

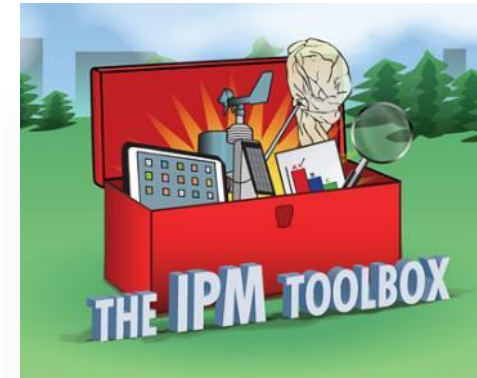
Increasing Access to Practical Biocontrol Information through Digital Resources

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**Northeastern
IPM
Center**

October 2, 2024



United States
Department of
Agriculture

National Institute
of Food and
Agriculture



New York State
Integrated Pest Management

Webinar Details



Live Transcription



A recording of this webinar will be available within a week at



<http://www.neipmc.org/go/ipmtoolbox>

We Welcome Your Questions

Please submit a question at any time using the Q&A feature to your right at any time

If you'd like to ask a question anonymously, please indicate that at the beginning of your query.

Webinar Presenter

Amara Dunn-Silver

Biocontrol Specialist

New York State Integrated Pest Management Program,
part of the Cornell College of Agriculture and Life Sciences



Webinar Presenter

Hillary Peterson

Integrated Pest Management Specialist

Maine Department of Agriculture, Conservation and Forestry

Plant Health Programs



Some Questions for You



Questions?



Increasing Access to Practical Biocontrol Information through Digital Resources

Biocontrol Website



Augmentative Biocontrol Working Group



Where we started...

The screenshot shows the homepage of the Cornell University Biological Control website. At the top, there is a red header with the Cornell University logo and the text "Cornell University College of Agriculture and Life Sciences". To the right of the header is a search bar labeled "SEARCH CORNELL:" with a "go" button and links for "Pages", "People", and "more options". Below the header is a dark red banner with the title "BIOLOGICAL CONTROL" in large white letters, followed by the subtitle "A Guide to Natural Enemies in North America" and the author's name "Anthony Shelton, Ph.D., Professor of Entomology, Cornell University". A navigation bar below the banner contains links for "Home", "Overview", "Types of Natural Enemies", "Habitat of Natural Enemies Index", and "Resources". The main content area features a "Welcome to the Biological Control Site" section with a paragraph of introductory text. Below this text are four small images representing different types of natural enemies: a parasitoid wasp, a pathogen (fungus), a predator (ladybug), and a weed feeder (beetle). Each image has a caption below it: "Parasitoids", "Pathogens", "Predators", and "Weed Feeders". To the right of the main content is a larger image showing a cadaver of a gypsy moth caterpillar killed by a parasitoid, with the caption "Cadaver of gypsy moth caterpillar killed by *Entomophaga maimaiga*". At the bottom right of the page is a "BACK TO TOP" button.

Cornell University
College of Agriculture and Life Sciences

SEARCH CORNELL: go
[Pages](#) [People](#) [more options](#)

BIOLOGICAL CONTROL

A Guide to Natural Enemies in North America
Anthony Shelton, Ph.D., Professor of Entomology,
Cornell University

[Home](#) [Overview](#) [Types of Natural Enemies](#) [Habitat of Natural Enemies Index](#) [Resources](#)

Welcome to the Biological Control Site

This guide provides photographs and descriptions of biological control (or biocontrol) agents of insect, disease, and weed pests in North America. It is also a tutorial on the concept and practice of biological control and integrated pest management (IPM). Whether you are an educator, a commercial grower, a student, a researcher, a land manager, or an extension or regulatory agent, we hope you will find this information useful. The guide currently includes individual pages of over 100 natural enemies of pest species, and we envision continued expansion. On each of these pages you will see photographs, descriptions of the life cycles and habits, and other useful information about each natural enemy.



Parasitoids **Pathogens** **Predators** **Weed Feeders**

Four types of natural enemies are included in this guide. Click on an image above to learn more about these natural enemies.

Photos: Parasitoid, @DOImstead; Pathogen, Penn State Image Library; Predator, J. Ogradnick; Weed Feeder, R. Richard

Cadaver of gypsy moth caterpillar killed by *Entomophaga maimaiga*

[BACK TO TOP](#)

Goals

1. Migrate to NYSIPM website
2. Improve usefulness and usability
3. Create and add new content

Goals

1. Migrate to NYSIPM website
2. Improve usefulness and usability
3. Create and add new content

Today: Biocontrol agent profiles

Example of previous
biocontrol agent
profile:

BIOLOGICAL CONTROL

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Cornell University

[Home](#) [Overview](#) [Types of Natural Enemies](#) [Habitat of Natural Enemies Index](#) [Resources](#)

[Back to Predators Table of Contents](#)

Syrphid Flies (Diptera: Syrphidae)

Compiled by Aloy Gu, Department of Entomology, Cornell University/NYSAES, Geneva, NY 14456
lg356@cornell.edu

Syrphid flies are also called flower flies or hover flies as the adults are usually seen hovering over or feeding on nectar or pollen at flowers. The larvae can be voracious predators of small insects, especially aphids, and all aphid-feeding (aphidophagous) species are in the subfamily Syrphinae. Common aphidophagous syrphid flies in California vegetable crops include *Toxomerus marginatus*, *Allograpta obliqua*, *Syrphus opinator*, *Eupeodes americanus*, *Eupeodes volucris*, *Paragus tibialis*, *Platycheirus* spp., *Scaeva pyrastris*, *Sphaerophoria* spp., *Syrphus opinator*, among many others. Syrphids are found throughout North America and are common on many crops attacked by aphids and other small soft-bodied insects.

Appearance

Adult flies vary in length from 3 to 13 mm depending on species. Adult bodies are black or brown marked with bands or dots of white or yellow covering abdomen and/or thorax. Their resemblance to bees and wasps is mimicry to ward off predators. However, they can be distinguished by a single pair of wings, with vestigial hind wings as balancing organs, characteristic of all dipterans. Syrphid fly larvae are slug-like maggots that are wrinkled and tapered anteriorly. Their color can be pink, yellow, green or brown marked



Top: *Paragus* spp. Peters Canyon, Orange, Orange County, CA. 6-15-09. © Ron Hemberger

Early success?

A Reddit post on
r/whatsthisbug...



Early success?

r/whatsthisbug •



I WORK AT SUBWAY AND 3 OF THESE FLEW OUT OF THE PEPPERONI AND I HAD TO KEEP MY COMPOSURE IN FRONT OF A CUSTOMER. im sorry i couldnt get a photo, but I made a drawing, and as goofy as it looks, it ACTUALLY looks like this... what's this bug? (I AM SO SORRY I COULDNT GET A PICTURE)

BPRoberts1 commented 10 days ago

The big eyes usually indicate a hover fly, a fly that often impersonates as a wasp to deter predators.

Did it look like this? <https://cals.cornell.edu/new-york-state-integrated-pest-management/outreach-education/fact-sheets/hover-fly-biocontrol-fact-sheet>

↑ 1K ↓ Reply Share ...

Early success?

Nearly 10,000 page visits on September 8!

Biocontrol Agent

Larvae of predatory syrphid flies are beneficial to farmers and gardeners, because they have the potential to reduce the severity of pest outbreaks.



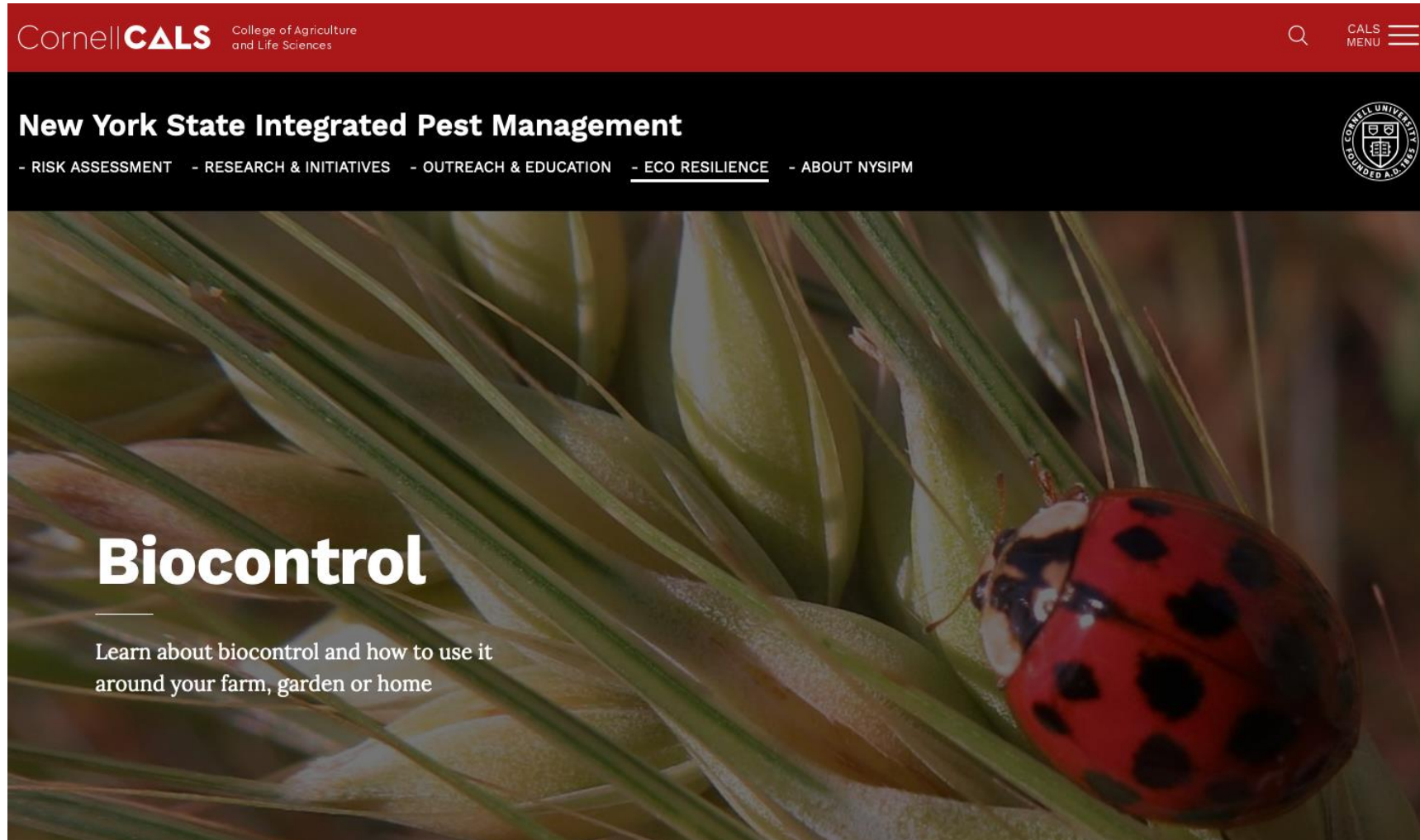
Overview

Pests Targeted: Aphids, Caterpillars, Leafhoppers, Planthoppers, Mealy Bugs, Thrips
Pest Stage: Larva or Adult
Commercially Available? Yes
Scientific Name: Syrphidae, e.g. Episyrphus balteatus
Biocontrol Agent Type: Predator

Biocontrol Website

New York State Integrated Pest Management

Let's take a tour!



go.nysipm.org/biocontrol

<https://cals.cornell.edu/new-york-state-integrated-pest-management/eco-resilience/biocontrol>



What's next?

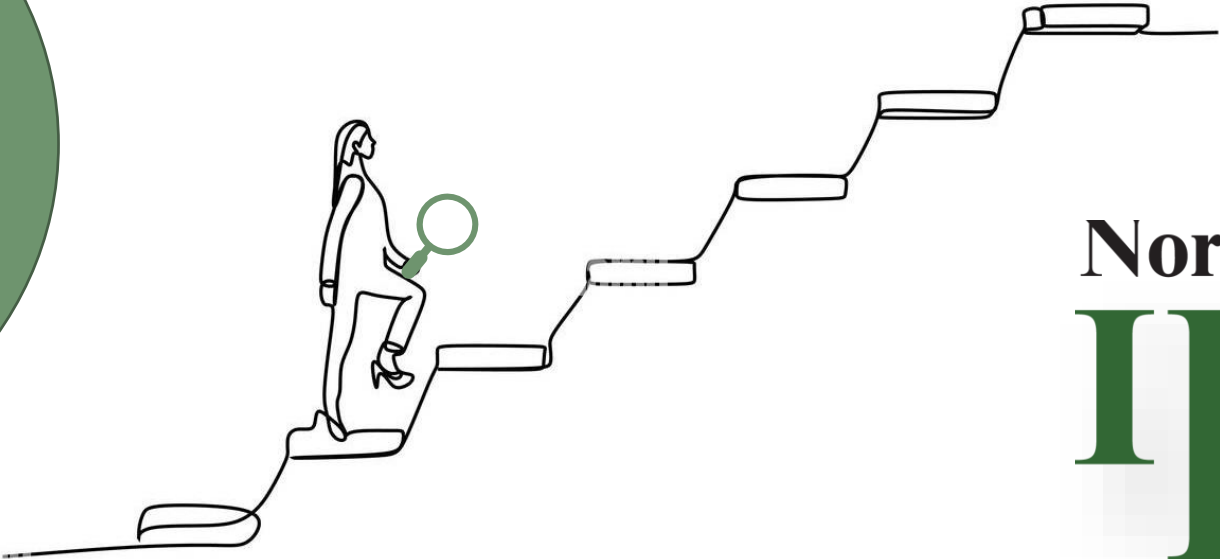
- 42 articles written so far – thank you to authors!
- More articles to migrate from old site
- We need you!
 - Propose a BCA we should add
 - Nominate an author (self-nominations welcome)
 - Please email Amara (arc55@cornell.edu) to volunteer yourself or someone else

Questions?



Augmentative Biological Control Working Group

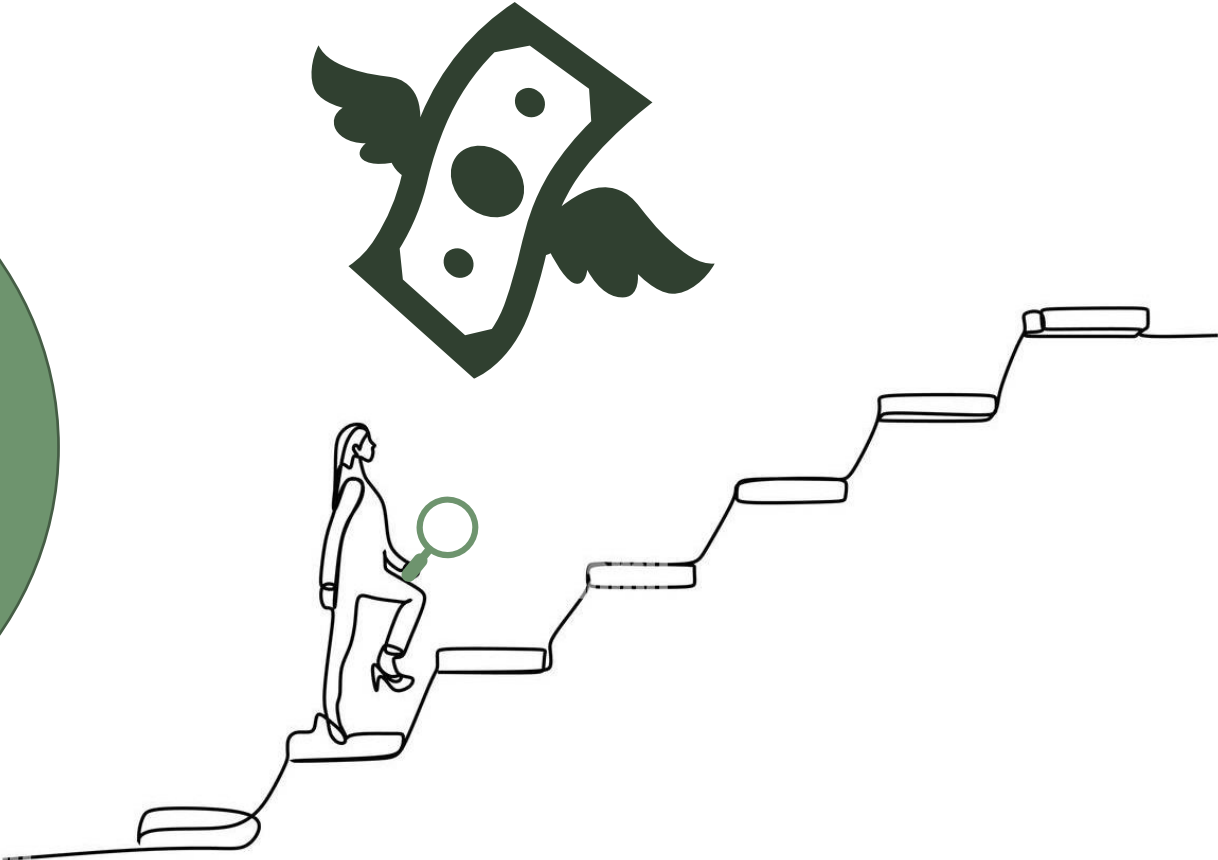
Imagine you are a grower interested in biocontrol...
Maybe you are 😊



**Northeastern
IPM
Center**

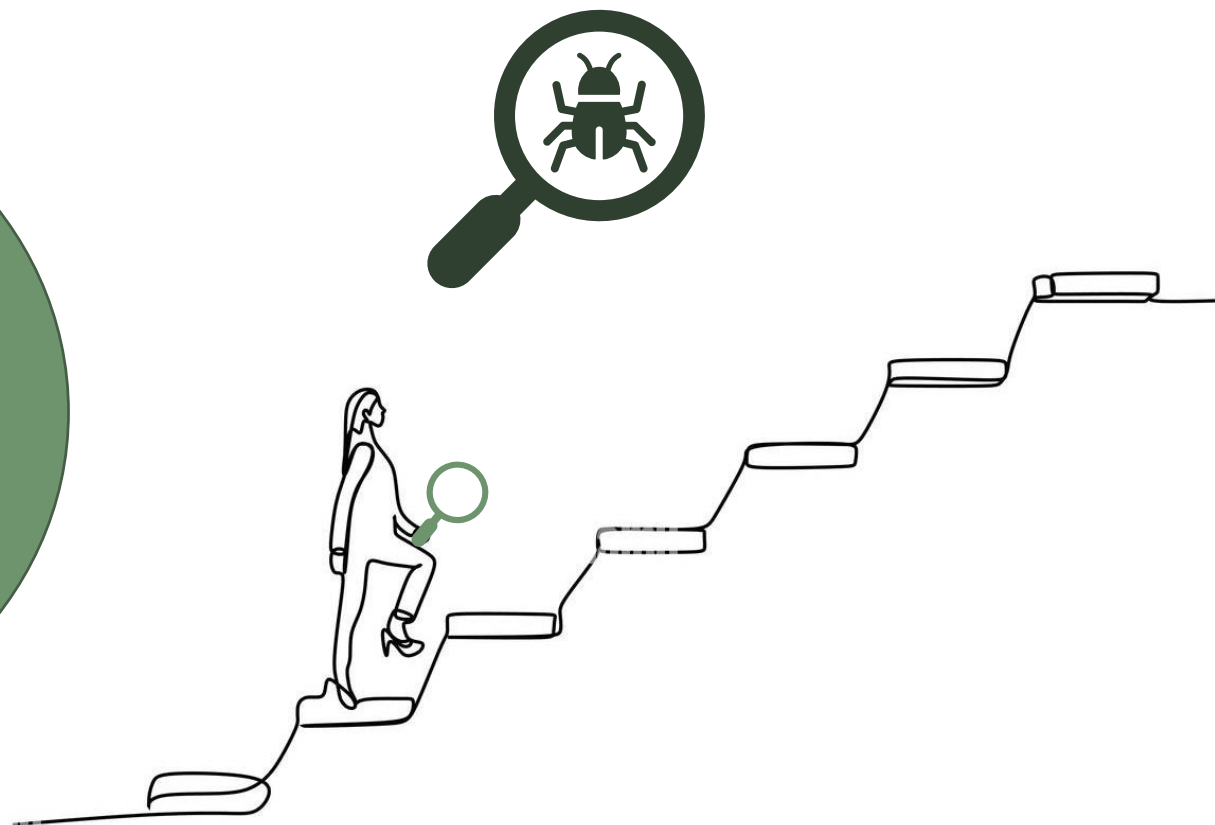
Augmentative Biological Control Working Group

You have heard it
can save you
money... but it
looks expensive!



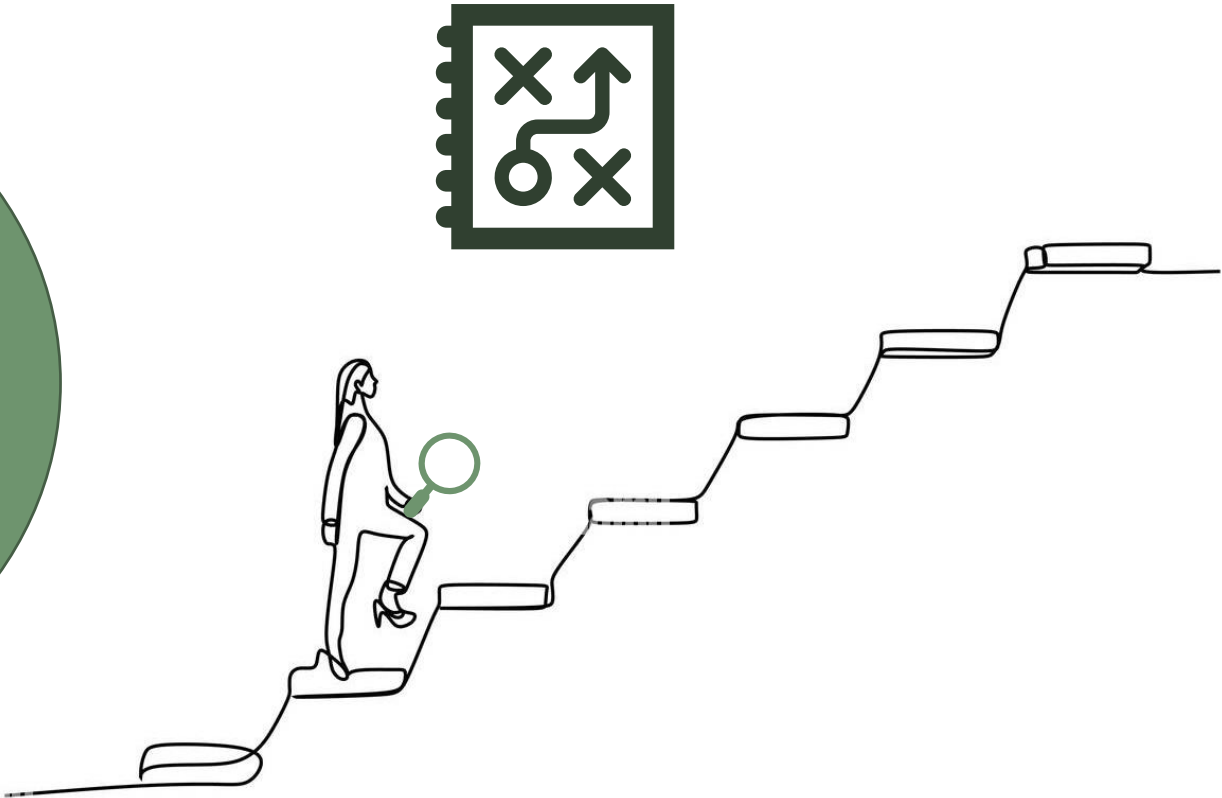
Augmentative Biological Control Working Group

You find lots of websites with options, but you don't know what pest species you have!



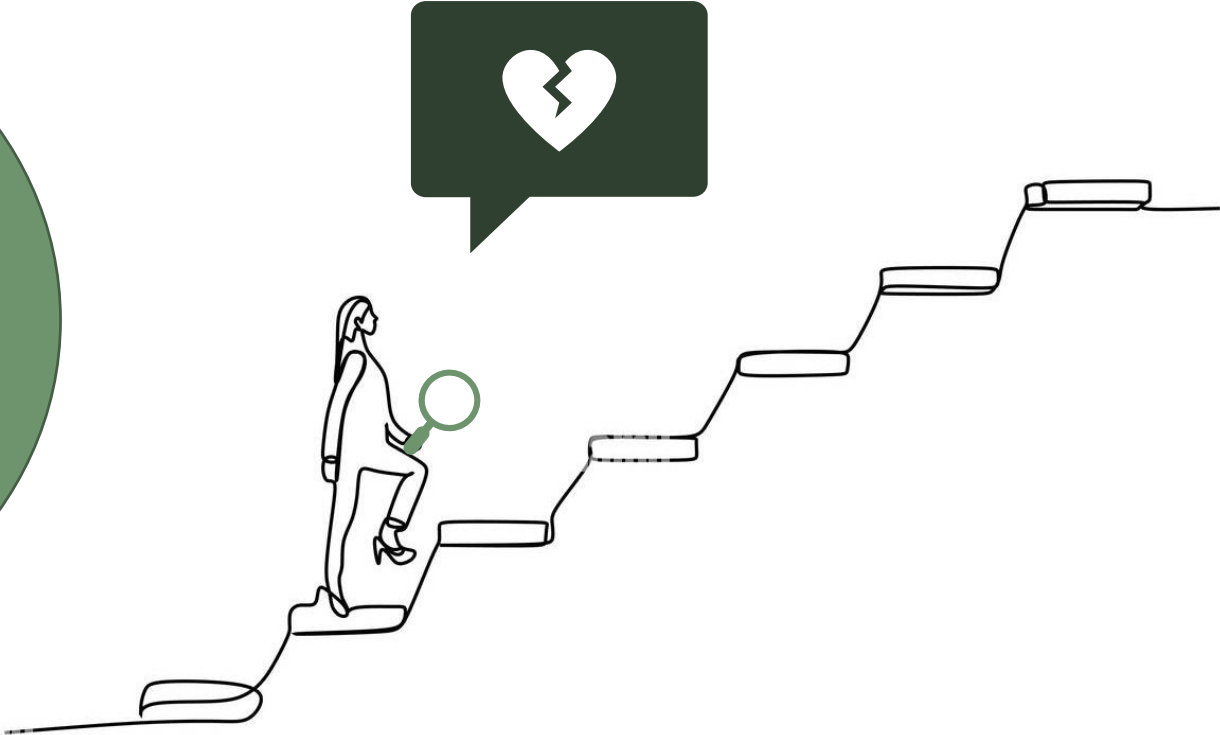
Augmentative Biological Control Working Group

You find some interesting webinars, definitions of biocontrol, and photos but have no idea where to begin...



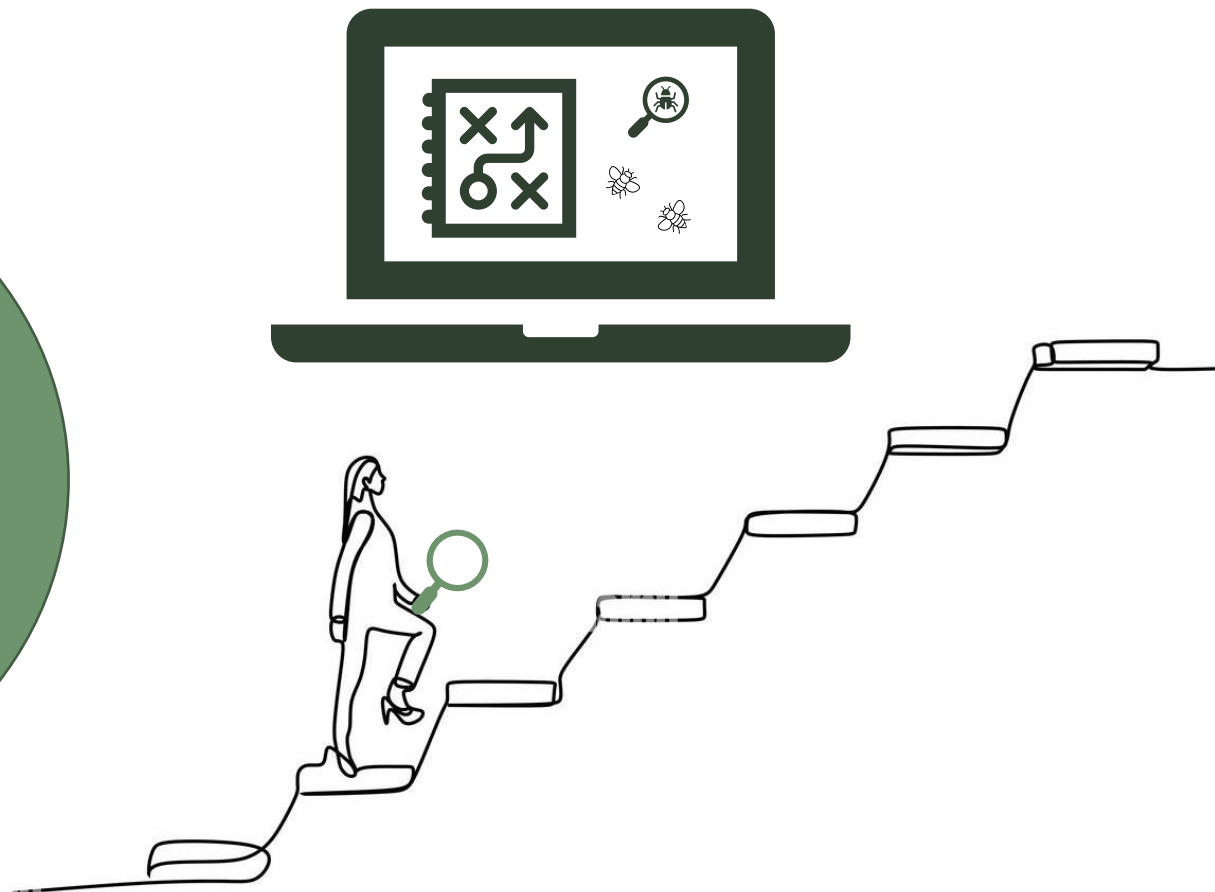
Augmentative Biological Control Working Group

You spend a whole day trying to outline a plan, but feel overwhelmed and are frustrated that nothing online helps 😞



Augmentative Biological Control Working Group

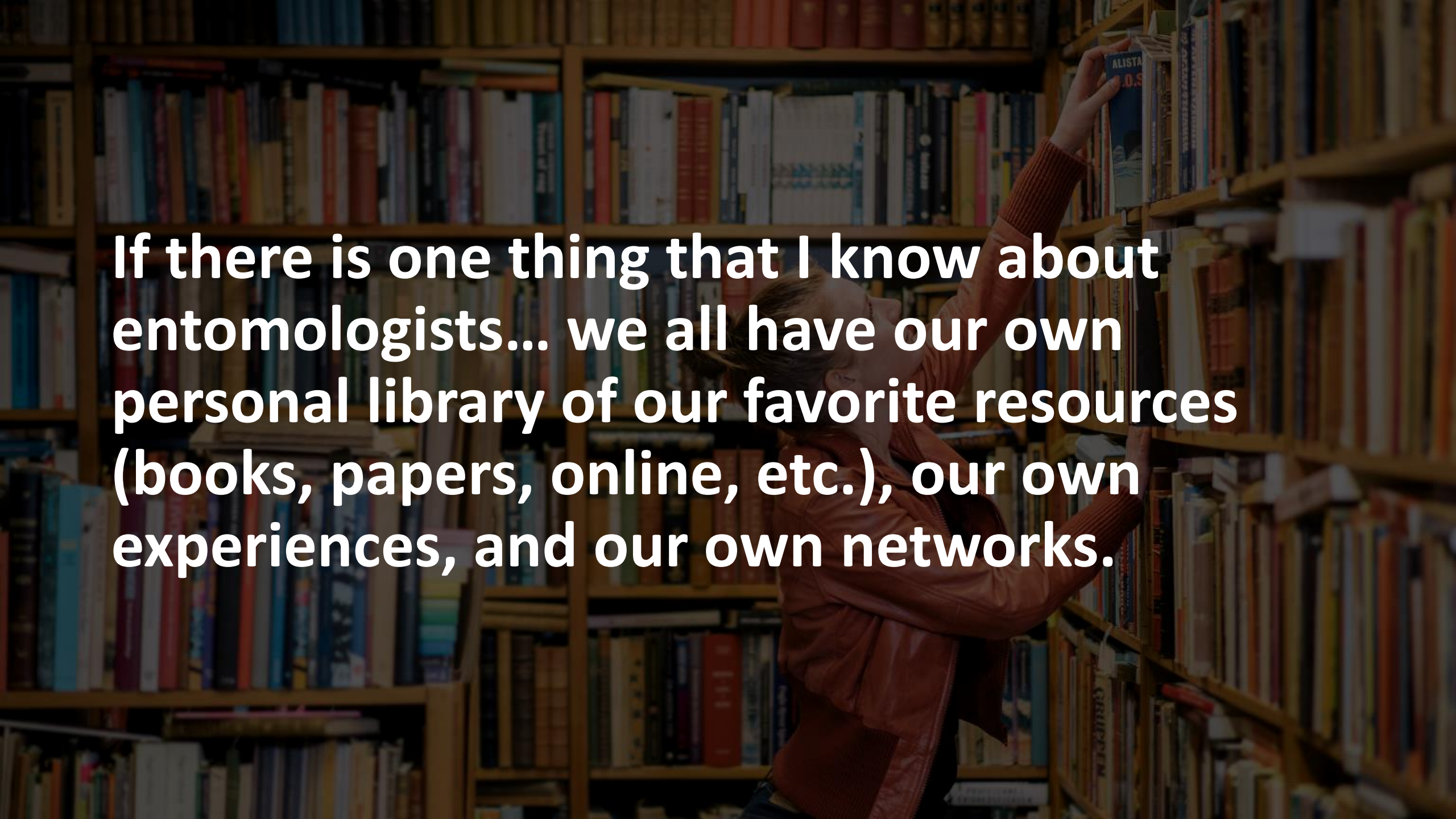
Our PRIMARY goal
– make that plan,
make it free, and
make it easy for
anyone to use!



How did this WG come to be?

- Conversations with Caleb Goossen (MOFGA) during IPM Council meetings
- Conversations with Suzanne Wainwright Evans
- My experiences
 - Setting up an IPM program for cannabis grower
 - Trying to educate the public and growers about ABC
 - Conversations with greenhouse growers, nurseries, and the horticulturalists within my department
 - **Working with systematists and in entomological collections...**



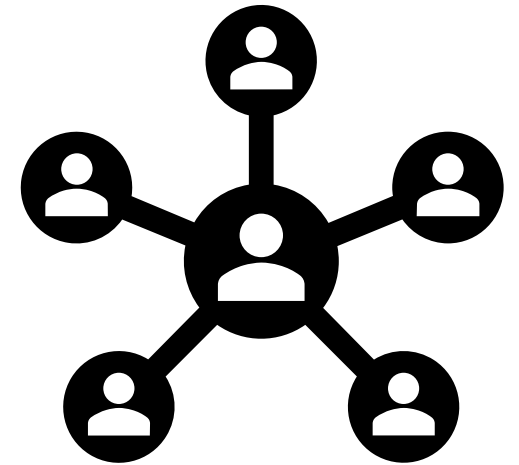
A person wearing a red jacket is standing in a library, reaching up to a high wooden shelf to handle a book. The shelves are filled with books, and the scene is dimly lit, creating a quiet, studious atmosphere. The text is overlaid on the left side of the image.

If there is one thing that I know about entomologists... we all have our own personal library of our favorite resources (books, papers, online, etc.), our own experiences, and our own networks.

1

Establish an Augmentative Biological Control Working Group (ABC WG) for the Northeast Region

Anticipated impacts: WG will consist of researchers, educators, and practitioners involved with biological control releases for pest control in indoor and outdoor agriculture.



Who are we?

8 States & Washington D.C.

Connecticut

Maine

Maryland

New Hampshire

New Jersey

New York

Pennsylvania

Vermont

Washington D.C.

Institutions, businesses, and government.

ARS / Smithsonian

ARS Invasive Insect Biocontrol & Behavior Laboratory

Cornell University

IPM Labs

Penn State University

Phillip Alampi Beneficial Insect Rearing Laboratory

Rutgers

University of Connecticut

University of Maine

University of New Hampshire

University of Vermont

Who are we?

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Institutions, businesses, and government.



Connecticut
Maine
Maryland
New Hampshire
New Jersey
New York
Pennsylvania
Vermont
Washington D.C.

Thomsonian
Plant & Behavior Laboratory
University
Jobs
University
Insect Rearing Laboratory
rs
Connecticut
of Maine
New Hampshire
University of Vermont

2

Gather available resources for growers seeking to implement augmentative biological control, and assess missing information, and create new factsheets for gaps in the available resources.

Anticipated impacts: Gaps will be found and need to be bridged between available educational information about ABC.

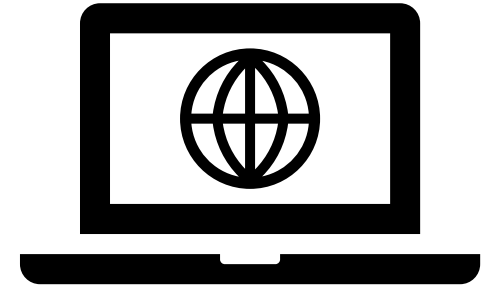
Anticipated gaps may include species-specific: release timing and conditions, pesticide compatibility, and quality control checks.

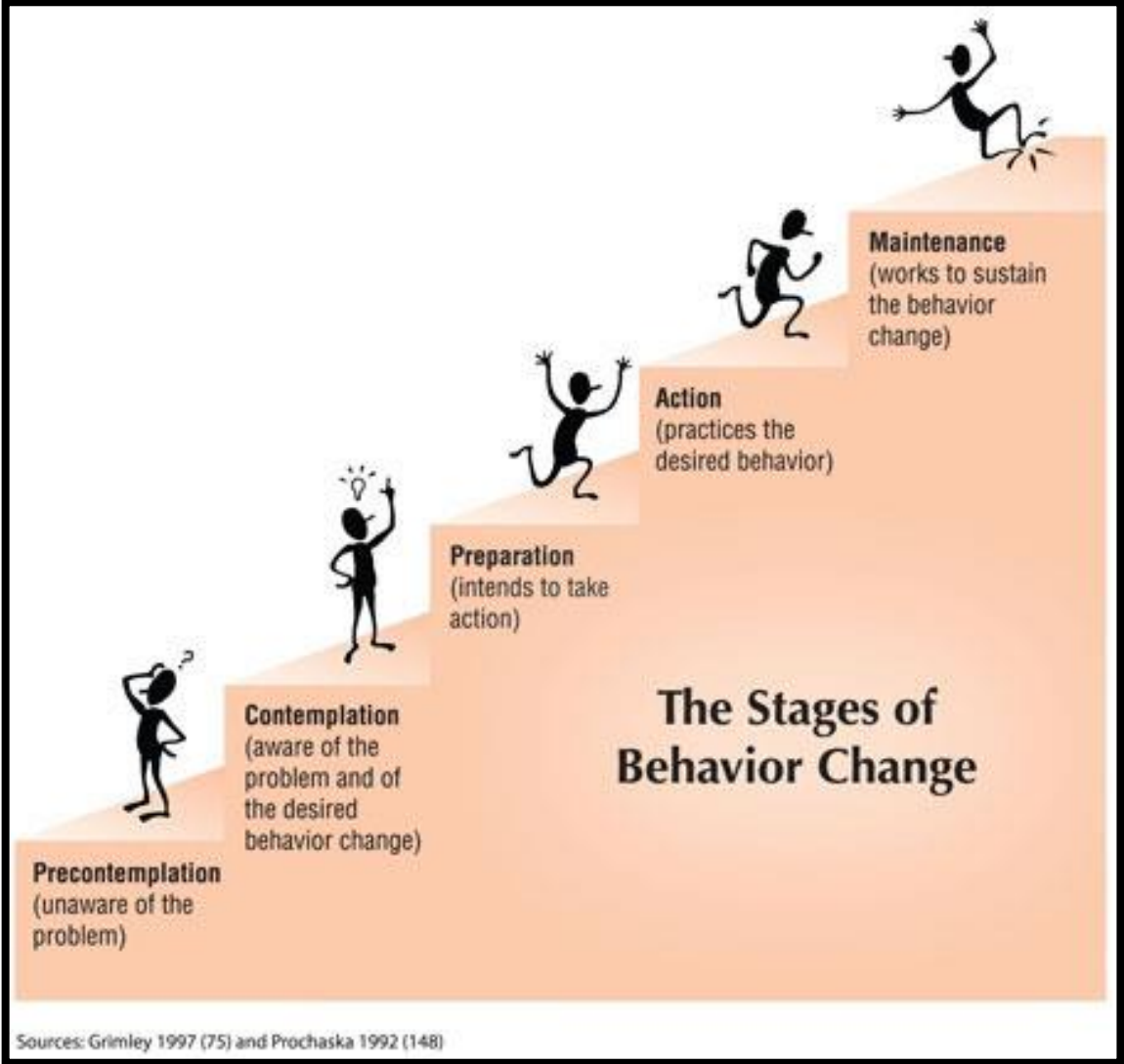


3

Create a website for growers to use to access this information and ensure growers know about it through outreach by WG members.

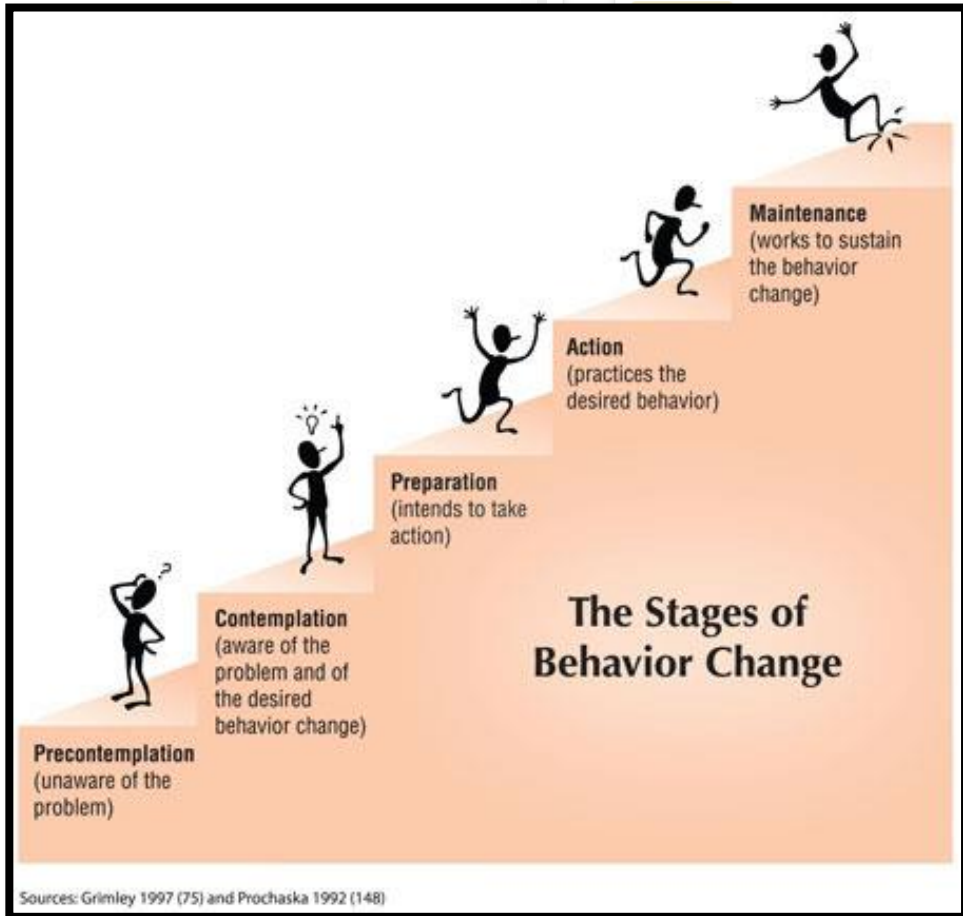
Anticipated impacts: Accessible information will be freely available to growers at this “one stop shop” location that will fill the missing gaps of what can currently be found online.





Process

Organized our thinking using “the stages of change” model



ABC Framework Board

Grid Board Schedule Charts

Filters (2) Group by Bucket

- Contemplation (considering ABC)**
 - + Add task
- Preparation (planning ABC)**
 - + Add task
 - In Outline : Taxonomy 101 with Mike Gates
 - In Outline : Training on Pests and Scouting (0 / 3)
 - In Outline : BCA Toolbox (Physical Items Needed) (0 / 1)
 - In Outline : Choosing the right BCA company (0 / 1)
 - In Outline : Choosing the right pesticides (0 / 1)
 - In Outline :
- Action (implementing ABC)**
 - + Add task
 - In Outline : Scheduling BCA Deliveries
 - In Outline : Invasive Pests (e.g. parvipisus)
 - In Outline : Pre-Release Scouting & Recordkeeping
 - In Outline : Proper Release
 - In Outline : Post-Release Scouting & Evaluations
 - In Outline : BCA Quality Control &
- Maintenance (sustaining)**
 - + Add task
 - In Outline : How to talk about ABC to customers
 - In Outline : Julia - posters to hang in retail (0 / 1)
 - In Outline : New Research
 - In Outline : New Technologies
 - In Outline : Troubleshooting Steps
 - In Outline : BCA Legality
 - In Outline :
- Other Discussions**
 - + Add task
 - IPM Symposi
 - General Disc
 - Due
 - Crop Prioritie
 - Due
 - Website Desi
 - 0 / 1
 - Due
 - Lack of Outre
 - 0 / 2
 - Due

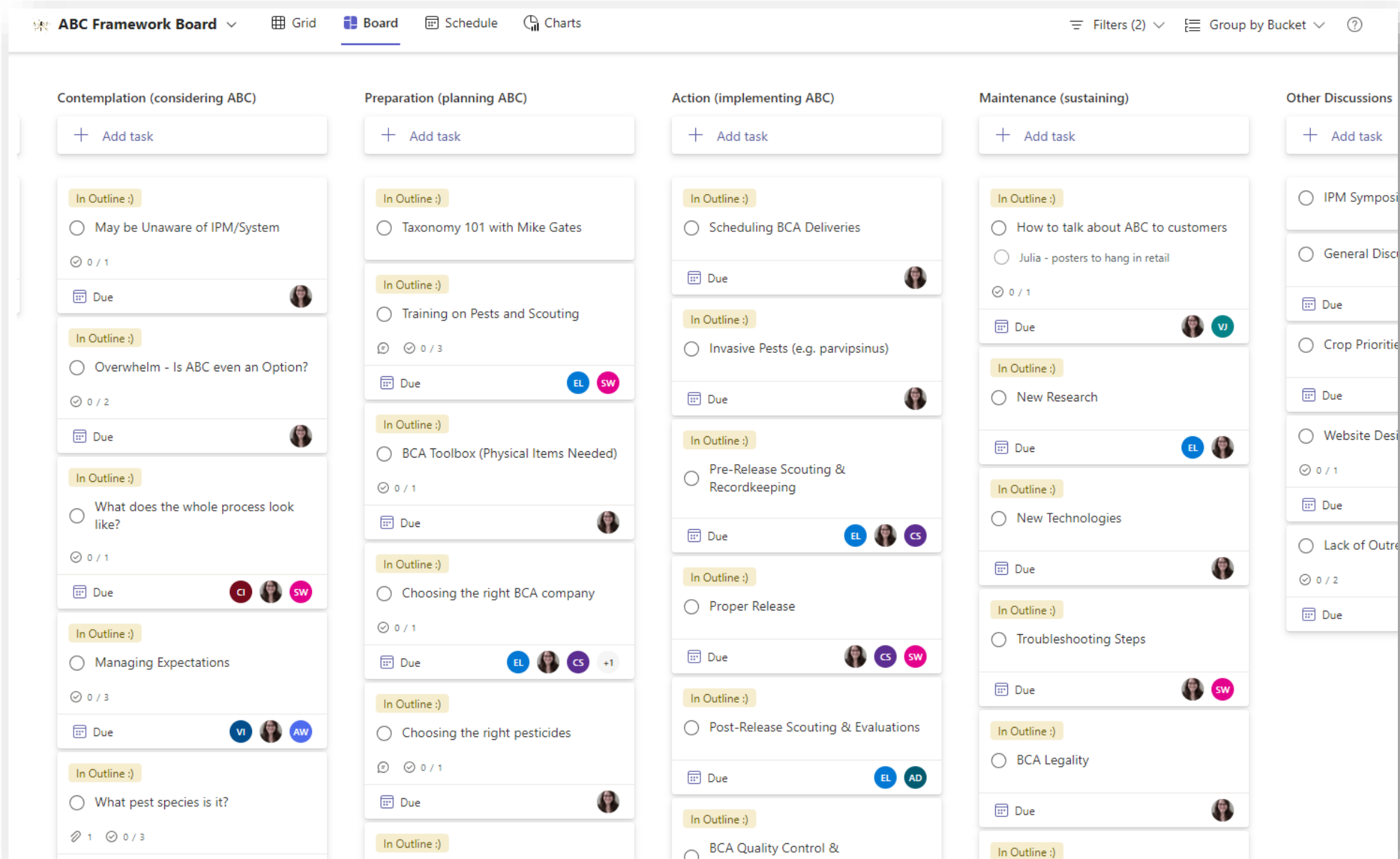
Process

Once per month meetings held

Discussions held within “category cards”

Organizing and consolidation between meetings

Used this system until the conversations started to slow down...



The screenshot shows a Kanban board titled "ABC Framework Board" with the following columns and tasks:

- Contemplation (considering ABC)**
 - Task: May be Unaware of IPM/System (0 / 1)
 - Task: Overwhelm - Is ABC even an Option? (0 / 2)
 - Task: What does the whole process look like? (0 / 1)
 - Task: Managing Expectations (0 / 3)
 - Task: What pest species is it? (1 / 3)
- Preparation (planning ABC)**
 - Task: Taxonomy 101 with Mike Gates (0 / 1)
 - Task: Training on Pests and Scouting (0 / 3)
 - Task: BCA Toolbox (Physical Items Needed) (0 / 1)
 - Task: Choosing the right BCA company (0 / 1)
 - Task: Choosing the right pesticides (0 / 1)
- Action (implementing ABC)**
 - Task: Scheduling BCA Deliveries (Due)
 - Task: Invasive Pests (e.g. parvipisus) (Due)
 - Task: Pre-Release Scouting & Recordkeeping (Due)
 - Task: Proper Release (Due)
 - Task: Post-Release Scouting & Evaluations (Due)
 - Task: BCA Quality Control & (Due)
- Maintenance (sustaining)**
 - Task: How to talk about ABC to customers (0 / 1)
 - Task: Julia - posters to hang in retail (0 / 1)
 - Task: New Research (Due)
 - Task: New Technologies (Due)
 - Task: Troubleshooting Steps (Due)
 - Task: BCA Legality (Due)
- Other Discussions**
 - Task: IPM Symposi (Due)
 - Task: General Disc (Due)
 - Task: Crop Prioritie (Due)
 - Task: Website Desi (0 / 1)
 - Task: Lack of Outre (0 / 2)

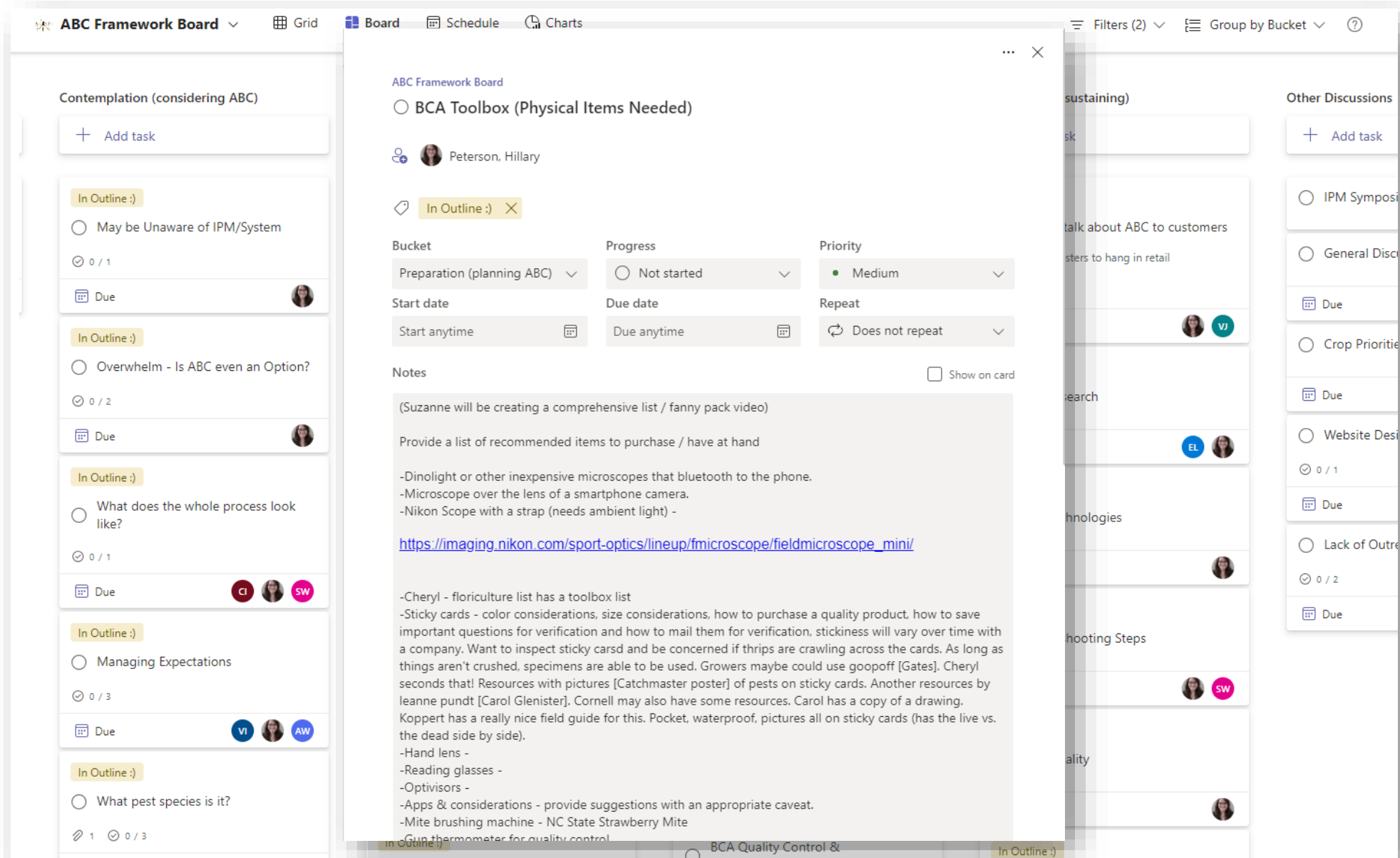
Process

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Used this system until the conversations started to slow down...



The screenshot displays a Trello board for the 'ABC Framework Board'. The board is organized into columns and contains several task cards. A detailed view of a card titled 'BCA Toolbox (Physical Items Needed)' is shown in the center, assigned to 'Peterson, Hillary'. The card includes a 'Bucket' of 'Preparation (planning ABC)', 'Progress' of 'Not started', and 'Priority' of 'Medium'. The 'Notes' section contains a list of items and resources, including a link to Nikon imaging equipment and a list of tools like microscopes and hand lenses. The card also shows a 'Start date' of 'Start anytime', a 'Due date' of 'Due anytime', and a 'Repeat' setting of 'Does not repeat'. The board interface includes filters, group by options, and a sidebar with additional task cards.

What is biocontrol?

Pests and natural enemies might be vertebrates, invertebrates, or microorganisms.



Aphids and ladybugs are a biocontrol example you are probably familiar with. Ladybugs (natural enemies, biocontrol agents) eat the aphids (pests) that might otherwise damage plants.

Types of Biocontrol

- ▲ Conservation biocontrol
- ▲ Classical biocontrol
- ▲ Augmentative biocontrol

Biology Behind Biocontrol



Process

<p>What is Augmentative Biocontrol?</p> <ul style="list-style-type: none">How to assess if relationship with supplier is workingComparing costs of suppliers <p>Step 7: Review and improve systems annually</p> <ul style="list-style-type: none">Are pests controlled by your facility well?Are staff comfortable with using ABC?Where are the hotspots in your system?	<p>Step 1: Assess your current pest management program & needs</p> <h3>Step 1: Assess your current pest management program & needs</h3> <p>Overview</p> <p>In order to implement a new pest management system, you will need to step back and assess how your current pest management system works and look for any inefficiencies and areas to improve. If you have not had an integrated pest management system yet, it is strongly recommended to do so. Here are some broad questions to ask yourself:</p> <p>Do you use integrated pest management?</p> <p>Having an integrated pest management system in place is critical for best outcomes when using augmentative biocontrol. The following pieces should be built into your operations:</p> <p>Monitoring System & Identification</p> <p>Employees need to be trained to know the symptoms of plant stress and the common pests and lesions for each system they are working in. These systems to develop include:</p> <ul style="list-style-type: none">Scouting regularly and systematically (e.g. weekly, in the same order)Recording data the same way each time (e.g. physical or digital database)Track diseases and other lesions on identified property <p>Communication, Recordkeeping, and Assessment</p> <p>It is critical to develop a system to communicate potential pest problems in a facility, starting from issues found during scouting and linked to information about how problems were dealt with and how well it worked. Ideas for communication include:</p>	<p>Step 1: Assess your current pest management program & needs</p> <ul style="list-style-type: none">Issues (e.g. pests, diseases) are always recorded with the date, area, area, etc.Control measures (e.g. pesticide use, plant removal, biological controls) are linked to the issue incidenceThere is not a table each week to discuss issues, control resources, and how well they workedInformation is reviewed annually to look for trends across time (how very you can anticipate seasonal or event-based issues that may arise) <p>Putting it all together</p> <p>Having a system and keeping records can help you to learn, adapt, and predict future problems.</p> <p>Integrated Pest Management Resources:</p> <ul style="list-style-type: none">Critical Questions to Help You Measure Whether Your Problem(s) is/are - UVM Entomology Research LaboratoryPest Management Planning System (PMPS) - Augmentative Biocontrol Working Group <p>What pests do you have? Are they compatible with ABC?</p> <p>Knowing the actual pest species that you are dealing with is ABSOLUTELY critical to a successful ABC program or any pest management program. Common pests included with ABC and resource guides to identify them are available below:</p> <p>Factors to consider:</p> <ul style="list-style-type: none">Price or value of the cropSize of the growAvailability of the biocontrolPlant factors (see below, e.g. trichomes) <p>Issues:</p>	<p>Step 1: Assess your current pest management program & needs</p> <p>Fungus Gnats</p> <p>Thrips</p> <p>Aphids</p> <p>Leaf miners</p> <p>Moth/bugs</p> <p>Mites</p> <p>Scale</p> <p>Whiteflies</p> <p>Challenging</p> <p>Fungus Gnats</p> <p>Thrips</p> <ul style="list-style-type: none">Challenging - this species is awaiting a new biocontrol agent not yet in production (as of 2024) but approval is likely by 2025.Challenging - this species is awaiting a new biocontrol agent not yet in production (as of 2024) but approval is likely by 2025. <p>Aphids</p> <p>Leaf miners</p> <p>Moth/bugs</p> <p>Mites</p> <p>Scale</p>	<p>Step 1: Assess your current pest management program & needs</p> <p>Whiteflies</p> <p>Likely Not Worth a Try</p> <p>Fungus Gnats</p> <p>Thrips</p> <p>Aphids</p> <p>Leaf miners</p> <p>Moth/bugs</p> <p>Mites</p> <p>Scale</p> <p>Whiteflies</p> <p>Know your free biocontrol!</p> <p>Suppliers contain species that they may offer your facility (along with their catalogues) and understanding which species you are most likely to import. They often have developed biocontrol products in some situations. These organisms can find their way into your greenhouse through:</p> <ul style="list-style-type: none">Plug flow from cuttingsOther grow houses <p>The top five threats:</p> <ul style="list-style-type: none">HarlequinSyrphid (brown) flyTomato PinwormWhitefliesOther aphid parasites
<p>Step 2: Assess your current pest management program & needs</p> <ul style="list-style-type: none">Learning about and how toLearnM (learning) website - Home app, E-Book <p>Other:</p> <ul style="list-style-type: none">Pest ID (in place with learning) <p>Learning resources: Pest Identification</p> <ul style="list-style-type: none">Free WebinarsWorkshopsPest ID: The New Way for Growers (2024) - Cerebra and Mery, 2022 <p>What to do when you can't figure out pest identification?</p> <p>Don't fret, insect and other small pest-identifications can be extremely difficult to identify and there is a learning curve. Depending on your location, the following are likely to be available for free or for a low fee. Contact them in your location, an internet search should get you to these services. If you copy/paste the label/picture into a search engine and add your state or location:</p> <ul style="list-style-type: none">State University based or Pathogen Identification Services - typically a service of cooperative education, with staff to replace other availableState Agency Departments including Departments/Divisions of: Agriculture, Plant Health, Disease Control, Agriculture Experiment Stations, Plant Industry, Enforcement, Sustainability, Food Detection, Invasive Species, Nursery, etc. In 2024, many use microscopical searching for your state's department of agriculture website and supporting them there. Good places to start can include looking for integrated pest management programs, best management practices for growers, and IS.Private Laboratories (Paid for Service) - search online for "insect identification testing laboratory" or ask your supplier to find one near you. You may need to search through several pages in many structural pest companies may come up. For a testing process, consider asking IS.INRA ARD Systematic Entomology Laboratory (Swiss & Insect Identification Service)	<p>Step 1: Assess your current pest management program & needs</p> <ul style="list-style-type: none">Biological supplier, growers in your areaThe web <p>What Crops</p> <p>Crops That are</p> <p>Pesticide use</p> <p>Pesticide and</p> <p>Timing of release</p> <ul style="list-style-type: none">ConsiderCheck yourpotentialflow	<p>Step 1: Assess your current pest management program & needs</p> <p>Receiving packages</p> <ul style="list-style-type: none">Work with your staff to determine the best time to handle packages as they arrive. It takes time to receive BCAs, quality check, and release. You do not want live organisms stuck waiting for release or a needed <p>Quality control checks</p> <ul style="list-style-type: none">Company quality control checks - discuss how quality control work at the distributor level with your company repShipment quality - check the date of shipment, it should be fresh (the temperature within the box should be low before opening and should be within the ideal range for the species, which should be provided from the company. For example, Chrysopa have an optimal temperature range of 10-20°C)Quantity - ensure that the quantity received matches what was ordered. This can be checked through weighing package (adding with re-weigh, ensuring the weight of a shipment and comparing with previous shipment weights) and good counting practices to estimate total numbers (e.g. put organisms to do on a grid under a microscope, count all organisms in rows/panels, and multiply by the number of panels)Quality - organisms can die due to improper conditions during shipment. The distributor should provide quality control instructions for each species. Typically, quality control includes inspecting for movement in vials that organisms are alive, and small test-cups to determine if they are behaving properly (e.g. providing a predatory species with a prey under microscope and observing for feeding behavior) <p>Storage</p> <ul style="list-style-type: none">While it is best to use biocontrols immediately or at least within 24 hours of receipt, sometimes it may be necessary to store biocontrols. If this happens, ensure they are at a proper temperature using an infrared heated gas. Storage temperature recommendations should be provided for each species.	<p>Step 3: Build your ABC toolbox & network</p> <p>Receiving packages</p> <p>Meet the BCAs!</p> <p>Learning reviews - weekly, monthly, quarterly, or annually. Success and failure. Open encouragement of feedback responses.</p> <p>Choosing which biocontrol agents to use</p> <p>Meet the BCAs!</p> <p>Initial introduction to the larger category and most commonly used BCAs</p> <p>Interactions between BCAs</p> <p>Purchasing Considerations</p> <ul style="list-style-type: none">Effectiveness in light/low light when you purchase to release <p>Legality of use and import</p> <ul style="list-style-type: none">Ensure how new different available species, and they are not allowed to be shipped over the border (USDA)Purchasing online without working with a company representative could open the door to buying illegal species, sellers that damage the environment by collecting native habitats illegally, and lower quality biocontrol. <p>ABC Toolbox</p>	<p>Step 2: Manage your expectations of augmentative biocontrol</p> <p>While some crops, species of pests, and systems have a long history of success with augmentative biocontrol, others may come with inherent challenges, a lack of adequate research, or a lack of performing (despite doing a lack of businesses having resources available).</p> <p>Crops & Systems Suitable for Augmentative Biocontrol</p> <p>Insect-crop and systems are suitable for ABC, and within this list, some are much easier to implement than others.</p> <p>Challenging</p> <p>Considerations with crops & systems</p> <ul style="list-style-type: none">Plant/Insect/Species - many BCAs require specific host plants. Flowering crops provide nectar and other crops like beans and corn provide extra floral nectar (e.g. nectar, root hairs) and corn leaf beetles, damaging the base of these organisms and reducing their value for your field.Temperature - BCAs will work best at certain temperatures depending on species, this will be informative to gather and compare with the growing conditions at your facility.Light - many BCAs require light to be effective (e.g. Chrysopa)Release - The Critical Role of Timing and Location in Successful Biocontrol and Research (USDA)
<p>Step 3: Build your ABC toolbox & network</p> <p>Step 3: Build your ABC toolbox & network</p> <p>Overview</p> <p>Once you have decided which crop and pest you will target first with augmentative biological control, you can build your "ABC toolbox." This toolbox include:</p> <p>Critical Networking</p> <p>Building a network with other growers</p> <p>Building a network with nearby growers who have had success with augmentative biocontrol can really help you as you troubleshoot. The following list has some ideas on how to connect with other growers:</p> <ul style="list-style-type: none">Area or crop-specific seed delivery options - for example, in Vermont, there is vegetable and berries delivery based by the University of Vermont. University Extension agents in your location should be able to help you find a list.Parish Association - search for farming associations in your location, and if you are in one, consider creating a subcommittee for growers who use augmentative biocontrol.Networking at educational meetings - look for educational meetings and conferences put on by University Extension or State Agricultural agencies. Both may also have email newsletters you can subscribe to for notification of upcoming events. <p>Building a relationship with potential suppliers</p> <ul style="list-style-type: none">First, you need to find what suppliers will ship to your area. A good place to start is the Distributor of Insect/Pathogen Packages (USDA) website.Once you have a list of suppliers to reach out to, you should call and "interview" each to find a supplier to work with. Some considerations when choosing a supplier include:	<p>Step 3: Build your ABC toolbox & network</p> <ul style="list-style-type: none">Cost - In money and risk - Sometimes it is more expensive to get things from a local distributor, but a downside of going online may be longer shipping times and differences in understanding local environmental factors.Producers vs. Distributors - do they produce biocontrol, or are they a "middleman" (do they provide logistical support)?Are they easy to reach through different methods (phone, text, email, etc.)?Reliability - it is essential to have a central relationship with your supplier. Few of communication and reaching out of communication is an important piece of this decision. <p>Develop a relationship with shipping services (e.g. FedEx, UPS, etc.)</p> <ul style="list-style-type: none">If you can figure out which service will be shipping your bin, it may be good to have a discussion with your carrier about shipping. <p>Standard operating procedures for staff</p> <p>Posting program & pest identification resources</p> <ul style="list-style-type: none">Pest ID guide (in place with learning)Pest ID (in place with learning) <p>Monitoring and recordkeeping system</p> <ul style="list-style-type: none">In-house made systems (e.g. Pest ID app, Pest ID app, etc.)Purchase systems several according to your needs, way or may not work. Ensure you have the pricing plan and it will work for your facility. Work with companies and request a reduced-cost plan for the first few months before committing to big costs.	<p>Step 3: Build your ABC toolbox & network</p> <p>Receiving packages</p> <ul style="list-style-type: none">Work with your staff to determine the best time to handle packages as they arrive. It takes time to receive BCAs, quality check, and release. You do not want live organisms stuck waiting for release or a needed <p>Quality control checks</p> <ul style="list-style-type: none">Company quality control checks - discuss how quality control work at the distributor level with your company repShipment quality - check the date of shipment, it should be fresh (the temperature within the box should be low before opening and should be within the ideal range for the species, which should be provided from the company. For example, Chrysopa have an optimal temperature range of 10-20°C)Quantity - ensure that the quantity received matches what was ordered. This can be checked through weighing package (adding with re-weigh, ensuring the weight of a shipment and comparing with previous shipment weights) and good counting practices to estimate total numbers (e.g. put organisms to do on a grid under a microscope, count all organisms in rows/panels, and multiply by the number of panels)Quality - organisms can die due to improper conditions during shipment. The distributor should provide quality control instructions for each species. Typically, quality control includes inspecting for movement in vials that organisms are alive, and small test-cups to determine if they are behaving properly (e.g. providing a predatory species with a prey under microscope and observing for feeding behavior) <p>Storage</p> <ul style="list-style-type: none">While it is best to use biocontrols immediately or at least within 24 hours of receipt, sometimes it may be necessary to store biocontrols. 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Some things below are "ready to go", while others may require a little more creativity and thought.</p> <p>Ready to go purchasing list</p> <p>(these are just examples, we do not endorse any particular products here)</p> <ul style="list-style-type: none">Final Scouting & Identification Guide<ul style="list-style-type: none">Identification Guide and keysSome Previous Field Guide to the Insects of North AmericaField Guide<ul style="list-style-type: none">Field Guide - for buying pests onlyField Guide - for buying pests onlyField Guide - for buying pests onlyMicroscope - many options exist at different price points<ul style="list-style-type: none">100x or 200x with Microscope (e.g. Qimac)200x or 400x with Microscope or Pest ID (e.g. Pest ID Microscope)Parity Pack<ul style="list-style-type: none">Soft-touch tweezers - can be found online, or can be part of a pest ID kit using this templateABC Quality Control<ul style="list-style-type: none">Get There faster (e.g. Pest ID) <p>"DIY" ABC Solutions</p> <ul style="list-style-type: none">Releasing containers - some species of ABC can be reared to release even they have been reared, Pest ID Pest ID boxes, which can be reared from their own old biocontrol control
<p>Step 3: Build your ABC toolbox & network</p> <p>Drafted augmentative biocontrol budget</p> <p>One-time purchases</p>	<p>Step 4: Prepare your facility and staff</p> <p>Step 4: Prepare your facility and staff</p>	<p>Step 4: Prepare your facility and staff</p> <ul style="list-style-type: none">Ask your company representative if deployment instructions will be shipped along with the biocontrols, or otherwise, if they are willing to create and demonstrate to you, it can be done with biocontrol, create control boxes, use, check, and instructions are here!	<p>Step 5: Begin ABC in one crop</p> <p>Step 5: Begin ABC in one crop</p>	<p>Step 5: Begin ABC in one crop</p> <ul style="list-style-type: none">Post-release scouting should be incorporated into database / systems used for pest scouting as well. <p>Assess Your Program Regularly</p>

We now have a 32 page (and counting) "Website Content Model" Many steps...

So, what do the steps look like?



So, what do some steps look like?

1

Assess your
current pest
management
program &
needs

- Does the grower have an integrated pest management program?
 - Do they scout regularly and systematically?
 - Do they take records and review them?
- How is communication throughout the facility?
- Which pests do the grower deal with?
 - Are they compatible with biocontrol?
 - How to find identification help and resources



So, what do the steps look like?

3

**Build your
ABC toolbox
& network**

- Building a network with other growers who use ABC
 - Do we need to make one??
- Building a relationship with suppliers
 - Worksheet- interviewing suppliers!
- Developing SOPs for staff
- Building an ABC Toolbox
 - Physical – sticky cards, clipboards, hand lens, microscope, fanny packs, soft touch forceps...
 - DIY Solutions – rearing containers
- Budgets



So, what do the steps look like?

4

**Prepare your
facility and
staff**

- Prepare a weekly schedule incorporating new ABC related tasks and expected times for each task. Some examples include:
 - Scouting for pests and evidence of biocontrol success
 - Receiving biocontrols in the mail and processing shipments
 - Backup plans for delayed shipments
 - Quality control assessment of shipments
 - Release of biocontrols
 - Data assessments – inspecting scouting data for trends over time to determine what is working and what is not working
 - Troubleshooting
- Practice deployment methods
- Discuss how biocontrol will be communicated to customers



Next Steps...

1. Website Content Model Development

Working weekly to flush out the details of the website content mode;

2. Grower Feedback (Round 1)!

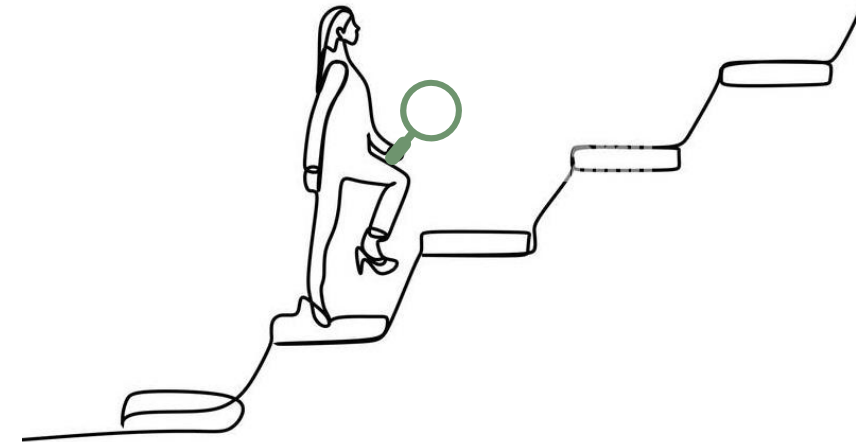
Host a virtual meeting with *experienced ABC growers* to gain insights and feedback. Continue to develop the website content model.

1. Augmentative Biocontrol Conference (Grower Feedback Round 2)!

Apply for funds to host a larger in-person conference to develop these materials even further. ABC Working Group members would present each of the materials we have, background to those materials, and get even further feedback. These presentations could be recorded and eventually used on the webpages as well.

2. Website Development & Outreach

More funding would be obtained to pay the website developers to add our materials to their site, and we would present about the site at conferences, workshops, etc.



Questions?



Some Questions for you



Upcoming Webinars

<https://www.northeastipm.org/ipm-in-action/the-ipm-toolbox/>

<https://www.northeastipm.org/ipm-in-action/deij-in-ipm/>

DEI in IPM Panel Discussion

October 29, 2024, at 2:00 p.m. (EDT)

Presenters: Dr. Antomia “Mia” Farrell, Dr. Quatez Scott, Dr. Jacquelyn Mosley, Dr. Anna Katharine Mansfield

Bee Breeding and IPM for Better Pollinator Health

November 20, 2024, 11:00 a.m.

Presenter: Dr. Hongmei Li-Byarlay

Weather Apps

February 18, 2025, 11:00am

Presenters: Dan Olmstead and Glen Koehler



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Land Acknowledgment

The Northeastern IPM Center is based at Cornell University in Ithaca, New York.

Cornell University is located on the traditional homelands of the Gayogohó:nq' (the Cayuga Nation). The Gayogohó:nq' are members of the Haudenosaunee Confederacy, an alliance of six sovereign Nations with a historic and contemporary presence on this land. The Confederacy precedes the establishment of Cornell University, New York state, and the United States of America. We acknowledge the painful history of Gayogohó:nq' dispossession, and honor the ongoing connection of Gayogohó:nq' people, past and present, to these lands and waters.

This land acknowledgment has been reviewed and approved by the traditional Gayogohó:nq' leadership.



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