
Total actual income	$322,041.98

Table A2.7. Estimated expenses, STL-FY11.

Salary and benefit costs	$265,000.00
Supplies and services	$35,000.00
Communications, marketing and travel	$5,000
Total potential cost FY10	$305,000.00

Table A2.8. Estimated income, STL-FY11.

Soil Analysis	
8,000 @ $35 average fee per sample	$280,000.00
Lecture fees	
OCPE and other honoraria	$1,000.00
Cost recovery	
Salaries (NJAES/SEBS)	$47,000.00
Total potential income FY10	$328,000.00

Appendix 3.

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Director, FY10.

Date	Title	Audience	Location	Par-ticipants[1]
07/16/09	Basic Turf Disease: Pick Your Best Defense (1.5 h)	Penn State Extension NE Region Grounds Seminar	East Stroudsburg, PA	A,L,T
07/22/09	Oak Tree Decline - Problems and Solutions (1h)	Master Gardeners Training Program	Camden County	H
09/19/09	Insect Pests in Shade Trees (3h)	International Society of Arboriculture NJ/PA/DE Chapter Meeting	Philadelphia, PA	A,L
10-12/09	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/09	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/09	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/09	Principles of Pest Control on the Golf Course (10 1.5 h lectures)	Professional Golf Turf Management School	Cook Campus	T
10/15/09	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Passaic County	H
10/16/09	Diseases of Turf (2h)	Emergency Pesticide Recertification Short Course	Cook Campus	A,T,L
10/21/09	Diseases of Turf and Ornamentals (2 h)	Emergency Pesticide Recertification Short Course	Cook Campus	A,T,L
10/22/09	Exotic Wood Boring Insect Pests (1h)	PA Community Forestry Conference	Philadelphia, PA	A,I,L,T
10/23/09	2009 Shade Tree Disease Review (1h)	NJ Shade Tree Federation Annual Conference	Camden County	A,I,L,T
11/05/09	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Middlesex County	H
11/06/09	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Middlesex County	H
11/10/09	The Art and Science of Disease Diagnosis (2h)	Master Gardeners Training Program	Union County	H
12/01/09	Exotic Wood Boring Insect Pests (1h)	South Jersey Landscape Conference & Nursery Growers Meeting	Gloucester County	I,L,N
12/09/09	New Jersey Year in Review (.5h)	National Plant Diagnostic Network National Mtg.	Miami, FL	I
12/21/09	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Morris County	H
01-03/10	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/10	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/10	Principles of Pest Control on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/10	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01/05/10	Summer Patch: the Whole Truth and Nothing but the Truth (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/06/10	Exotic Wood Boring Insect Pests (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/07/10	2009 Shade Tree Disease Review (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/14/10	Insect and Disease Control Options for Ornamentals (2h)	John Deere University	Atlantic County	A,L,T
01/14/10	Insect and Disease Control Options for Turfgrass (2h)	John Deere University	Atlantic County	A,L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
01/15/10	Integrated Pest Management of Golf Turf (1.5h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/20/10	The Art and Science of Disease Diagnosis (1.5h)	Landscape IPM Short Course	Cook Campus	L,T
01/22/10	The Complete Turf Disease for Golf Courses (6h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
02/04/10	Basic Turf Diseases: Pick Your Best Defense (2h)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/04/10	Insect Pests of Turfgrass (2h)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/12/10	Disease and Insect Pests in the Urban Garden (6h)	The High Line Staff Training Program	New York, NY	L
02/16/10	Basic Turf Diseases: Pick Your Best Defense (1h)	Athletic Field Construction Short Course	Cook Campus	T
02/18/10	Diagnostic Tips for the Problem Lawn (1h)	Shemin Landscape Supply Company: Philadelphia Turf Day	Philadelphia, PA	L,T
02/18/10	Leaf Feeding Insects in Turf (1h)	Shemin Landscape Supply Company: Philadelphia Turf Day	Philadelphia, PA	L,T
02/19/10	Basic Turf Diseases: Pick Your Best Defense (1h)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/19/10	Understanding White Grubs in Turf (1h)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/23/10	2009 Shade Tree Disease Review (1h)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
02/24/10	Basic Turf Disease: Pick Your Best Defense (1h)	New York State Turf and Landscape Association Southeast Regional Conference	Suffern, NY	A,I,L,T
02/24/10	Sports Turf Disease Update (1h)	New York State Turf and Landscape Association Southeast Regional Conference	Suffern, NY	A,I,L,T
03/01/10	Scouting and Diagnosis are the Keys to Good Pest Control (1h)	New York State Turf and Landscape Association Western Regional Conference	Buffalo, NY	A,I,L,T
03/01/10	Brown Ring Patch and Other Rhizoctonia Diseases (1.5h)	New York State Turf and Landscape Association Western Regional Conference	Buffalo, NY	A,I,L,T
03/01/10	Fungicide Selection and Use (1h)	New York State Turf and Landscape Association Western Regional Conference	Buffalo, NY	A,I,L,T
03/04/10	Disease and Insect Show and Tell (3h)	Master Gardeners Training Program	Middlesex County	H
03/09/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Monmouth County	H
03/11/10	The Complete Turf Disease (6h)	Advanced Turf Disease Management Short Course	Cook Campus	I,L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
03/12/10	Basic Turf Diseases: Pick Your Best Defense (1h)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L,T
03/12/10	Understanding White Grubs in Turf (1h)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L,T
03/16/10	Insect Pests in New Jersey Landscapes (3h)	Master Gardeners Training Program	Ocean County	H
03/23/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Atlantic County	H
03/24/10	Exotic Wood Boring Insect Pests (1h)	Master Gardeners Training Program	Somerset County	H
03/30/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Ocean County	H
03/31/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Essex County	H
04/10/10	Tree Disease Basics (2 h)	Certified Tree Expert Training Program	Cook Campus	A,L
04/15/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Camden County	H
04/21/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Gloucester County	A,L
04/22/10	Insect Pests in New Jersey Landscapes (3h)	Master Gardeners Training Program	Monmouth County	H
05/18/10	The Art and Science of Disease Diagnosis (3h)	Master Gardeners Training Program	Cumberland County	H

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, FY10.

Date	Title	Audience	Location	Par-ticipants[1]
10-12/09	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/09	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10/16/09	Wasp and Bee Identification and Management (0.75h)	Pest Control Operators and Health Officers Day	Essex County	Hf,I
10/16/09	Food Infesting Insect Identification and Management (0.75h)	Pest Control Operators and Health Officers Day	Essex County	Hf,I
11/04/09	Insect Orders (3h)	Master Gardeners Training Program	Essex County	H
12/21/09	Turf Bowl Review (2h)	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C
01-03/10	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/10	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01/13/10	Leaf Feeding Insects of Ornamentals (0.75h)	Central Jersey Turf and Ornamentals Institute	Somerset County	L,N
01/14/10	Leaf Feeding Insects in Turf (0.5h)	Central Jersey Turf and Ornamentals Institute	Somerset County	L, N
01/18/10	Turf Bowl Review (2h)	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C

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

Date	Title	Audience	Location	Par-ticipants[1]
01/26/10	Laboratory Tour (1.25h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
02/24/10	Insects that Suck (3h)	Professional Golf Turf Management School	Cook Campus	T
02/24/10	Chinch Bugs and Greenbugs (1.5h)	Professional Golf Turf Management School	Cook Campus	T
03/01/10	Insect Pests of Small Trees and Shrubs (1h)	Brooklyn Landscape Gardeners Association	New York, NY	L
03/02/10	Diagnostic Tips and ID of Emerging Ornamental Plant Pest Problems (0.5h)	Central Jersey Turf and Ornamentals Institute	Monmouth County	L, N
03/04/10	Disease and Insect Show and Tell (3h)	Master Gardeners Training Program	Middlesex County	H
03/17/10	Household Insects (3h)	Master Gardeners Training Program	Essex County	H
03/23/10	Household Insects (3h)	Master Gardeners Training Program	Ocean County	H
04/15/10	Household Insects (3h)	Master Gardeners Training Program	Monmouth County	H
04/27/10	Bees and Wasps in the Landscape (2h)	Master Gardeners Training Program	Middlesex County	H

Table A3.3. Complete listing of lectures presented by Dr. Stephanie Murphy, STL Director, FY10.

Date	Title	Audience	Location	Par-ticipants[1]
08/17/09	Soil Testing at Rutgers (interview filmed for TV)	RUTV viewers	Cook Campus	C
09/12/09	Understanding Soil - Plant Relationships (1.5h)	Home Gardeners School	Douglass Campus	H
10/03/09	Soils of New Jersey and Their Management	Master Gardeners Annual Conference	Douglass Campus	H
10/19/09	Soil Physical Properties: Soil Texture and the Textural Triangle (0.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/19/09	Field Exercises: Determining Soil Texture (1h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/19/09	Soil Physical Properties: Soil Structure and Soil Color (0.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/19/09	Field Exercises: Determining Soil Texture, Structure, Color, and Consistency in the Pits (2h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/20/09	Soil Morphology and Treatment of Septic Effluent and Storm Water (0.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf

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

Date	Title	Audience	Location	Par-ticipants[1]
10/20/09	How Water Moves in Soil, the movie (0.75h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/20/09	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/23/09	Soil Health for Tree Health (1h)	NJ Shad Tree Federation Conference	Cherry Hill, NJ	A, L
10/26/09	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	B.Byrne State Forest	E,Co,Hf
10/26/09	Field Exercises: Writing Individual Soil Logs and Review (4h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	B.Byrne State Forest	E,Co,Hf
10/27/09	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Schooley's Mtn. (Morris County) Park	E,Co,Hf
10/27/09	Field Exercises: Writing Individual Soil Logs and Review (4h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Schooley's Mtn. (Morris County) Park	E,Co,Hf
11/03/09	Soil Testing at Rutgers (1.5 h)	Soil Fertility (11:776:440)	Cook Campus	C
11/05/09	Best Management Practice #1:Soil Testing (1.5h)	Soils and Society (11:375:102)	Cook Campus	C
11/19/09	What Does Soil Quality Have To Do With Water Quality? (0.5h)	NJ Water Monitoring Summit	EcoComplex	L
12/18/09	Topsoil Evaluation for Landscape Use (w/ LM; 1h)	Turfgrass Establishment Course, OCPE	Cook Campus	L
01/05/10	Complying with Phosphorus Fertilizer Ordinances	North Jersey Turf and Ornamental Conference	County Colleof of Morris	L
01/12/10	Soil Testing Laboratory Update (0.5h)	Atlantic Coast Fruit and Vegetable Meetings	Atlantic City, NJ	F
01/13/10	Restoring Problem Soils (0.5h)	NJNLA Convention	Somerset, NJ	L
01/21/10	Soil Testing at Rutgers (1.5h)	Landscape Management and Maintenance (11:550:238)	Cook Campus	C
01/26/10	Soils and the Environment (3h)	Environmental Stewardship Training	Duke Farms	H
01/28/10	Soils and the Environment (3h)	Environmental Stewardship Training	Essex County RCE	H
01/29/10	Soils and the Environment (3h)	Environmental Stewardship Training	EcoComplex	H
02/08/10	Web Soil Survey (w/ F. Schoenagel, NRCS; 1.5h)	Turf Management (11:776:403)	Cook Campus	
03/02/10	Soil Testing for Plant Health: What Do the Numbers Mean? (0.5h)	Central Jersey Turf and Ornamentals Institute	Battleground CC (Manalapan, NJ)	L,N
03/23/10	Soil Testing at Rutgers (2h)	Soils and Water (11:375:360) lab section	Cook Campus	C
03/26/10	Soil Testing at Rutgers (2h)	Soils and Water (11:375:360) 2 lab sections	Cook Campus	C
04/23/10	Assessment of Soil Disturbance on Farmland (0.5h)	NJ Department of Agriculture/SADC	Trenton, NJ	S,F
06/25/10	Soil Texture and Morphology for Septic Treatment (1h)	Environment & Public Health OCPE Course	Cook Campus	Hf

Appendix 3. (Continued)

Table A3.4. Complete listing of lectures presented by Loren S. Muldowney, STL Soil Scientist , FY10.

Date	Title	Audience	Location	Par-ticipants[1]
10/19/09	Field Exercises: Determining Soil Texture, Structure, Color, and Consistency in the Pits (2h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/20/09	Soil Physical Properties: Coarse Fragments And Consistence (0.3h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/20/09	Field Exercises: Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Cook Campus	E,Co,Hf
10/26/09	Permeability Testing (0.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	B. Byrne State Forest	E,Co,Hf
10/26/09	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	B. Byrne State Forest	E,Co,Hf
10/26/09	Field Exercises: Writing Individual Soil Logs and Review (4h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	B. Byrne State Forest	E,Co,Hf
10/27/09	Permeability Testing (0.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Schooley's Mtn. (Morris County) Park	E,Co,Hf
10/27/09	Field Exercises: Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Schooley's Mtn. (Morris County) Park	E,Co,Hf
10/27/09	Field Exercises: Writing Individual Soil Logs and Review (4h)	Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs Short Course	Schooley's Mtn. (Morris County) Park	E,Co,Hf
12/01/09	Phosphorus: Do We Use Too Much or Too Little? (0.5h)	South Jersey Landscape Conference and Nursery Growers Meeting	Glassboro, NJ	L,N
12/18/09	Topsoil Evaluation for Landscape Use (w/ SM, 1h)	Turfgrass Establishment Course, OCPE	Cook Campus	L
01/28/10	Exercise in Soil Sampling (1h)	Soil & Plant Relationships Course, OCPE	Cook Campus	L
01/29/10	Soil Physical Properties (1.5h)	Soils & Water Course	Cook Campus	C
03/0910	Soil Biology Primer (0.5h)	Soil Health Conference	Burlington County College	S,Co,L

[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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