

RUTGERS

New Jersey Agricultural
Experiment Station

**Rutgers Soil Testing
and
Plant Diagnostic Services**

2011 Fiscal Year Report
(July 1, 2010 to June 30, 2011)

Mr. Richard J. Buckley
Director
Plant Diagnostic Laboratory

Dr. Stephanie Murphy
Director
Soil Testing Laboratory

Ms. Sabrina Tirpak
Principal Laboratory Technician
Plant Diagnostic Laboratory

2011 Fiscal Year

Rutgers Soil Testing and Plant Diagnostic Services

Annual Report

Prepared by:
Mr. Richard J. Buckley
Dr. Stephanie Murphy
Ms. Sabrina Tirpak

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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 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 2011 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 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 38,000 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. Relevant experience included clinical biochemistry laboratory work and private consulting as a 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, Soil Science Society of America, Crop Science Society of America, Soil and Water Conservation Society, and New Jersey Association of Professional Soil Scientists. She performed soil tests, aided development of the current soil testing database program, and provided customer service on a variety of soil and gardening-related queries. Contributions also included research in the laboratory and in the field, as well as data analysis. Ms. Muldowney left Rutgers in 2011 to accept a soil scientist position with USDA.

Ms. Phyllis Berger was hired 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 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 2011 Report

Operations

PDL

During the 2011 fiscal year (July 1, 2010 to June 30, 2011), the PDL examined 1957 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 2.2% decrease (or 45 samples) from FY10. Samples (Table 2) submitted for diagnosis (+69) and nematode analysis (+67) increased slightly in FY11. These increases were offset by a reduction in insect identifications (-181) 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 Table 2. Most samples (1366 or 70%) were plant samples submitted for

Table 1. PDL sample submissions by month, FY07 to FY11.

Month	FY07	FY08	FY09	FY10	FY11
July	489	320	333	382	527
August	622	494	227	347	403
September	404	265	185	248	135
October	280	276	293	229	143
November	86	123	140	35	26
December	184	51	68	181	21
January	36	29	74	18	1
February	13	40	17	9	8
March	84	20	56	31	102
April	72	105	110	112	84
May	241	124	200	161	148
June	284	247	245	249	359
Total	2795	2094	1948	2002	1957

Table 2. PDL sample submissions by sample type, FY11.

Sample Type	Number of samples	%
Plant samples	1366	70
Nematode assay	375	19
Insect, weed, and fungus identification	216	11
Total	1957	100

diagnosis, 19% (375) of the samples were for nematode analysis, and 11% (216) samples were insect, mold, or plant identifications.

In Table 3, samples submitted to the laboratory are presented by origin. In FY11, 91% of the plant submissions were from commercial clientele, 7% were from residential clientele, and 2% 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. 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 FY11, 60% of samples submitted for plant or insect identification were from commercial clients, and 39% were residential in origin (Table 3). Most of these samples were from larger State Department of Agriculture surveys. Household or nuisance pests, which are largely issues of concern for residential clients, make up the remaining submissions. Of the nematode assays submitted, 68% of the samples were from commercial clients, and 32% 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.

Table 3. PDL sample submissions by origin, FY11.

Origin	Plant		Nematode		Identification	
	number	%	number	%	number	%
Commercial	1243	91	255	68	130	60
Residential	101	7	1	0	84	39
Research	22	2	119	32	2	1
Total	1366	100	375	100	216	100

Table 4. PDL sample submissions by crop category, FY11.

Crop	Plant samples		Nematode samples	
	Number	%	Number	%
Turf	787	58	153	41
Ornamentals	494	36	74	20
Field crops	3	0	0	0
Vegetable	65	5	6	1
Fruit	17	1	142	38
Total	1366	100	375	100

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 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 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 FY11 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 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.

Table 5. PDL sample submissions by county, FY07 to FY11.

In-state	FY07	FY08	FY08	FY10	FY11
Atlantic	181	186	168	147	90
Bergen	94	74	110	73	113
Burlington	454	232	110	57	61
Camden	74	41	28	20	41
Cape May	37	26	14	24	11
Cumberland	27	66	53	59	53
Essex	50	43	30	53	13
Gloucester	56	41	36	27	40
Hudson	6	11	21	10	22
Hunterdon	117	143	13	27	42
Mercer	244	76	77	323	169
Middlesex	258	148	104	109	191
Monmouth	110	88	74	74	117
Morris	199	176	131	247	160
Ocean	69	37	28	40	36
Passaic	23	12	36	32	18
Salem	12	7	62	58	11
Somerset	91	73	129	81	61
Sussex	60	34	19	14	21
Union	65	39	50	38	34
Warren	133	101	28	22	12
RU research	69	79	41	22	85
In-state total	2429	1733	1623	1557	1401
Out-of-state	366	360	586	445	556
Total	2795	2093	1948	2002	1957

Samples were submitted to the PDL from all 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 28% of the samples submitted for diagnosis to the laboratory were from out-of-state. The percent of out-of-state samples is higher than in FY10 and primarily reflects a year-to-year increase in the numbers of out-of-state turf samples. In fact, nearly 65% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 16 states in FY11. Turf samples were received from states as far away as Arkansas, Texas, Arizona, and California. New York, Pennsylvania, and Virginia provide the largest number of out-of-state samples. In fact, New York submits almost as many samples as New Jersey (278 NY to 338 NJ). 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 Inguigato at the University of Connecticut and Dr. 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 labo-

Table 6. PDL sample submissions by diagnosis, FY11.

Diagnosis	Number of samples	%
Disease (biotic)	743	38
Disease (abiotic)	540	28
Insect pest	83	4
Nematode	375	19
Arthropod identification	163	8
Fungus identification	10	1
Plant identification	43	2
Total	1957	100

Table 7. PDL sample response time, FY11.

Response Time	Number of samples	%
0 to 3 days	1792	92
4 to 6 days	69	4
7 to 10 days	53	2
11 to 21 days	40	2
>21 days	3	0
Total	1957	100

ratory 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 (Table 6). Abiotic disease-causing factors (e.g., environmental extremes, nutrient deficiencies, poor cultural practices, poor soil conditions, etc.) accounted for another 28% of the laboratory diagnoses. Insect pest damage was diagnosed on 4% of the submissions. Identifications comprised 11% of the total number of samples submitted; of these, 8% 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.

Table 8. STL sample submissions by month, FY07 to FY11.

Month	FY07	FY08	FY09	FY10	FY11
July	672	699	464	717	559
August	725	1148	588	496	605
September	776	798	925	800	794
October	802	767	887	559	576
November	587	363	656	473	600
December	366	247	496	298	386
January	680	349	241	497	125
February	317	358	337	253	230
March	987	1053	1309	976	1085
April	1154	1817	1404	996	1077
May	946	934	647	615	805
June	578	673	622	581	822
Total	8590	9206	8576	7261	7664

Table 9. STL soil sample submissions by test type, FY11.

Test type	Number of samples	%
Standard fertility only	4373	57
Special tests	3291	43
Total	7664	100

Table 10. STL soil sample submissions by origin, FY11.

Origin	Number of samples	%
Residential	2818	36.8
Engineering	1451	18.9
Commercial landscape	1325	17.3
Farm/Greenhouse	757	9.9
Rutgers/Research	485	6.3
Golf/Sports turf	414	5.4
Other	303	4.0
Reference	111	1.4
Total	7664	100

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 FY11 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 FY11. 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 FY11, a laboratory response was prepared in less than three days for most (92%) of the samples submitted (Table 7), and 96% of our clients received a response in less than a week. A number of the samples (43) 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.

STL

The STL processed 7664 samples for soil fertility and physical analysis in FY11 (Table 8). The total number of samples received increased slightly (6%) compared to FY10 (7261 samples). Of the soil samples submitted to the STL for analysis in FY11, 57% were for the standard soil analysis (only) and 43% included requests for additional special tests (Table 9). The number of special tests indicates the additional work load, which is not sim-

Table 11. STL soil sample submissions by county, FY08 to FY11.

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

ply 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 (Table 8), sample submissions were greatest in early spring in preparation for the growing season. The typical secondary surge of samples arrived in September as many laboratory clientele were preparing for fall lawn fertilization. This secondary peak also was similar to FY10 but less than in prior years, as were sample numbers during most other months. The low numbers in January and February are certainly related to snow cover during that time. The relatively low total sample numbers also may be related to other weather problems (too wet, too dry) as well as the struggling economy.

In FY11, soil samples from residential clientele represented 36.8% of the total number of soil samples (Table 10). Commercial growers, including

the producers of fruit and vegetables crops, submitted 9.9% of samples; samples from landscape professionals represented 17.3%, and golf course or athletic field samples represented 5.4% of the total. Samples from engineering firms comprised 18.9% of the workload, 6.3% of the samples were from research or Cooperative Extension programs at Rutgers, and 4.0% were from government agencies, school districts and non-profits. 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. A higher percentage of samples from these clientele groups include special tests, which is a clear financial benefit. However, turnaround time is affected when laboratory staff workload is heavily laden with special tests, with more time required to complete and distribute soil test reports.

Sample numbers submitted annually by various clientele groups over the past four years show no consistent trends; numbers of samples from landscape professionals increased over the past 3 years but FY11 total is similar to FY08. Numbers from government/schools/other organizations increased in FY11 compared to past years, possibly due to increased interest in community or school gardens.

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 (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, 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 actively 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 boosted the 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 identified. 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 generating reports for clients, an internet-based database was developed and is still being updated with additional crops and improved with additional features. The database is designed to handle the multitude of various sample types in terms of test data and complex reporting requirements. Robert Muldowney of the NJAES IT staff developed the database and has spent countless hours revising and upgrading the system.

"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 2010 to June 2011 are summarized in Fig. 1. 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

Figure 1. Percentages of samples within macronutrient classes.

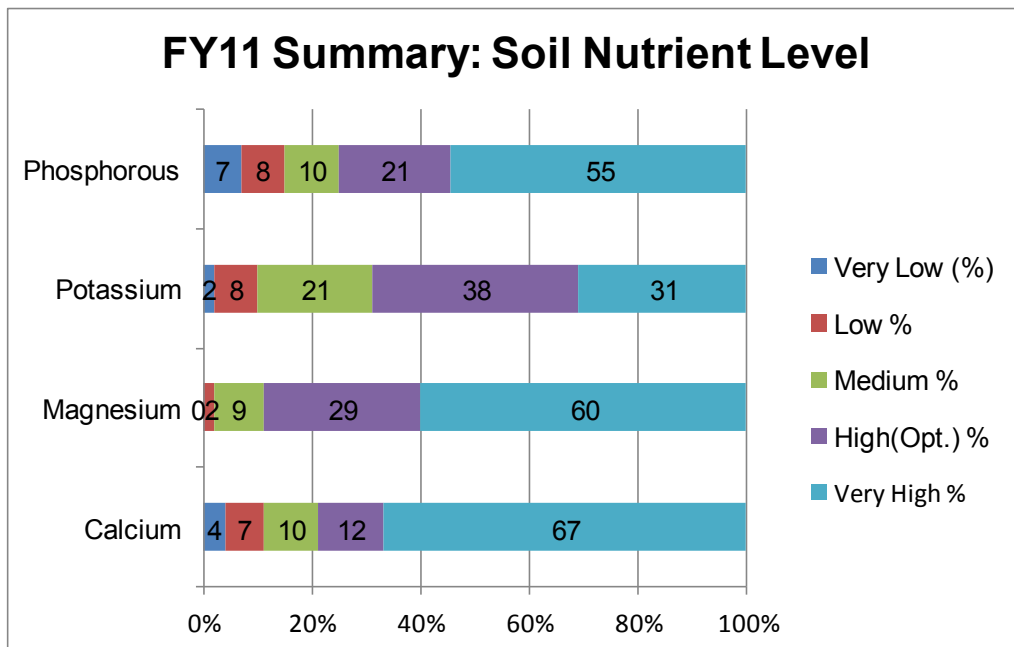


Figure 2. Soil pH of samples submitted in FY11.

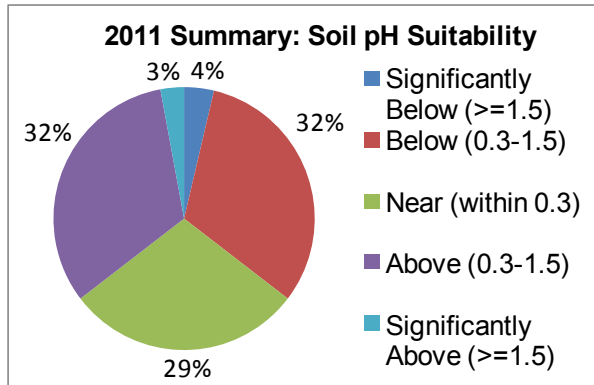


Table 12. Number of STL samples by month and test type, FY11.

Month	Fertility test only samples	Special test samples	Total
July	286	273	559
August	373	232	605
September	517	277	794
October	332	244	576
November	371	229	600
December	242	144	386
January	47	78	125
February	86	144	230
March	675	410	1085
April	677	400	1077
May	343	462	805
June	424	398	822
Total	4373	3291	7664

(K) levels were high or very high in 69% 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-%P2O5-%K2O (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; fertilizer manufacturers have had to re-formulate products to provide zero- (or low-) P contents, and so 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. 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 samples received in FY11, 79% and 89% 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 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 Rutgers Soil Testing Laboratory 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 recommenda-

tions are customized to account for these differences.

Soil pH data of samples submitted to the STL in FY11 are in summarized Fig. 2. 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 29% of samples of those analyzed for pH during FY11 were “near” (within 0.3 pH units) the target, and no amendment was recommended. Thirty-six percent of samples were below the optimum pH range, and appropriate limestone recommendations (various rates depending on difference from target and buffering capacity of 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, 32% 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 3% of samples that were more than 1.5 units higher, it is advised that the cause of alkalinity be determined before recommendations are provided.

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 OCEP short courses in FY11. 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 18th 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 12th time he planned and coordinated that short course. For 2011 only, Mr. Buckley planned and coordinated a one-day course titled: Abiotic Stress Disorders in Landscape Plants Short Course. He also hosted a two-day First Detector and Invasive Species workshop.

Mr. Buckley planned and co-instructed a revival of the undergraduate course Tree Diseases 11:770:391 with Dr. Ann Gould. The new course was renamed Diseases and Insect Pests of Ornamental Plants and was offered for 1.5 credit hours in the spring semester. He also participated as a guest speaker in several other plant pathology courses in FY11 including: two lectures in the Plant Disease Clinic 16:765:536; one in General Plant Pathology 11:776:302; and one in General Plant Pathology Laboratory 11:776:311.

Mr. Buckley was an invited speaker in several RCE programs. The following programs were included: North Jersey Ornamental Horticulture Conference – Turf Day, and Landscape Day. Lectures in support of the Atlantic, Bergen, Camden, Gloucester, Essex, Mercer, 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 in Atlantic City, NJ as well as John Deere programs in Saratoga, Batavia, and Verona, NY; Citizens United to Protect Maurice River Monthly Meeting; New Jersey Agribusiness Association Annual Conference; Michael Fisher and Sons Turfgrass Seminar Series; New Jersey Green Expo Turf and Landscape Conference; Maplewood Garden Club Monthly Meeting; New Jersey Nursery and Landscape Association Plants Show; Shemin Landscape Supply Turf Days in Philadelphia, Baltimore, and New York; Reed and Perrine Turf and Ornamentals Seminar; New York

State Turfgrass and Landscape Association Westchester Conference; Suffolk County New York's Golf Course Training Day; 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. Other OCPE programs in which she participated include: the Golf Turf Management School: Three Week Preparatory Course; and Landscape Integrated Pest Management: An Intelligent Approach.

Ms. Tirpak was an invited speaker in several RCE programs. The following programs were included: the Central Jersey Turf and Ornamentals Institute; the Rutgers Gardens Intern Training Program; and the East Orange VA Landscape Training Program. She also presented programs in support of the Essex, Middlesex, Monmouth and Ocean County Master Gardener Programs.

Ms. Tirpak was also an invited speaker for the Brooklyn Landscape Gardeners Association Annual Seminar; FMC Corporate Nematode Training Event; New Jersey Nursery and Landscape Association Plants Show; New Jersey Green Expo Turf and Landscape Conference; and the Golf Course Superintendents Association of New Jersey Assistants Meeting.

Ms. Tirpak spent considerable time and effort in FY11 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 teams to the competition in Orlando, FL. The higher scoring Rutgers team placed 12th out of 87 teams.

Stephanie Murphy and Loren Muldowney

Dr. Murphy participated in the Rutgers Professional Golf Turf Management School (Soils 1) for both the Fall 2010 and Spring 2011 sessions and in the Turfgrass Establishment Short Course. Ms. Muldowney participated in the Turfgrass Establishment Short Course, the Soil and Plant Relationships Short Course, and the "On-Farm and Manure Composting School". The Soil and Site Evaluation for Septic Systems Short Course, usually an annual event for both Dr. Murphy and Ms. Muldowney, was cancelled this year due to low enroll-

ment, another consequence of the poor economy.

Dr. Murphy was an invited speaker at the Central Jersey Turf and Ornamental Institute. She was also invited to give a presentation about soil testing at Rutgers to the Mercer County Board of Agriculture. Dr. Murphy presented a lecture in support of the Environmental Stewardship program in Somerset County (Duke Farms). She was also invited to present "Lead in Soil" to the Wipe Out Lead NJ organization. She participated behind the scenes in organizing the NJ Soil Health Conferences, sponsored primarily by the NJ Association of Conservation Districts but also by NJAES. Internally at SEBS, she presented a departmental seminar, "Turf Fertilizer Law in NJ", to update researchers, professors, agents, students, etc. about policy decisions that were being made about turf management in our State. Also, two posters were presented internally by Dr. Murphy and Loren Muldowney at the annual RCE conference, explaining research efforts and involvement with development of soil restoration standards.

Dr. Murphy and Loren Muldowney promoted soil management practices that improve soil organic matter content during the wagon tour of the Snyder Farm during the Great Tomato Tasting event. Experimental plots at the Snyder Farm were used for research funded by USDA-NRCS and the Rutgers Equine Science Center.

Ms. Muldowney hosted reporter Katie Payne's visit to the lab (8/21/2010); Ms. Payne then wrote an article on Soils for her column, Village Gardener, on the "South Orange Patch" website. <http://southorange.patch.com/articles/never-cry-clay-and-other-soil-fables#c>. Her presentation, "Assessing Compost Quality" for the OCPE Composting School was recycled/re-used for the Northeast Recycling Council's Compost and Mulch Marketing Workshop at Duke Farms.

Dr. Murphy developed and taught a new undergraduate course, Soil Quality (11:776:413), for the Department of Plant Biology and Pathology in Spring 2011 semester, enrolling 11 students; Ms. Muldowney was a guest lecturer during the course. Dr. Murphy and/or Ms. Muldowney were also guest lecturers in the undergraduate courses Soils & Society, Soil Fertility, and Soils & Water, and they 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. A lecture about soils of New Jersey and their management was presented to the Rutgers Gar-

dens undergraduate summer interns.

Dr. Murphy served on the graduate committee of Alexandra Fowler, who defended her Master's thesis, "The long-term impact of initial resource availability and seed bank on woody vegetation during early succession on the New Jersey Piedmont" on 12/8/2010. Ms. Fowler was a long-term visiting researcher at the Soil Testing Laboratory, learning the procedures and helping to analyze client samples as well as her own research samples.

Extension Publications

During FY11, 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 authored one article for the New Jersey Turfgrass Association Newsletter Clippings in FY11. He co-authored two RCE factsheets in FY11 and, with Ms. Tirpak, et al., was cited in a disease note for the journal Plant Disease.

Buckley, R.J. 2010. Some Like it Hot; Ramblings on the Summer of 2010 in the Rutgers Plant Diagnostic Laboratory. Clippings 76, pp 6-8.

Daniels, G.H., N. Polanin, and R.J. Buckley. 2011. Bagworm, *Thyridopteryx ephemeraeformis* (Haworth). FS1144. Rutgers Cooperative Extension Publications.

Daniels, G.H., N. Polanin, and R.J. Buckley. 2011. Cedar-Apple Rust in the Home Landscape. FS1113. Rutgers Cooperative Extension Publications.

Njambere, E.N, B.B. Clarke, S.A. Bonos, J.A. Murphy, R.J. Buckley, S. Tirpak, and N. Zhang. 2011. First Report of Brown Ring Patch Caused by *Waitea circinata* var. *circinata* on *Poa annua* and *Agrostis stolonifera* in New Jersey. Plant Disease 95:1, pp 78.

Dr. Murphy and Loren Muldowney also contributed several articles to the Plant & Pest Advisory and "What's in Season from the Garden State" newsletters. Three Extension publications about

soil organic matter were developed as a result of a grant from the Equine Science Center; the fact sheets are still in final stages of editing/production.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in FY11. 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", including many discussions and presentations regarding fertilizer products, fertilization practices, and certification of professional applicators. State legislation regulating turf fertilization, as well as legislation regarding soil management/restoration after land development, was enacted in January 2011.

Dr. Murphy reviewed two scientific manuscripts for publication, one for Soil Science (Robert Tate, editor) and the other for Ecology (Stephen Handel, editor). Dr. Murphy served on the advising committee of one graduate student. She also serves on the scholarship selection committee for the Soil & Water Conservation scholarships (Hanna, Hanna & Duell).

Loren Muldowney participated in "Sustainable Agricultural Systems in the 21st Century" in Washington DC for the American Society of Agronomy-Crop Science Society of America-Soil Science Society of America committee on organic and sustainable agriculture (COSA), substituting for J. Heckman.

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 re-

source 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. Ms. Muldowney did much of the field work and trained undergraduates to assist in the field and in the laboratory.

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 FY11, this marketing initiative brought the display to the following programs: The 2010 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 Show; New Jersey Nursery and Landscape Association Meeting; Ag Field Day; and Turf Field Days. The Soil Testing Lab also hosted an Open House (12/9/2010), primarily aimed at agents, Master Gardeners, and other partners.

The presence of STL/PDL staff at other functions enhances the visibility and reputation of Rut-

gers, SEBS/NJAES and RCE. Dr. Murphy attended the Association of Conservation Districts' Soil Health Conference in Mendham, a Rutgers conference: "Ag in the City: Urban Lands Agriculture", and meetings of the NJ Agribusiness Association, the New Jersey Association of Conservation Districts, and the Firman E. Bear chapter of the Soil & Water Conservation Society.

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 FY11, \$227,091.66 was generated from all PDL activities. In FY11, \$309,892.70 was generated from all STL activities. Income generated by each laboratory covered 100% of all costs in FY11. 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 FY11. 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 FY12 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 FY12. 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 FY12 to cover increasing costs.

Further development of the soil testing database continues, such as graphics, enhanced interpretations, and addition of recommendations for more crops. Targeted action to improve efficiency of Soil Testing operations will be implemented as additional funds become available. Further work to develop ICP spectrophotometer's capability to analyze sulfur will be a goal for the coming year. The newest soil test, soil CO₂ 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 intro-

duced 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 FY11 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 FY12 will be used to continue to upgrade laboratory capability to handle pathogens of consequence and other bio-hazards; 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. To date, the PDL has processed 8,682 orders for 24,332 packets of seeds. The t-shirts were extremely popular also. 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-FY11.

Salaries and benefits (full and part time staff)	\$201,788.26
Supplies and services	
Diagnostic and testing supplies	
Printing and marketing	
References	
Equipment maintenance	
Office supplies	
Credit card fees	\$7,502.60
Communications	
Telephone/fax	
Postage	\$1,947.13
Travel	
Paid talks and professional meetings	\$2,400.92
Total operating costs	\$213,638.91

Table A2.2. Income, PDL-FY11.

Sample fees	\$93,910.00
Lecture fees	
OCPE and other honorarium	\$21,356.25
Grants and contracts	
NPDN	\$35,500.00
Other	
Salaries (NJAES/SEBS)	\$76,325.41
Total actual income	\$227,091.66

Table A2.3. Estimated expenses, PDL-FY12.

Salary and benefit costs	\$205,000.00
Supplies and services	\$20,000.00
Communications, marketing and travel	\$10,000.00
Total potential cost FY12	\$235,000.00

Table A2.4. Estimated income, PDL-FY12.

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
Total potential income FY12	\$235,500.00

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

Table A2.5. Expenses, STL-FY11.

Salaries and benefits (full and part time staff)	\$244,889.94
Supplies and services	
Testing supplies	
Chemicals	
Equipment repair and maintenance	
Printing and marketing	
Office supplies	
Credit card fees	\$40,525.04
Communications	
Telephone/fax	
Postage	\$2,501.46
Travel	
Paid talks and professional meetings	\$488.23
Payment to NJAES	
ICP purchase reimbursement	\$11,000.00
<hr/>	
Total operating costs	\$299,404.67

Table A2.6. Income, STL-FY11.

Sample fees	
STL.....	\$283,597.20
Lecture fees	
OCPE and other honoraria	\$1,402.50
Other	
Salaries (NJAES/SEBS)	\$24,893.00
<hr/>	
Total actual income	\$309,892.70

Table A2.7. Estimated expenses, STL-FY12.

Salary and benefit costs	\$257,000.00
Supplies and services.....	\$37,000.00
Communications, marketing and travel	\$5,000
<hr/>	
Total potential cost FY12.....	\$299,000.00

Table A2.8. Estimated income, STL-FY12.

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
<hr/>	
Total potential income FY12.....	\$328,000.00

Appendix 3.
Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Director, FY11.

Date	Title	Audience	Location	Participants ¹
07/16/10	Plant Diagnostic Laboratory Operating Protocols (1hr)	Plant Disease Clinic 16:765:536	Cook Campus	C
08/10/10	Greenhouse Diseases (1hr)	Plant Disease Clinic 16:765:536	Cook Campus	C
08/18/10	Basic Turf Disease: Pick Your Best Defense (1hr)	John Deere University	Cook Campus	A,L,T
09/08/10	Oak Tree Decline - Problems and Solutions (1.5hr)	Citizens United to Protect the Maurice River	Cumberland County	H
10-12/10	Insects of Turfgrass (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/10	Diseases of Turfgrass (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/10	Diseases of Ornamentals (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/10	Principles of Pest Control on the Golf Course (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10/21/10	Diseases of Turf (1hr)	Emergency Pesticide Recertification Short Course	Cook Campus	A,L,T
10/21/10	Insects in Turf (1hr)	Emergency Pesticide Recertification Short Course	Cook Campus	A,L,T
10/28/10	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Passaic County	H
10/29/10	Basic Nematology (3hr)	General Plant Pathology Laboratory: 11:776:311	Cook Campus	C
11/04/10	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Middlesex County	H
11/05/10	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Middlesex County	H
11/08/10	The Art and Science of Disease Diagnosis (1.3hr)	General Plant Pathology: 11:776:302	Cook Campus	C
11/16/10	The Art and Science of Disease Diagnosis (2hr)	Master Gardeners Training Program	Union County	H
12/02/10	Xylella fastidiosa (1hr)	New Jersey Agribusiness Association Annual Conference	Burlington County	I
12/08/10	Hands-on Borer Demonstration (0.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/08/10	Exotic Wood-Boring Insect Pests (0.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/09/10	Buckley's Boot Camp: Basic Training in Diseases of Turf and Ornamentals (2 1hr lectures)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/16/10	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Mercer County	H
12/17/10	The Complete Turf Disease (6hr)	Suffolk County Golf Course Turf Day	Riverhead, NY	T
12/20/10	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Morris County	H
01-03/11	Diseases of Turfgrass (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/11	Diseases of Ornamentals (10 2hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/11	Principles of Pest Control on the Golf Course (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/11	Insects of Turfgrass (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T

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

Date	Title	Audience	Location	Participants¹
01-03/11	The Complete Insect Pests in Ornamental Plants (7 1.5hr lectures)	Diseases and Insect Pests of Ornamental Plants: 11:770:391	Cook Campus	C
01/03/11	Understanding White Grubs in Turf (1.5 hr)	Maplewood Garden Club	Union County	H
01/04/11	Scouting Tips for Turf Managers (1hr)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/05/11	Lab Encounters of the Third Kind (1hr)	Michael Fisher and Son Turfgrass Seminar	Burlington County	T
01/06/11	Extreme Weather: 2010 Year in Review (1hr)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/12/11	Understanding White Grubs in Turf (1hr)	New York State Turf and Landscape Association: Westchester Conference	Westchester, NY	A,L,T
01/12/11	Leaf Feeding Insects in Turf (1hr)	New York State Turf and Landscape Association: Westchester Conference	Westchester, NY	A,L,T
01/14/11	Integrated Pest Management of Golf Turf (1.5hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/19/11	The Art and Science of Disease Diagnosis (1.5hr)	Landscape IPM Short Course	Cook Campus	L,T
01/21/11	The Complete Turf Disease for Golf Courses (6hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/25/11	Turf Disease Management for School Grounds (1hr)	New Jersey Nursery and Landscape Association: Plants Show	Middlesex County	A,L,T
01/26/11	Lab Encounters of the Third Kind (1hr)	Michael Fisher and Son Turfgrass Seminar	Lancaster, PA	T
02/03/11	Basic Turf Diseases: Pick Your Best Defense (2hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/03/11	Insect Pests of Turfgrass (2hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
02/15/11	Extreme Weather: 2010 Year in Review (1hr)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
02/16/11	Basic Turf Diseases: Pick Your Best Defense (1hr)	Athletic Field Construction Short Course	Cook Campus	T
02/17/11	Key Diseases in the Landscape: Plants I love To Hate (1hr)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/17/11	Leaf Feeding Insects in Turf (1hr)	Shemin Landscape Supply Company: Baltimore Turf Day	Baltimore, MD	L,T
02/18/11	Chemical Injury in the Landscape (2hr)	Abiotic Stress Disorders in Landscape Plants Short Course	Cook Campus	A,L,T
02/22/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Atlantic County	H
02/24/11	Basic Turf Diseases Part 2: The Rings of Death (1hr)	Shemin Landscape Supply Company: Philadelphia Turf Day	Philadelphia, PA	L,T

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

Date	Title	Audience	Location	Participants
02/24/11	Scouting Tips for Turf Managers (1hr)	Shemin Landscape Supply Company: Philadelphia Turf Day	Philadelphia, PA	L, T
03/01/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Camden County	H
03/08/11	Hands-on Diagnostics Training (3hr)	Master Gardeners Training Program	Hunterdon County	H
03/10/11	Basic Turf Diseases Part 2: The Rings of Death (1hr)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L, T
03/10/11	Leaf Feeding Insects in Turf in Turf (1hr)	Shemin Landscape Supply Company: New York Turf Day	New York, NY	L, T
03/11/11	The Complete Turf Disease (6hr)	Advanced Turf Disease Short Course	Cook Campus	L, T
03/15/11	Scouting Tips for Turf Managers (1hr)	John Deere University: Saratoga New York	Saratoga, NY	A, L, T
03/15/11	Anthraxnose: The Scourge of the Modern Golf Green (1hr)	John Deere University: Saratoga New York	Saratoga, NY	A, L, T
03/16/11	Scouting Tips for Turf Managers (1hr)	John Deere University: Turning Stone Resort	Verona, NY	A, L, T
03/16/11	Anthraxnose: The Scourge of the Modern Golf Green (1hr)	John Deere University: Turning Stone Resort	Verona, NY	A, L, T
03/17/11	Scouting Tips for Turf Managers (1hr)	John Deere University: Batavia New York	Batavia, NY	A, L, T
03/17/11	Anthraxnose: The Scourge of the Modern Golf Green (1hr)	John Deere University: Batavia New York	Batavia, NY	A, L, T
03/22/11	Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program	Ocean County	H
03/24/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Monmouth County	H
03/30/11	Hands on Diagnostics Training (3hr)	Master Gardeners Training Program	Essex County	H
03/30/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Ocean County	H
03/31/11	Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program	Monmouth County	H
04/09/11	Tree Disease Basics (2hr)	Certified Tree Expert Training Program	Cook Campus	A, L
04/26/11	Understanding White Grubs in Turf (1hr)	Master Gardeners Training Program	Bergen County	H
05/11/11	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Gloucester County	H
05/19/11	Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program	Monmouth County	H

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, FY11.

Date	Title	Audience	Location	Participants¹
08/04/10	Introduction to Entomology (2.5hr)	East Orange VA Landscape Maintenance Training Program	Essex County	L
10-12/10	Turf Disease Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/10	Turf Insect Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
11/03/10	Insect Orders (3hr)	Master Gardeners Training Program	Essex County	H
11/04/10	Review Session for GCSAA Collegiate Turf Bowl Competition	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C
11/11/10	Annual Bluegrass Weevils on NJ Golf Courses (1hr)	GCSANJ Assistants' Meeting	Monmouth County	T
11/11/10	Review Session for GCSAA Collegiate Turf Bowl Competition	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C
12/09/10	Key Insect Pests of Ornamentals (1hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/09/10	Leaf Feeding Insects in Turf (1hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic County	A,I,L,T
12/09/10	Review Session for GCSAA Collegiate Turf Bowl Competition	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C
01/17/11	Review Cession for GCSAA Collegiate Turf Bowl Competition	Undergraduate GCSAA Turf Bowl Participants	Cook Campus	C
01-03/11	Turf Disease Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/11	Turf Insect Laboratory (10 1.5hr lectures)	Professional Golf Turf Management School	Cook Campus	T
01/24/11	Key Insect Pests of Ornamentals (1.5hr)	Landscape IPM Short Course	Cook Campus	L,T
01/25/11	Leaf Feeding Insects in Turf (.75hr)	New Jersey Nursery and Landscape Association: Plants Show	Middlesex County	A,L,N,T
01/25/11	Exotic Wood-Boring Insect Pests (.75hr) -ST	New Jersey Nursery and Landscape Association: Plants Show	Middlesex County	A,L,N,T
01/25/11	Tour of Plant Diagnostic Lab (.5hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
03/07/11	Wood Boring Beetles (1hr)	Brooklyn Landscape Gardeners Association 30th Annual Seminar	Brooklyn, NY	L
03/08/11	Top 5 Insect Pests of Ornamentals (.75hr)	Central Jersey Turf and Ornamentals Institute	Manalapan, NJ	A,L,N,T
03/29/11	Household Insect Pests (3hr)	Master Gardeners Training Program	Ocean County	H
04/04/11	Termites: Biology and Management (1hr)	Master Gardeners Training Program	Mercer County	H
04/14/11	Household Insect Pests (3hr)	Master Gardeners Training Program	Monmouth County	H
05/11/11	Household Insect Pests (3hr)	Master Gardeners Training Program	Essex County	H
05/18/11	Basic Nematology: Biology and Management (2hr)	FMC Corporate Training Event	Ewing, NJ	I

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

Date	Title	Audience	Location	Participants ¹
05/19/11	Key Insect Pests of Ornamentals (1hr)	Master Gardeners Training Program	Ocean County	H
06/15/11	Key Insect Pests of Ornamentals (3hr)	Rutgers Gardens Intern Training Program	Cook Campus	C
06/22/11	Introduction to Entomology (2.5hr)	East Orange VA Landscape Maintenance Training Program	Essex County	L

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

Date	Title	Audience	Location	Participants ¹
09/14/10	Posters: Fertilizer Legislation; Evaluating and Promoting the NRCS-NJ Soil Management Standard (0.5hr)	Rutgers Cooperative Extension Conference	Busch Campus	C
10/08/10	Soils 1: Soil Formation (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/11/10	Soils 1: Soil Formation, continued (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/15/10	Soils 1: Physical Properties (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/26/10	Soils 1: Physical Properties, continued (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/18/10	Soil Testing at Rutgers (1.5hr)	Master Gardener Training Program - Mercer	Cook Campus	H
12/03/10	Soils 1: soil profiles (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
12/03/10	Role of Nutrient Management in Urban and Suburban Landscapes in Nutrient Loading of Surface and Ground Water (1hr)	Departmental Seminar	Cook Campus	C
12/17/10	Manufactured Topsoils (0.75hr)	Turfgrass Establishment Short Course	Cook Campus	L,T
01-05/11	Soil Quality (10 1.5hr lectures)	Soil Quality: 11:776:413	Cook Campus	C
01/07/11	Soils 1: Soil Formation (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/14/11	Soils 1: Soil Formation, continued (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/25/11	Soils and the Environment (3hr)	Environmental Steward Training	Somerset County	E
01/28/11	Soils 1: Physical Properties (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/04/11	Soils 1: Physical Properties, continued (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/09/11	Soil Testing at Rutgers (1.5hr)	Planting Design, 11:550:340	Cook Campus	C
02/09/11	Turf Fertilizer Legislation in NJ (0.5hr)	MidAtlantic Soil Testing and Plant Analysis Working Group	Virginia	C
03/08/11	Update on New Jersey's Turf Fertilization Law (0.5hr)	Central Jersey Turf and Ornamentals Institute	Manalapan, NJ	A,L,N,T

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

Date	Title	Audience	Location	Participants ₁
05/09/11	Soil Testing at Rutgers (1hr)	Master Gardener Training Program	Mercer County	H
06/07/11	Lead in Soil (1hr)	Wipe Out Lead NJ	Washington Twp., NJ	Hf
06/28/11	Soils and Soil Management in New Jersey (1hr)	Rutgers Gardens Intern Training	Cook Campus	C
06/29/11	Turf Fertilizer Legislation in NJ (0.5hr)	Northeast Regional Coordinating Committee on Soil Testing Annual Meeting	Maryland	C

**Appendix 3. (Continued)
Table A3.4. Complete listing of lectures presented by Loren S. Muldowney, STL Soil Scientist , FY11.**

Date	Title	Audience	Location	Participants ₁
09/14/10	Posters: Fertilizer Legislation; Evaluating and Promoting the NRCS-NJ Soil Management Standard (0.5hr)	Rutgers Cooperative Extension Conference	Busch Campus	C
11/01/10	Soil Testing at Rutgers (1.5hr)	Soil Fertility (11:776:440)	Cook Campus	C
11/04/10	Soil Testing at Rutgers (1.5hr)	Soils and Society (11:375:102)	Cook Campus	C
12/14/10	Assessing Compost Quality (1.5hr)	Compost School Short Course	Cook Campus	F
12/17/10	Manufactured Topsoils (0.75hr)	Turfgrass Establishment Short Course	Cook Campus	L,T
01/28/11	Assessing Compost Quality (3hr)	Northeast Recycling Council Conference	Somerset County	I
02/08/11	Soil Quality: Why should we care? (1.5hr)	Soil Quality (11:776:413)	Cook Campus	C

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



Plant Diagnostic Laboratory

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

Soil Testing Laboratory

New Jersey Agricultural Experiment Station
Rutgers, The State University of New Jersey
ASB II
57 US Highway One
New Brunswick, NJ 08901

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