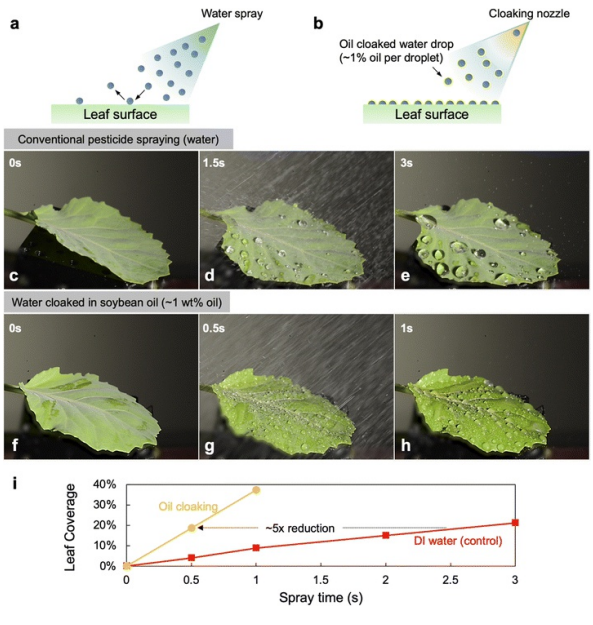
Tribal Pesticide Program Council Summer 2025

## Pesticide Usage and New Technology

New technology surrounding pesticide application is focused on reducing environmental impacts, making spraying more efficient and precise, and helping farmers save money. The following highlights a few of these newer advances being made. One development involves new research out of Massachusetts Institute of Technology (MIT) where they developed a way to coat pesticide droplets to make them adhere better to plants. Another advancement looks at drones and highlights the work of Guardian Ag. Finally, site-specific applications will be covered looking at map-based and sensor-based approaches.

### Oil-Cloaked Droplets

An issue that arises when it comes to pesticides is spray waste and pollution from runoff. When pesticides are sprayed on plants, a significant portion of the product can bounce off leaves because many are water repellent. New technology developed by MIT researchers allows for the pesticide droplet to be coated in a super thin layer of oil, making up less than 1% of the droplet's volume. The MIT researchers found that when the oil-coated droplet is sprayed, rather than bounce off when it hits the leaf surface, the droplets spread out and cling to the surface, increasing the adhesiveness of the pesticide by as much as a hundredfold.




From Jayaprakash et al., 2025: https://pubs.rsc.org/en/content/articlehtml/2025/sm/d4sm01496k

The MIT researchers formed a company called AgZen to commercialize the technology. They initially used soybean oil for the coating, but after market testing switched to common pesticide additives called adjuvants because farmers were already using them and didn't need to add new products into the mix. The

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only additional requirement for farmers to implement this is to add a specialized nozzle. This nozzle adds the coating and is easily adapted to a farmer's existing sprayer. Farmers can save money as they are using pesticides more efficiently allowing more of the product to stick to the plant. Incorporating the coating also results in the reduction in run off and overuse by farmers, leading to a significant reduction in environmental impacts.

**Drones**

A drone is a remotely piloted aircraft that can vary in size but is smaller than a traditional aircraft. Drones can be used for aerial pesticide spraying, especially in areas where the topography makes it difficult for a fixed-wing aircraft to access and where other conventional methods of spraying are neither safe nor practical, although currently this is more common outside the United States. Drones are safer than traditional agricultural aviation which requires a pilot to fly extremely close to the ground at high speeds. In addition, drones allow for more precise spraying and increase efficiency. Depending on the type of nozzle, how fast the drone is flying, and the application rate, it is possible to significantly reduce spray drift.

One company, Guardian Ag, focuses on building drones for aerial pesticide spraying on commercial farms. Using carbon fiber and aerospace grade aluminum, their drones are lightweight and durable, with an 18-foot spray radius and a 30 gallons per minute (GPM) pump allowing them to spray close to the canopy while minimizing drift. When it comes time to administer the pesticides, the operator arrives about 30 minutes before they want to spray, mixes the product, uses an app on their phone to plan out flight paths for the field, and it gives an estimate for how long the job will take. The system is designed to be easy, so that applicators can make the shift from spraying with a tractor to spraying with a drone with a minimal learning curve. With growing demand for this technology, Guardian Ag and other companies are refining their products and increasing production, hoping to shape the agricultural landscape when it comes to aerial spraying by using less pesticides, lowering the impact on the environment, and reducing costs.

**Precision Agriculture**

Site-specific pesticide application is a method of applying the pesticides only where they are needed. Some areas of a field may have different levels of infestation and require different types of pesticides and in different amounts. Rather than spraying an entire field, this approach uses a variety of variables to assess the needs of different zones. It can incorporate GIS mapping, remote sensing, smart sprayers, soil and pest sensors, prescription maps, and autonomous machinery.

One approach to site-specific application is map-based. This method uses maps to represent spray and no-spray zones based on extensive data analysis. The data collection process includes


sources such as soil type, color and texture, topography, crop yield, field scouting data, and remotely sensed images, among others. This information is then assigned position coordinates and computer-generated geographic information system (GIS) maps are created based on this data. Once the map generation is complete, specialized software is used to create an application map based on user-selected algorithms. This application map is then transferred to a data card that is read by the variable rate applicator to deliver the specific pesticides in each location.

The second approach to site-specific application is sensor-based, a real time approach that measures specific properties in the field then uses that information to determine the variable rate application. The sensor-based approach requires less data analysis prior to spraying as it occurs in real time. Sensor-based application systems must be able to complete multiple things in one machine pass including the sensing (data collection/sampling), processing the data, and determining the application rate. The biggest challenges this approach faces are ensuring the sensors can work in various field conditions and making sure the speed at which the data is collected, processed, and the variable rate applicator is adjusted all occurs at realistic working speeds on-the-go.

**Conclusion**

From coated droplets to drones and precision agriculture, new developments surrounding pesticide application tools are evolving to address both economic and environmental concerns. By improving spray efficiency, helping chemicals adhere to plants, and targeting specific crops, these technologies help farmers save money and reduce waste and run off. As research continues to grow, implementing new technologies has the potential transform the process into a more sustainable one.

**Weblinks:**

https://news.mit.edu/2025/mit-engineers-develop-pesticides-stick-on-plant-leaves-0325

https://news.mit.edu/2025/guardian-ag-crop-spraying-drone-replaces-dangerous-pilot-missions-0605

https://ohioline.osu.edu/factsheet/fabe-540

https://agcrops.osu.edu/newsletter/corn-newsletter/2024-06/using-drones-spray-application-adoption-trends-us-and-worldwide

https://www.extension.purdue.edu/extmedia/ae/ssm-2-w.pdf

## Vacant Executive Committee Representative Positions

The Executive Committee consists of TPPC Members elected by their peers to represent their regions on the Council. When fully staffed the Executive Committee includes the Chair and Vice-Chair, representatives from each of the ten EPA regions as well as one from Alaska, and four At-Large positions. Executive Committee members are responsible for ensuring that their region's tribes are represented at TPPC meetings in order to determine and raise issues of importance to these tribes, and relay information back to them. Executive Committee members are encouraged to communicate with their Regional Tribal Operations Committee (RTOCs) and EPA Regional Offices prior to TPPC meetings in order to identify pesticide program needs and issues.

The TPPC is currently seeking regional representatives to fill several vacancies on the Executive Committee and represent their Tribes' and/or Tribal Organizations interests' related to pesticides and environmental concerns. Representatives must be nominated by a TPPC member from their region or may nominate themselves, and the representative must have an authorization letter on file. If you are interested in representing your region or have questions about participating in the Executive Committee, please contact TPPC Coordinator Mark Daniels at mark.daniels@nau.edu or (928) 523-8897. Current vacancies include: **Region 1, Region 3, Region 4, Region 7, Region 8, and Alaska.**

## Updates and Announcements

### Conferences and Meetings:

**ASPCRO Annual Conference**
The Association of Structural Pest Control Regulatory Officials (ASPCRO) will hold its annual conference August 25-29 in Portland, Maine. For more information click here.

### Trainings and Courses:

**Basic Inspector PIRT**
The National Association of State Departments of Agriculture (NASDA) will provide a Pesticide Inspector Residential Training (PIRT) geared toward inspectors with less than five years experience October 6-9 in Burlington, VT. To learn more click here.

**TPPC Fall Meeting (tentative)**
If funding is availavble, the Tribal Pesticide Program Council will hold its Fall meeting October 14-16 at the Ak-Chin Indian Community south of Phoenix, AZ. For more information click here.

### Tribal Consultation and Public Comment Opportunities:

**Upcoming Efforts to Address Implementation Challenges Associated with Clean Water Act Section 401 (closes September 7)**
The U.S. Environmental Protection Agency is initiating consultation with federally recognized Indian Tribes on regulatory uncertainty or implementation challenges associated with Clean Water Act Section 401 certification process as defined in the 2023 Water Quality Certification Improvement Rule. For more information click here.

# TPPC Executive Committee Members

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(Vacant)
At-Large Representative

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The TPPC is a member-based organization with more than 95 members from 59 Tribes and tribal organizations as of April 2025, whose activities are funded by a cooperative agreement with the EPA. The Council serves as a tribal technical resource, and provides a forum for dialogue between Tribes and the EPA on program and policy development relating to pesticides issues and concerns. Assistance provided to Tribes includes support in building tribal pesticide programs and conducting pesticide education and training, and the preparation of resources for Tribes interested in specialized issues such as Integrated Pest Management and pollinators. Through its interaction with the EPA, the TPPC keeps Tribes informed of developments in the regulation of pesticides and pesticide use, and provides feedback to the EPA on such matters from a tribal perspective (though it is important to note that communication between the EPA and the TPPC does not substitute for direct government-to-government consultation).

**For information about how to join the TPPC, contact Mark Daniels at mark.daniels@nau.edu or (928) 523-8897.**