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New Hampshire
Department of Agriculture, Markets & Food

Shawn N. Jasper, Commissioner

August 22, 2019

His Excellency, Governor Christopher T. Sununu
and the Honorable Council
State House
Concord, New Hampshire 03301

REQUESTED ACTION

Authorize the New Hampshire Department of Agriculture, Markets & Food, Division of Pesticide Control to grant funds and enter into a Cooperative Project Agreement, in the amount of $9,681.00, with the University of New Hampshire Office of Sponsored Research, vendor #177867, for the advancement of agricultural research and to assist in the promotion of Integrated Pest Management practices in New Hampshire, for the period from Governor and Council approval through March 31, 2020. 100% Other Funds.

Funds to support this request are anticipated to be available in the following account in FY 2020 upon the availability and continued appropriation of funds in the future operating budget. Funding is available in account as follows: **02-18-18-183010-21820000 INTEGRATED PEST MANAGEMENT**

OBJECT CLASS	ACCOUNT	FY 2020
075-500590	Grants and Subsidies	$9,681

EXPLANATION

The New Hampshire Department of Agriculture, Markets and Food (NHDAMF), Division of Pesticide Control in fulfilling its responsibilities under the Integrated Pest Management (IPM) Program, RSA 430:50; to promote the principles of IPM and assist New Hampshire citizens to advance the practice of such principles, has reviewed the project, "*Verification of action thresholds for management of brown marmorated stink bug (BMSB) and spotted wing drosophila (SWD) in New Hampshire horticultural crops*", and finds it exemplifies good practices associated with Integrated Pest Management. The research and educational aspects associated with this project and the efforts of the University of New Hampshire Cooperative Extension verify action levels for control of the Brown Marmorated Stink Bug and the Spotted Wing Drosophila. Experience and results of this project serve the benefit of all citizens of New Hampshire. The attachment includes a summary of the project and the dollar amount associated with each component.

In the event that these funds become no longer available, general funds will not be requested to support this program.

Respectfully submitted,

Shawn N. Jasper
Commissioner

Office of Commissioner 25 Capitol Street PO Box 2042 Concord, NH 03302-2042
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TDD Access: Relay NH 1-800-735-2964

COOPERATIVE PROJECT AGREEMENT
between the
STATE OF NEW HAMPSHIRE, **Department of Agriculture, Markets & Food**
and the
University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE

A. This Cooperative Project Agreement (hereinafter "Project Agreement") is entered into by the State of New Hampshire, **Department of Agriculture, Markets & Food**, (hereinafter "State"), and the University System of New Hampshire, acting through **University of New Hampshire**, (hereinafter "Campus"), for the purpose of undertaking a project of mutual interest. This Cooperative Project shall be carried out under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, except as may be modified herein.

B. This Project Agreement and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire approve this Project Agreement ("Effective date") and shall end on **3/31/20**. If the provision of services by Campus precedes the Effective date, all services performed by Campus shall be performed at the sole risk of Campus and in the event that this Project Agreement does not become effective, State shall be under no obligation to pay Campus for costs incurred or services performed; however, if this Project Agreement becomes effective, all costs incurred prior to the Effective date that would otherwise be allowable shall be paid under the terms of this Project Agreement.

C. The work to be performed under the terms of this Project Agreement is described in the proposal identified below and attached to this document as Exhibit A, the content of which is incorporated herein as a part of this Project Agreement.

Project Title: **Verification of action thresholds for management of brown marmorated stink bug (BMSB) and spotted wing drosophila (SWD) in New Hampshire horticultural crops**

D. The Following Individuals are designated as Project Administrators. These Project Administrators shall be responsible for the business aspects of this Project Agreement and all invoices, payments, project amendments and related correspondence shall be directed to the individuals so designated.

State Project Administrator	**Campus Project Administrator**
Name: David J. Rouuseau	Name: Cheryl Moore
Address: State House Annex 25 Capitol Street P.O. Box 2042 Concord, NH 03301	Address: University of New Hampshire Sponsored Programs Administration 51 College Road Durham, NH 03824
Phone: 603 271-3640	Phone: 603 862-1992

E. The Following Individuals are designated as Project Directors. These Project Directors shall be responsible for the technical leadership and conduct of the project. All progress reports, completion reports and related correspondence shall be directed to the individuals so designated.

State Project Director	**Campus Project Director**
Name: David J. Rousseau	Name: Anna Wallingford
Address: State House Annex 25 Capitol Street P.O. Box 2042 Concord, NH 03301	Address: UNH Cooperative Extension 38 Academic Way Spaulding 133 Durham, NH 03824
Phone: 603 271-3640	Phone: 603 862-1734

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F. Total State funds in the amount of **$9,681** have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.

Check if applicable

☐ Campus will cost-share % of total costs during the term of this Project Agreement.

☐ Federal funds paid to Campus under this Project Agreement are from Grant/Contract/Cooperative Agreement No. from under CFDA# . Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

G. Check if applicable.

☐ Article(s) of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002 is/are hereby amended to read:

H. ☒ State has chosen **not to take** possession of equipment purchased under this Project Agreement.

☐ State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

This Project Agreement and the Master Agreement constitute the entire agreement between State and Campus regarding this Cooperative Project, and supersede and replace any previously existing arrangements, oral or written; all changes herein must be made by written amendment and executed for the parties by their authorized officials.

IN WITNESS WHEREOF, the University System of New Hampshire, acting through the **University of New Hampshire** and the State of New Hampshire, **Department of Agriculture, Markets & Food** have executed this Project Agreement.

By An Authorized Official of:
University of New Hampshire

Name: Karen M. Jensen
Title: Manager, Sponsored Programs Administration
Signature and Date: 7/12/19

By An Authorized Official of:
Department of Agriculture, Markets & Food

Name: Shawn N. Jasper
Title: Commissioner
Signature and Date:

By An Authorized Official of: the New Hampshire Office of the Attorney General

Name: Erik Bal
Title: Assistant Attorney General
Signature and Date: 8/30/2019

By An Authorized Official of: the New Hampshire Governor & Executive Council

Name:
Title:
Signature and Date:

Campus Authorized Official
Date 7/12/19

EXHIBIT A

A. **Project Title:** Verification of action thresholds for management of brown marmorated stink bug (BMSB) and spotted wing drosophila (SWD) in New Hampshire horticultural crops

B. **Project Period:** Upon Governor and Council Approval through March 31, 2020

C. **Objectives:** The objectives of the University of New Hampshire are to assist the Department of Agriculture, Markets & Food in the promotion and advancement of Integrated Pest Management in New Hampshire

D. **Scope of Work:** A detailed scope of work is on file with the Department of Agriculture, Markets & Food and described in Attachment A of this agreement.

E. **Deliverables Schedule:** A detailed description with schedule for each project is on file with the Department of Agriculture, Markets & Food and described in Attachment A of this agreement.

Major Project Components:

On Farm Monitoring: Summer 2019
Insect/Crop: brown marmorated stink bug/fruits and vegetables
spotted wing drosophila/fruit and vegetables

Final Report: April 30, 2020

F. **Budget and Invoicing Instructions:** Campus will submit an invoice on regular Campus invoice form for $9,681 at the time of Governor and Council approval. State will pay Campus within 30 days of receipt of the invoice. Any unused funds must be returned to the State after the project end date.

Budget Items	State Funding	Cost Sharing (if required)	Total
1. Salaries & Wages	$ 2,723	0	$ 2,723
2. Employee Fringe Benefits	1,152	0	1,152
3. Mileage	1,308	0	1,308
4. Supplies	2,500	0	2,500
5. Equipment	0	0	0
6. Facilities & Admin. Costs	1,998	0	1,998
Subtotals		0	$ 9,681
In Kind Contribution		0	0
Total Project Costs			$ 9,681

G. Other

A representative of the Department of Agriculture, Markets & Foods reserves the right to attend

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seminars and audit any work performed by the grant recipient.

Attachment A: Project Proposal - "Verification of action thresholds for management of brown marmorated stink bug (BMSB) and spotted wing drosophila (SWD) in New Hampshire horticultural crops."

I. Itemized Budget

Funding can only be used for items detailed in your budget. Requests for the purchase of non-consumable equipment that may serve a broader purpose than the IPM project will be rejected. Itemized budget must be specific.

Expense Account	TOTAL
Personnel	
Anna Wallingford, Extension State Specialist	$2,723
Benefits	$1,152
Mileage: 2,400 miles @ $0.545/mile	$1,308
Supplies	$2,500
Subtotal:	$7,683
Indirect Costs at 26%	$1,998
Total	$ 9,681

Personnel: $2,723

Anna Wallingford, Extension State Specialist, (8 days effort) will conduct weekly data collection and analysis, provide regular reports to participating growers, and produce extension materials for publication and grower meeting presentations.

Benefits Rate(s): $1,152

The Employee Benefit Rates are based on UNH's most current Rate Agreement with the U. S. Department of Health and Human Services, as required under OMB Circular A-21. A copy of the Rate Agreement is provided annually to the NH Department of Administrative Services. The full Employee Benefits rate applies to salaries and wages, except for hourly and college work study wages, FICA-eligible graduate student pay, faculty summer salaries, and other exceptions to faculty and staff contract pay. The postdoctoral research rate applies to all postdoctoral staff.

Travel: $1,308

This application is requesting $1,308 to support project staff travel activities. Mileage and per diem expenses will be reimbursed at the current federal rates. Travel expenses will include instate travel to farms participating in the project. We estimate approximately 200 miles per week for the 12 weeks of peak activity for BMSB and SWD. The total estimated mileage for this project is therefore 2,400 miles and, based on the current federal rate of $0.545/mile, the total funds request for travel is $1,308.

Supplies & Services: $2,500

This application is requesting $2,500 for the purchase of project supplies/services directly related to the support of this project. Funds will be used for purchasing traps (projected at $1,000),

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attractants/lures (projected at $1,000) and other monitoring supplies (i.e.; wires, fasteners, ziplock bags, etc.; projected at $500).

Facilities and Administrative Costs Rate: $1,998

The Facilities and Administrative Cost Rate (26%) is based on UNH's most current Rate Agreement with the U. S. Department of Health and Human Services, as required under OMB Circular A-21, unless capped by the State of New Hampshire or Federal Sponsor. A copy of the Rate Agreement is provided to the NH Department of Administrative Services when rates change.

II. Project Description (3 lines or less, to be used for publicity purposes):

Action thresholds are used by farmers to make pest management decisions based on pest density; their proper use can help to avoid unnecessary applications of chemical pesticides. Recently proposed action thresholds will be verified for management of brown marmorated stink bug (BMSB) and spotted wing drosophila (SWD) at a minimum of fifteen farms growing fruits and vegetables throughout the summer of 2019.

III. Project Objectives (be sure to include how this project serves the concepts of IPM):

- Identify appropriate action thresholds for BMSB in apple and SWD in blueberry.
- Identify barriers to adoption of monitoring and use of action thresholds for management BMSB in apple, SWD in blueberry
- Compare popular traps (with various attractants and trapping mechanisms) for monitoring BMSB in apple and SWD in blueberry for the following qualities:
    - Ease of use, cost of materials and maintenance
    - Trapping efficacy (i.e. number of insects trapped/week)
    - Monitoring efficacy (i.e. which traps best predict insect activity/injury in crop)
- Identify whether or not the current regional trapping network provides enough information for growers that they do not need to conduct their own trapping.

IV. Economic and Environmental Impact

Brown marmorated stink bug (BMSB) feeding by adults and nymphs causes economic injury to several crop and wild host plants including, but not limited to, apple, peach, raspberry, cherry, tomato, green pepper, snap bean, and sweet corn. While BMSB has been reported in New Hampshire in previous years, we did not observe economically damaging populations until 2018. While low compared to numbers observed in the mid-Atlantic states, these 2018 New Hampshire numbers are alarming extension specialists considering 100% crop loss in apple, peach, tomato, etc. in areas affected by outbreak populations. This pest has been heavily researched and action thresholds have been developed for mid-Atlantic states (10 bugs/trap/week) but it is unclear whether or not these thresholds are appropriate for New Hampshire. Additionally, easier-to-use trapping approaches have been proposed that need to be field-tested in our systems (Krawcyk et al. 2016, Acebes-Doria et al. 2017).

Spotted wing drosophila (SWD) is a fruit fly that lays its eggs in ripe and ripening fruit of several crop and wild host plants including, but not limited to, blueberry, raspberry, blackberry, cherry, grape, and peach. The SWD situation is brand new to not only New Hampshire (arriving in 2011) but also the United States (first reported in 2008). According to grower reports and data from the National Agricultural Statistics Services from our first year with SWD (2012), our team calculated $1,516,000

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of crop loss due to SWD in New Hampshire, alone. Economic losses due to SWD has remained high since their arrival, as populations continue to reach crushingly high levels each summer. Currently, best practice for management relies on regular application of chemical pesticide , every 4-7 days, while fruit are ripe and SWD are present. Action thresholds have been proposed by Drummond et al. (2018) based on a sliding scale of acceptable infestation (Table 1).

Strong IPM relies on monitoring to tell farmers when pest insects are present at high enough numbers in their susceptible fruit crops to justify application of insecticides. UNHCE maintains a regional monitoring program which monitors both BMSB and SWD using lure-baited traps located throughout fruit growing areas of New Hampshire. This monitoring data is available online and via regional extension specialist and serves as critical indicators as to when these pests are detected in the state. However, pest pressure may vary from farm to farm, and so we recommend that farmers conduct their own monitoring, which can be challenging and costly.

We aim to prevent economic losses due to these serious, invasive pest insects, which are new to New Hampshire fruit and vegetable production. Use of trapping and action thresholds helps growers decide if and when to use chemical pesticides, which helps to avoid unnecessary insecticidal sprays. Beyond dollar savings, reduced insecticide spraying can help protect populations of beneficial insects: predators, parasitoids, and pollinators. Fewer sprays also reduces farm worker exposure to pesticides, in particular those involved with spraying, pesticide mixing & loading. Reduced spraying also reduces the opportunity for drift and the risk of environmental contamination. It can help keep farms in business growing locally produced food to meet the rising demand for fresh, local products.

Table 1 (from Drummond et al: 2018). ACTION THRESHOLDS. Data from 2012-2017 that show the frequency (# fields) of cumulative SWD male captures in fields that the following week had infested fruit.

CUMULATIVE MALE SWD FLIES CAPTURED (average from 3 traps / field)	Probability of NOT having infested fruit the following week
0.25	99.9%
0.5	99.5%
1.0	99%
2.0	95%
3.5	90%
7.0	75%
16.0	50%

V. How will your goals be accomplished? (i.e., experimental design)

- This project will act to supplement current monitoring programs and will be conducted in concert with other extension activities carried out by Anna Wallingford, George Hamilton, and support staff during the 2019 growing season.
- We will work with at least fifteen growers/farmers/orchardists in New Hampshire monitoring for SWD adults and BMSB adults and nymphs on a weekly basis, checking traps to determine need, frequency, and timing for insecticide control applications for insects we are trapping, as well as making observations of pest presence in the crop. Results will be reported weekly to participating farms.
- If there are major outbreaks, we will consider disseminating alerts through additional means, including Weekly Market Bulletin

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- At the end of the season, growers/farmers/orchardists in the program will complete a survey evaluating the project.

VI. Sampling Methods (if applicable):

Experiment 1: Does following the Drummond action threshold keep SWD infestation below threshold in high bush blueberry.

Three SWD cup traps will be placed in blueberry plots at each of eight sites (4 with commercial traps, 4 with homemade traps) and the number of male SWD will be recorded weekly, attractive baits replaced monthly, taking care to record the time it takes to maintain traps at each site. Growers will be informed immediately if the average trap numbers reach a pre-determined threshold and growers will treat their crop according to their preference. Fruit samples (400 fruit/plot) will also be collected weekly and infestation will be estimated using a salt flotation method (Van Timmeren et al. 2017). This infestation data, combined with grower-provided spray records, will indicate whether or not the pre-determined action threshold kept SWD injury below the desire threshold.

Experiment 2: Does following the Acebes-Doria action threshold keep BMSB feeding injury below threshold in apple?

Three BMSB sticky traps will be placed in apple blocks belonging to eight orchards where there is currently a trapping network pyramid trap (4 with sticky cards hanging in branches, 4 with sticky cards affixed to a stake), and the number of BMSB nymphs and adults will be recorded weekly, sticky cards and attractive baits replaced monthly, taking care to record the time it takes to maintain traps at each site. Growers will be informed immediately if the average trap numbers reach threshold (average of 2 adults per hanging trap, 4 adults per staked trap) and growers will treat their crop according to their preference. Timed observations will be carried out weekly to observe BMSB presence in orchard borders and fruit will be observed for feeding injury at harvest (500 fruit from border rows, 500 fruit from interior rows). Weekly observations and final injury data, combined with grower-provided spray records, will indicate whether or not the action threshold kept BMSB injury below the desired threshold.

Experiment 3: Are light-baited ghost traps as effective in capturing BMSB as pheromone-baited ghost traps?

Three ghost traps will be placed in apple blocks belonging to six orchards where there is no current pheromone-based monitoring programs. At each site, one trap will be deployed with a pheromone lure, one with no lure, and one with no lure that is illuminated with a solar powered LED light. The number BMSB nymphs and adults on or below traps will be recorded weekly and trap efficacy will be determined by comparing total number of insects trapped and average number trapped per week.

VII. How will your data be evaluated?

- A "rate of success" will be calculated for each approach (i.e. what percentage of sites maintained fruit injury below desired threshold).
- At the end of the season, growers/farmers/orchardists in the program will complete a program evaluation survey to be reviewed by the UNH CE IPM Coordinator and/or other UNH CE personnel, with a focus on how likely growers are to adopt monitoring or how likely CE professionals are likely to recommend monitoring for each system.

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VIII. Explain how the results of your project will be shared/publicized.

All published literature (papers, presentations, publications, advertisements, etc.) must contain a statement attributing funding to the New Hampshire Department of Agriculture, Markets and Food IPM Grant Program. Publications must be submitted with the final report.

- A weekly visit to each grower will be made to monitor trap counts where the grower will be provided the information on need, frequency and timing for insecticide control applications.
- Updates on insect pest situations will be given at scheduled grower twilight meetings throughout the growing season and online.
- Pending agreement by participating growers, trap catches will posted on UNHCE's website, for anyone to access whenever he/she wishes. This will support decision-making by growers beyond those directly involved, and by other agricultural workers.
- If there are any major insect outbreaks, we will consider disseminating alerts through additional means, including Weekly Market Bulletin.
- A presentation on the results of this project will be developed and presented to vegetable growers/farmers upon request.
- Extension materials will be generated with side-by-side comparisons of price per trap and estimated hours of maintenance for the season, quality rating provided bt participant farmers, as well as "rate of success" for action thresholds based on on-farm monitoring data (i.e. what percentage of sites maintained fruit injury below desired threshold), as well as infestation estimates compared to regional monitoring data.

IX. Detail how other groups may adopt some of the information you learn or develop:

- Adult monitoring data presented alongside infestation and/or injury data is highly sought after among researchers studying these pest systems, and will contribute to IPM in New Hampshire and surrounding regions.
- This project will generate preliminary data which may be used in further efforts to identify helpful tools for IPM in affected crops.

Provide a complete list of all persons involved in the proposed project; include the names, addresses and phone numbers of the individuals.

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