INTEGRATED PEST MANAGEMENT

Insights

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Integrated Pest Management

Northeastern IPM Center

Insights

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Inside

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IPM Education at Vermont's Largest Greenhouse Facility

By Lori King, IPM manager, Claussen's Florist, Greenhouse & Perennial Farm

I first learned about using Integrated Pest Management (IPM) in greenhouses about 25 years ago through the Tri-State Greenhouse IPM Workshops offered by the University of Vermont (UVM), Entomology Research Laboratory. IPM is the practice of using a combination of strategies, like natural predators (biocontrols), to prevent and manage pests while minimizing the use of chemical pesticides. Learning about using natural predators to combat the pest problems was exciting and a new alternative approach to relying solely on chemicals. There are several advantages to using biocontrols: They are safer for employees and customers and better for the environment.

These pots contain alyssum and peppers that give food and shelter for the *Orius* predatory bug. Photo: Lori King.

After attending the initial workshops, we decided to develop and implement a biocontrol program at Claussen's Florist, Greenhouse & Perennial Farm in Colchester, VT. Our facility spans 500,000 square feet when in full production. Since opening our doors in 1972, we had relied exclusively on chemical pest control until adopting biocontrols.

Educating our staff about biocontrols remains a top priority. Each year, I conduct a "Show-and-Tell" meeting with new employees to explain the biocontrol program. This includes identifying natural predators, recognizing parasitized pests, and understanding the time frames for different processes. We emphasize that a few pests must remain to sustain the biocontrols, and if necessary, we use soft chemicals as a last resort.

Banker Baskets

A key part of our IPM program is the use of "banker baskets." These are mobile, open rearing systems for natural predators. One type of banker system we use involves the *Aphidius* wasp, which targets aphids. This system begins by introducing bird cherry-oat aphids on organic wheat, barley, or rye in newly planted baskets. Once these aphids populate the baskets, we place them in the greenhouse, where *Aphidius* wasps feed on and reproduce with the pest aphids. Within two weeks, new wasps emerge and search for additional pests. To prevent the aphids from spreading to monocot plants, we hang the banker baskets away from these crops.

Greenhouse

Continued from Cover Page

After several unsuccessful attempts to rear these baskets within our greenhouses—due to the efficiency of *Aphidius* in collapsing the system too quickly—we partnered with the local high school's Vocational Department of Natural Resources. Now, high school students create and maintain the banker baskets. Each week, fresh baskets are delivered to Claussen's, allowing students to learn about biocontrols and the predator-prey relationship. At the end of the school year, students tour our facility to see their banker baskets in action, offering them firsthand experience with alternative pest management methods.

The *Aphidius* banker basket system. Photo: Lori King.

We also use banker baskets made of *Lobularia* (alyssum) or a combination of *Lobularia* and Purple Flash pepper to support the *Orius* predatory bug. *Orius* is a generalist predator that consumes various pests and can sustain itself on *Lobularia* and pepper pollen when pest populations are low. Informational picture signs are displayed on all banker baskets to educate customers about the biocontrol process, providing them with a chance to see the process in action!

Growing banker baskets offers many benefits. They provide a continuous supply of natural predators to manage pests. When pest populations are low, the banker baskets sustain the biocontrols, ensuring a consistent presence throughout the growing season. Additionally, these baskets attract other beneficial insects that further aid in pest control.

Beyond our partnership with high school students, we offer facility tours and educational programs on biocontrols for students of all ages, from elementary to college. Each spring, I also host a "Grower to Grower" tour for local growers. We discuss current greenhouse conditions, pest issues, scouting methods, and biocontrol strategies. A specialist from the UVM Entomology Research Lab and a biocontrol representative often co-host the tour, providing additional expertise. In addition, I host public "Behind the Scenes" tours, allowing customers and visitors to explore our facility, learn about biocontrols, and observe live specimens in our banker baskets. I am proud to participate in UVM's Tri-State Greenhouse IPM Workshop as an active speaker, sharing my IPM experiences with growers from Vermont, New Hampshire, and Maine. I also enjoy traveling to other greenhouses to share my knowledge and promote IPM and biocontrol.

Since implementing biocontrol at Claussen's nearly two decades ago, we have reduced our chemical usage by 90 percent.

Signs inform greenshouse customers about the biocontrol process. Photo: Lori King.

I am deeply grateful to Cheryl Frank Sullivan and Margaret Skinner of the UVM Entomology Research Lab for their invaluable support and to Chris Conant for trusting me to develop Claussen's successful biocontrol program.

Lori King

Lori King, IPM manager, Claussen's Florist, Greenhouse & Perennial Farm (www.claussens.com), received the *Outstanding Achievements in Integrated Pest Management Award* from the Northeastern IPM Center in 2022. The annual award, launched in 2019, recognizes individuals or organizations whose work on IPM in the Northeast deserves special recognition.

More details can be found at neipmc.org/go/ApbM.

Herbicide-Resistant Weeds in the Northeast: An Urgent Call for Integrated Weed Management

By Preetaman Bajwa, Vipan Kumar, and Antonio DiTommaso – Soil and Crop Sciences Section, School of Integrative Plant Science, Cornell University

Weeds are among the most persistent and damaging pests in agricultural systems that compete with crops for essential resources such as light, water, space, and nutrients. Uncontrolled weed infestations pose a major threat to sustainable agricultural production since they can cause significant yield losses and increased production costs. In the United States, weeds have the potential to reduce annual corn and soybean yields by 50 percent and 37 percent, respectively. The rapid spread of herbicide-resistant weed populations during the last decade has brought additional challenges to weed management. This situation has highlighted that reliance on herbicides alone is no longer a sustainable long-term strategy for managing weeds.

Herbicide resistance occurs when a weed population develops the ability to survive herbicide applications that previously controlled it. The primary cause of resistance is repeated application of the same herbicide or herbicide mode of action, which applies strong selection pressure on weed populations. Over time, resistant individuals survive and reproduce, leading to a resistant population. The use of herbicides is a key tool for managing weeds in field crops as evident by the fact that 96 percent of U.S. corn and soybean acreage receives herbicide applications annually. The overreliance of herbicides in field crops has been in part due to the introduction of herbicide-resistant crop traits (e.g., Roundup Ready crops), which has facilitated the use of broad-spectrum products like glyphosate (Roundup PowerMax® or similar brands). Prior to the introduction of glyphosate-resistant crops in 1996, farmers used a range of preemergence (PRE) and selective postemergence (POST) herbicides with distinct modes of action to manage weeds. This overreliance on a single or relatively few herbicide modes of action has led to a substantial increase in the number of herbicide-resistant weed populations. Globally, there are over 534 documented unique cases of herbicide-resistant weed populations, involving 273 weed species across 75 countries (www.weedscience.org). In the United States alone, over 160 herbicide-resistant weed populations have been confirmed. In the Northeast, particularly in New York State, herbicide resistance among weed populations is becoming a serious and growing concern.

In New York State, common lambsquarters (*Chenopodium album* L.), common ragweed (*Ambrosia artemisiifolia* L.), and common groundsel (*Senecio vulgaris* L.) populations have confirmed resistance to atrazine (a major corn herbicide). Additionally, horseweed [*Conyza canadensis* (L.) Cronq.] populations from orchards have shown resistance to paraquat, and

Waterhemp [*Amaranthus tuberculatus* (Moq.) Sauer]. Photo: Vipan Kumar.

current research at Cornell University suggests that horseweed populations in soybeans are potentially resistant to glyphosate and chlorimuron-ethyl + thifensulfuron-methyl (Synchrony® XP). Preliminary research at Cornell has also identified a few annual ryegrass (*Lolium multiflorum*) populations from New York wheat fields with high level resistance to glyphosate. Most recently, two highly problematic pigweeds from the Midwest and southeastern United States, Palmer amaranth (*Amaranthus palmeri* S. Watson) and waterhemp [*Amaranthus tuberculatus* (Moq.) Sauer] have also been found in the Northeast, including New York State. Since first identified in 2014, waterhemp has rapidly spread to 23 counties in New York State. Both waterhemp and Palmer amaranth populations in New York State have been confirmed resistant to glyphosate. In addition, some of these selected waterhemp and Palmer amaranth populations

have also shown multiple resistance to atrazine, mesotrione, and chlorimuron-ethyl + thifensulfuron-methyl. These recently established herbicide-resistant pigweeds are not only a serious threat to corn and soybean production but also to various vegetables and specialty crops in the rotation. These new weeds to the region can cause substantial crop yield losses and increase the need for costly management strategies.

Integrated Weed Management

All these recent reports of herbicide-resistant weed populations in the northeastern region of the United States highlight the urgent need to adopt an Integrated Weed Management (IWM) approach that combines multiple control tactics to manage these weed populations. The foundational concept of IWM adoption aims to reduce selection pressure from any one control method, thereby preserving the effectiveness of existing herbicides while improving long-term weed suppression. Some of the IWM tools currently being investigated in New York include:

- Cultural practices such as narrow row spacing and crop rotation to disrupt weed life cycles and increase crop competitiveness.
- Cover cropping, particularly planting cereal rye, which provides early-season weed suppression through shading and allelopathy.
- Mechanical tools, including inter-row mowing and electric weeders, which target weeds that escape chemical control.
- Precision sprayers and laser weeders that target site-specific weed control in high value specialty crops.
- Seed impact mills, mounted on commercial combines that destroy weed seeds at harvest and help prevent seedbank replenishment.
- Diversified herbicide programs, including rotating herbicide modes of action and applying effective PRE herbicides with residual activity.

While many of these strategies are being assessed at Cornell by colleagues, Vipan Kumar, Lynn Sosnoskie, Matt Ryan, and Bryan Brown, interest from farmers is increasing as awareness of herbicide resistance grows. For example, northeastern U.S. states have among the highest rates of cover crop adoption in the nation. Between 2012 and 2017, cover crop adoption (excluding alfalfa) increased by 24 percent in Maryland to 115 percent in Vermont. By 2017, cover crops were adopted on 32.6 percent of cropland in Maryland, 16.9 percent in Pennsylvania, 10.3 percent in Vermont, and 9.2 percent in New York, exceeding the national average of 5.1 percent. Despite these gains, the adoption of newer non-chemical

Palmer amaranth (*Amaranthus palmeri* S. Watson). Photo: Vipan Kumar.

tools such as seed impact mills and electric weeders remains limited in the Northeast. This is partly due to a lack of weed-specific efficacy knowledge or technical know-how, but likely to the relatively high upfront costs for this equipment. For example, at present, there are only 50 farms in the country that have seed impact mills, whose cost is around $75,000. Similarly, the cost of electric weeders ranges from $78,000 to $90,000, making them a substantial investment. It is hoped that costs for these pieces of equipment will decrease in the future with advancement in technology and competition among different manufacturers.

Although herbicides are often viewed by growers as more convenient, requiring less time and management compared with alternative non-chemical options, the ever-increasing threat of herbicide-resistant weeds in the Northeast will necessitate the use of alternate strategies for their management. Relying entirely on herbicides will possibly be no longer a viable approach because weeds such as Palmer amaranth, waterhemp, horseweed, and annual ryegrass continue to spread and evolve resistance to additional herbicides. IWM provides an effective and flexible approach that combines cultural, mechanical, and chemical tactics to manage weeds more sustainably.

Many IWM practices are now moving from experimental research plots to actual farms thanks to researcher and outreach educator efforts and greater farmer engagement. Continued collaboration between these groups is essential for increasing the adoption of these practices and developing regionally adapted solutions. The key takeaway is that a diversified weed management approach based on regional conditions and cropping systems is essential for preserving the efficacy of current herbicides, minimizing resistance development, and maintaining long-term agricultural productivity and profitability of farmers in the Northeast.

Antonio DiTommaso

Antonio DiTommaso, Professor, School of Plant Science, Cornell University, received the *Outstanding Achievements in Integrated Pest Management Award* from the Northeastern IPM Center in 2025. The annual award, launched in 2019, recognizes individuals or organizations whose work on IPM in the Northeast deserves special recognition.

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A Promising New Pesticide for Bed Bugs

By Susannah Krysko, M.S., Northeastern IPM Center

Recent research from the Department of Entomology at Rutgers, The State University of New Jersey, has revealed a long-awaited new pesticide for treating bed bug (*Cimex lectularius* L.) infestations shows promise. Since their resurgence across the country in the early 2000s, bed bugs have posed significant challenges to the pest control industry due to their secretive behavior and growing resistance to insecticides. In some cases, bed bug populations in multi-unit housing have been repeatedly exposed to the same chemicals for over a decade. Currently, registered chemical pesticides for bed bugs have limited effectiveness, leaving pest management professionals with few options, especially for resistant populations.

According to the study, the insecticide isocycloseram, which belongs to the isoxazoline class, exhibits excellent efficacy against bed bugs. Researchers tested two formulations (400 SC and 45 SC), both of which proved highly effective, with the 45 SC performing slightly better. They resulted in faster mortality rates among resistant populations and outperformed five commercially available insecticides typically used for bed bug treatments. Notably, the 45 SC formulation, when applied at a rate of 0.1 percent, was the only insecticide in the experiment that achieved 100 percent mortality after it aged on substrates for 30 days.

While this development marks a significant advancement in bed bug management, it should not be viewed as a silver bullet solution. Other studies suggest that bed bugs in the field may develop reduced sensitivity to isocycloseram due to regular pesticide exposure, which can trigger the expression of various detoxification genes. Therefore, it is crucial to adhere to the basic principles of integrated pest management (IPM) even when using this product. This includes rotating among different classes of insecticides and incorporating non-chemical methods to help delay the onset of insecticide resistance.

Close-up of an adult bed bug. Photo: Susannah Krysko.

According to researchers, insecticide treatment will likely remain the primary method for controlling bed bugs in the future, due to the low cost and ease of application compared to non-chemical methods. The development of new insecticides and advanced formulations is essential. The high efficacy of isocycloseram demonstrated in this study indicates that it could significantly enhance future bed bug management, if and when it becomes commercially available.

Further Reading

Pan, X.; Sarker, S; Wang, C. Laboratory Evaluation of a Novel Insecticide, Isocycloseram, Against the Common Bed Bug (*Cimex lectularius* L.) (Hemiptera: Cimicidae). *Insects*. 2025; 16(2):200. doi.org/10.3390/insects16020200

11th International IPM Symposium

March 3–6, 2025, San Diego, CA

An impressive collaboration of IPM researchers, educators, and practitioners joined together for an outstanding conference, the 11th International IPM Symposium (ipmsymposium.org/2025/). The IPM Institute, Regional IPM Centers, state IPM coordinators, and many state and federal agencies, practitioners, and nonprofit organizations were deeply involved in the organizing of the event.

Most U.S. Department of Agriculture and other federal agency employees who had registered were unable to attend due to recently announced travel restrictions, but otherwise the conference unfolded without any major mishaps.

We heard presentations that included housing IPM, biocontrol, public outreach, and examples of every IPM effort imaginable. We were honored to welcome knowledgeable speakers from all over the world.

Here are some quick stats:

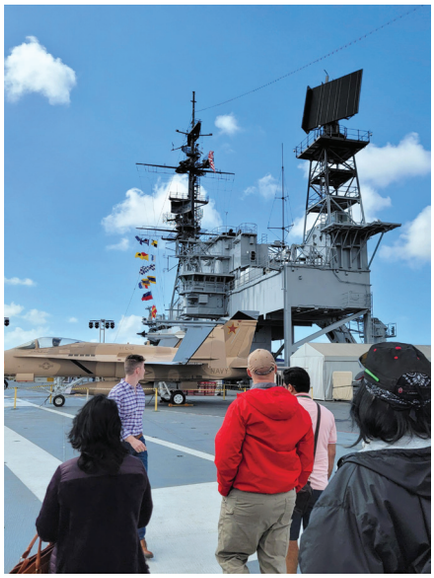
About 470 people registered for the symposium and 417 attended. That's up from the COVID-impacted Denver symposium, but down from earlier editions of the meeting. Attendees came from 11 countries, including Canada, China, India, Israel, Japan, Mexico, Pakistan, Philippines, Switzerland, Thailand, and the United States, including Puerto Rico.

IPM professionals made 168 presentations and exhibited 86 posters, and 20 exhibitors set up booths in the main exhibit hall.

Conversations after presentations, in the hallways or over lunch were too numerous to count but animated and excited about the conference and the work it represented.

I am sure that I am joined by co-chairs Dr. Dawn Gouge, Ms. Janet Hurley, and Ms. Shannah Whithaus in thanking the team that made the conference possible and also our participants who made it come alive!

Many thanks to Steve Elliot, Western IPM Center, for sharing his article about the Symposium.



A tour of the USS *Midway* Museum was led by active-duty Navy personnel and showcased the shipboard IPM practices. Photo: Jerrie Haines.

Alma R. Galván, M.H.C., of the Migrant Clinicians Network, shared the strategies her organization uses to reach farmworkers with pesticide, health, and safety information. Photo: Susannah Krysko.

The field trip to University of California San Diego campus began with a tour of a pesticide storage facility and a discussion of the process used to determine when pesticide applications are necessary on campus. Photo: Shannah Whithaus.

A tour of a University of California San Diego art installation called Fallen Star (Do Ho Suh, 2012) showed how pests are controlled on this and other living roofs around campus. Photo: Shannah Whithaus.

Northeastern IPM Center Announces Recipients of 2025 Partnership Grants

Annual grant program supports IPM research and extension in the Northeast

The Northeastern Integrated Pest Management (IPM) Center has announced the recipients of its 2025 Partnership Grants.

Each year, through a competitive request-for-applications (RFA) process, the Center's IPM Partnership Grants Program distributes funding to projects that further the mission of the Center, address or identify IPM priorities for the Northeast, and benefit the region at large. The total pool of available funding for 2025 projects was $160,000, generally with a maximum of $40,000 per award.

Each funded project falls under one of three categories: **applied research**, **communications**, and **working groups**.

This Year's Funded Projects by Category

Applied Research

- **Seedborne Disease Screening on Organic Dry Beans in the Northeast** (*Heather Darby, Agronomist and Nutrient Management Specialist – University of Vermont and State Agricultural College)*

- **Optimizing IPM Tools To Manage Anthracnose Crown Rot of Strawberry in the Northeast** (*Nathaniel Westrick, Assistant Agricultural Scientist – Connecticut Agricultural Experiment Station*)

Communications

- **Development and Circulation of Novel Pollinator Education Resources for the Northeast** (*Jason Lanier, Extension Specialist and Group Leader, Commercial Horticulture | Nicole Bell, Extension Pollinator Specialist – University of Massachusetts Amherst*)

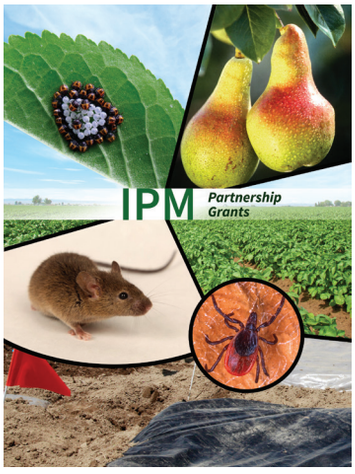
Working Group

- **Sweet Corn IPM Working Group** (*Kelly Hamby, Associate Professor and Extension Specialist of Sustainable Agroecosystems Entomology – University of Maryland*)

About the Projects

Seedborne Disease Screening on Organic Dry Beans in the Northeast

Dry beans (*Phaseolus* spp.) are well suited for the Northeast as they serve as a great addition to grain rotations and are a highly marketable crop. However, due to climate change, weather conditions in the Northeast are becoming more suitable for disease outbreaks. Approximately 50 percent of the major dry bean pathogens can be seedborne or seed transmitted (Loria 2021). This is particularly concerning for organic dry bean growers in the Northeast that rely on saved seed for planting future crops. There has not been a dry bean seedborne pathogen assessment conducted in the Northeast to better understand the prevalence of these pathogens, along with other seedborne pathogens whose incidence may be increasing with climate change. In order for researchers and extension staff to better understand the issues organic dry bean growers are facing in this region we will evaluate seed lots from organic farms throughout the Northeast to determine which seedborne pathogens are posing the highest risk.



Optimizing IPM Tools To Manage Anthracnose Crown Rot of Strawberry in the Northeast

Historically, cold northern winters have protected the region's strawberry crop from many pathogens, but in 2023 an outbreak of strawberry anthracnose crown rot (ACR) in Connecticut, caused by the fungus *Colletotrichum siamense*, led to major crop losses. While common in the southeastern United States, ACR poses new challenges in the Northeast due to different farming practices and the susceptibility of regional varieties. The first step in addressing this knowledge gap is to assess the utility of pre-plant fungicide dips as a simple and cost-effective method to eliminate/reduce pathogen populations in nursery material as a form of exclusion. The next critical step is the selection of tolerant and/or resistant strawberry varieties, given that genetic resistance is incredibly effective for disease management, but no information on ACR susceptibility is available for commercially available northern varieties. Finally, the year in which serious disease was first observed in Connecticut coincided with the outbreak of climate-change driven wildfires. Preliminary studies have shown that the pathogen exclusively sporulates in darkness, raising questions about the role that increased rain and wildfire events which block the sun may play on the effective management of ACR.

Development and Circulation of Novel Pollinator Education Resources for the Northeast

Pollinators are essential to environmental and ecological health, as 87 percent of flowering plant species and 70 percent of crops rely on animal-mediated pollination services. Urban environments pose unique risks to pollinators, including habi-

Partnership Grants

Continued from Page 7

tat loss and fragmentation, and urbanization is only projected to increase in the coming years. Research indicates that pollinators are experiencing declines, but we also know that urban green spaces can function as a refuge for pollinator groups. Moreover, urban green spaces provide important social benefits and fulfillment of socio-cultural needs, but pollination needs are not met in 27 percent of urban farm systems. This project will create and disseminate educational materials and practical management guidelines through collaboration with New England universities and other partner organizations to maximize native pollinator health and abundance in urban and semi-urban areas throughout New England.

Sweet Corn IPM Working Group

Sweet corn's taste and versatility make it a favorite among consumers and an essential (ranks second for harvested acres) vegetable crop for U.S. food systems. Insect, weed, and pathogen pests reduce marketable yield and increase management costs. Management efforts also may pose risks to human health and the environment, risks that can be mitigated through the adoption of Integrated Pest Management (IPM). This project will help sweet corn producers remain economically viable and encourage them to adopt IPM by improving interdisciplinary collaboration and coordination among professionals working in sweet corn. We anticipate this working group will engage additional sweet corn producers beyond those who already participate in our extension programming, encourage the use of production guides, increase IPM adoption, and lead to new collaborations and extension resources. Ultimately, stakeholders will be more successful managing pests of sweet corn, and capacity for meeting needs in sweet corn will also be expanded through these efforts.

About the Partnership Grants Program

To learn more about the IPM Partnership Grants Program, visit neipmc.org/go/bfgs.

To receive Center news and announcements, including information about the Partnership Grants RFA, please sign up for our e-mail list and follow us on social media at www.northeastipm.org/about-us/contact/.

Northeastern IPM Center Announces 2025 IPM Award Winners

The Northeastern Integrated Pest Management (IPM) Center has announced the winners of its 2025 *Outstanding Achievements in Integrated Pest Management Award*:

- **Antonio DiTommaso**, Professor, SIPS, Cornell University

- **Ajay Giri**, Ph.D. student, UMass Stockbridge School of Agriculture

- **GROW (Getting Rid of Weeds)**, College of Agriculture & Natural Resources, University of Delaware (group award)

- **Leonardo D. Salgado**, Ph.D. student, Department of Entomology, Cornell University

- **Abby Seaman**, Associate Director of Agricultural IPM and the Vegetable IPM Coordinator, NYS IPM, Cornell University

The annual award, launched in 2019, honors those whose work on IPM in the Northeast deserve special recognition. Professionals (or organizations) and students are eligible. Nominations come from colleagues, advisors, supervisors, and others familiar with the nominees' work. External reviewers with expertise in IPM evaluate the nominees.

Each winner receives $500 and agrees to provide a story and/or host a webinar for the Center.

For more information about the criteria and nomination process, see last year's call for nominations at neipmc.org/go/FdNt.

Look for the Center to release the next call for nominations later this year. Sign up to receive our newsletters or follow us on social media by visiting www.northeastipm.org/about-us/contact/.

Northeastern IPM Center

Credits

IPM Insights: Deborah G. Grantham, Director; Kevin Judd, Designer. **Northeastern IPM Center:** Deborah G. Grantham, Jerrie Haines, Jana Hexter, Kevin Judd, Susannah Krysko, David Lane, Mike Webb.

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