

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Implementation in Agronomic Crops

Our region now has 7 flour mills, 8 malt houses, 2 food grade oil businesses, 3 tortilleria, 18 distilleries, 120 microbreweries and dozens of other local food businesses using locally grown grains, beans, oilseeds, and hops. The need for locally grown organic and non-GMO feed grains has continued to increase and although New England boasts highly developed organic dairy and vegetable sectors, it lags behind other regions for local grain production. Organic grain (cereal, oilseed, and legume) acreage has increased in New England, from 800 in 2008 to 6,500 acres in 2016 (USDA NASS) demonstrating our region's potential for growth. The number of Vermont farms growing organic dry beans more than doubled between 2007 and 2012, contributing to Vermont's agricultural income (USDA, 2014). Pest management is a serious obstacle in the production of cereal grains, dry beans, and oilseed crops. Over the last five years, farmers throughout the Northeast have experienced reduced yields and quality due to intense disease pressure related to increased rain events. In 2013, farmers reported 25-50% yield and quality loss due to cereal foliar diseases. In 2015, grain samples submitted to the UVM Cereal Grain testing lab indicated 25- 40% of samples are above the 1% DON (vomitoxin) threshold for human consumption. IPM strategies to manage Fusarium Head Blight as well as other grain diseases in the region are critical (2014 NEERA Priority). In 2015, we found a high incidence of loose smut in wheat variety trials as a result of infested seed lots. Testing of farmers' seed lots will be essential to keep this disease from further damaging organic grain production. In a 2016 survey of oilseed growers in the Northeast, 85% said they were interested in receiving more information about avian and insect id and management to grow a successful crop and 75% said disease identification and management knowledge would increase their success. Managing diseases is a main challenge of organic dry bean growers. Seedborne pathogens provide a source of destructive diseases and limiting these pathogens before sowing can reduce common root rots in addition to foliar, pod and seed diseases. Limiting seedborne diseases in one season also reduces the amount of disease carried in seed for next year's crop, an important consideration for seed companies and farmers who choose to save their own seed. In 2016, multiple farmers reported yellow and stunted dry beans resulting in 50-100% yield loss. The UVM PDC identified two seedborne diseases, Anthracnose and Aschochyta blight. Starting with certified and/or disease free seed grown on farm will help these farms avoid these destructive diseases and remain viable. There are over 350 acres of hops in the Northeast, expanding yearly with new growers. At our 2016 Hop Conference, 51% of growers indicated more information on disease and arthropod pest management would help them increase yield. This is a new industry in the Northeast and growers are asking for introductory IPM education, which will have a direct and significant impact on regional hop yield. The majority of hop growers are identified as "beginning farmers" (2014 NEERA Priority) with little to no experience in pest management. This has led to growers spraying broad-spectrum pesticides without consideration of economic thresholds, beneficial arthropod populations, and other environmental risks. In this project we will identify the disease and pests that challenge northeast growers. Farmers will learn to identify pests in their fields and learn if their seed sources are disease free. They will learn the best agronomic practices to minimize pest damage and we will promote the UVM PDC for help in identifying disease, insect and weed problems in farmers' fields. Our goal is to help farmers design robust local grain and hop systems that successfully address pertinent pest challenges to produce a diversity of food and feed grains for expanding local grain markets.



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Priority Area: IPM Implementation in Agronomic Crops

Approach -

1. Field Days and Winter Conferences. We will offer three yearly Field Days (~50 farmers/event) and two yearly Winter Conferences (~150 stakeholders/event) highlighting grain, oilseed, beans and hops pest management trials, IPM scouting strategies, and pest identification tools. We will live-stream each of the winter conferences on our website.

2. Dry Bean Disease Survey. In 2018 and 2019, twenty northeast dry bean farms will be surveyed for seedborne and non-seedborne foliar diseases throughout the growing season with the information provided weekly to the grower. Photos and information from surveying will also be produced in outreach materials for all growers. Unknown diseases will be brought to the UVM PDC for diagnosis.

3. Seed Quality Testing. 50 farmers will be offered seed quality testing each year over three years. Results with information on how to reduce pathogens in seed lots will be sent to the grower to promote certified seed use or cleaning of seed when disease is present.

4. Extension Outreach Education. Conference proceedings and meeting videos will be posted to our website. Two IPM Briefs will be published/year and posted on the UVM Extension crop “What’s Cropping Up” and hops blog “What’s Hoppening” with scouting info, id and IPM strategies for a broad range of crops. A Dry Bean IPM guide will be created and posted online including pest id, lifecycle and management tools by 2020. Previous guides (hops, oilseeds, cereal grains) will be updated with new information. New innovative outreach techniques will be launched and will include: goScout Action Survey-hop growers will be surveyed (2x/month) by mobile device to help them scout and id pests. The results of the survey will help focus an ID Hour where critical pest information identified by the farmers is discussed to improve scouting. The monthly ID Hour meeting will be offered by webinar during the growing season and will include current issues and picture sharing, IPM action with question and discussion time. Two Virtual Reality (VR) video environments (with 360 camera and mobile app platform) will be developed for growers as aides for insect/disease identification. Immersive VR is a 3D, computer-generated environment where participants use specialized headsets (aka optical head-mounted displays, Oculus Rift) to explore and manipulate virtual objects. Emerging research suggests VR can be an effective teaching strategy with adult students (Heydarian et al., 2015; Freina and Ott, 2015; Du and Arya, 2015).

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Implementation in Specialty Crops: Apples and Grapes

Apples are a critical component of Vermont's specialty crops industries, with a total value over \$20 million annually (Bradshaw 2013, NASS 2016). Winegrapes, while a relatively new crop to the state, are planted on over 160 acres and produce approximately \$5 million in wine value annually (Vermont Sustainable Jobs Fund 2013, NASS 2015, Bradshaw, Hazelrigg et al. 2016). Vermont apple and grape growers have a critical need for IPM information, with an evolving complex of over 15 disease, 35 arthropod, and diverse weed pests that require season-long management programs that integrate cultural, biological, and chemical strategies in a horticulturally and economically-appropriate framework (Agnello, Chouinard et al. 2006, Wilcox, Gubler et al. 2015). For both crops, consequences of failure to manage insect or disease pests can be catastrophic and may completely devalue a crop. Vermont apple growers are also diversifying to new production systems which require adaption of traditional IPM practices for their success, including: adoption of modern, high-density planting techniques; planting of cider apple orchards which presents an opportunity to reduce pesticide applications on fruit destined for high-value fermented cider production; and transition to organic orchard management (VTFGA 2011, NASS 2012, Becot, Bradshaw et al. 2016). The activities performed under this proposal will provide interdisciplinary extension information to Vermont apple growers including arthropod, disease, horticulture, and weed management strategies that address IPM needs in an economic, environmental, and socially sustainable framework. Additionally, the Vermont Apple IPM Program is considered a regional leader on organic orchard management practices, and we will continue to provide this expertise through this proposal (Berkett and Bradshaw 2013). In a 2017 survey (Bradshaw, unpublished), 92% of respondents reported using information from UVM Fruit Program in their decision-making, 77% reported using that information to determine if pesticides were needed in their orchard, and 69% reported using IPM information to reduce pesticide use. While 100% of respondents reported using a monitoring program for orchard pests, only 50% reported scouting regularly using traps and methodical evaluation criteria. Pollinator issues were also commonly cited, with a majority of respondents reporting using multiple pollinator conservation practices and 45% relying on wild pollinators for pollination. Issues with balancing crop protection and pollinator conservation in orchards are critical to Vermont fruit growers (VT Pollinator Protection Committee, 2017), but sustainable IPM programs that do that are nuanced and require continued research and outreach efforts (Biddinger and Rajotte 2015). There is a continued increase of new growers in Vermont who are starting vineyards with limited or no background in agriculture, and it is imperative to not only continue the Vermont Cold-Climate Grape IPM program but to also expand transdisciplinary educational outreach and training demonstrations so that those growers will start, from the beginning of their operation, to make vineyard pest management decisions that minimize health, environmental and economic risks. The Vermont Grape IPM Program has become the acknowledged resource in northern New England for IPM information and is committed to increasing IPM implementation in commercial vineyards across the state by continuing to deliver an integrated extension program that addresses the priorities identified by growers, IPM advisors and other industry service providers. Weather-related damage and disease management were ranked first and third, respectively, of perceived threats to vineyard operators in a recent survey (Berkett, et al., 2014; Bradshaw, Hazelrigg et al. 2016). Attendees at stakeholder IPM trainings taught by UVM Fruit faculty in New Hampshire (2015), New York (2016, 2017), and Vermont (2015, 2016) report increases in knowledge of disease



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Priority Area: IPM Implementation in Specialty Crops: Apples and Grapes

identification, IPM concepts, and how to develop IPM programs (Bradshaw, unpublished data). Two recently updated IPM Fact Sheets from the UVM Fruit Program are used throughout the region for development of core IPM programs in cold-climate cultivar vineyards (Bradshaw and Berkett 2017, Bradshaw and Berkett 2017). Specific priorities identified for this program include timely delivery of IPM information to apple and grape growers; implementation of regional orchard and vineyard monitoring programs; and development of baseline data on pollinator diversity in commercial orchards (see Priority Area IPM for Pollinator Health). We will continue to highlight the Plant Diagnostic Clinic as a resource for insect, weed and disease diagnosis and IPM recommendations.

Approach -

1. Orchard and Vineyard Scouting Network. In Year 1, six orchards in four counties will participate in weekly coordinated orchard pest monitoring (Clements, Autio et al. 2015). Weekly results will be communicated to participating orchards and apple producers to guide pest management decisions. An online reporting platform will be developed to track state-wide trap captures. In Year 2, growers will be trained to scout and report. By Year 3 growers will be responsible for their on-farm scouting and reporting. Fruit will be sampled at harvest from evaluated orchards and assessed for pest-related damage and defects (Bradshaw, Berkett et al. 2016). Two vineyards will be evaluated each year at veraison and harvest for incidence of disease and insect pest damage following standard protocols (Berkett, Bradshaw et al. 2014). The same orchards and vineyards will be monitored in each year of the project to evaluate trends in pest populations within the region.

2. Apple and Grape IPM Guideline Assessment. From 2014-2017, a selected group of advisory stakeholders participated in a pilot assessment of crop-specific IPM practices in their operations and identified practices to adopt by using UMass guidelines (<http://ag.umass.edu/integrated-pest-management/ipm-guidelines/apple>, <http://ag.umass.edu/integrated-pest-management/ipm-guidelines/wine-grape>). The information gathered from this pilot assessment will now be used to develop a self-assessment of crop-specific IPM practices tailored to Vermont growers. The assessment will be available as an online tool to facilitate IPM education and assist grower decision-making.

3. Extension Outreach Education. Timely IPM information for apple and grape growers will be distributed via electronic communications platforms including a program website and email lists with over 400 subscribers. At least 12 newsletters, blog posts, and/or factsheets containing time- and crop-sensitive IPM information including arthropod, disease, and weed management as well as horticultural, food safety, risk management, and economic issues will be published each season. At least one on-farm workshop will be held annually to demonstrate IPM practices. Outreach communications will integrate site- and region-specific weather and pest models provided by the Cornell University's Network for Environmental and Weather Applications (NEWA) and from monitoring commercial orchards and vineyards to provide timely information to growers. Growers will be provided with one-on-one consultations when necessary to provide specific information applicable to unique farm operations. Dr. Bradshaw will contribute to annual revisions of the New England Tree Fruit Management Guide and with planning and presentations at regional grower meetings including the VT Tree Fruit Growers Annual Meeting and New England Fruit and Vegetable Meetings.

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Implementation in Specialty Crops: Ornamentals/ vegetables in greenhouses/high tunnels and nursery settings

Floricultural and other horticultural specialty crops are significant components of Vermont's and the nation's agricultural revenues, increasing 18% since 2009 (USDA 2015a). All US horticultural sales increased at least 11% from 2009 to 2014 (bedding plants and nursery stock up 11%; potted flowering plants up 24%) (USDA 2016). In Vermont, over 90% of the farms are small diversified, family-owned operations and specialty crops are critical for their economic survival (USDA 2015b). In 2012, 660 VT farms produced nursery and greenhouse/floriculture crops, with sales amounting to \$25.5 million, ranking #5 in market value among other agricultural products (USDA 2015a, d). In 2014, Vermont reported having 542 organic farms, most of which produce vegetables (USDA 2015c). High tunnel vegetable production has increased significantly, extending the growing season and supplying higher quality crops for local markets. Nationwide, beginning farmers comprise 14% of all farms for greenhouse/nursery crops and vegetable production. Vermont is ranked 6th in the nation for number of beginning farmers (USDA 2012). The UVM Greenhouse IPM program addresses grower needs while improving environmental sustainability and profitability of the greenhouse industry in ME, NH and VT by reducing losses from arthropod pests and increasing growers' revenues through IPM. "IPM First" is a VT-based program targeting individual, underserved growers. UVM personnel provide one-on-one instruction and support to growers with their pest problems, guiding them towards adopting IPM practices that meet their specific pest management priorities. The Tri-State Greenhouse IPM Workshop series is a successful 21-year-old program offered to growers in ME, NH and VT, reaching over 150 annually. These workshops include presentations on IPM implementation, using a hands-on training approach that growers prefer. According to the 2017 workshop evaluations, 58% were first-time attendees, showing that we are reaching beginning farmers in addition to well-established ones. Over 90% of participants learned new IPM techniques they intend to use in the future to reduce pesticide use and increase IPM adoption. Given the expansion of high tunnel production, vegetable growers now attend our greenhouse workshops seeking IPM advice. Arthropod pests have a serious impact on the revenues for these farms, and adoption of economically-viable IPM practices is essential. Many growers lack expertise in basic IPM tactics and seek Extension support to improve their skills. In a survey of high tunnel growers, over 50% of respondents applied general use pesticides and 18% applied restricted use products (Sideman et al., 2016). Less than 50% of the growers release natural enemies or use plant-mediated systems and only 55% identify their pests or diseases. When asked what limits their use of biocontrol, 52% said a lack of knowledge about how to use them and 22% lack confidence that it will work (Skinner & Parker 2014, Sideman et al. 2016). In our surveys of growers recruited to take part in the UVM "IPM First" program, when asked what Extension could do to help them expand IPM adoption, 92% selected 'hold educational workshops', 85% chose 'provide regular site visits' and 77% picked 'prepare/circulate factsheets'. In the survey of high tunnel growers, results were similar: 76% said 'hold educational meetings', 64% said 'site visits' and 60% said 'prepare fact sheets' (Skinner & Parker 2014, Sideman et al. 2016).



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CULTIVATING HEALTHY COMMUNITIES
COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Priority Area: IPM Implementation in Specialty Crops: Ornamentals/vegetables ingreenhouses/high tunnels and nursery settings

Approach -

- 1. Tri-State IPM Workshops** will be organized and offered for growers of greenhouse ornamentals, high tunnel vegetables and nurseries in ME, NH and VT annually and will include presentations on insect and disease-related IPM topics. Attendees will take part in hands-on demonstrations and receive information packets on current IPM topics.
- 2. “IPM First”**. Five specialty crop operations will be enrolled annually, receiving on-site visits by specialists over the growing season to improve IPM skills.
- 3. Extension Outreach Education.** Greenhouse/High Tunnel IPM website: Two Webinettes (10-minute narrated, web-based presentations), two IPM factsheets for workshops, 3 new pages on advanced IPM topics and three case studies on IPM adoption based on grower experiences (serving as a blueprint for other growers) will be developed and posted to our website. The website will be linked to the UVM PDC to promote this service as a critical step in the IPM process. IPM Facebook posts will be added and sent to the northeast region Greengrower listserve.

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Implementation in Communities

Consumers are often quick to resort to over-the-counter pesticides when dealing with unknown pests in their lawns, landscapes, and gardens. The gardening public often rely on information from potentially untrained 'big box' store or garden center staff when making pest management choices. As a result, pesticides are used by consumers incorrectly or unnecessarily. The effective statewide UVM Master Gardener (MG) program will be used to deliver IPM information to 125 students/year through a 13 week course. According to our 2016 Course evaluation, 40% of the students did not know what IPM was before the class and 100% planned to adopt a new IPM practice. In 2017 we surveyed MG students from the 2015 and 2016 MG Course to see if they had adopted an IPM practice since the course. 100% of the 2015 and 89% of the 2016 students had adopted a new IPM practice as a result of the earlier training. Out of the 29 identified IPM practices the students could choose from, the highest number indicated they increased air circulation in the garden to limit foliar diseases (73%); 65% regularly inspected plants for pests and diseases and 35% increased use of resistant landscape tree and shrub varieties. The MG program also delivers IPM information through the toll-free MG Helpline, blogs, website, emails, MG outreach activities and advanced training webinars. In the 2016 gardening season, the Helpline received 1,046 calls, 377 emails (with ability to upload photos and questions in a template) and 107 specimens from home gardeners and consumers. According to our 2016 Helpline Client Survey, 95% of the Helpline inquiries related directly to pest id and IPM basic principles. In our 2016 year end survey, 93% of clients said they used a new IPM practice and 48% reduced pesticide use as a result of the diagnosis and recommendations. The UVM PDC will provide all diagnostic support for samples coming in to the MG Helpline. Stakeholders receiving the IPM information includes MG volunteers, home gardeners, consumers, hospitals, school gardens, agricultural fairs, community gardens, farmers markets, libraries, prisons, and garden centers. Each of the 523 active MG volunteers have visibility and projects in diverse communities throughout the state, amplifying an IPM message to many more consumers than could be reached without this established and well-respected program. These volunteers are active in the state forming connections and linkages with schools, agricultural fairs, farmers markets, community gardens, prisons, libraries, hospitals, condo associations and garden centers. They will educate Vermonters about garden and landscape pest identification and management using IPM strategies. Over 10,019 hours were logged by the volunteers in IPM outreach in 2016. The UVM Master Gardener program receives no salaries or funding from UVM Extension. The income from the 13 week MG course with 120 students covers about one third of the costs of the program and outreach. The requested VT EIP funds are critical to allow this vital IPM outreach and education program to continue and expand the IPM message to an important and diverse community of stakeholders including underserved populations comprised of new Americans, seniors and women.



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CULTIVATING HEALTHY COMMUNITIES
COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Priority Area: IPM Implementation in Communities

Approach -

- 1. Master Gardener Course.** A 13-week course with at least 120 students will be offered through a web-based platform. Several of the 3 hour lectures introduce and incorporate IPM: Entomology; Vegetable Crops; Plant Diseases and Pesticides 101; Turf Care; Landscaping & Planting for Pollinators and Caring for Woody Trees and Shrubs. The PDC team will be responsible for entomology, plant pathology and weed management lectures (see Secondary Priority Area: IPM Support for Pest Diagnostic Facilities).
- 2. Master Gardener Helpline.** A popular statewide toll-free service staffed with trained volunteers to answer questions on insect, weed and disease problems and their management.
- 3. Advanced Training Webinars with factsheets.** The MG program, in cooperation with the UVM PDC, will offer three advanced training webinars in IPM concepts and emerging insect, weed and disease problems. After consulting the 2016 Helpline volunteers and the client logs of calls and samples, it was determined the following three webinars would address a lot of recent inquiries from the public: “Using IPM for managing deciduous tree diseases and pests”, “IPM for diseases and pests in the home vegetable garden” plus “IPM for management of apple tree diseases and pests.” Factsheets will be developed on these topics and posted on the Master Gardener website. Webinars will be archived on the website and so they will be available for future Helpline trainings and for the general public.

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM for Pollinator Health

Managed and native pollinators are important to Vermont agriculture. In 2016, the Vermont legislature passed a bill (Act 83) creating a Pollinator Protection Committee to “evaluate the causes and occurrences of reduced pollinator populations in the State; and to recommend measures the State can adopt to conserve and protect pollinator populations.” The membership of the committee included the VT Secretary of Agriculture, a UVM employee with knowledge of pollinators, a tree fruit and vegetable grower, a greenhouse/nursery operator, a pesticide dealer and a non-profit organization advocating for pollinators. The committee prepared a Pollinator Protection Report (PDF) in February 2017 with recommendations to the Governor and the Vermont legislature for pollinator protection. Key themes in the report included 1) native pollinators are vital to Vermont’s agricultural systems, thus providing healthy habitats for managed and native pollinators should be considered wherever possible (rural, suburban, urban landscapes) 2) Education and outreach about pollinator health are essential, not only to key stakeholders (pesticide applicators & sellers, organic and conventional farmers, local, state and federal government land managers) but also to homeowners and the general public 3) Improving and maintaining healthy populations of managed honeybees can protect native bees and requires eliminating exposures of pollinators to pesticides, especially those that are highly toxic to bees, or those that may have synergistic effects, such as when used in combination with other pesticides (certain fungicides). The VT EIP Priority Area on IPM Health for Pollinators will address these three key themes developed by the Pollinator Protection Committee through the UVM Fruit IPM Program, the Greenhouse IPM Program and the UVM MG Program. The UVM Fruit IPM Program will conduct an orchard-based survey of pollinators and offer outreach extension education on IPM practices to protect pollinator health; the Greenhouse IPM program will work with greenhouse and nursery operators in a pilot habitat program and offer outreach extension education on IPM practices to protect pollinator health and the MG program will offer a short course educating and promoting IPM practices to enhance pollinators on small acreage properties and offer outreach extension education to the general public.



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Priority Area: IPM for Pollinator Health

Approach -

1. Orchard Pollinator Survey. Issues with balancing crop protection and pollinator conservation in orchards are critical to Vermont fruit growers (VT Pollinator Protection Committee, 2017), but sustainable IPM programs that do that are nuanced and require continued research and outreach efforts (Biddinger and Rajotte 2015). In a 2017 UVM Fruit Program Apple Survey, growers cited more information was needed on pollinator issues.

- Orchard pollinator community composition will be assessed in two orchards per year using pan traps to collect pollinators weekly throughout the growing season (Joshi et al. 2015). Collected insects will be identified to develop baseline data for use in developing or assessing IPM programs protective of pollinators in orchard systems. Abundance, diversity, and community composition of pollinators in orchards will be catalogued. Educational outreach on IPM and pollinator health will be offered to fruit growers through on-farm workshops, listserves and newsletters.

2. Pollinator Habitat Program for ornamentals/vegetables in greenhouses/high tunnels and nursery settings.

The careless use of pesticides, habitat loss and the displacement of native by introduced species contributes to declines in beneficial insects, such as pollinators like the rusty patched bumblebee and important natural enemies of greenhouse/ high tunnel pests including aphids and thrips. Encouraging biodiversity of native natural enemies within a greenhouse/high tunnel/nursery-landscape setting by providing enticing habitat may reduce pest populations thus eliminating the need for harmful chemical applications while protecting pollinators and other taxa. Growers at past Tri-State Greenhouse IPM Workshops indicated that they want more information on pollinator safety, pesticide compatibility with natural enemies and information on how to support native pollinators by growing plants around greenhouses to support and attract beneficial insects (Skinner 2015-2017).

- Three operations will be enrolled to encourage conservation of pollinators for over three years. Habitat plantings at each site will be established with annual and native perennial plant varieties useable for sale as cut flowers, providing continual floral resources to attract the pollinators and beneficials that provide pest management. Beneficial insects (pollinators, predators and parasitoids) will be surveyed at the three habitat plantings monthly from May-September. Sticky cards, visual inspections and plant tapping to dislodge insects will be used to quantify populations. A subsample of the pollinators and beneficials will be collected and identified to genus and/or species. An educational program with signs and brochures will be established at the pilot sites to increase awareness among growers and the public about pollinators and their protection (primarily from pesticides). Additional IPM factsheets, Facebook posts and updated web information on best management practices for pollinator health will be offered. Information on the benefits of pollinator habitats, with how to set up and maintain plantings will be covered through educational presentations at grower workshops to increase adoption of this IPM strategy to protect pollinator health.

(continued)

Priority Area: IPM for Pollinator Health

Approach (cont.) -

3. Master Gardener Short Course. The MG program is uniquely positioned to reach private landowners and gardeners and will develop and offer a new MG Short Course, “Living on the Land: Encouraging small land owners to use IPM to attract pollinators and reduce pesticide use”. The course will be offered using an interactive online webinar platform.

- Five two hour sessions may include: 1) Status of pollinators 2) Promoting pollinator habitat 3) IPM practices to encourage pollinator health 4) Small scale landscape design for pollinators 5) Keeping bees on small acreage. Each session would incorporate expertise from researchers/extension, bee keepers and growers of bee-pollinated crops. Handouts covering the course information will be developed by the MG program and the PDC to be offered at MG information booths at fairs, farmers markets and other events. The Short Course would be also be archived on the MG website so it can be accessed throughout the year.

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Support for Pest Diagnostic Facilities

The PDC serves as the overarching resource providing diagnostic support for all the stakeholders and Priority area directors in the VT EIP. The stakeholders in these areas (and those not represented by the VT EIP priority areas) need access to timely, accurate and cost-effective diagnostics to make informed management decisions based on IPM strategies. The PDC serves commercial growers, Master Gardeners, home gardeners and the urban consumer by providing the critical first step in any IPM program, i.e., positive identification of the disease, insect or weed accompanied by non-biased IPM management recommendations. The 2016 PDC client survey results showed 91% of stakeholders who submitted a pest, weed or disease sample to the PDC used IPM strategies to manage their problem as a result of the diagnosis. Growers (34%) also indicated they reduced the use of pesticides as a result of the information they received from the Plant Diagnostic Clinic. The PDC team includes a plant pathologist, entomologist and weed specialist. New crop producers unfamiliar with pests and IPM are steadily increasing. These beginning growers often have limited background in agriculture and it is essential to have one facility in the state that growers can rely on to identify existing and emerging pests in a wide range of crops and provide IPM information for management decisions that minimize environmental, health and economic risks. With smart phones in the field, several growers now send pictures of the issues they are seeing and often can receive a diagnosis within minutes. The pest and disease samples coming into the PDC also drive the IPM information presented by Hazelrigg in newsletters, bi-weekly veg and berry listserves and at meetings and workshops throughout the year. Home gardeners and urban consumers represent expanding audiences requiring diagnostic and IPM information on current and emerging problems (spotted wing drosophila, onion leek moth, Swede midge, late blight, etc.) to avoid unnecessary pesticide use. The PDC also works closely with the MG Helpline volunteers (statewide toll-free resource for home gardeners with pest problems), to provide diagnostic backup for the hundreds of calls and samples/photos the Helpline volunteers receive each season from the gardening public. The PDC addresses several 2014 NEERA extension priorities: “increasing knowledge and tools for emerging and current pest and disease problems”; “increasing knowledge in cultural and alternative practices for management of current and emerging pests”; “increasing IPM resources created for the public including home gardeners and urban public”; and “IPM programs and tools for the (underserved) young farmer.” (2014 NEERA Priorities). The PDC represents Vermont’s interests in the National Plant Diagnostic Network (NPDN) and receives no operating funding other than the limited funds (~ \$20,000/year) received from NPDN. All PDC samples are logged and uploaded to the NPDN National Repository so emerging insect, weed and disease problems of high significance can be nationally tracked. The PDC director attends all NPDN meetings and trainings and contributes to the New England Small Fruit and Vegetable IPM Pest Management Guides.



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Priority Area: IPM Support for Pest Diagnostic Facilities

Approach -

- 1. Disease/Insect/Weed Diagnostics.** The PDC will provide new and established stakeholders with rapid and accurate diagnosis and current IPM recommendations. Clients will include commercial growers in our Priority areas and those not included in these areas, Master Gardener Helpline volunteers, the gardening public and urban consumers. Approximately 600 samples per year will be processed with IPM recommendations that consider pollinator health.
- 2. Extension Outreach Education.** The PDC director will present IPM information in at least 12 talks/workshops each year addressing current and emerging insect, weed and diseases using IPM tactics in commercial crops in Vermont and New England [VT Vegetable and Berry Growers Assoc., NE Vegetable and Fruit Conference, VT Tree Fruit and Grape Growers Assoc., the VT Greenworks Nursery/Landscape Assoc., NE Grows, VT grain grower annual meetings and field days plus organic association meetings]. The PDC will contribute a column, "From the PDC" to the bi-weekly VT vegetable and berry listserv (750 growers in VT and NE) on current insect/ disease problems on farms and in the PDC with IPM information. We will also provide Vermont information for the UMass Veg Notes on a weekly basis throughout the summer. The PDC will provide three "Across the Fence" television programs on insect, weed and disease outbreaks, id and IPM management strategies (daily farm and home TV show with over 20,000 viewers in VT, NY and Canada) and will also contribute to blogs, websites, webinars, press releases, articles and newsletters.
- 3. Program Support for IPM Communities (Master Gardener).** The PDC team will work closely with the MG Program to: provide three lectures for the MG Course; provide three Advanced Training webinars and corresponding IPM factsheets, in addition to contributing to Master Gardener blogs, websites, articles and newsletters geared to the home garden and consumer. The PDC team will provide all diagnostic backup for Helpline. (Please see evaluation of these outputs under the IPM for Communities, Master Gardener Program.)

VERMONT IPM EXTENSION IMPLEMENTATION PROGRAM 2017-2020 (WITH 2021 EXTENSION)

Priority Area: IPM Education for Pesticide Applicators

Vermont is a small state with 1200 certified pesticide applicators. The UVM Pesticide Education and Safety Program (PSEP) works closely with the Vermont Agency of Agriculture to provide training and education opportunities for private, commercial and non-commercial applicators through a variety of workshops, newsletters and meetings. Since the USDA certification and training funding has been infrequent and minimal, the UVM PSEP has relied solely on the CropLife Foundation grant (\$85,000/3 years-ends 2017), some Extension base funding (~.1 FTE of Hazelrigg salary) in addition to about \$3,000 each year from workshop registration fees to fund pesticide education and training in recent years. Although we are exploring external funding opportunities through our work on the CropLife grant, we currently receive no funding from the state lead agency. This lack of funding and the unknown future of Federal funding has impacted pesticide safety and training programs in the state and has eroded initiatives to develop new programs. One of the goals of the CropLife Foundation grant is to develop a business plan including a 'SWOT' (strengths, weaknesses, opportunities and threats) analysis. Through this work, we have identified an opportunity for new sources of revenue by offering online education for applicators to earn pesticide recertification credits. Vermont applicators have expressed enthusiasm for this training option since it does not require attending an off-site meeting. This idea for online training has been discussed with the state lead agency and they have expressed interest in working with us to pursue this new outreach option.



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Priority Area: IPM Education for Pesticide Applicators

Approach -

1. Online Education for Pesticide Applicators with factsheets. We propose to develop at least three hour-long trainings based on one of the key directives developed by the 2017 VT Pollinator Protection Committee (see IPM for Pollinator Health section) “to provide essential education and outreach on pollinator health to key stakeholders including pesticide applicators, pesticide dealers, farmers and local, state and federal government land managers”. The content of the three online trainings will address IPM and pollinator health targeted for pesticide applicators in apple orchards, in blueberries and for applicators in the nursery/greenhouse ornamentals industry. The hour long training would be worth one pesticide recertification credit. We would use a webinar platform where the content could be accessed by applicators across the state either live with questions and discussion or as archived materials on the UVM PSEP website through a password-protected page. These trainings would also be worth recertification credits in other New England states since there is reciprocity. We could also offer the information on the national PSEP shared website to be used in other states outside New England. In Year 1 we would develop course materials and work with the state lead agency to develop methods and protocols to validate course attendees. We would offer the trainings in Years 2 and 3. Three factsheets will be developed for apple growers, blueberry growers and nursery/greenhouse operators on the course content for distribution at annual grower meetings and workshops and will also be posted online on the UVM Fruit, VT Vegetable and Berry Growers and the Greenhouse IPM websites. One fact-sheet will be developed for the MG program and consumer audience to address the use of pesticides to protect pollinators in the home garden and landscape. These will be distributed by Master Gardener volunteers at fairs, workshops, farmers markets and posted to the MG website.