RUTGERS
New Jersey Agricultural Experiment Station

Plant Diagnostic Laboratory

2020 Fiscal Year Report

(July 1, 2019 to June 30, 2020)

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2020 Fiscal Year
Rutgers Plant Diagnostic Laboratory
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 the 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 the Plant Diagnostic Laboratory during the 2020 fiscal year.

History

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 57,849 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.

Other Support

The PDL regularly employs Rutgers undergraduate students 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. In an effort to control costs for FY20, as well as, due to the impact of COVID-19 on University functions, no undergraduate students were employed.

The laboratories also benefit from the assistance of faculty in several departments, Centers, and Institutes at Rutgers University/School of Environmental and Biological Sciences (SEBS). We owe a great deal of our success to the expertise of faculty in the departments of Plant Biology, Entomology, Ecology, Evolution and Natural Resources, and Agricultural and Resource Management Agents. We would also like to thank the staff of the Rutgers Office of Continuing Professional Education for their support and assistance with our educational programming, and we also acknowledge members of the SEBS/NJAES Office of Communications for their support and assistance.

Laboratory Policies

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

Fiscal Year 2020 Report

Operations

During the 2020 fiscal year (July 1, 2019 to June 30, 2020), the PDL examined 1,984 specimens submitted for diagnosis, identification (insects, weeds, or fungi), or nematode assay (Table 1), representing a 28% decrease (or 789 samples) from FY19. Samples (Figure 2) submitted for diagnosis (-268) decreased and nematode analysis (-30) decreased in FY20. There was a decrease in insect identifications (-491) mostly from Cooperative Agricultural Pest Survey (CAPS) and NJ State Forestry Services 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 1,500 to 2,000 samples represent peak laboratory capacity, so at 1,984 sample submissions, the PDL was operating at the capacity of the laboratory to function efficiently.

Figure 1.

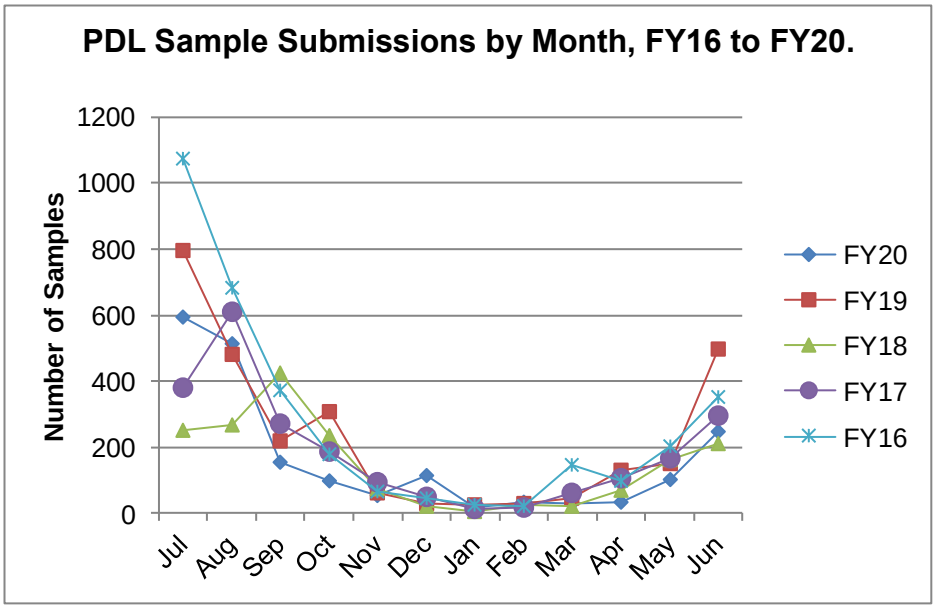
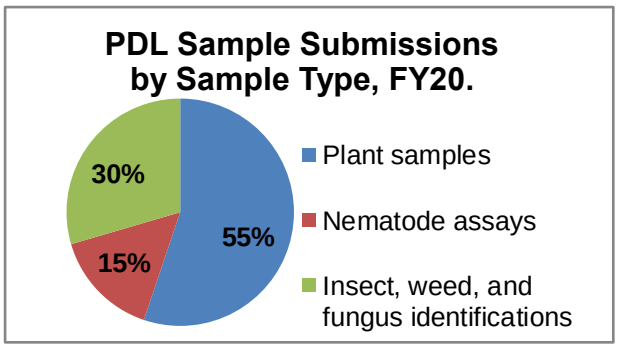


Table 1. PDL sample submissions by month, FY16 to FY20.

Month	FY16	FY17	FY18	FY19	FY20
July	1076	380	252	795	596
August	681	609	266	481	513
September	371	272	424	219	156
October	178	188	236	309	96
November	66	93	74	62	52
December	47	50	20	27	112
January	24	14	6	25	18
February	21	16	25	29	32
March	148	62	21	46	27
April	96	105	71	131	33
May	201	168	161	152	103
June	353	295	212	497	246
Total	3262	2252	1768	2773	1984

Figure 2.



The specimens submitted to the PDL by sample type are presented in Figure 2. Most samples, 55% (1,095), were plant samples submitted for diagnosis, 30% (586) of the samples were insect, mold, or plant identifications and 15% (303) of the samples were for nematode analysis.

In Figure 3, samples submitted to the laboratory are presented by origin. In FY20, 86% of the plant submissions were from commercial clientele, 9% were from residential clientele, and 5% were submitted from research faculty at Rutgers University. Commercial plant managers benefit more financially from our services, thus they submit the majority of samples to the laboratory. This distribution is consistent with other years.

In FY20, 97% of samples submitted for plant or insect identification were from commercial clients, 3% were residential in origin, and 0% (0 samples) were from research (Figure 3). Household or nuisance pests are the primary issues of concern for residential clients. Of the nematode assays submitted, 100% of the samples were from commercial clients, with 0% (0 samples) from research, and 0% (0 samples) from residential clientele. We expect that the number of nematode samples submitted from residential clients will remain low or nonexistent, since much of this clientele is not familiar with nematode pests.

In general, samples from research programs represent a relatively small percentage of the total number of plant and soil samples received. However, research samples are an extremely important component of our submissions. Research samples allow the diagnosticians to cooperate with University faculty on problems of great importance to the State of New Jersey.

Turfgrass and ornamentals represent the largest agricultural commodities in New Jersey. In support of New Jersey as an urban agriculture state, it follows that the vast majority of samples (95%) were either turfgrass or ornamental plants (Figure 4). The wide variety of turf and ornamental species grown under diverse environmental conditions in our state results in a large number of problems not readily identifiable by growers or county faculty with these crops. Furthermore, extension faculty and staff who deal primarily with turfgrass and ornamental plants as commodities, as well as plant managers in the turf and ornamentals industries, readily adopted the user fee-based delivery of service. Alternatively, commercial growers of traditional agricultural crops have been slow to adopt a fee-for-service system. Certain RCE faculty members in New Jersey's southern counties continue to 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 FY20 were submitted to the laboratory through the Rutgers 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

Figure 3.

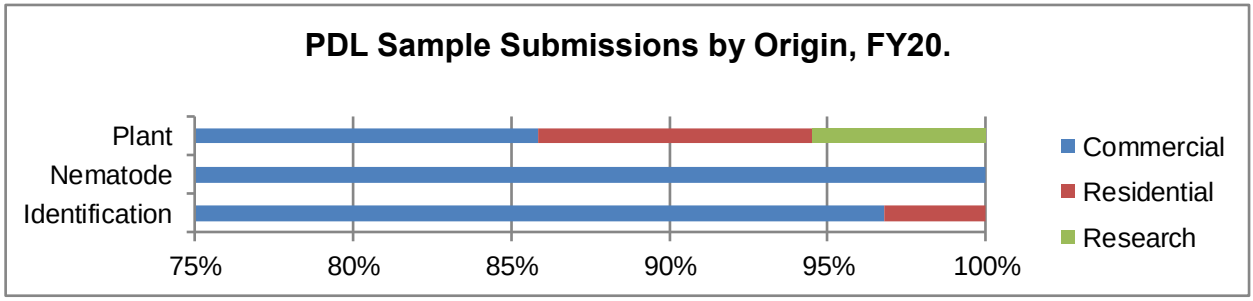


Figure 4.

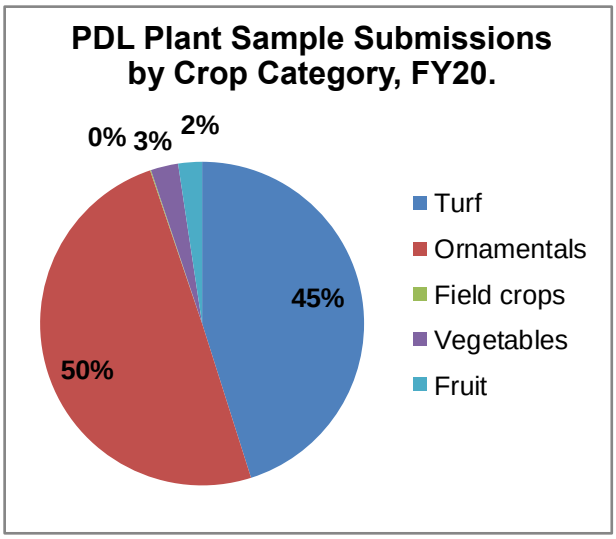
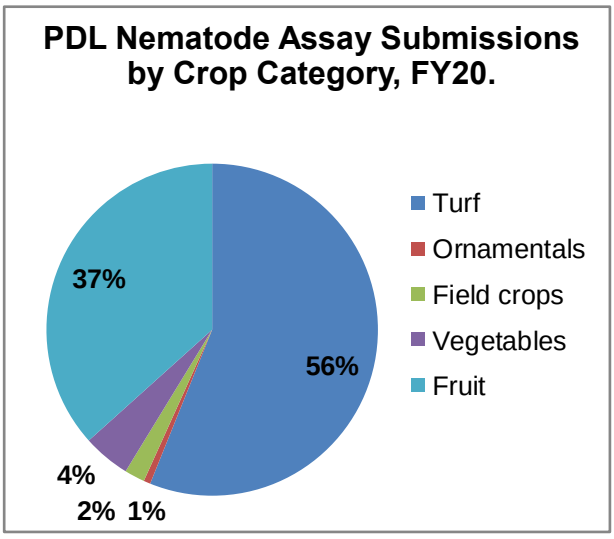


Figure 5.

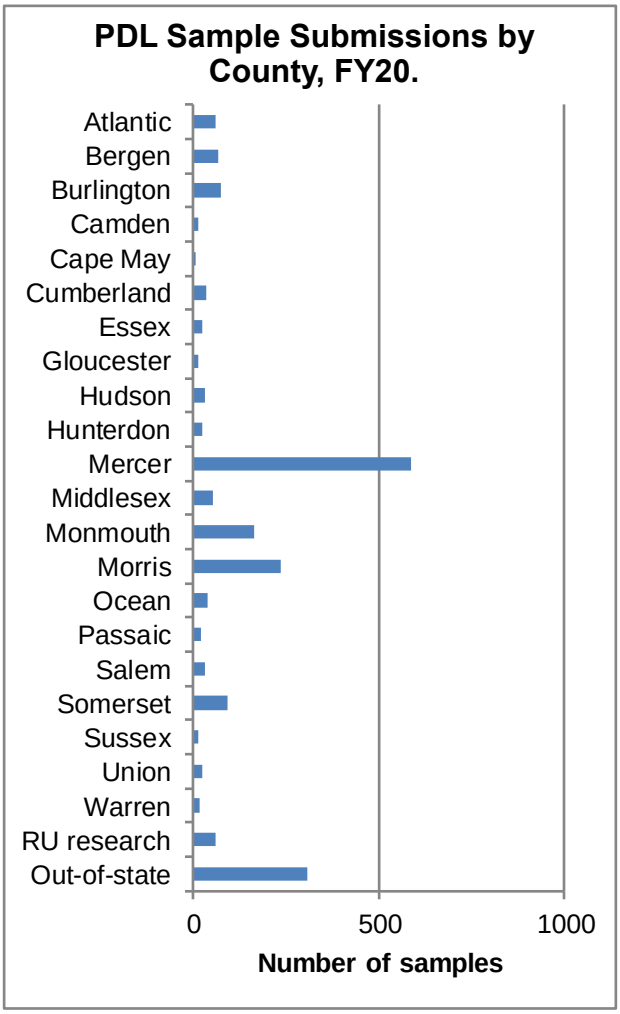


options have been removed from the market. Problems in golf turf, particularly with nematodes, are more severe during seasons with considerable heat and drought stress, and it is those years that carry the highest submission totals.

Samples were submitted to the PDL from all counties in New Jersey (Figure 6). The majority of samples, however, were submitted from counties in close proximity to the laboratory. The probable 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 23% of the samples submitted for diagnosis to the laboratory were from out-of-state. The percent of out-of-state samples remained the same from the previous FY19. Of particular note, 39% of all turf samples were from out-of-state. Golf turf samples were submitted to the laboratory from 17 states in FY20. Turf samples were received from states as far away as Arkansas, California, Connecticut, Delaware, Idaho, Massachusetts, Michigan, Nevada, Ohio, Vermont, Virginia, Washington, and West Virginia. New York, Maryland and Pennsylvania provide the largest

Figure 6.



number of out-of-state samples. Because of his national reputation and his strong support for the laboratory, Dr. Bruce Clarke has helped the Rutgers laboratory develop into one of the premier golf turf diagnostic facilities in the country. Many golf course superintendents contact Dr. Clarke for help, who always forwards them to the laboratory for diagnostic services. Because there are very few laboratories in the country that diagnose turfgrass diseases, these superintendents have continued to submit samples to the PDL. Many golf turf professionals at other universities often refer their clients to Rutgers for second opinions or when they are on leave. Dr. John Inguagiato at the University of Connecticut and Dr. 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 2,700 turf managers in New York State. Lastly, Mr. Buckley's association with the Professional Golf Turf Management School allows for contact with as many as 90 potential new clients each year. Many of the students turn into regular patrons of the laboratory services. The charge for out-of-state samples is substantially higher to help defray the cost of in-state samples.

Of the samples submitted to the PDL for diagnosis or identification, 34% were associated with biotic disease-causing agents (Figure 7). Abiotic disease-causing factors (e.g., environmental extremes, nutrient deficiencies, poor cultural practices, poor soil conditions, etc.) accounted for another 17% of the laboratory diagnoses. Insect pest damage was diagnosed on 5% of the submissions. Identifications comprised 29% of the total number of samples submitted; of these, 28% (557) were arthropods, 0% (3) fungi, and 1% (26) were plants. Nematode detection accounted for the other 15% of submissions. The overall breakdown in sample

Table 2. PDL sample submissions by county, FY16 to FY20.

In-state	FY16	FY17	FY18	FY19	FY20
Atlantic	102	43	39	73	61
Bergen	69	84	65	88	67
Burlington	79	66	51	68	75
Camden	47	36	10	32	11
Cape May	3	11	9	13	7
Cumberland	75	85	71	86	33
Essex	42	101	17	17	24
Gloucester	17	10	23	62	12
Hudson	12	21	19	9	32
Hunterdon	42	23	32	60	22
Mercer	1528	607	358	875	585
Middlesex	114	106	82	62	51
Monmouth	180	202	249	263	164
Morris	199	169	159	197	234
Ocean	65	47	53	50	39
Passaic	66	35	23	27	20
Salem	20	20	51	85	32
Somerset	120	108	15	115	91
Sussex	15	6	98	16	14
Union	13	18	2	53	25
Warren	11	5	25	14	17
RU research	195	61	11	83	60
In-state total	3014	1864	1462	2348	1676
Out-of-state	248	388	306	425	308
Total	3262	2252	1768	2773	1984

Figure 7.

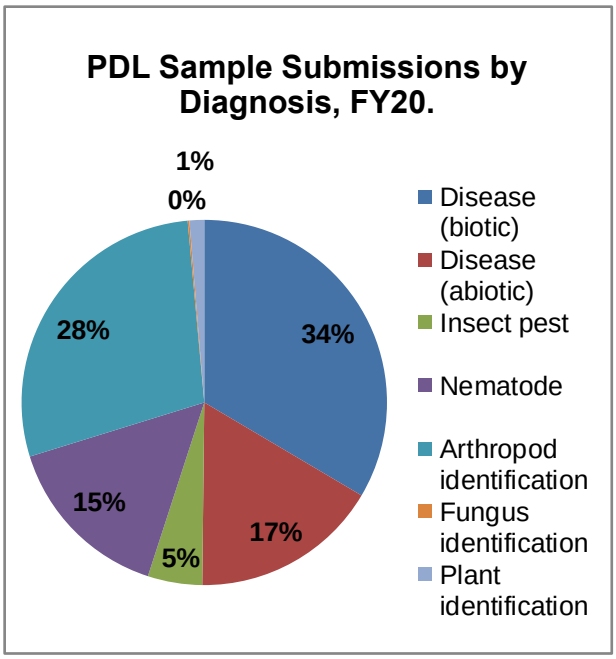
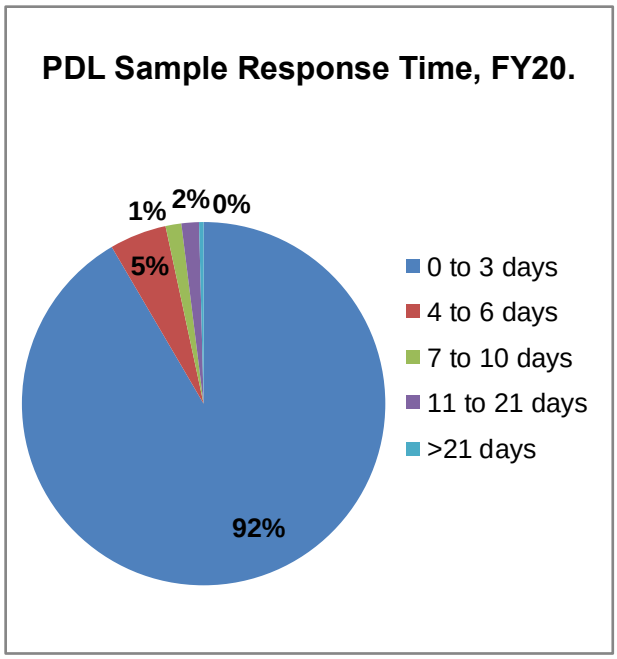


Figure 8.



submissions is typical of that reported by other diagnostic laboratories and reflects the normal seasonal totals for submissions to the Rutgers laboratory.

Insect samples account for most of the organisms identified by the laboratory. Many residential clients submit samples of stored product or nuisance pests that are found within the household. The number of these samples has declined as the Department of Entomology has added an urban entomologist who offers the service free-of-charge. Arthropod identifications decreased in FY20 because the number of trap catch samples from the state's CAPS and NJ State Forestry Services programs decreased (-481).

Fungal identification is also a popular service for the laboratory. Samples from mold-infested houses remained steady in FY20. 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 FY20, a laboratory response was prepared in less than three days for most (92%) of the samples submitted (Figure 8), and 97% of our clients received a response in less than a week. A number of the samples (39) 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.

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 FY20. These courses included: The Golf Turf Management School: Three Week Preparatory Course; Landscape Integrated Pest Management: An Intelligent Approach; and the Emergency Pesticide Credit Recertification Short Course.

Mr. Buckley served as the course coordinator and lecturer for the Pest Management in Landscape Turf Short Course. This was the 28th 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 22nd time he planned and coordinated that short course.

Mr. Buckley was an invited speaker in several RCE programs including the Master Gardener Association of NJ Annual State Conference. Lectures were also given in support of the Atlantic, Bergen, Camden, Hunterdon, Essex, Mercer, Monmouth, Morris, Ocean, and Passaic County Master Gardener Programs.

Mr. Buckley was also an invited speaker for: New Jersey Nursery and Landscape Association Member Meeting; Morris Arboretum School of Arboriculture; Jersey-Friendly Yards Conference 2019; Royal Knight Ag: 2019 Golf Education Day; New Jersey Shade Tree Federation; West Virginia Golf Course Superintendents Association; Eastern Shore Association of Golf Course Superintendents; Fisher and Sons 2019: North Jersey Sales Conference; International Society of Arboriculture of PA/DE/NJ Pest Bull Session; New Jersey Green Expo Turf and Landscape Conference; Fisher and Sons 2019: Northeast PA Sales Conference; Sierra Club of Mercer County; North Jersey Ornamental Horticulture Conference; New York State Turf and Landscape Association: Professional Conference and Trade Show; New York State Turf Association Southeast Regional Conference; Pennsylvania Turfgrass Council: Eastern Pennsylvania Turfgrass Conference; New Jersey Christmas Tree Growers Association; Penn State Winter Turf and Ornamentals School; PLANT Western NY 2020 Trade Show and Education Conference; Grass Roots Inc. Open House; Fisher and Sons 2020 Sales Conference; Maryland Nursery and Landscape Garden Association: Chesapeake Green 2020; Connecticut Grounds Keeper Association: Turf and Landscape Conference; Garden State Tree Conference; / Central Jersey Turf and Ornamentals Workshop; Golf Course Superintendent Association of New Jersey: Spring Education Seminar; Syngenta Webinar Series; Cornell Golf Turf Webinar; Harrell's Northeast Sales Team Webinar; and TurfNet RADIO—Turfgrass Hotline NE.

Sabrina Tirpak

Ms. Sabrina Tirpak is responsible for teaching Turf Diseases and Turf Insects laboratory practicums 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 were Landscape Integrated Pest Management: An Intelligent Approach, and Pest Management in Landscape Turf Short Course.

Ms. Tirpak also presented programs in support of the Essex, Hunterdon, Monmouth, and Ocean, County Master Gardener Programs.

Ms. Tirpak participated as a guest speaker in one undergraduate course at Rutgers: General Plant Pathology (11:776:302). She was also a guest speaker for the Horticulture Course at County College of Morris.

Ms. Tirpak was also an invited speaker for: Garden Club of New Jersey—Gardening Studies School; New Jersey Green Expo Turf and Landscape Conference; Brooklyn Landscape Gardeners' Association Annual Seminar; and the EPA Center for Integrated Pest Management Webinar Series.

Ms. Tirpak conducted a Turfgrass Insects Review Session 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, most recently in Orlando, FL.

Extension Publications

Mr. Buckley is a contributor to the Plant & Pest Advisory. The print version of the newsletter was transformed for the 2013 growing season into a blog format. A special section on the blog site was designated for Plant Diagnostic Laboratory activities. To date, the PDL has more than 350 unique subscribers to the site. Mr. Buckley and Ms. Tirpak wrote brief posts on the disease and insect pests problems submitted to the laboratory. Most of the articles submitted to the PPA blog were also submitted for publication in the Cornell University ShortCUTT turfgrass newsletter. The Plant Diagnostic Laboratory's PPA blog posts can be found at plant-pest-advisory.rutgers.edu/category/plant-diagnostic-lab.

Service

The PDL staff provided tours of the Ralph Geiger Turfgrass Education Center and the Plant Diagnostic Laboratory to numerous groups in FY20. In

addition, the STL staff also provided tours of their lab for several programs.

Mr. Buckley is a member of the newly formed Nursery Working Group initiated by Dr. Timothy Waller, County Agent from RCE of Cumberland County.

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. They are also members of the Forest, Landscape, and Agriculture Pest Roundtable (FLAPR) organized by the Rutgers Urban Forestry Program of NJAES. Universities, natural resource protection organizations, and industry groups are also partners of both groups.

Marketing

To help advertise laboratory services at grower meetings or other activities, two sets of table-top and banner display units are available on loan to anyone who wishes to advertise Soil Testing Laboratory and Plant Diagnostic Laboratory services. The laboratory staff regularly attends and staffs an exhibit to explain laboratory services and sell soil test kits.

In FY20, this marketing initiative brought the display to the following programs: The 2019 Great Tomato Tasting; New Jersey Green Expo Turf and Landscape Conference; Frelinghuysen Arboretum's Community Garden Conference; Rutgers Home Gardeners School; Rutgers Gardens Summerfest; New Jersey Nursery and Landscape Association NJ Plants Show - Professional Landscape and Nursery Tradeshow; and the Rutgers Turf Field Days.

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 for educational activities. Grant activity and cost-sharing arrangements also provide some degree of funding. In the spring of 2019, PDL staff convened a focus group of laboratory stakeholders to discuss the laboratory fee schedule. The group consisted of golf course superintendents, lawn and landscape professionals, academic advisors, and chemical industry representatives. The group review fees from similar labs from other states and agreed that prices were too low. The fee schedule was adjusted accordingly and the new fees were implemented immediately to zero complaints. This was the first fee increase since 2006. We agreed to reconvene the group every three years to review the changes and adjust according to market needs. The STL increased their fees on July 1, 2006 and partially again on November 1, 2008. While the fee for the standard fertility test (and soil test kits) remained the same, fees for special tests were increased in June 2015. This was done to help meet rising costs while not discouraging clients from testing for basic soil information and recommendations. Current fee schedules are reported in Appendix 1.

A sample submission form and the appropriate payment accompanied the majority of samples received by the PDL from residential clientele. A submission form accompanied most commercial samples; however, the majority of these submissions did not include payment. In most cases, commercial growers preferred to be sent a bill. Most soil testing laboratory samples require payment at submission or when the soil test kits are purchased in each county office, but invoicing of corporations or organizations has become more common. In this case, soil test results are not released until invoices are paid. Monies collected in the county are passed to the laboratory accounts by check or internal transfer. Internal transfer of funds was used to pay for the plant and soil samples diagnosed or tested for research programs at Rutgers University.

In FY20, $286,601.67 was generated from all PDL activities and covered 104% of all costs. A complete breakout of all revenues and expenses is included in Appendix 2 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 15 "no charge" samples in FY20. 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 FY20 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 FY20. 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 FY21 to cover increasing costs.

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 FY20 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 FY21 will be used to continue to upgrade laboratory capability to handle pathogens of consequence and other biohazards; attend training programs for insect and disease identification; hire labor to enter data into the National Plant Disease Information System; and train Master Gardeners as first detectors.

Ramapo Tomato Sale

In the spring of 2008, the New Jersey Agriculture Experiment Station revived the hybrid tomato variety 'Ramapo'. The staff of the PDL conducted the retail sale of the seed with Cindy Rovins. The variety 'Moreton' was added for the 2009 season, a "Rediscover the Jersey Tomato" t-shirt for 2010, and the variety 'KC-146' was introduced for 2013. The 'Rutgers 250' tomato seed variety was released for the 2016 growing season, coinciding with the 250th anniversary of Rutgers University, and a "Rediscover Jersey Strawberries" t-shirt was added for 2017. The 'Pumpkin' habanero pepper seeds were offered for sale to the public in 2018. A bicolor grape tomato variety, 'Scarlet Sunrise', was added to the seed sales in 2020. Through FY20, the PDL has processed 17,458 orders for 49,025 packets of seeds. The t-shirts are extremely popular also with over 1,761 sold. Orders continue to come into the laboratory almost daily.

COVID-19

Laboratory activities during the spring and summer of 2020 were interrupted by the emergence of a viral pandemic. As early as April, government-imposed business closures and work-from-home orders were instituted to stem the spread of the virus. This included the closure of Rutgers University and the Plant Diagnostic Laboratory. Many of the outreach programs scheduled for our participation were cancelled or moved onto online forums and sample submissions were temporarily interrupted. Laboratory staff began to do samples from home to maintain continuity with our stakeholders. Eventually by May, we were allowed back into our laboratory to begin normal operations under strict COVID restrictions. Clients were instructed via our website and on Twitter about changes to our sample submission procedures and contact information. The changes were advertised by several grower groups including the New Jersey Turfgrass Association and the New Jersey Nursery and Landscape Association. Sample submissions in March and April were significantly impacted but by mid-May laboratory activities had recovered to near normal operations.

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	$50
Out-of-state	$100

FINE AND SPORTS TURF

In-state	
Disease/insect diagnosis	$100
Disease/insect diagnosis & nematode assay*	$150
Out-of-state	
Disease/insect diagnosis	$120
Disease/insect diagnosis & nematode assay*	$200

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

NEMATODE ASSAY

In-state (except fine turf)	$50
In-state fine turf	$75
Out-of-state	$100

FUNGUS AND MOLD IDENTIFICATION

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

INSECT IDENTIFICATION

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

PLANT AND WEED IDENTIFICATION

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

SPECIAL TESTS AND SERVICES*

Endophyte screening

Fungicide resistance testing

Pesticide residue and contaminant testing

Site consultation

Speaker request

Virus testing

***Please call ahead to discuss available tests, fees, and specifics.**

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

Appendix 2. Plant Diagnostic and Soil Testing Budgets

Table A2.1. Expenses, PDL-FY20.

Salaries and benefits	
(full and part time staff)	$263,682.21
Supplies and services	
Diagnostic and testing supplies	
Printing and marketing	
References	
Equipment maintenance	
Office supplies	
Credit card fees	$8,979.05
Communications	
Telephone/fax	
Postage	$1,201.72
Travel	
Paid talks and professional meetings	$1,982.74
Total operating costs	$275,845.72

Table A2.2. Income, PDL-FY20.

Sample fees	$95,535.00
Lecture fees	
OCPE and other honorarium	$23,155.00
Grants and contracts	
NPDN	$25,100.00
IPM	$25,095.60
Other	
Salaries (NJAES/SEBS)	$117,716.07
Total actual income	$286,601.67

Table A2.3. Estimated expenses, PDL-FY21.

Salary and benefit costs	$285,000.00
Supplies and services	$10,000.00
Communications, marketing and travel	$3,000.00
Total potential cost FY21	$298,000.00

Table A2.4. Estimated income, PDL-FY21.

Plant Health Samples	
2000 @ $55 average fee per sample	$110,000.00
Lecture fees	
OCPE and other honoraria	$22,000.00
Cost recovery	
Grant and contracts	$42,000.00
Salaries (NJAES/SEBS)	$127,000.00
Total potential income FY21	$301,000.00

Appendix 3.
Table A3.1. Complete listing of lectures presented by Richard J. Buckley, PDL Director, FY20.

Date	Title	Audience	Location	Par-ticipants[1]
07/23/19	Pathogens of Forest Nurseries (.5hr)	New Jersey Nursery and Landscape Association Member Meeting	Atlantic City, NJ	A,N
09/09/19	Your Climate Resilient Urban Grassland (1.5hr)	Master Gardeners Training Program	Mercer County	H
09/23/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Morris County	H
09/24/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Essex County	H
09/26/19	Insect Pests of Shade Trees (6hr)	Morris Arboretum School of Arboriculture	Philadelphia, PA	A,C,L,N
10/02/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Hunterdon County	H
10/05/19	Your Climate Resilient Urban Grassland (1.5hr)	Jersey-Friendly Yards Conference 2019	Toms River, NJ	H
10/07/19	Principles of Pest Management: What is IPM? (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/07/19	Turf Diseases: Basic Plant Pathology (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/08/19	Insects in Fine Turf: Introduction to Entomology / Structure and Function (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/08/19	Diseases and Insect Pests of Ornamentals: New Plant Pathogens; Bacteria and Viruses (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/09/19	Diseases and Insect Pests of Turf (3hr)	Emergency Pesticide Recertification Short Course	Cook Campus	I,L,T
10/14/19	Principles of Pest Management: IPM Basics(1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/14/19	Turf Diseases: Basic Mycology (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/15/19	Insects in Fine Turf: Insect Orders (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/15/19	Diseases and Insect Pests of Ornamentals: Abiotic Stress Disorders (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/18/19	Advanced Turf Disease Workshop (6hr)	Advanced Turf Disease Short Course	Cook Campus	I,L,T
10/19/19	Your Climate Resilient Urban Grassland (1.5hr)	Master Gardener Association of NJ: Annual State Conference	Cook Campus	H
10/21/19	Cultural Disease Control Strategies (1hr)	Emergency Pesticide Recertification Short Course	Cook Campus	I,L,T
10/21/19	Principles of Pest Management: Scouting (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/21/19	Turf Diseases: Red Thread / Snow Molds (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/22/19	Insects in Fine Turf: Growth and Development / Behavior (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/22/19	Diseases and Insect Pests of Ornamentals: Leaf, Needle and Transition Diseases / Cankers (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/23/19	Anthracnose: The Scourge of the Modern Putting Green (1hr)	Royal Knight Ag: 2019 Golf Education Day	Philadelphia, PA	G,I
10/24/19	New and Improved Invasive Pests (1hr)	New Jersey Shade Tree Federation	Atlantic City, NJ	A,I,L,N
10/28/19	Principles of Pest Management: Principles of Pest Control (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
10/28/19	Turf Diseases: Pythium Diseases/Yellow Tuft (2hr)	Professional Golf Turf Management School	Cook Campus	T
10/29/19	Insects in Fine Turf: Nematodes (1.5hr)	Professional Golf Turf Management School	Cook Campus	T

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

Date	Title	Audience	Location	Par-ticipants[1]
10/29/19	Diseases and Insect Pests of Ornamentals: Root and Crown Rots / Vascular Wilts (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/01/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Bergen County	H
11/04/19	Principles of Pest Management: Cultural Strategies (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/04/19	Turf Diseases: Fairy Ring / Rhizoctonia Diseases (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/05/19	Insects in Fine Turf: White Grubs (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/05/19	Diseases and Insect Pests of Ornamentals: Molds, Mildews, and Rusts / Mites (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/06/19	Rhizoctonia Diseases in Cool and Warm Season Turf (1hr)	West Virginia Golf Course Superintendents Association	Morgantown, WV	I,L,T
11/06/19	Fear no Weevil (1hr)	West Virginia Golf Course Superintendents Association	Morgantown, WV	I,L,T
11/07/19	Too Much of Everything is Just Enough! 2019 Disease Review (2hr)	Eastern Shore Association of Golf Course Superintendents	Dewey Beach, DE	I,T
11/11/19	Principles of Pest Management: Fungicide Selection (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/11/19	Turf Diseases: Root Infecting Patch Diseases / Bentgrass Dead Spot (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/12/19	Insects in Fine Turf: Billbugs and Annual Bluegrass Weevils (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/12/19	Diseases and Insect Pests of Ornamentals: Defoliators (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/13/19	Spotted Lanternfly and Friends (1hr)	Fisher and Sons 2019: North Jersey Sales Conference	Parsippany, NJ	A,L,T
11/14/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Passaic County	H
11/18/19	Principles of Pest Management: Insecticide Selection (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/18/19	Turf Diseases: Anthracnose / Dollar Spot / Copper Spot (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/19/19	Insects in Fine Turf: Lepids in Turf (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/19/19	Diseases and Insect Pests of Ornamentals: Sucking Insects (2hr)	Professional Golf Turf Management School	Cook Campus	T
11/21/19	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program	Mercer County	H
11/25/19	Principles of Pest Management: Biorational Pesticides (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/25/19	Turf Diseases: Gray Leaf Spot / Leaf Spots (2hr)	Professional Golf Turf Management School	Cook Campus	T

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

Date	Title	Audience	Location	Par-ticipants[1]
11/26/19	Insects in Fine Turf: Chinch Bugs and Green Bugs (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
11/26/19	Diseases and Insect Pests of Ornamentals: Borers - Lepids (2hr)	Professional Golf Turf Management School	Cook Campus	T
12/02/19	Principles of Pest Management: Turf Diagnostic Tips (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
12/02/19	Turf Diseases: Rusts, Smuts, Molds, Mildews and Minor Leaf Blights (2hr)	Professional Golf Turf Management School	Cook Campus	T
12/03/19	Insects in Fine Turf: Moles Crickets and Crane Flies (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
12/03/19	Diseases and Insect Pests of Ornamentals: Borers - Beetles (2hr)	Professional Golf Turf Management School	Cook Campus	T
12/05/19	Pest Bull Session: Diseases of Shade Trees (2hr)	ISA of PA-DE-NJ	Philadelphia, PA	A
12/10/19	Key Diseases of Herbaceous Ornamentals in Landscape Beds (1hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	L,N,T
12/11/19	Too Much of Everything is Just Enough! 2019 Disease Review (.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,T
12/11/19	Practical IPM for Sports Turf (.75hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,T
12/12/19	Buckley's Bootcamp: Spotted Lanternfly and Lotsa Other Suckers (1.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,T
12/12/19	Buckley's Bootcamp: Fungicide Selection and Use for Landscape Turf (1.5hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,T
12/17/19	2019 Disease Review for the Lawn and Landscape (1hr)	Fisher and Sons 2019: Northeast PA Sales Conference	Bethlehem, PA	A,L,T
01/07/20	Insects in Fine Turf: Introduction to Entomology / Structure and Function (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/07/20	Diseases and Insect Pests of Ornamentals: New Plant Pathogens; Bacteria and Viruses (2hr)	Professional Golf Turf Management School	Cook Campus	T
01/08/20	Emerald Ash Borer and Spotted Lanternfly (1.5hr)	Sierra Club of Mercer County	Mercer County	H
01/08/20	Problems Down Below: Diseases of Annuals, Perennials, and Ground Covers (1hr)	North Jersey Ornamental Horticulture Conference	Morris County	I,L,T
01/13/20	Principles of Pest Management: What is IPM? (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/13/20	Turf Diseases: Basic Plant Pathology (2hr)	Professional Golf Turf Management School	Cook Campus	T
01/14/20	The Magical Mushrooms of Turf (1hr)	New York State Turf and Landscape Association: Professional Conference and Trade Show	Westchester, NY	C,G,H,I L,N,T
01/17/20	Basic Turf Diseases: Pick Your Best Defense (1.5hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
01/17/20	The Complete White Grub (1hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
01/20/20	Principles of Pest Management: IPM Basics (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/20/20	Turf Diseases: Basic Mycology (2hr)	Professional Golf Turf Management School	Cook Campus	T
01/23/20	The Art and Science of Disease Diagnosis (3hr)	Landscape IPM Short Course	Cook Campus	L,N,T
01/23/20	The Complete Turf Disease for Golf Courses (3hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
01/21/20	Leaf Spot Diseases in Turf: The Case for Proper Seed Selection (1hr)	New York State Turf Association: Southeast Regional Conference	Monticello, NY	I,L,T
01/22/20	Sports Turf Disease Management for the Low and High End Facility (1hr)	New York State Turf Association: Southeast Regional Conference	Monticello, NY	I,L,T
01/22/20	Out of Sight and Out of Mind: Nematodes in Turfgrass (1hr)	New York State Turf Association: Southeast Regional Conference	Monticello, NY	I,L,T
01/24/20	Leaf Spot Diseases in Turf: The Case for Proper Seed Selection (1hr)	Pennsylvania Turfgrass Council: Eastern PA Turf Conference	Morgantown, PA	A,I,L,T
01/25/20	Christmas Tree Update: The Trouble with Spruce (1hr)	New Jersey Christmas Tree Growers Association	Bordentown, NJ	X
01/27/20	Problems Down Below: Diseases of Annuals, Perennials, and Ground Covers (1hr)	Penn State Winter Turf and Ornamentals School	Grantville, PA	A,I,L,T
01/28/20	Insects in Fine Turf: Growth and Development / Behavior (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/28/20	Diseases and Insect Pests of Ornamentals: Leaf, Needle and Transition Diseases / Cankers (2hr)	Professional Golf Turf Management School	Cook Campus	T
01/29/20	The Complete Turf Disease for Golf Courses (3hr)	Professional Golf Turf Management School: Three Week Course	Cook Campus	T
02/03/20	Principles of Pest Management: Scouting (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/03/20	Turf Diseases: Red Thread / Snow Molds (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/04/20	Insects in Fine Turf: Nematodes (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/04/20	Diseases and Insect Pests of Ornamentals: Root and Crown Rots / Vascular Wilts (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/07/20	Key Diseases of Ornamental Plants (1hr)	Plant Western NY Trade Show and Conference	Buffalo, NY	H,L,T
02/07/20	Rhododendron: Royalty or Roadkill (1hr)	Plant Western NY Trade Show and Conference	Buffalo, NY	H,L,T
02/10/20	Principles of Pest Management: Principles of Pest Control (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/10/20	Turf Diseases: Pythium Diseases/Yellow Tuft (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/11/20	Insects in Fine Turf: White Grubs (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/11/20	Diseases and Insect Pests of Ornamentals: Molds, Mildews, and Rusts / Mites (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/13/20	Boxwood: Now You see Them, Soon You Won't (.5hr)	Grass Roots, Inc. Open House	Randolph, NJ	I,L,T

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

Date	Title	Audience	Location	Par-ticipants[1]
02/13/20	Winter on the Golf Course (.5hr)	Grass Roots, Inc. Open House	Randolph, NJ	I,L,T
02/17/20	Principles of Pest Management: Cultural Strategies (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/17/20	Turf Diseases: Fairy Ring / Rhizoctonia Diseases (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/18/20	Insects in Fine Turf: Billbugs and Annual Bluegrass Weevils (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/18/20	Diseases and Insect Pests of Ornamentals: Defoliators (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/19/20	2019 Disease Observations in the Landscape (1hr)	Fisher and Sons 2020 Sales Conference	Malvern, PA	A,I,L,T
02/20/20	Basic Turf Diseases: Pick Your Best Defense (1hr)	Maryland Nursery and Landscape Garden Association: Chesapeake Green 2020	Linthicum Heights, MD	L,T
02/24/20	Principles of Pest Management: Fungicide Selection (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/24/20	Turf Diseases: Root Infecting Patch Diseases / Bentgrass Dead Spot (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/25/20	Insects in Fine Turf: Lepids in Turf (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/25/20	Diseases and Insect Pests of Ornamentals: Sucking Insects (2hr)	Professional Golf Turf Management School	Cook Campus	T
02/26/20	Key Diseases of Ornamental Plants (1hr)	Connecticut Grounds Keeper Association: Turf and Landscape Conference	Plantsville, CT	A,I,L,T
02/27/20	Principles of Pest Management: Insecticide Selection (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
02/27/20	Turf Diseases: Anthracnose / Dollar Spot / Copper Spot (2hr)	Professional Golf Turf Management School	Cook Campus	T
03/02/20	Principles of Pest Management: Biorational Pesticides (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
03/02/20	Turf Diseases: Gray Leaf Spot / Leaf Spots (2hr)	Professional Golf Turf Management School	Cook Campus	T
03/03/20	Insects in Fine Turf: Chinch Bugs and Green Bugs (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
03/03/20	Diseases and Insect Pests of Ornamentals: Borers - Lepids (2hr)	Professional Golf Turf Management School	Cook Campus	T
03/04/20	Pine Wilt and Other Maladies of New Jersey Pines (1hr)	Garden State Tree Conference	Atlantic City, NJ	A,I,L
03/05/20	Spotted Lanternfly and Friends (.75hr)	Master Gardeners Training Program and Webinar	Essex County	H
03/09/20	Principles of Pest Management: Turf Diagnostic Tips (1.5hr)	Professional Golf Turf Management School	Cook Campus	T

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

Date	Title	Audience	Location	Par-ticipants[1]
03/09/20	Turf Diseases: Rusts, Smuts, Molds, Mildews and Minor Leaf Blights (2hr)	Professional Golf Turf Management School	Cook Campus	T
03/10/20	Insects in Fine Turf: Moles Crickets and Crane Flies (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
03/10/20	Diseases and Insect Pests of Ornamentals: Borers - Beetles (2hr)	Professional Golf Turf Management School	Cook Campus	T
03/11/20	Leaf Spot Diseases in Turf: The Case for Proper Seed Selection (.5hr)	Central Jersey Turf and Ornamentals Workshop	Monmouth County	A,I,L,T
03/12/20	If it's Summer, Must be Summer Patch (1hr)	Golf Course Superintendent Association of New Jersey: Spring Education Seminar	Kenilworth, NJ	I,T
03/24/20	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program Webinar	Monmouth/Ocean Co.	H
04/02/20	Key Insect Pests in New Jersey Landscapes (3hr)	Master Gardeners Training Program Webinar	Monmouth/Ocean Co.	H
04/07/20	RUPDL Golf Turf Update (1hr)	Syngenta Webinar Series	online	I,T
04/08/20	RUPDL Golf Turf Update (1hr)	Cornell Golf Turf Webinar	online	I,T
04/09/20	The Art and Science of Disease Diagnosis (3hr)	Master Gardeners Training Program Webinar	Atlantic /Camden Co.	H
04/29/20	Rutgers Plant Diagnostic Laboratory Update (1hr)	Harrell's Northeast Sales Team Webinar	online	I
05/19/20	Boxwood: Now You see Them, Soon You Won't (1hr)	Master Gardeners Training Program Webinar	Monmouth/Ocean Co.	H
06/08/20	RUPDL Golf Turf Update (.25hr)	TurfNet RADIO - Turfgrass Hotline NE	podcast	I,T

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

Table A3.2. Complete listing of lectures presented by Sabrina Tirpak, PDL Principal Laboratory Technician, FY20.

Date	Title	Audience	Location	Par-ticipants[1]
10/01/19	Plant Diseases and Garden Pests (2hr)	Garden Club of NJ - Gardening Studies School	Cook Campus	H
10/15/19	Turf Disease Laboratory - Basic Mycology (3hr)	Professional Golf Turf Management School	Cook Campus	T
10/16/19	Turf Insect Laboratory - Insect Orders (3hr)	Professional Golf Turf Management School	Cook Campus	T
10/16/19	The Art and Science of Disease Diagnosis (3hr)	County College of Morris Horticulture Course	Randolph, NJ	C
10/29/19	Turf Disease Laboratory - Introduction to Microscopy (3hr)	Professional Golf Turf Management School	Cook Campus	T
10/30/19	Turf Insect Laboratory - White Grubs (3hr)	Professional Golf Turf Management School	Cook Campus	T
11/12/19	Turf Disease Laboratory - Turfgrass Pathogens (3hr)	Professional Golf Turf Management School	Cook Campus	T

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

Date	Title	Audience	Location	Par-ticipants[1]
11/13/19	Turf Insect Laboratory - Turfgrass Insect Pests (3hr)	Professional Golf Turf Management School	Cook Campus	T
11/18/19	The Art and Science of Disease Diagnosis (1.5hr)	General Plant Pathology (11:776:302)	Cook Campus	C
11/26/19	Turf Disease Laboratory - Turfgrass Pathogens (3hr)	Professional Golf Turf Management School	Cook Campus	T
11/27/19	Turf Insect Laboratory - Turfgrass Insect Pests (3hr)	Professional Golf Turf Management School	Cook Campus	T
12/05/19	Turf Disease Laboratory - Review and Final (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
12/05/19	Turf Insect Laboratory - Review and Final (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
12/10/19	The Trouble with New Jersey Pines, Parts 1&2 (1hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,N
12/11/19	The Trouble with New Jersey Pines, Parts 3&4 (1hr)	New Jersey Green Expo Turf and Landscape Conference	Atlantic City, NJ	A,I,L,N
01/09/20	Turfgrass Insects Overview (3hr)	GCSAA Turf Bowl Prep	Cook Campus	C
01/14/20	Insects in Fine Turf: Insect Orders (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
01/14/20	Diseases and Insect Pests of Ornamentals: Abiotic Stress Disorders (2hr)	Professional Golf Turf Management School	Cook Campus	T
01/15/20	Turf Insect Laboratory - Insect Orders (3hr)	Professional Golf Turf Management School	Cook Campus	T
01/17/20	Leaf Feeding Insects (1hr)	Pest Management in Landscape Turf Short Course	Cook Campus	L,T
01/21/20	Turf Disease Laboratory - Basic Mycology (3hr)	Professional Golf Turf Management School	Cook Campus	T
01/22/20	Key Insect Pests in New Jersey Landscapes (1.5hr)	Landscape IPM Short Course	Cook Campus	L,T
01/28/20	Turf Disease Laboratory - Introduction to Microscopy (3hr)	Professional Golf Turf Management School	Cook Campus	T
01/29/20	Turf Insect Laboratory - White Grubs (3hr)	Professional Golf Turf Management School	Cook Campus	T
02/11/20	Turf Disease Laboratory - Turfgrass Pathogens (3hr)	Professional Golf Turf Management School	Cook Campus	T
02/12/20	Pantry Pests (1hr)	Master Gardeners Training Program	Hunterdon County	H
02/13/20	Turf Insect Laboratory - Turfgrass Insect Pests (3hr)	Professional Golf Turf Management School	Cook Campus	T
02/24/20	Pesky Pine Problems (1hr)	Brooklyn Landscape Gardeners Association Annual Seminar	Brooklyn, NY	L,T
02/25/20	Turf Disease Laboratory - Turfgrass Pathogens (3hr)	Professional Golf Turf Management School	Cook Campus	T
02/28/20	Turf Insect Laboratory - Turfgrass Insect Pests (3hr)	Professional Golf Turf Management School	Cook Campus	T
03/12/20	Turf Disease Laboratory - Review and Final (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
03/02/20	Turf Insect Laboratory - Review and Final (1.5hr)	Professional Golf Turf Management School	Cook Campus	T
03/17/20	Household Insect Pests (3hr)	Master Gardeners Training Program Webinar	Essex County	H
04/07/20	Household Insect Pests (3hr)	Master Gardeners Training Program Webinar	Monmouth/Ocean Co.	H
05/05/20	PICEA - Sprucing Up Your Knowledge of IPM for Spruce Trees (1hr)	EPA Center for Integrated Pest Management Webinar Series	online	A,I,L,T

[1] Audience Addressed: A=Arborists; C=College (Academic); Co=Construction; E=Engineers; F=Farmers; G=Greenhouse; H=Residential Clientele; Hf=Health Officers; I=Industry; L=Landscapers; 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

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.