Maryland
Department of Agriculture

Office of the Secretary

Agriculture | Maryland's Leading Industry

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January 21, 2018

The Honorable Lawrence J. Hogan Jr.
Governor
100 State Circle
Annapolis, MD 21401

The Honorable Thomas V. Mike Miller, Jr.
President
Maryland Senate
State House, H-107
100 State Circle
Annapolis, MD 21401

The Honorable Michael E. Busch
Speaker
Maryland House of Delegates
State House, H-101
100 State Circle
Annapolis, MD 21401

RE: Report Required by Chapter 246 of the Acts of 2018 (HB 515) Agriculture – Palmer Amaranth – Study – Reports MSAR # 11649

Dear Governor Hogan, President Miller and Speaker Busch,

Chapter 246 of the Acts of 2018 (HB 515) requires the Department of Agriculture to conduct a study to:

1. assess the adverse financial impact of the invasive weed Palmer amaranth on the agricultural industry in the State; and
2. determine the necessary actions each stakeholder must take to reduce the impact of Palmer amaranth and the cost of each action.

I hope you find the information contained in this report useful. Should you have any questions, please do not hesitate to reach out to Cassie Shirk, Director of Legislation and Governmental Affairs, at cassie.shirk@maryland.gov or 410-841-5886.

Sincerely,

Joseph Bartenfelder

Joseph Bartenfelder
Secretary, Department of Agriculture

Maryland 2018 House Bill 515
Palmer Amaranth Summer Study

House Bill 515 of 2018 requires the Maryland Department of Agriculture to conduct a study to (1) assess the adverse financial impact of the invasive weed Palmer amaranth on the agricultural industry in the State and (2) determine the necessary actions each stakeholder must take to reduce the impact of Palmer amaranth and the cost of each action. In conducting the study, the Maryland Department of Agriculture was required to consult with representatives of the State Highway Administration, the Maryland Farm Bureau, soil conservation districts, the Maryland Association of Counties, the Maryland Grain Producers, and any other interested stakeholders, as determined by the Maryland Department of Agriculture.

Amaranthus palmeri - Palmer amaranth

Overview:

Description: Within the last decade, Palmer amaranth has become one of the most serious weed pests in the Southern and Midwestern United States. The invasive weed first became a problem in Maryland approximately five to six years ago. Initially limited to the Lower Eastern Shore of Maryland and lower Southern Maryland, Palmer amaranth has rapidly spread to all of the Eastern Shore and Southern Maryland as well as areas of Central Maryland.

Why is Palmer amaranth a problem in Maryland?

Palmer amaranth has become one of the most serious weed problems in Maryland because of the following:

- Rapid spread due to herbicide resistance.
- Populations are resistant to multiple herbicides with different modes of action.
    - Confirmed resistance in Maryland to:
        - Glyphosate – Group 9 (Roundup)
        - ALS Inhibitors – Group 2 (Pursuit, Scepter)
    - Potential or unidentified resistance in Maryland to:
        - Triazines – Group 5 (Atrazine)
        - HPPD Inhibitors – Group 27 (Balance Pro, Calisto)
        - PPO Inhibitors – Group 14 (fomesafen, Cobra) in the southern US.
        - *Note: (Resistance to these herbicides has been confirmed in other states)*
- Prolific seed production, from 250,000 to 500,000 seeds per female plant.
- Rapid spread of the plants extremely small seeds, which are readily moved on farming equipment.
- Ability to germinate throughout the growing season (seedling pressure all season, not just in the spring).
- Rapid growth (can grow up to 3 inches per day) and very competitive.
- Can handle moisture and heat stress more efficiently than crops and other weeds.
- Yield losses from 80 to 90 percent in uncontrolled fields.
- Increased control costs. Once established in a field, **estimated costs to control increase by $30 to $60 per acre** due to increased herbicide costs and additional trips across field to treat. This does not include increased management and scouting costs.

Action Required: Research is needed to find best management practices for Palmer amaranth and to increase awareness of the invasive weed among local Maryland growers.

History:

A native to the U.S. southwest desert, Palmer amaranth started to spread outside its original range in the early 1900's where is was first reported in Virginia in 1915 and South Carolina in 1957. Movement most likely occurred because of humans and agricultural expansion. Palmer amaranth first appeared in a weed survey in 1989. By 1995, it was the most troublesome weed in cotton fields in North Carolina and South Carolina. By 2009, Palmer amaranth ranked as the most troublesome cottonweed in the southern United States. Now, Palmer amaranth is ranked among the most troublesome weeds of corn and soybeans and has become the most economically damaging glyphosate resistant weed in America. *(Weed Technology 2013 27:12-27, Palmer Amaranth: A Review by S Ward, T. Webster and L. Steckel)*

Palmer amaranth is currently regulated by state noxious weed laws in:

- Delaware (2012)
- Minnesota (2014)
- Iowa (2017)
- Pennsylvania (2017)
- Ohio (2018)

Spread:

Palmer amaranth is **most commonly spread by humans**, but can also travel by the following means:

- **Machinery** – Contaminated equipment, such as combines that are purchased and moved from an area of infestation to Maryland. Within the state, infestation can spread by moving from field to field with equipment. Cleaning of equipment helps, but the seeds are small and almost impossible to remove completely.
- **Feed and Commodities** – Cottonseed in feed mixes appears to be a source of infestation. Both from equipment contamination and through the manure.
- **Manure** – When feed mixes are contaminated with seed, the seeds easily pass through animals. This appears to be the case with both ruminants and poultry.
- **Seed mixes** – Pollinator/conservation seed mixes sourced from areas with Palmer amaranth infestations may have become contaminated.
- **Wildlife** is also a potential source of seed movement.

Action Required: Funding for educational training and awareness is needed to avoid the movement and spread of Palmer amaranth. Increased knowledge of sources for clean seed.

Identification:

Rapid identification is critical to rapid response.

Many I.D. resources are available through the University of Maryland Extension Service and online resources are available at the following links:

- www.extension.psu.edu/invasive-pigweeds-palmer-amaranth-and-waterhemp
- www.extension.purdue.edu/extmedia/ws/ws-51-w.pdf
- www.youtube.com/watch?v=A1vB_DQTkHI

Palmer amaranth moved quickly into Maryland due, in part, to a lack of awareness, as it is a new weed and was not recognized until it was already established in fields.

Action Required: Educational resources are needed to teach growers how to quickly identify Palmer amaranth.

Control:

Below are recommended practices to help control Palmer amaranth. Each practice has an expense associated with it, either financial or time-related.

Prevention:

- Zero Tolerance Policy – Every plant should be controlled or removed if possible.
- Scout fields to detect early infestations.
- Clean equipment. Avoid purchasing equipment that comes from areas with known Palmer amaranth infestations. Avoid custom operators with contaminated equipment.
- Use seed from trusted sources; certified seed preferred.
  - *Note: Palmer amaranth seed is **not** easily differentiated from other Amaranth species seed, so it is not feasible to do seed sampling and inspection. **If placed on the Noxious Weed Law, any seed found to contain any unidentified amaranth seed would be condemned.***
- Avoid cotton-based feeds. (cottonseed)
- Avoid movement of contaminated manure. ***This has serious ramifications for producers required to have Nutrient Management Plans. It will limit where producers can use contaminated manure.***
- Destruction of crops in areas of fields with initial infestation to prevent further spread.

Cultural:

- **Crop Rotation** – The presence of Palmer amaranth will inherently restrict rotation options. It is much easier to control in corn than in soybeans.
- **Tillage** – Moldboard plow to bury seeds. Soil erosion and cost issues are associated with this method. This goes against most soil conservation practices established in Maryland.
- **Hand Removal** – An expensive and time-consuming option in larger infestations. Used for initial removal of new infestations or as a "save" treatment. One of the few options for organic growers.
- **Cover Crop** – Shown to help in control of Palmer amaranth. Already in practice by most growers in Maryland.
- **Scouting** – More frequent scouting of fields will be needed to allow for effective, timely treatments.
- **Mowing** – Used only in non-row crop situations and is not generally effective.
- **Harvesting** – Do not combine or harvest through spots or areas with infestations to avoid dragging/spreading seed across the field or to other fields.

Action Required: Research on treatment methods and options for Palmer amaranth is needed, especially for organic growers.

Herbicide treatments:

- As stated earlier, Palmer amaranth populations are resistant to multiple herbicides with different sites of action. Since many of the commonly used herbicides are ineffective, there are very few options left. If Palmer amaranth becomes resistant to more herbicides, then even fewer tools will remain for control.
- Consult with the University of Maryland Extension Service or your agricultural supplier for recommendations.
- Herbicide resistance issues dictate careful planning, timing, and multiple applications.
- Herbicides generally need to be used when Palmer amaranth is 4 inches or less in height. A rainy week could result in late treatment and failure of control.
- Cost of control per acre will increase greatly.
- Dicamba tolerant soybeans will help, but using them may be problematic due to use restrictions around sensitive crops.
- Crops such as melons and pumpkins have no available herbicide treatments for post emergent control.
- Weather conditions such as drought (canopy cover insufficient) and excessive rain can cause failure of a weed control plan, inability to treat, and reduce efficacy of pre-emergent herbicides.
- Organic growers will be impacted due to the rapid spread and competitiveness of Palmer amaranth with no "natural" treatments available.

Action Required: More local research and education on herbicide treatments are needed to control Palmer amaranth.

Increased Costs to Growers:

- **GMO Seed costs** – Increased cost of patented seeds.
- **Herbicide costs** – More treatments and higher cost materials.
- **Application costs** – More trips across fields.
- **Equipment costs** – Addition of owning spray equipment for timely treatments and additional costs for tillage.
- **Scouting costs** – More times across fields.
- **Harvesting costs** – Clean operators or buying own equipment.
- **Nutrient and/or soil loss** – Due to increased tillage.

Grower Concerns:

- Growers who do not control problematic weeds, such as Palmer amaranth.
- Throughout the state, there are landowners and farmers who do not control their weeds for multiple reasons including: lack of interest, resistance to use of herbicides and sometimes laziness.

Throughout the history of the Maryland Department of Agriculture's Plant Protection & Weed Management program, it is often the same growers/landowners who have problems controlling noxious weeds. We predict that these growers will have the same problems with controlling Palmer amaranth.

Options for Palmer Amaranth Action in Maryland:

1. **Add Palmer amaranth to an updated noxious weed law, with funding for additional new personnel, equipment and support.**

Update law to add Palmer amaranth to the current noxious weeds list and to include new Maryland Department of Agriculture regulations concerning noxious weed control, enforcement, and management. This could include hearings and civil penalties for violators, flexibility to add and remove weeds from the list, and a weed advisory committee.

Current Status of the Maryland Department of Agriculture's Plant Protection & Weed Management, Weed Control Program.

Copies of the Maryland Noxious Weed Laws are attached at end of document.

- Current Prohibited Noxious Weeds – Maryland Noxious Weed Control Law
    - Annotated Code of Maryland Title 9, Subtitle 4. Weed Control
        - Johnsongrass
        - Shattercane
        - Canada Thistle
        - Musk Thistle
        - Plumeless Thistle
        - Bull Thistle

- Multiflora Rose Management Law
    - Annotated Code of Maryland Title 9 Subtitle 7. Multiflora Rose Management
        - Separate Form the Noxious Weed Law, the Multiflora Rose Management Law requires action to be based on a written complaint to the Secretary of Agriculture of Maryland. The management law requires control of a specific weed that does not impact field crop production, but may be a public and common nuisance on land used for agricultural production.

The Maryland Noxious Weed Control Program is a part of the Plant Protection & Weed Management section at the Maryland Department of Agriculture. The purpose of this program is the control and eradication of designated noxious weeds in order to reduce their economic and aesthetic impact on farmers and landowners. Noxious weeds *(Johnsongrass, shattercane, thistles)* can cause losses in excess of $25 million annually to Maryland agriculture due to reduced yields, decline of quality of crops and forages, and increased control costs. Increased expenses are also incurred for roadside and non-crop property management.

The Maryland General Assembly enacted the first Nuisance Weed Law on Johnsongrass in 1969. In 1975 and 1979, this law was amended. In 1984, the law was repealed, revised and consolidated with the Thistle Control Law. In 1987, the Nuisance Weed Law was rewritten and renamed the Noxious Weed Law (Title 9, Subtitle 4, Agriculture Article, Annotated Code of Maryland). The Multiflora Rose Management Law became effective on July 1, 1982. The Noxious Weed Law requires that a landowner, or a person who possesses and manages land, eradicate or control the noxious weeds on that land by using practices prescribed by the department, including mowing, cultivating, or treating with an approved herbicide. The law prohibits the importation of these weeds into or within the state and it also prohibits transportation of viable noxious weed seed and rhizomes in seed, topsoil, mulch, nursery stock, on farm machinery, or any other method.

The Noxious Weed Law has a provision that the Maryland Department of Agriculture may enter into a cooperative agreement with a county or political subdivision to provide management, technical assistance, training, and education for implementing a noxious weed control program. The county weed control programs are supervised by state personnel as specified by these cooperative agreements.

In the 14 participating counties, a weed control advisory committee with representatives from farming organizations, governmental agencies, local farmers, and property owners, provides guidance for the noxious weed control program in that county. A county weed control coordinator is employed to determine noxious weed infestations within the county, inspect uncontrolled infestations, provide information on appropriate control practices, and initiate control agreements with landowners to implement control. In many counties, the weed control coordinator also performs herbicide treatments for a fee on private lands, Maryland State Highway Administration and county rights-of-way, as well as parks and other public lands. Spray revenues support program activities in the county. Statewide, spray revenue for all the county programs was in excess of a million dollars.

Current Maryland Department of Agriculture Weed Control employees

- **Lane Heimer** – Supervising statewide program and direct responsibility for the western shore of MD
- **Jim Calao** – Responsible for county weed control programs on the Eastern Shore
- *Note: Reduced from four employees after budget cuts two years ago. In order to have effective enforcement and control through the Noxious Weed Law,* ***additional funding for new staff and support would be required.***

County Weed Control Programs information:

- **Cooperating County Weed Control Programs***
  - Currently only 14 of 23 counties in Maryland have Cooperative Weed Control Programs.
  - Counties that participate in Cooperative Weed Control Programs are Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Harford, Howard, Kent, Montgomery, Queen Anne's, St. Mary's, Talbot, and Washington.
  - Most county programs are funded through revenues from spraying.
- **Counties that do NOT participate in Cooperative Weed Control Programs** are Allegany, Baltimore, Calvert, Garrett, Prince Georges, Somerset, Wicomico, and Worcester.

It is recommended that Cooperative Weed Control Programs be re-established in counties that currently do not have them.

It is recommended that the state reestablish the 50/50 cost share program that was in place until 2009. The Cost Share funding was $90,000 statewide. At that time, 20 of the 23 counties had cooperative programs. The focus of the cost share funds is to start county programs where needed and prioritize in areas with Palmer amaranth.

2. Create a "Weeds of Concern" List:

A list would be created for problematic weeds of concern to the state that are not already regulated by the Noxious Weed Law. This idea came from discussions with agricultural groups in Maryland.

- A board/committee would need to be formed to evaluate requests for weeds to be placed on the "Weeds of Concern" list
- Once a weed is on the "Weeds of Concern" list, it could be evaluated through a weed risk assessment tool and a request for addition to the Noxious Weed Law for weeds could be made if deemed eligible. Weed risk assessment evaluations are time consuming and costly.

- Possible Weeds of Concern Maryland:
  - Water Hemp, *Amaranthus tuberculatus* (also in the Pigweed family, herbicide resistant)
  - Mare's Tail/Horse Weed, *Erigeron canadensis (*herbicide resistant)
  - Texas Panicum, *Panicum texanum* (herbicide resistant)
  - New and yet unknown herbicide resistant weeds.
- Once a weed on the "Weeds of Concern" list is deemed to be eligible for elevation to the noxious weed list, funding would then be required for enforcement.

The Maryland Department of Agriculture is concerned that growers who see the species listed on a "Weeds of Concern" list will expect control and enforcement of that species even if it has no legislative or regulatory status.

The Maryland Department of Agriculture is concerned the weed risk assessments, as a part of this, would be time consuming, expensive, and require funding.

3. Fund Education, Outreach, and Research

- Provide additional funding for the University of Maryland Extension to continue research on Palmer amaranth.
- Fund the Maryland Department of Agriculture's Weed Control Program to assist in outreach to county programs.
- Assist county programs with funding for outreach to growers and homeowners.

Request funding for all programs listed and allow for coordination of these funds to avoid duplication.

Conclusions:

The Maryland Department of Agriculture held two Palmer Amaranth Stakeholders Meetings on February 28, 2018 and on December 11, 2018 for input by farmers, the public, organizations, and agencies.

In addition, the Maryland Department of Agriculture has also held meetings and engaged with the Maryland Extension Service, Maryland Farm Bureau, county weed control programs, county, state and federal agricultural agencies, agri-businesses, and farmers.

After reviewing all discussions and comments, the best recommendation for controlling Palmer amaranth is **option number 1** in this document – adding Palmer amaranth to an **updated** noxious weed law with funding and new personnel.

For questions or concerns in reference to this study, contact the department's Plant Protection & Weed Management Program at ppwm.mda@maryland.com or 410-841-5920.