RUTGERS
New Jersey Agricultural Experiment Station

Rutgers Soil Testing and Plant Diagnostic Services

2009 Fiscal Year Report

(July 1, 2008 to June 30, 2009)

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2009 Fiscal Year
Rutgers Soil Testing and Plant Diagnostic Services
Annual Report

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Introduction

Rutgers Soil Testing and Plant Diagnostic Services are provided by Rutgers Cooperative Extension (RCE), the outreach component of the New Jersey Agricultural Experiment Station (NJAES) and School of Environmental and Biological Sciences (SEBS). Located on the Cook Campus, these laboratories provide New Jersey citizens with diagnoses of plant problems and chemical and mechanical analyses of soil. Their mission is to provide such services in an accurate and timely manner to meet the increasing agricultural and environmental needs of the State. These goals are achieved in cooperation with extension and research faculty and staff at NJAES. This report summarizes the activities of these laboratories during the 2009 fiscal year.

History

The Rutgers Soil Testing Laboratory

Soil testing at Rutgers has a history as long as the NJAES has been in existence. As early as the 1860s, George Cook was involved in the chemical analysis of soils and fertilizers. E.B. Voorhees followed Cook as director of the Experiment Station and became famous for applying chemistry to soil fertility issues. By 1940 when the Department of Soils was formed, soil testing for the public had begun in earnest as thousands of samples were analyzed for elemental deficiencies, acidity levels, and organic matter content. After the 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 130,000 soil samples for chemical and physical analysis and continues to play an integral role in soil nutrient management for the public and for RCE and SEBS/NJAES programs. In recent years, the STL services have expanded into engineering and environmental assessments. 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 34,000 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 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. Her interests include soil conservation, soil fertility, and the interaction of soil structure with plant roots. Dr. Murphy is responsible for the day-to-day operations of the STL and participates in research, teaching, and outreach activities.

Mr. Steve Griglak, Principal Laboratory Technician, has worked in the STL since 1995. Mr. Griglak received his B.S in Environmental Science from Rutgers University in May 1998. Although his primary duty is the performance of various soil tests offered by the laboratory, he is also responsible for the maintenance and repair of laboratory equipment and testing devices.

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

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

Other Support

Both the STL and the PDL employ several Rutgers undergraduate students each year to assist in sample preparation, data entry, and clean-up. As the students help with many of the basic day-to-day tasks, they also gain invaluable laboratory experience that will contribute to career success after graduation.

The laboratories also benefit from the assistance of faculty in several SEBS Departments, 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.

Although soil samples are processed according to entry into the laboratory system, analysis can be prioritized by paying a special express processing fee. Upon the completion of the tests, general lime and fertilizer recommendations are provided for most New Jersey plantings. The client must supply appropriate planting information to receive fertility guidelines. Responses are sent by mail to the client and to the appropriate county agricultural office.

Fiscal Year 2009 Report

Operations

PDL

During the 2009 fiscal year (July 1, 2008 to June 30, 2009), the PDL examined 1948 specimens submitted for diagnosis, identification (insects, weeds, or fungus), or nematode assay (Table 1), representing a 7% decrease (or 146 samples) from FY08. The decrease in sample submissions was an across-the-board decrease in samples of all types. Good weather for turfgrass, a mild winter, ample rainfall, and a slowing economy can all be counted as contributing factors. In general, sample submissions remained steady for most of the year, peaking in the summer and declining during the winter. It is our view that 2,000 to 2,500 samples represent peak laboratory capacity, so despite the slow-down, 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 (1538 or 79%) were plant samples submitted for diagnosis, 15% (296) of the samples were for nematode analysis, and 6% or 114 samples were insect, mold, or plant identifications.

In Table 3, samples submitted to the laboratory are presented by origin. In FY09, 63% of the plant submissions were from commercial growers, 11% were from residential clientele, and 26% were submitted by 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 FY09, 33% of samples submitted for plant or insect identification were from commercial clients, and 65% were residential in origin (Table 3). Most of these samples were household or nuisance pests, which are largely issues of concern for residential clients. Of the nematode assays submitted, 44% were requested by commercial clients and 55% were from research. We expect that the number of nematode samples submitted from residential clients (2) will remain low since much of this clientele is not familiar with nematode pests.

In general, samples from research programs represent a relatively small percentage of the total number of plant and soil samples received. 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

Table 1. PDL sample submissions by month, FY05 to FY09.

Month	FY05	FY06	FY07	FY08	FY09
July	355	418	489	320	333
August	260	362	622	494	227
September	353	288	404	265	185
October	520	157	280	276	293
November	80	90	86	123	140
December	54	107	184	51	68
January	30	41	36	29	74
February	25	23	13	40	17
March	64	75	84	20	56
April	120	235	72	105	110
May	182	279	241	124	200
June	317	317	284	247	245
Total	2360	2392	2795	2094	1948

Table 2. PDL sample submissions by sample type, FY09.

Sample Type	Number of samples	%
Plant samples	1538	79
Nematode assay	296	15
Insect, weed, and fungus identification	114	6
Total	1948	100

New Jersey as an urban agriculture state, it follows that the vast majority of samples (95%) 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 in southern counties continue to provide free diagnostic services and do not advertise diagnostic laboratory services to these growers. Inroads are being made with these commodity groups through the Vegetable and Fruit IPM groups, and it is our hope that sample submissions from traditional agricultural crops will increase in future years.

Traditionally, most of the soil samples submitted to the laboratory for nematode analysis were from golf turf managers; however, nematode samples from growers establishing vineyards were also very common. A great majority of the nematode samples in FY09 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.

Table 3. PDL sample submissions by origin, FY09.

	Plant		Nematode		Identification	
Origin	number	%	number	%	number	%
Commercial	1056	69	130	44	38	33
Residential	135	9	9	2	74	65
Research	347	22	164	55	2	2
Total	1538	100	296	100	114	100

Table 4. PDL sample submissions by crop category, FY09.

	Plant samples		Nematode samples	
Crop	Number	%	Number	%
Turf	538	36	119	40
Ornamentals	924	60	1	0
Field crops	3	0.5	0	0
Vegetable	63	5	5	2
Fruit	10	1.5	171	58
Total	1538	100	296	100

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 17% of the samples submitted for diagnosis to the laboratory were from out-of-state. The percent of out-of-state samples is the same as FY08. Nearly all of these samples were turf. In fact, nearly 50% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 17 states in FY09. 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.

Table 5. PDL sample submissions by county, FY05 to FY09.

In-state	FY05	FY06	FY07	FY08	FY09
Atlantic	84	196	181	186	168
Bergen	72	90	94	74	110
Burlington	106	214	454	232	110
Camden	39	38	74	41	28
Cape May	33	26	37	26	14
Cumberland	41	73	27	66	53
Essex	48	40	50	43	30
Gloucester	25	47	56	41	36
Hudson	7	10	6	11	21
Hunterdon	49	36	117	143	13
Mercer	349	103	244	76	77
Middlesex	327	193	258	148	104
Monmouth	151	179	110	88	74
Morris	124	169	199	176	131
Ocean	60	90	69	37	28
Passaic	21	34	23	12	36
Salem	21	31	12	7	20
Somerset	200	112	91	73	128
Sussex	18	14	60	34	19
Union	40	73	65	39	50
Warren	35	28	133	101	28
RU research	146	105	69	79	345
In-state total	1996	1901	2429	1733	1623
Out-of-state	364	491	366	360	325
Total	2360	2392	2795	2093	1948

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, 40% 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 33% of the laboratory diagnoses. Insect pest damage was diagnosed on 6% of the submissions. Identifications comprised 6% of the total number of samples submitted; of these, 3% were arthropods, 1% were fungi, and 2% were weeds. 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 product or nuisance pests that are found within the household. Over the last several years, the Department of Entomology has cooperated with the laboratory to forward clients with insect identification needs. Their cooperation has been invaluable in increasing the awareness of the laboratory to potential clients. Arthropod identifications decreased in FY09, however, which is in stride with the overall trend of sample submissions in the lab.

Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses decreased in FY09 as well. The submissions of samples for mold identification rise with media attention to the perceived health issues associated with mold infested homes and the incidence of local flooding.

In FY09, a laboratory response was prepared in less than three days for most (90%) of the samples submitted (Table 7), and 95% of our clients received a response in less than a week. A number of the samples took longer than 10 days to diagnose. In these cases, special consultation (ie. 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 6. PDL sample submissions by diagnosis, FY09.

Diagnosis	Number of samples	%
Disease (biotic)	766	40
Disease (abiotic)	648	33
Insect pest	124	6
Nematode	296	15
Arthropod identification	66	3
Fungus identification	17	1
Plant identification	31	2
Total	1948	100

Table 7. PDL sample response time, FY09.

Response Time	Number of samples	%
0 to 3 days	1752	90
4 to 6 days	108	5
7 to 10 days	30	2
11 to 21 days	35	2
>21 days	23	1
Total	1948	100

STL

The STL processed 8,576 samples for soil fertility and physical analysis in FY09 (Table 8). The total laboratory output decreased 7% from FY08 (9602 samples). Sample submission totals were highest in early spring in anticipation of the growing season and again in August when laboratory clientele are preparing for fall lawn fertilization. During the rest of the year, sample submissions remained relatively steady, except for the sharp seasonal decrease in the winter months when the ground is frozen and sampling becomes difficult.

Of the soil samples submitted to the STL for analysis in FY09 (Table 9), 72% were for the standard soil analysis (level 1) only and 28% included requests for additional special tests.

In FY09, soil samples from residential clientele represented 42% of the submission total, (Table 10).

Table 8. STL sample submissions by month, FY05 to FY09.

Month	FY05	FY06	FY07	FY08	FY09
July	561	886	672	699	464
August	768	1275	725	1148	588
September	786	854	776	798	925
October	761	640	802	767	887
November	621	994	587	363	656
December	392	538	366	247	496
January	241	556	680	349	241
February	395	508	317	358	337
March	831	1451	987	1053	1309
April	1543	1296	1154	1817	1404
May	840	873	946	934	647
June	1253	762	578	673	622
Total	8992	10633	8590	9206	8576

Table 9. STL soil sample submissions by test type, FY09.

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

Table 10. STL soil sample submissions by origin, FY09.

Origin	Number of samples	%
Residential	3600	42
Engineering	1634	19
Commercial	2393	28
Research	564	6
Government/school	173	2
Reference	212	3
Total	8576	100

Commercial growers, including the producers of fruit and vegetables, as well as the managers of ornamental crops and turfgrass, represented 28% of the total. Samples from engineering firms comprised 19% of the workload, another 6% of the samples were from research programs at Rutgers, and 2% were from government/local school districts, and 3% were reference samples. In the past, samples from residential clientele largely dominated laboratory submissions; however, recent growth in samples from engineering and commercial clientele indicates a trend toward a professional client base.

Samples were submitted to the STL from all counties in New Jersey (Table 11). Many samples were submitted from counties in close proximity to the laboratory; however, because samples for soil testing are normally delivered in the mail, public access to the laboratory is less of a factor for sample submissions than those destined for the PDL. County profiles, therefore, reflect RCE programs with active home horticulture programs or those with outreach events (fairs, field days) that provide opportunities to sell soil test kits. To some degree, the profile also identifies county faculty and programs that promote and utilize STL services. A large number of county affiliations were unidentified on submission forms. Many of these samples were from engineering firms that submit soil from a central office that may not conform to the location where the soil was sampled.

Figures 1 and 2 indicate the relative phosphorus and potassium content of the soil samples submitted for fertility analysis in FY09. High or very high levels of phosphorus were measured in 75% of the samples tested, and potassium levels were high or very high in 74% of the samples tested. These data suggest the historical overuse of fertilizers containing potassium and phosphorus on soils that do not need them. Commercial fertilizer manufacturers have promoted

Table 11. STL soil sample submissions by county, FY08 and FY009.

County	FY08	FY09
Atlantic	262	168
Bergen	466	484
Burlington	429	487
Camden	204	271
Cape May	173	135
Cumberland	254	150
Essex	261	303
Gloucester	301	286
Hudson	45	108
Hunterdon	255	358
Mercer	522	570
Middlesex	912	513
Monmouth	655	1165
Morris	438	435
Ocean	502	473
Passaic	165	119
Salem	7	12
Somerset	511	557
Sussex	170	190
Union	269	386
Warren	111	79
Reference	315	212
Unidentified	1979	1327
Total	9206	8576

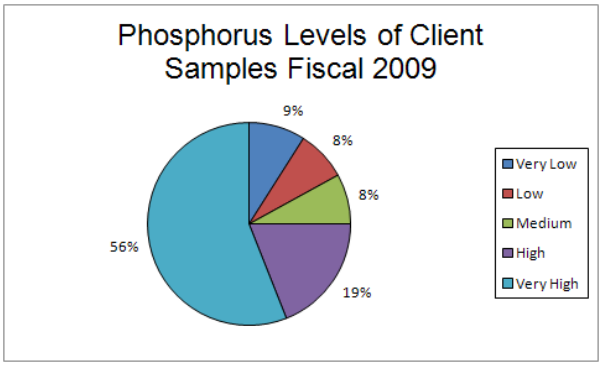

Figure 1. Phosphorus content in soil samples submitted in FY09.

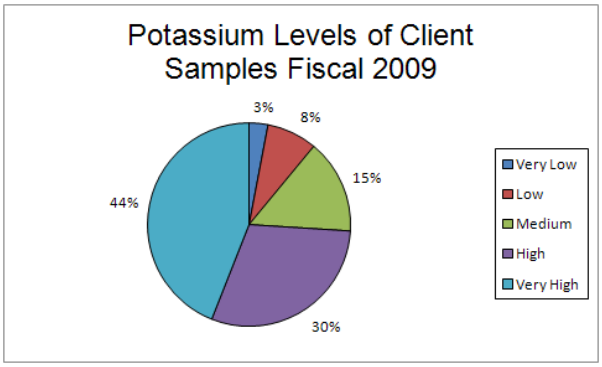

Figure 2. Potassium content in soil samples submitted in FY09.

routine applications of their products without benefit of soil tests. Turfgrass products vary in levels of N-P_2O_5-K_2O in their four or five step programs according to season and without regard to soil test levels. 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. Furthermore, most of the materials commercially available for residential use are combination products. Single nutrient materials are less common in the market. It has become difficult to apply adequate nitrogen on turfgrass or residential gardens without over-application of phosphorus and potassium. However, more low-phosphorus fertilizers are becoming available as new environmental regulations are enacted.

In Figure 3, the soil pH of soil samples submitted to the STL in FY09 is summarized in functional classes (based on plant suitability and recommendations). Percentages are based on the number of samples that were analyzed for pH (8311). The optimum pH range for most plants includes the slightly acidic class (pH 6.05 to 6.95) with 36% of samples. The moderately acidic soils (pH 5.55 to 6.00) represented 17% of samples. This group should be limed (are too acidic) for optimal growth of most plants but have higher than optimal pH for acid-loving plants. In the latter case, acidifying recommendations would be made. The 23% of samples in the very acidic class, pH 4.50 to 5.50, are well-suited for acid-loving plants; for other species, the soil must be limed. Extremely acidic

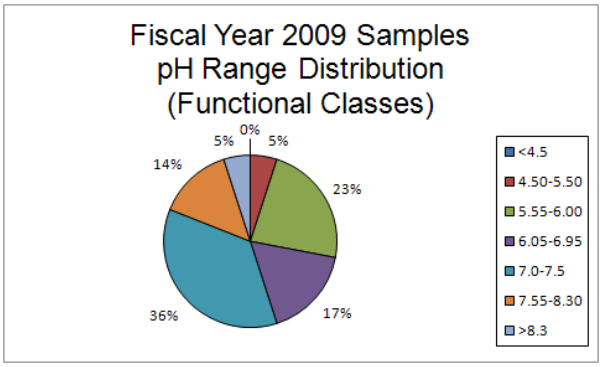

Figure 3. Soil pH of samples submitted in FY09.

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, 14% 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 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, if ammoniacal-nitrogen fertilizer has not been applied, no amendment for adjusting pH is given in this pH range unless for acid-loving plants. Samples with soil pH 7.55 to 8.30 (5%) are moderately alkaline and will be recommended for acidification by application of elemental sulfur or aluminum sulfate. Again, over-application of limestone and/or high soluble salt content may be responsible for such high pH. There were 1% of samples in the pH range above 8.30, which can be explained only by high soluble salt content. Remediation is a longer term prospect with these situations, since the recommended acidification can temporarily exacerbate the salt problem.

Table 12. STL samples by month and test type, FY09.

Month	Number of standard (level 1) tests	Number of special tests
July	286	178
August	328	260
September	726	199
October	617	256
November	520	136
December	329	167
January	128	113
February	165	172
March	993	316
April	1021	383
May	449	198
June	262	360
Total	5824	2752

Table 12 shows the number of standard soil fertility tests done each month in FY09. 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 direct current plasma spectrophotometer (DCP) used for nutritional analyses was broken in March, which delayed soil processing more than usual this year. Moreover, special tests may be held by the laboratory until the number of samples accumulates enough to efficiently run the tests. The purchase of a new inductively coupled plasma spectrophotometer (ICP) to replace the current DCP should improve response time in FY10.

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 FY09. 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 16th 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 10th time he coordinated that short course.

Mr. Buckley was an invited speaker in several RCE programs. The following programs were included: North Jersey Ornamental Horticulture Conference – Turf Day and Landscape Day; the Central Jersey Turf and Ornamentals Institute; and the Spring Forestry Workshop. Lectures in support of the Atlantic/Cape May, Camden, Cumberland, Gloucester, Essex, Mercer, Monmouth, Middlesex, Morris, Somerset/ Hunterdon, and Union County Master Gardener Programs were also given.

Mr. Buckley was also an invited speaker for the New Jersey Christmas Tree Growers Association; the Reed and Perrine Turf and Ornamentals Seminar; New Jersey Nursery and Landscape Association; the New Jersey Certified Tree Expert Training Program; the Northeast Golf Course Superintendents Association; the Bergen Bonsai Society; the North east Pennsylvania Turf Conference; Shemin Landscape Supply Turf Day; the New York State Turfgrass and Landscape Association; and the New Jersey-Philadelphia Golf Course Superintendents Association; and the New Jersey Green Industry (Turf) Expo.

Sabrina Tirpak

Ms. Sabrina Tirpak is responsible for teaching a laboratory practicum in the Rutgers Professional Golf Turf Management School (Appendix 3.2). 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 Winter Meeting. She also presented programs in support of the Essex and Monmouth County Master Gardener programs and the Central Jersey Turf and Ornamentals Institute.

Other educational services provided by the PDL staff members, for which the laboratory received no compensation, included lectures by Mr. Buckley in undergraduate and graduate courses including: the Plant Disease Clinic.

Stephanie Murphy

Dr. Murphy participated in the OCPE Home Gardeners School; and the Soil and Site Evaluation for Septic Systems Short Course. Dr. Murphy presented programs in support of the Environmental Stewardship programs in Burlington, Essex, and Somerset Counties (Appendix 3.3). Dr. Murphy was a guest lecturer in the undergraduate course Soils and Society and hosted several classes of undergraduates for tours of the soil testing laboratory along with detailed explanations of soil testing theory and practices.

Extension Publications

During FY09, 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. Mr. Buckley also contributed articles to the New Jersey Turfgrass Association quarterly newsletter, Greenerside.

Dr. Murphy and the STL staff produced two posters for the RCE Annual Conference: (A) Soil test value trends in NJ and (B) “Topsoil” vs. soil substitute blends.

Dr. Murphy published a chapter in the Brooklyn Botanic Garden Handbook:

Murphy, S. 2009. Physical Properties of Soil. *In* N. Dunne (ed.) Healthy Soils for Sustainable Gardens (All Region Guide, Handbook #192). Brooklyn Botanic Garden.

The STL was also acknowledged in the following articles:

Reilly, Fishman, and Baehr (USGS), 2009. Effect of grain-coating mineralogy on nitrate and sulfate storage in the unsaturated zone. Vadose Zone Journal 8:75-85.

Zhang, Kariuki, Schroder, Payton, and Focht, (OkSU) 2009. Interlaboratory validation of the Mehlich 3 method for extraction of plant-available phosphorus. Journal of AOAC International 29:91-102.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in FY09. In addition, the STL staff also provided tours for several Master Gardener programs.

Dr. Murphy served as the dean’s representative to the State Soil Conservation Committee where she participated in several subcommittees. She also participated in the New Jersey Association of Conservation Districts Conference and two NJDEP initiatives: “Healthy Lawns Clean Water” and “Testing

for Acid Sulfite Soils in Flood Hazard Zones in New Jersey."

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.

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 FY09, this marketing initiative brought the display to the following programs: The 2008 Great Tomato Tasting; New Jersey Master Gardeners Association Fall Event; 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 Day. The display was also used each week of the Rutgers Farmers Market at Rutgers Gardens.

Income

The PDL and STL are expected to recover all costs and be self-supporting. Income is generated by charging clientele for diagnostic services and educational activities. Grant activity and cost-sharing arrangements also provide some degree of funding. 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 FY09, $163,845.45 was generated from all PDL activities. Income generated from all laboratory activities covered 100% of the non-salary expenses incurred in FY09. When all expenses and real revenues are considered, the PDL recovered 76% of all costs for the FY09.

In FY09, $256,142.91 was generated from all Soil Testing Laboratory activities. Income generated from all laboratory activities easily covered 100% of the non-salary expenses incurred in FY09. When all expenses and real revenues are considered, the STL recovered 74% of all costs for the FY09.

Laboratory 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 34 "no charge" samples in FY09. As per laboratory 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.

A complete breakout of all PDL and STL revenues and expenses is included in Appendix 2 of the unabridged copies of this report.

Future Directions

As in the past, the top priority for FY10 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 FY10. 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 FY10 to cover increasing costs.

As part of the current curriculum initiative for undergraduate education at SEBS, Mr. Buckley, Dr. Murphy, and Ms. Tirpak will be expected to develop courses. Dr. Murphy has two soil science courses in development and Mr. Buckley has partnered with Dr. Ann Gould to offer a course in disease and pest problems of ornamental plants. These courses should be available to students in the fall of 2010 and spring of 2011.

Summary of 2009 Soil Testing and Plant Diagnostic Laboratory Surveys Completed by RCE Agents and Master Gardener Coordinators

During late-spring and early-summer of 2009, laboratory staff visited unit meetings for the Agricultural and Resource Management Agents (ARMA) and the Master Gardener Coordinators (MGC) to discuss the status of the PDL and the STL. A survey was conducted to assess attitudes about laboratory services and to determine the needs of each county. A copy of the survey can be found in Appendix 4. The following is a summary of the survey results.

Soil Testing Laboratory (STL)

Soil test kits are sold by a variety of county office staff including agents, professional and clerical staff, and volunteers. In 13 of 21 counties surveyed, soil test kits are sold by receptionists or secretaries; in 5 counties, this duty is reserved for the most experienced Master Gardener volunteers.

While staff members who sold soil test kits in certain counties were considered "very knowledgeable" of soil testing procedures, proficiency of personnel in one-third of the counties surveyed was "just enough" or "not at all." This demonstrates a genuine need (and opportunity) to improve the understanding of soil testing. Most agents surveyed indicated that an information sheet or an in-service training on soil testing procedures would be beneficial to their staff, and MGCs were generally in agreement that an information sheet would be helpful. Only four counties responded that an in-service or information sheet was not necessary, due primarily to a highly knowledgeable staff, a lack of time, or low interest in promoting laboratory services. Those who do not use the STL did not explain why in their survey responses.

Clients visit RCE county offices "rarely" to "100% of the time" to obtain soil testing kits. While the higher percentages may reflect greater awareness by the public of soil testing in those counties, the lower percentages might suggest a need to better educate the public about the STL and its services. In fact, an overwhelming majority of ARMA and MGC personnel "often" recommend soil testing to a client who wouldn't otherwise have considered it, demonstrating the value they place on soil testing.

The majority of ARMA faculty responding to the survey wish to receive copies of soil test reports, often specific to the type of client (commercial agriculture vs. residential/landscape) and the commodity responsibility of the agent. The single exception among agents was a respondent who wanted homeowner reports "only upon request." Some ARMA faculty said that they or other staff review soil test reports with clients "sometimes" or "often," and several counties have staff who review every report received by the office. The single agent who answered "rarely" explained: "homeowner recommendations speak for themselves." Master Gardeners rarely review a soil test report with a client because of the technical questions that might arise.

The number of calls that counties receive from clients with questions concerning soil test reports varies widely. Frequency ranges from once per week (or about 50 per year) to 10 times per week; the most common response was twice per week. The Master Gardener Helpline receives questions about soil test reports one to two times per week. Inquiries received from most clients concerned the interpretation of test results or fertilizer recommendations; most clients want to know where a recommended fertilizer ratio could be purchased (brand/retail store). Clients also use the opportunity to ask questions about plantings, pests, and other related issues.

ARMA faculty suggested a variety of changes that might improve STL services and reporting:

* Lower the price of soil test kits
* Include percent organic matter, texture and runoff potential
* Explain the effect of pH on fertility
* Explain the Lime Requirement Index or leave it out of the soil test report
* Specify when calcitic limestone is needed
* Improve readability of the soil testing reports: fertilizer recommendations are not user friendly, and more general recommendations with more graphics are needed for homeowners
* Do not suggest specific fertilizer analysis (this represents confusion when clientele with poor agronomic backgrounds can't find recommended analysis)
* Include a list of fertilizers that customers can find locally
* Add field crop recommendations (e.g., sweet corn, field corn, soybean, hay, alfalfa)

It was suggested that the STL cooperate with existing working groups to develop commercial crop recommendations. The following ARMA faculty offered to help to add these recommendations to the STL database:

* Field crops (Bamka, Komar, Sciarappa)
* Vegetables and small fruit (Nitzsche)
* Vegetables (Carson)
* Field Nursery (Obal)
* Blueberries and grapes (Pavlis)

In addition, a number of ARMA faculty have expressed willingness to work with the STL to update fertilizer recommendations and to provide input to improve soil test reports for better understanding by clientele. Some ARMA staff and Master Gardener groups are willing to provide lists of fertilizer brands available in their counties.

Additional Comments:

* Organic recommendations are a great addition - make this option more prominent on questionnaire.
* Why is the test report mailed to client without recommendations?
* The front page of the report is good: graphics are easy to read, levels are easy to understand. The back page is a challenge: recommended fertilizer ratios are difficult to find and purchase. Need to visit stores and check fertilizer websites to see what is for sale in the stores.

Plant Diagnostic Laboratory (PDL)

According to the two surveys, plant diagnostic services and insect pest identifications are offered by all of the counties in New Jersey. Most counties handle about 250 plant samples each year. Ten counties refer about half of their samples to the Rutgers Plant Diagnostic Laboratory (PDL), while five counties send most of their samples and five others refer almost none. MGCs were more likely to refrain from referring clientele to the laboratory. Cost of the service is a deterrent for many county clients to use the PDL and may be the most important issue for residential clientele. Of those plant and insect samples that are handled in the counties, Rutgers fact sheets and recommendations or those from other University programs are provided to the client along with each diagnosis.

The staff in each county has some knowledge of the PDL services, fees, and procedures. An in-service or training program on laboratory offerings, however, was only requested by a few counties. On the other hand, MGCs in each county are well aware of PDL programs even though they appear to be hesitant about referring clients to the laboratory.

Most counties would like to receive copies of the PDL reports. Those reports should include more detailed information about the pest or disease, up-to-date and accurate pesticide recommendations, and options for control including alternate (non-pesticide) methods. As in the counties, survey recipients felt that fact sheets should be included with the PDL reports, and commercial recommendations should be distinguished from residential. MGCs would be willing to receive monthly summaries of sample submissions for educational purposes.

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 FY09 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. Continued upgrades to laboratory technology improves 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 provides 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.

In March of 2009, the Rutgers Plant Diagnostic Laboratory hosted the NEPDN Annual Meeting. The conference was held at the University Inn and Conference Center at Rutgers and was attended by land grant and State Department of Agriculture diagnosticians, plant pathologists, and entomologists from 12 northeastern states. The program included three days of state reports, disease and insect pest diagnostic training, and a field trip to the Francis Krim Memorial Inspection Station in Linden to see the USDA-APHIS-PPQ and Customs and Border Protection personnel in action.

Ramapo Tomato Sale

In the spring of 2008, the New Jersey Agriculture Experiment Station revived the hybrid tomato variety 'Ramapo'. Retail sale of the seeds was conducted by Cindy Rovins and the staff of the PDL. The variety 'Moreton' was added for the 2009 season. To date, the PDL has processed 3,850 orders for 10,064 packets of seeds with revenue of $43,147.00. Orders continue to trickle into the laboratory daily.

The staff of the PDL were 2009 Excellence Award winners for the Team Award "Rediscovering the Jersey Tomato-Revitalizing a Signature Crop for New Jersey." The team included Bill Hlubik, Michelle Infante-Casella, Wes Kline, Joe Musumeci, Peter Nitzsche, Tom Orton, Jack Rabin, Cindy Rovins, Bill Sciarappa, Richard Buckley, and Sabrina Tirpak.

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

Fertility Test: $15 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; interpretation & recommendations

Problem Solver (soil/plant suitability test): $45 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; soluble salt level: organic matter content; soil textural class; interpretation & recommendations

Topsoil Evaluation: $75 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content, recommendations

FARM

Farm Fertility Test: $15 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated CEC & basic cation saturation, recommendations from RCE agent

Pre-sidedress Nitrate Test (only): $15 Nitrate-nitrogen in soil to determine mid-season fertilizer requirement. Results within 3 working days (assuming dry sample when received), report FAXed.

Full Farm Test: $45 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated CEC & basic cation saturation, available nitrogen, organic matter content, recommendations from RCE agent

GOLF & SPORTS TURF

Golf/Sports Turf Fertility Test: $15 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated cation exchange capacity and basic cation saturation, recommendations

Golf/Sports Total Turf Soil Test: $45 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated cation exchange capacity and basic cation saturation, soluble salt level, organic matter content, soil textural class, recommendations

Sand-based Root Zone Analysis: $45 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated cation exchange capacity and basic cation saturation, soluble salt level, organic matter content by loss-on-ignition, % fines, recommendations

ORGANIC MEDIA ANALYSIS

Greenhouse (soilless) Potting Media: $50 Media pH, nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, Fe and available nitrogen, & electrical conductivity by saturated media extract; interpretation

Compost/Basic: $60 Compost pH, electrical conductivity, & nitrate-nitrogen by saturated media extract; maturity index; interpretation & recommendations for use

Compost/Technical: $125 Compost 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 Nutrients, Available: add $10 (add to compost test above) Water-soluble P, K, Ca, Mg, Cu, Mn, Zn, B, Fe by saturated media extract

Compost Nutrients, Total: add $40 (add to compost test above) Total P, K, Ca, Mg, Cu, Mn, Zn, B, Mo by ashing

Appendix 1. (continued).

TECHNICAL TESTING

Permeability Class Rating: $100 Percentages of sand/silt/clay, sieve analysis (#10, #60, #140, #270) 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 $80 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; soluble salt level; organic matter content; percentages of sand/silt/clay; soil textural class; gravel content; visual assessment. Report FAXed.

Ecological Research Test: $110 Soil pH; nutrients: P, K, Ca, Mg, Cu, Mn, B, Zn, and Fe; estimated CEC & cation saturation; soluble salts; organic matter content; percentages of sand/silt/clay; soil textural class; total Kjeldahl nitrogen; available nitrogen. Report FAXed.

INDIVIDUAL SOIL TESTS

Soil pH and Lime Requirement Index: $10

Soluble Salt Level by electrical conductivity: $10

Soil Organic Matter Content: $15 by chemical oxidation

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

Available Nitrogen: $20 nitrate- and ammonium-nitrogen

Total (Kjeldahl) Nitrogen: $20

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

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

Lead Screening by Mehlich 3: $15 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, 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-FY09.

Salaries and benefits	
(full and part time staff)	$200,440.93
Supplies and services	
Diagnostic and testing supplies	
Printing and advertising	
References	
Rentals	
Equipment maintenance	
Office supplies	
Credit card fees	$9,249.00
Communications	
Telephone/fax	
Postage	$3,791.12
Travel	
Paid talks and professional meetings	$2,865.53
Total operating costs	$216,346.58

Table A2.2. Income, PDL-FY09.

Sample fees	$73,821.00
Lecture fees	
OCPE and other honorarium	$18,703.00
Grants and contracts	
USFS BLS Survey	$3,140.00
Center for Turfgrass	$472.50
NEPDN	$35,500.00
Ramapo tomato seed sales	$7,500.00
Other	
Salaries (NJAES/SEBS)	$24,708.95
Total actual income	$163,845.45

Table A2.3. Estimated expenses, PDL-FY10.

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-FY10.

Plant Health Samples	
2000 @ $40 average fee per sample	$80,000.00
Lecture fees	
OCPE and other honoraria	$20,000.00
Cost recovery	
Grant and contracts	$76,000.00
Salaries (NJAES/SEBS)	$54,000.00
Ramapo tomato seed sales	$5,000.00
Total potential income FY10	$235,000.00

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

Table A2.5. Expenses, STL-FY09.

Salaries and benefits	
(full and part time staff)	$258,821.60
Supplies and services	
Testing supplies	
Chemicals	
Printing and advertising	
Office supplies	
Credit card fees	$33,447.32
Equipment maintenance	
DCP service contract	$14,000.00
Loan Repayment	
FY08 loan from PDL	$35,839.70
Communications	
Telephone/fax	
Postage	$5,821.91
Travel	
Paid talks and professional meetings	$492.00
Total operating costs	$348,422.53

Table A2.6. Income, STL-FY09.

Sample fees	
STL	$244,219.49
Lecture fees	
OCPE and other honoraria	$907.50
Other	
Salaries (NJAES/SEBS)	$11,015.92
Total actual income	$256,142.91

Table A2.7. Estimated expenses, STL-FY10.

Salary and benefit costs	$265,000.00
Supplies and services	$34,000.00
Equipment maintenance	$14,000.00
Communications, marketing and travel	$7,000
Total potential cost FY10	$320,000.00

Table A2.8. Estimated income, STL-FY10

Soil Analysis	
10,000 @ $25 average fee per sample	$250,000.00
Lecture fees	
OCPE and other honoraria	$1,000.00
Cost recovery	
Salaries (NJAES/SEBS)	$22,000.00
Total potential income FY10	$273,000.00

Appendix 3.

Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Director, Fiscal 2008/2009.

Date	Title	Audience	Location	Partici-pants[1]
07/19/08	Christmas Tree Pest Update (.5h)	NJCTGA Annual Summer Meeting	Hunterdon County	I
07/31/08	Basic Diagnostic Practice (2h)	Plant Disease Clinic (16:765:536)	Cook Campus	C
08/28/08	Nursery Disease and Pest Diagnostic Clinic (.5h)	Cream Ridge Nursery Growers Meeting	Burlington County	N
10-12/08	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/08	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/08	IPM on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/09	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10/10/08	Diseases of Turf and Ornamentals (2h)	Emergency Pesticide Recert. Short Course	Cook Campus	A,T,L
10/16/08	Nursery IPM Disease Update (1h)	Nursery Growers Twilight Meeting	Middlesex County	N
10/28/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Hunterdon County	H
10/30/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Mercer County	H
11/06/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Middlesex County	H
11/07/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Middlesex County	H
11/18/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Union County	H
12/03/08	Oak Tree Decline - Problems and Solutions (.75h)	South Jersey Landscape Conference	Gloucester County	I,L,N
12/09/08	Understanding Fungicide Mode of Action (1h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/09/08	Significant Insect Pests in NJ Landscapes (1h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/11/08	Least Toxic Products for Turf and Ornamentals (.75h)	New Jersey Green Industry (Turf) Expo	Atlantic County	I,L,T
12/15/08	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Morris County	H
01-03/09	Diseases of Turfgrass (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/09	Diseases of Ornamentals (10 2h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/09	IPM on the Golf Course (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/09	Insects of Turfgrass (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01/06/09	Leaf Feeding Insects for NJ Turfgrass (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/08/09	2008 Plant Disease Update (1h)	North Jersey Ornamental Horticulture Symposium	Morris County	A,L,T
01/14/09	Patch Disease Update (1h)	Northeast Golf Course Superintendents Association	Albany, NY	T
01/15/09	Introduction to IPM and Insect Control (3h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/18/09	Diseases of Woody Ornamentals (1.5h)	Bergen County Bonsai Society	Bergen County	H
01/20/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Cumberland County	H
01/22/09	The Art and Science of Disease Diagnosis (3h)	Landscape IPM Short Course	Cook College	L,T
01/23/09	The Complete Turf Disease for Golf Courses (6h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T

Appendix 3. (Continued)

Table A3.1. Complete listing of lectures presented by Richard J Buckley, PDL Director, Fiscal 2008/2009.

Date	Title	Audience	Location	Participants[1]
01/29/09	Leaf Feeding Insects in Cool Season Turfgrass (.5h)	Northeast PA Turf Conference and Trade Show	Wilkes Barre, PA	L,T
01/29/09	Understanding White Grubs in Turfgrass (.5h)	Northeast PA Turf Conference and Trade Show	Wilkes Barre, PA	L,T
02/03/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Camden County	H
02/05/09	Basic Turf Diseases: Pick Your Best Defense (1.5h)	Pest Management in Landscape Turf Short Course	Cook Campus	A,L,T
02/05/09	Insect Pests of Turfgrass (2h)	Pest Management in Landscape Turf Short Course	Cook Campus	A,L,T
02/18/09	Basic Turf Diseases: Pick Your Best Defense (1h)	Athletic Field Construction Short Course	Cook Campus	T
02/23/09	Insects that Suck (1h)	Reed and Perrine Turf and Ornamental Seminar	Monmouth County	A,L,T
02/24/09	Basic Turf Diseases: Pick Your Best Defense (1h)	Shemin Landscape Supply Turf Day	Philadelphia, PA	L,N,T
02/24/09	Understanding White Grubs in Turf (1h)	Shemin Landscape Supply Turf Day	Philadelphia, PA	L,N,T
03/02/09	Basic Turf Diseases: Pick Your Best Defense (1h)	NY State Turf and Landscape Association	Buffalo, NY	L,N,T
03/02/09	Patch Disease Update (1h)	NY State Turf and Landscape Association	Buffalo, NY	L,N,T
03/02/09	Turf and Ornamentals Round Table (1h)	NY State Turf and Landscape Association	Buffalo, NY	L,N,T
03/04/09	Diagnostic Tips for the Problem Lawn (1h)	Central Jersey Turf and Ornamentals Institute	Monmouth County	A,L,T
03/12/09	The Complete Turf Disease (6h)	Advanced Turf Disease Mgmt. Short Course	Cook Campus	I,L,T
03/24/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Atlantic County	H
03/26/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Monmouth County	H
04/01/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Essex County	H
04/04/09	Tree Disease Basics (1h)	Certified Tree Expert Training Program	Cook Campus	A,L
04/14/09	Diseases and Insect Problems in NJ Oaks (2h)	Spring Forestry Workshop	Hunterdon County	A,L
04/16/09	Insect Pests in New Jersey Landscapes (3h)	Master Gardener Training	Monmouth County	H
04/22/09	The Art and Science of Disease Diagnosis (3h)	Master Gardener Training	Gloucester County	H
04/27/09	Anthracnose	New Jersey Golf Course Superintendents Meeting	Atlantic County	T
04/29/09	Diseases and Insect Problems in NJ Oaks (2h)	Spring Forestry Workshop	Gloucester County	A,L
05/02/09	Key Diseases and Insects in Landscape Plants (1h)	Master Gardener Training	Cape May County	H
05/14/09	Basic Turf Diseases: Pick Your Best Defense (1h)	Master Gardener Training	Ocean County	H
05/14/09	Understanding White Grubs in Turf (1h)	Master Gardener Training	Ocean County	H
06/05/09	Basic Turf Diseases: Pick Your Best Defense (1h)	Master Gardener Training	Morris County	H
06/05/09	Understanding White Grubs in Turf (1h)	Master Gardener Training	Morris County	H

[1]Audience Addressed: A=Arborists; C=College (Academic); G=Greenhouse; H=Residential Clientele; I=Industry; L=Landscape Professionals; N=Nursery Growers; T=Turfgrass Managers; X=Christmas Tree Growers

Appendix 3. (continued).

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, Fiscal 2008/2009.

Date	Title	Audience	Location	Partici-pants[1]
10-12/08	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
10-12/08	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
11/12/09	Insect Orders (3h)	Master Gardener Training	Essex County	H
01-03/09	Turf Disease Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01-03/09	Turf Insect Laboratory (10 1.5h lectures)	Professional Golf Turf Management School	Cook Campus	T
01/14/09	Bees and Wasps in the Landscape (.75h)	Central Jersey Turf and Ornamentals Institute	Somerset County	L
01/19/09	Turf Insect and Weed Review (2h)	Turf Bowl Preparatory Review	Cook Campus	C
01/27/09	Laboratory Tour (.5h)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
02/11/09	Bees and Wasps in the Landscape (1h)	Master Gardener Training	Somerset County	H
03/03/09	Bees and Wasps in the Landscape (.75h)	Brooklyn Landscape Gardeners Association	New York, NY	L
03/11/09	Household Insects (3h)	Master Gardener Training	Essex County	H
03/12/09	Household Insects (3h)	Master Gardener Training	Monmouth County	H
04/01/09	Turf Pathogens Prepared Slides Lab	Turf Pest Science (11:776:408)	Cook College	C
04/08/09	Turf Pathogens Plant Samples Lab	Turf Pest Science (11:776:408)	Cook College	C
05/05/09	Bees and Wasps in the Landscape (1h)	Master Gardener Training	Cape May County	H
05/20/09	Insects are Our Friends (4h)	Riverside Elementary School Science Day	Mercer County	H

[1]Audience Addressed: A=Arborists; C=College (Academic); G=Greenhouse; H=Residential Clientele; I=Industry; L=Landscape Professionals; N=Nursery Growers; T=Turfgrass Managers; X=Christmas Tree Growers; V=Vegetable Growers

Table A3.3. Complete listing of lectures presented by Dr. Stephanie Murphy, STL Coordinator, Fiscal 2008/2009.

Date	Title	Audience	Location	Partici-pants[1]
09/02/08	Soil Testing and Fertilizer Recommendations (.5h)	PLANJ - NJNLA Meeting	Cook Campus	L
09/20/08	Understanding Soil - Plant Relationships (1.5h)	Home Gardeners School	Douglas Campus	H
10/06/08	Soil Physical Properties: Soil Texture and the Textural Triangle (.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf

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

Date	Title	Audience	Location	Participants[1]
10/06/08	Field Exercises: Determining Soil Texture (1h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/06/08	Soil Morphology and Treatment of Septic Effluent and Storm Water (.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/06/08	Soil Physical Properties: Soil Structure and Soil Color (.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/06/08	Field Exercises: Determining Soil Texture, Structure, Color, and Consistency in the Pits (2h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/09/08	Best Management Practice #1:Soil Testing (1.5h)	Soils and Society (11:375:102)	Cook Campus	C
10/17/08	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/17/08	Field Exercises: Write Individual Soil Logs and Review (4h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/18/08	Field Exercises : Establishing Horizons and Determining Redoximorphic Features (1.5h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
10/18/08	Field Exercises: Write Individual Soil Logs and Review (4h)	Soil and Site Evaluation for Septic Systems Short Course	Cook Campus	E,Co,Hf
11/20/08	Soil Workshop (2h)	Stoney Brook Garden Club	Mercer County	H
12/09/08	Soil Testing at Rutgers (1.5 h)	Soil Fertility (11:776:440)	Cook Campus	C
01/20/09	Web Soil Survey for Cream Ridge (1.5h)	Landscape Architect Design Week	Cook Campus	C
01/21/09	Soil Testing at Rutgers (1.5h)	Landscape Management and Maintenance (11:550:238)	Cook Campus	C
02/27/09	Soils and the Environment (3h)	Environmental Stewardship Training	Somerset County	H
02/29/09	Soils and the Environment (3h)	Environmental Stewardship Training	Essex County	H
02/30/09	Soils and the Environment (3h)	Environmental Stewardship Training	Burlington County	H
03/16/09	Soil Conservation and Testing (1h)	Radio Show		H
03/21/09	Understanding Soil and Plant Relationships (1h)	Home Gardeners School	Douglas Campus	H
04/14/09	Soil Testing at Rutgers (2h)	Soils and Water (11:375:360)	Cook Campus	C
04/17/09	Soil Erosion and Conservation (1.5h)	Soils and Water (11:375:360)	Cook Campus	C
04/17/09	Soil Testing at Rutgers (2h)	Soils and Water (11:375:360)	Cook Campus	C

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

Appendix 4. 2009 Plant Diagnostic and Soil Testing Surveys

Name: _____

County: _____

Soil Testing Survey for County RCE Agricultural and Natural Resource Agents

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1. Who distributes soil testing kits in your county office?
   - □ agent
   - □ program associate/horticultural consultant
   - □ Master Gardener
   - □ receptionist/secretary

   A. How knowledgeable is this person/are these people about soil testing?
   - □ very
   - □ moderately
   - □ just enough
   - □ not at all

   B. Would a soil testing in-service or info sheet to county staff be helpful?
   - □ yes, very
   - □ maybe
   - □ no, not necessary for my county

2. How often do clients come in specifically for soil testing kits?
   - □ 100% of clients who buy kits came in specifically for this purpose
   - □ 75%
   - □ 50%
   - □ 25%
   - □ very few or none

3. How often do you recommend soil testing to a client who wouldn't otherwise have considered it?
   - □ often (average 20/month or about 250/year)
   - □ sometimes (average 10/month or about 120/year)
   - □ rarely (less than 4/month or less than 10/year)

Appendix 4. Plant Diagnostic and Soil Testing Surveys (continued).

4. Would you like to receive Soil Testing Lab reports?

   □ Yes, for all clients

   □ Yes, for commercial producer clients (not golf course/sports turf)

   □ Yes, for homeowner clients

   □ No, never

5. How often do you (or your staff) utilize (in response to client questions) the soil test reports received in your office?

   □ I/staff review every soil test report received in my office

   □ often (average 20/month or about 250/year)

   □ sometimes (average 10/month or about 120/year)

   □ rarely (less than 4/month or less than 10/year)

   If not, why not? _____

6. On average, how many clients call with questions about soil test reports?

   _____ per week/month/year (circle)

   What questions do these clients have?

   _____% with questions about soil test results or interpretation

   _____% with questions about recommendations

   _____% with other questions about plantings, pests, or other

7. What do you think is the best improvement we can make to the soil test reports (be specific)?

8. Would you be willing to provide input to the Soil Testing Lab to help improve our service to clients?

   □ I can commit to work with the STL on recommendations for

   _____ (crop or planting type)

   □ I will provide lists of fertilizer brands/analysis available in my county

   □ I will provide feedback on improving report “message” (understanding)

   □ Other _____

Comments: (write on back for more space)

Appendix 4. Plant Diagnostic and Soil Testing Surveys (continued).

Plant Diagnostic Services Survey for County RCE Agents

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1. What diagnostic services are provided at your county office and by whom?

   □ insect/tick (all specimens? some? none?) _____

   □ disease (all specimens? some? none?) _____

2. What recommendations related to plant problems are provided?

3. How often do clients come in specifically for plant problem diagnosis?
   □ often (average 20/month or about 250/year)

   □ sometimes (average 10/month or about 120/year)

   □ rarely (less than 4/month or less than 10/year)

4. How often do you (or staff) recommend Plant Diagnostic Services to a client who wouldn't otherwise have sent in a sample?

   □ often (average 20/month or about 250/year)

   □ sometimes (average 10/month or about 120/year)

   □ rarely (less than 4/month or less than 10/year)

5. How knowledgeable is your county staff about Plant Diagnostic Lab services, fees, and procedures?

   □ very knowledgeable

   □ some knowledge

   □ unaware

6. Would a plant diagnostic in-service or info sheet to county staff be helpful?

   □ yes, very

   □ maybe

   □ no, not necessary for my county

7. Would you like to receive Plant Diagnostic Lab reports?

   □ yes, for all clients

   □ yes, for golf course/sports turf

   □ yes, for other commercial producers

   □ yes, for homeowner clients

   □ no, never

8. What is the most important improvement(s) you would like to see on plant diagnostic test reports?
Comments:

RUTGERS
New Jersey Agricultural Experiment Station

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
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