

## **2015 Project Abstract**

For the Period Ending June 30, 2021

### **PROJECT TITLE: Palmer Amaranth Detection and Eradication**

**Project Manager:** Monika Chandler

**Organization:** Minnesota Department of Agriculture

**Mailing Address:** 625 Robert Street North

**City/State/Zip Code:** St. Paul, MN 55155

**Telephone Number:** (651) 201-6537

**Email Address:** [Monika.Chandler@state.mn.us](mailto:Monika.Chandler@state.mn.us)

**Web Address:** [www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/palmeramaranth.aspx](http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/palmeramaranth.aspx)

**FUNDING SOURCE:** Environment and Natural Resources Trust Fund

**LEGAL CITATION:** M.L. 2015, Chp. 76, Sec. 2, Subd. 10 - Emerging Issues Account

M.L. 2017, Chapter 96, Section 2, Subdivision 18

**APPROPRIATION AMOUNT: \$ 173,000**

**AMOUNT SPENT: \$ 145,746**

**AMOUNT REMAINING: \$ 27,254**

### **Sound bite of Project Outcomes and Results**

Contaminated conservation seed mixes introduced Palmer amaranth to in Minnesota in 2016 and resulted in an agricultural emergency. This project intensively monitored Palmer amaranth, deployed control measures, and developed methods for ground and aerial surveys. By 2018 no Palmer amaranth was found in the conservation areas where the initial introduction occurred.

### **Overall Project Outcome and Results**

We are very pleased that our methods to manage Palmer amaranth in conservation plantings have been very effective. At multiple plantings, hundreds of Palmer amaranth plants in 2016 in Lyon and Yellow Medicine counties were torched in the fall. This greatly reduced Palmer to a handful of plants in the summer of 2017. We followed up with prescribed fire in spring 2018 to kill Palmer seed in seedheads and seedlings. There were also hundreds of Palmer plants in Todd County found in fall 2017. We were helped at these Palmer plantings by frost killing plants before much seed was developed. As a result of our efforts and frost, no Palmer amaranth plants were found at these plantings in 2018. To improve Palmer amaranth detection, we continue to work on aerial survey and are testing aircraft, sensors and software. All of these efforts will continue with the Palmer amaranth detection and eradication project that received continuation funding for 07/01/18 – 06/30/20.

### **Project Results Use and Dissemination**

#### **Presentations and Events**

- Chandler, M. gave a project update to MDA's Noxious Weed Advisory Committee on February 8, 2018.
- Presented Palmer amaranth identification and reporting at a public meeting on March 8, 2018 in Clarkfield, for a total of 9 presentation and outreach events during this project.
- Palmer amaranth was included in two Weed 'Em Out workshops held in Duluth (3/27/18) and Chaska (4/4/18) for 96 natural resource and road maintenance professionals.



# Environment and Natural Resources Trust Fund (ENRTF) M.L. 2017 LCCMR Final Report

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**Date of Submission:** January 31, 2019  
**Date of Work Plan Approval:** July 26, 2017  
**Project Completion Date:** June 30, 2018

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**Location:** Statewide

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<b>Total ENRTF Project Budget:</b>	<b>ENRTF Appropriation:</b>	<b>\$173,000</b>
	<b>Amount Spent:</b>	<b>\$145,746</b>
	<b>Balance:</b>	<b>\$27,254</b>

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**Legal Citation:** M.L. 2015, Chp. 76, Sec. 2, Subd. 10 - Emerging Issues Account  
M.L. 2017, Chapter 96, Section 2, Subdivision 18

**Appropriation Language:**

\$1,000,000 the first year is from the trust fund to an emerging issues account authorized in Minnesota Statutes, section 116P.08, subdivision 4, paragraph (d)

Carryforward (a) The availability of the appropriations for the following projects are extended to June 30, 2018:

(3) Laws 2015, chapter 76, section 2, subdivision 10, Emerging Issues Account.

## I. PROJECT TITLE: Palmer Amaranth Detection and Eradication

### II. PROJECT STATEMENT:

Palmer amaranth is an invasive plant that threatens row crop production and prairies. Growing quickly at 2-3 inches per day and reaching heights of 10 feet tall, it outcompetes other plants. Palmer amaranth is an annual that produces prolific seed – up to a million per plant. It developed resistance to multiple classes of herbicides making it challenging to control. Palmer amaranth can cause yield losses up to 91% in corn (Weed Sci. 49:202-208) and 78% in soybeans (Weed Sci. 51:37-43). It has invaded established prairies in Illinois.

Palmer amaranth was first found in Minnesota in fall 2016 and declared an agricultural emergency. Palmer amaranth seed was a contaminant of a conservation seed mix that was planted at 30 locations. Infrastructure developed with our *Elimination of Target Invasive Plant Species* LCCMR project and Minnesota Department of Agriculture (MDA) emergency funds enabled us to respond quickly. Palmer plants, including seedheads, were incinerated to reduce establishment and spread. There are currently less than 200 acres of Palmer amaranth in Minnesota and the density is low. We will

- **Intensively monitor sites with Palmer amaranth.** Vegetation at Palmer sites will be monitored closely to identify Palmer plants before seed is produced. Palmer germinates throughout the growing season so monitoring the entire season is needed. Palmer amaranth seedbanks are not long-lived so aggressive management now could eradicate Palmer from these sites.
- **Continue control efforts at sites with Palmer amaranth.** Control methods may include flame weeding with torches, prescribed fire, spot treatment, increased plant competition by seeding more native grasses and, if necessary, broadcast herbicide application (ENRTF dollars will not be used for broadcast application).
- **Conduct ground and aerial surveys.** Additional conservation planting will be surveyed for Palmer amaranth presence or absence. Aerial survey will increase efficiency of ground survey by advance scouting for Palmer or similar looking plants. It will also reduce the amount of field entries and exits thereby reducing the risk of inadvertent spread of Palmer.

Rapid and effective management now could prevent statewide establishment and spread.

### III. OVERALL PROJECT STATUS UPDATES:

#### Project Status as of January 31, 2018:

Project funding has enabled us to respond quickly to new infestations and to continue to successfully manage existing infestations. We are concerned that there were new infestations in conservation plantings. The seed source is being investigated.

In order to begin aerial survey work quickly, we requested and the Department of Administration signed an emergency authorization to begin work before a contract with the U of M could be executed. Therefore, we collected aerial images of Palmer amaranth and conservation plantings before the Palmer plants died in the fall. Our contract with U of M has been executed. We were able to execute a contract with CCM prior to beginning fall work so did not need an emergency authorization for this.

MDA hired Shane Blair to monitor, survey and coordinate with landowners and CCM. Shane also helped with aerial survey and is involved with database development. MDA is developing a database for Palmer amaranth investigation using MDA seed program funds. We are currently using EDDMapS and ISMTrack for documenting Palmer amaranth infestations and management activities. The aim is for these databases to work together.

### **Amendment Request January 31, 2019**

MDA requests a budget amendment to move \$1,700 from personnel to travel. Travel costs were difficult to budget for exactly as we didn't know exactly where Palmer might be found during the project period. Actual travel costs were higher than budgeted.

### **Approved by LCCMR 4/21/19**

#### **Overall Project Outcomes and Results:**

We are very pleased that our methods to manage Palmer amaranth in conservation plantings have been very effective. At multiple plantings, hundreds of Palmer amaranth plants in 2016 in Lyon and Yellow Medicine counties were torched in the fall. This greatly reduced Palmer to a handful of plants in the summer of 2017. We followed up with prescribed fire in spring 2018 to kill Palmer seed in seedheads and seedlings. There were also hundreds of Palmer plants in Todd County found in fall 2017. We were helped at these Palmer plantings by frost killing plants before much seed was developed. As a result of our efforts and frost, no Palmer amaranth plants were found at these plantings in 2018. To improve Palmer amaranth detection, we continue to work on aerial survey and are testing aircraft, sensors and software. All of these efforts will continue with the Palmer amaranth detection and eradication project that received continuation funding for 07/01/18 – 06/30/20.

#### **IV. PROJECT ACTIVITIES AND OUTCOMES:**

##### **ACTIVITY 1: Monitor, survey and control**

**Description:** We will regularly monitor existing infestations to look for Palmer and determine control steps needed. We will survey additional conservation plantings both on the ground and with drones. Prescribed fire and flame weeding are methods that will control Palmer amaranth while benefitting native species in conservation plantings. Initial drone survey will focus on imaging fields. This is relatively simple and the technology and methods are largely developed. For aerial survey method testing, we request to use project funds for out of state travel to areas where Palmer is more common such as Iowa for method testing.

##### **Monitor**

Monitoring existing infestations will involve visiting each site a minimum of three times per growing season to walk the fields and look for Palmer amaranth. If it is difficult to tell whether a pigweed is Palmer amaranth, samples from the suspect plant will be sent to the University of Illinois Plant Clinic for a species determination with a genetic test. MDA general or emergency funds will be used for this testing. If Palmer amaranth is found, control measures will be implemented. Monitoring data will be entered into [ISMTrack](#), an EDDMapS product.

##### **Survey**

To ground survey additional conversation plantings we will work with agency partners to identify and prioritize plantings for survey. Plantings will be selected throughout the state, but there will be an emphasis on the southern border region due to concerns about Palmer amaranth introduction from Iowa. We will develop a survey protocol based on walking a pattern in the planting. Presence/absence survey data will be entered into EDDMapS. If Palmer amaranth is found, data will be displayed at a county level due to landowners' sensitivity about Palmer amaranth.

Aerial survey will be done by imaging fields with a camera/sensor attached to a UAV. Initial survey will be done at plantings selected for ground survey so they are ground truthed. We will also image plantings in another state such as Iowa where Palmer amaranth is present so that we can test our methods and develop a library of aerial images of Palmer amaranth. Imaging fields during the growing season will enable us to work with these images over the winter.

##### **Control**

If Palmer amaranth is found, the project team will determine the best course of action. Extension weed scientists will be consulted when appropriate. Indications to date are that incinerating plants in fall 2016 with propane torches was effective at reducing seed. We will continue torching plants as needed. Additionally, prescribed fire will be used at all known Palmer sites in spring 2018 to reduce Palmer and improve the native plant competition. Data from management activities will be entered into ISMTrack.

**Summary Budget Information for Activity 1:**

**ENRTF Budget: \$ 173,000**  
**Amount Spent: \$ 145,746**  
**Balance: \$ 27,254**

<b>Outcome</b>	<b>Completion Date</b>
1. Infestations will be monitored during the growing season a minimum of three times per year. Palmer plants will be controlled prior to seed development. Currently there are 30 locations to monitor in Lyon and Yellow Medicine Counties.	06/30/18
2. At least 75 additional conservation plantings statewide are surveyed each year for the presence/absence of Palmer amaranth. Selection of sites to survey will be based on geographic distribution and newer plantings will be prioritized.	06/30/18
3. Investigate potential infestation reports from the public and agency partners. We anticipate approximately 300 reports per week during the growing season.	06/30/18
4. A minimum of 30 plantings will be imaged using a drone.	06/30/18
5. Utilize prescribed fire and flame weeding to control Palmer amaranth	06/30/18

**Activity 1 Status as of January 31, 2018:**

**New infestations detected and report follow up**

- Palmer amaranth was confirmed to be in the seed mix sown at three plantings own by a single landowner. The landowner purchased seed from a vendor involved with contaminated seed mix. The landowner called MDA to discuss his concern. A sample was taken of his remaining seed. Based upon a genetic test, the seed mix was confirmed on 07/26/17 to contain Palmer. On 07/27/17, we surveyed all three plantings with the landowner. The good news is that no Palmer was found in the field. These plantings will be surveyed in 2018 as well. These plantings are in Lyon County and the total acreage is approximately four acres.
- Palmer amaranth was confirmed in Todd County. Suspect plants were noticed growing in conservation plantings and called into the local NRCS office. Local NRCS did a preliminary investigation then contacted MDA on 10/05/17 for confirmation. On 10/06/17, MDA confirmed Palmer amaranth in the field then also confirmed by genetic testing. Shortly after Palmer was confirmed in the field, there were some hard frosts that killed the Palmer plants. Because seed for these plantings was sown in the summer, Palmer didn't have time to produce much mature seed before the killing frost. This was very fortunate. The seed was sown at 5 plantings and possibly a 6<sup>th</sup> planting that did not appear to be recently planted although it was on the plans. Acreage of the 5 plantings is approximately 127 acres. These plantings will be burned in spring 2018 by CCM.
- Palmer amaranth was confirmed in Douglas County. Seed mixes from the same vendor for the Todd County infestations were used at multiple plantings in Douglas, Dodge and Hennepin Counties. All plantings were checked. Douglas County had the only infestations and this was confirmed on 10/17/17 in the field followed by genetic testing. There were 30-40 Palmer plants over approximately 51 acres. These plants were torched on 11/27/17.
- Concern about weedy plantings in Meeker and Redwood Counties were reported by area Pheasants Forever and the Redwood SWCD. Follow up in the field confirmed that the fields were weedy, but there

was no Palmer found. We also followed up on a report of suspect Palmer near a soybean field in Nobles County and no Palmer was found.

- Palmer amaranth reports submitted to Arrest the Pest had images that showed the plants reported were not Palmer.

### **Monitoring existing sites**

- Monitored plantings where seed mix containing Palmer amaranth was sown in 2016. All plantings were monitored twice between the end of July and mid-September in 2017. The good news is that very few Palmer plants were found. This means that our torching efforts in fall 2016 were very effective.
- Palmer was identified and flagged at two plantings in Yellow Medicine and one in Lyon for torching in November.

### **Survey**

We are working with federal and state partners to survey additional conservation plantings. We developed our survey methodology. A zig zag pattern will be walked through the planting. The planting location, survey date and presence/absence of Palmer amaranth and other weeds will be recorded in Survey 123. A report in EDDMapS will be created for finds of prohibited noxious weeds such as wild parsnip and the area resource manager will be notified.

- A Freedom of Information Act request was submitted to NRCS in August with follow up in November. Additional follow up will be done in 2018. The request was for the location of conservation plantings. We are not requesting landowner names and contact information.
- In collaboration with BWSR and area SWCDs, we are in the process of selecting plantings in the Conservation Reserve Enhancement Program to survey in 2018.
- DNR readily provided information about their conservation plantings. We visited a Wildlife Management Area planting in Nobles County. Pigweeds were present. Although the pigweeds didn't appear to be Palmer, weed samples were collected to make sure. Genetic tests confirmed that the plants are not Palmer.

### **Aerial survey**

We pushed to initiate aerial survey quickly to have an image set to work with over the winter. Studying these images will inform us about improvements needed for better imaging in 2018.

- For an initial test, we flew one site in Yellow Medicine and one site in Lyon Counties. Both sites are large and had mature Palmer amaranth plants in 2016. Only a handful of small Palmer amaranth plants were found at these sites in 2017 by monitoring on the ground. No additional Palmer plants were found by aerial survey. In our aerial images, we could see individual waterhemp (a closely related pigweed) plants. This is good image quality but we strive to improve image quality. We learned that flying lower and using a high resolution sensor improved image quality. The difficulty may be in stitching these images together. Images taken at higher altitude are easier to stitch together.
- In order to be sure of capturing Palmer amaranth images, we flew plantings in southern Iowa and at a University of Nebraska research station in Hastings Nebraska. There was abundant Palmer in Hastings.
- A GIS expert at MDA is trialing ESRI's Drone2Map software using the collected image set. Ideally, images are georeferenced and can be stitched together and mapped. This is more difficult than it sounds.

### **Control**

- CCM controlled Palmer amaranth plants using propane torches. This is a very good method of destroying seed. Torching was done at a Douglas County plantings on 11/27/17 and one planting in Lyon and one planting in Yellow Medicine Counties on 11/28/17.

- We are preparing to use prescribed fire in spring at plantings where Palmer amaranth has been found.
  - Fire breaks are needed at Todd County plantings. Breaks were mowed by the landowner in fall 2017. Palmer amaranth plants in the fire breaks were cut and placed in burn areas by MDA.
  - CCM is writing burn plans.

**Activity 1 Final Report Summary**

**New infestations detected and report follow up**

Early in 2018, Palmer amaranth seed was detected in a seed lot that was sold to landowners in northwestern Minnesota. This mix was planted in 2017 at conservation plantings in Roseau, Pennington, Marshall and Red Lake counties. The contamination was found in 2018 by MDA’s seed program sampling remaining seed from the lot. Amaranth seeds were detected in the mix then genetically tested. MDA’s seed program traced seed lots to specific planting in these northwestern counties. Shane surveyed all of these plantings in June 2018 and no Palmer amaranth was found. Very few pigweeds in general were found at these plantings.

A single seed in a genetic test of a MnDOT seed mix was positive for Palmer. However, it was only this one seed. All other amaranth seeds in the mix were not Palmer. The seed mix had been planted in Cottonwood County in 2017. The planting was surveyed in both 2017 and 2018 and no Palmer was found. The seed mix was re-tested for Palmer and came back negative reducing our concern about this seed mix.

**Monitoring existing sites**

No Palmer amaranth plants were found during the following monitoring.

Site Name	Date	Acres
Lyon 01	5/15/2018	50.06
Yellow Medicine 01	5/15/2018	6.33
Yellow Medicine 11	5/15/2018	53.12
Yellow Medicine 04	5/16/2018	4.67
Yellow Medicine 05	5/16/2018	2.56
Todd 01	6/1/2018	143.57
<b>Total</b>		<b>260.30</b>

**Survey**

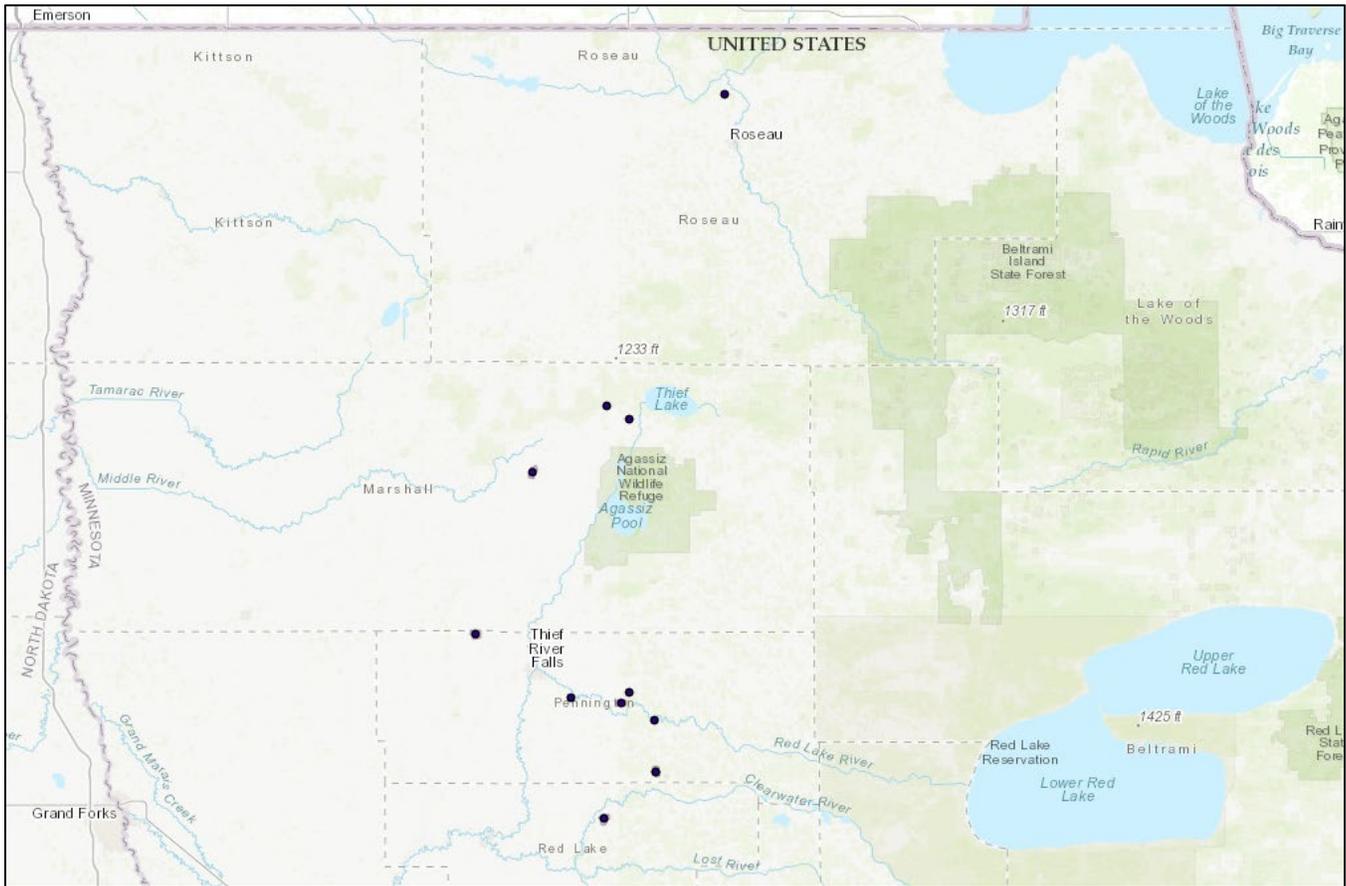
Survey potential new sites

No Palmer amaranth plants were found during the following survey.

Site Name	Date	Acres
Cottonwood County 01	6/4/2018	49.39
Pennington 02	6/15/2018	856.17
Pennington 03	6/18/2018	61.04
Red Lake 02	6/18/2018	191.11
Marshall 01	6/19/2018	38.29
Pennington 01	6/19/2018	154.00
Red Lake 01	6/19/2018	275.00
Marshall 02	6/20/2018	116.12
Roseau 01	6/21/2018	80.44
<b>Total</b>		<b>1,821.56</b>
<b>Monitor and Survey Total</b>		<b>2,081.86</b>

We originally committed to surveying 75 sites/plantings in addition to the existing sites (260.30 acres) we were monitoring. We estimated an average of 10 acres each for the additional 75 sites for approximately 750 additional acres. Our game plan changed when Palmer amaranth seed was found in seed mixes planted in

Cottonwood (1 planting), Marshall (3 plantings), Pennington (5 plantings), Red Lake (2 plantings) and Roseau (1 planting) counties. We prioritized survey of these 12 plantings. These sites were very large and time consuming to survey. We added over 1,800 acres to the total surveyed. These additional sites are shown on the map below.



Locations where a seed mix contaminated with Palmer amaranth was planted in 2017.

### Aerial survey

Aerial imaging and mapping is a valuable tool for understanding and managing invasive plant species. There are a variety of commercial tools available but the focus tends to be on commercial industries such as agriculture, construction, and infrastructure. The UMN UAV Lab is investigating how we can apply these technologies towards specific invasive species. No single tool does everything well, so as part of this project we are investigating a range of systems including a traditional quadcopter (drone) and fixed wing aircraft. We are testing several different camera systems and lens including high resolution RGB cameras and multispectral cameras. Concurrently, we are developing in-house tools to address gaps in the functionality of existing commercial tools. The goal is to investigate a variety of systems and tools to gain experience in applying this emerging drone technology towards the elimination of invasives in Minnesota.

In May 2018 the UAV lab purchased an educational license for Pix4D. Pix4D stitches a set of overlapping aerial images collected by a drone into a single map mosaic. Combining all the images into a single map shows all the features in their correct location and orientation. This helps make the imagery more intuitive for a human to process and understand.

### **Control**

Plantings in Yellow Medicine and Lyon counties were burned in May of 2018 to eliminate any Palmer amaranth seedheads and/or seedlings. Plantings where Palmer amaranth was found 2017 were prioritized. Other

plantings that had enough fuel to conduct a prescribed burn were also burned in case we had missed any Palmer. A total of 12 plantings consisting of 105 acres were burned. The 12 plantings that were burned looked very healthy later in the season. The burned plantings filled in well with grasses and forbs and the number of pigweeds was dramatically reduced.



Prescribed fire was used in May 2018 on conservation plantings where a contaminated seed mix was sown in 2016. Later in the season, the plantings responded well to the burn with a healthy stand of grasses and forbs and no Palmer.

## **V. DISSEMINATION:**

**Description:** We will communicate about our activities and findings with the public, Cooperative Weed Management Areas, land managers, and weed scientists. Communication with the public will be via news media (print, television, and radio) and social media such as Facebook and Twitter. We will provide updates to the University of Minnesota Extension blog [Minnesota Crop News](#) for communication with the agricultural community. We will also provide updates to MDA's multi-agency/organization Noxious Weed Advisory Committee that meets a minimum of two times per year.

### **Status as of January 31, 2018:**

#### Presentations and Events

- Anthony Cortilet gave an update on Palmer amaranth at the Minnesota Association of County Agricultural Inspectors Annual Short Course on July 19, 2017 in Owatonna.
- Monika Chandler included Palmer amaranth in her roundtable discussion at the Minnesota Association of Townships Educational Conference and Annual Meeting on November 17, 2017.
- MDA's Noxious Weed Advisory Committee received updates on September 7, 2017 and November 28, 2017 in Arden Hills.
- Emilie Justen gave an update about Palmer amaranth at the Western Weed Coordinating Committee November 28-30, 2017 in Las Vegas.

- Shane Blair, Michael Merriman and Kevin Ballman displayed and discussed Palmer amaranth, native seed mixes and conservation plantings at a booth at the Minnesota Association of Soil and Water Conservation Districts Annual Convention on December 4, 2017.
- Emilie Justen gave an update about Palmer amaranth at the request of North Dakota’s weed forum on January 9, 2018 in Bismarck.
- Anthony Cortilet addressed Todd County township supervisor and landowner concerns about Palmer amaranth on January 23, 2018 in Browerville.

Articles

- Shane Blair’s article *Torching Noxious Weeds* was MDA’s January 2018 Weed of the Month article. It was distributed to outstate media outlets. Palmer amaranth was included in this article.

**Dissemination Final Report Summary:**

Presentations and Events

- Chandler, M. gave a project update to MDA’s Noxious Weed Advisory Committee on February 8, 2018.
- Presented Palmer amaranth identification and reporting at a public meeting on March 8, 2018 in Clarkfield, for a total of 9 presentation and outreach events during this project.
- Palmer amaranth was included in two Weed ‘Em Out workshops held in Duluth (3/27/18) and Chaska (4/4/18) for 96 natural resource and road maintenance professionals.

**VI. PROJECT BUDGET SUMMARY:**

**A. Preliminary ENRTF Budget Overview:**

**\*This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

<b>Budget Category</b>	<b>\$ Amount</b>	<b>Overview Explanation</b>
MDA Personnel:	\$ 56,100	One full time Plant Health Specialist position estimated salary \$38,000 per year plus fringe benefits @ 46% for survey and coordination
MDA Travel Expenses in MN:	\$ 4,000	Travel for Activity 1 for Plant Health Specialist. Mileage \$2,000, lodging \$1,400; meals \$600
<b>Contracts</b>		
Contract with CCM:	\$ 38,000	Contract with Conservation Corps Minnesota for Palmer amaranth survey and management in conservation areas. Management methods include spot herbicide application, flame weeding and prescribed burning. Training and equipment for crews is included.
Contract with U of M	\$ 74,900	Contract with University of Minnesota to develop and utilize aerial survey methods. Costs include a 50% time engineer \$63,100 (salary \$47,325 and fringe @ 25% \$15,775), travel \$7,900 (mileage \$5,400 and meals and lodging \$2,500), and other (repairs \$1,000 and specialized pix4d software license \$2,900)
<b>TOTAL ENRTF BUDGET:</b>	<b>\$ 173,000</b>	

**Explanation of Use of Classified Staff:** NA

**Total Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation:** 1.0 FTE

**Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF**

**Appropriation:**

Contract with U of M = 0.5 FTE

Contract with CCM: Crews will work an estimated 1,600 hours. FTEs = 1,600/2,080 = 0.77

Total = 1.27

**B. Other Funds:**

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
<b>State</b>			
<b>Other State \$ To Be Applied To Project During Project Period:</b> MDA Emergency Funds M.L. 2016, Chp. 17, Sec. 17.041, Subd. 1	\$ 52,200	\$ 62,395.85 (FY 2017) \$3,807.66 (FY 2018)	Herbicide application, other management needed and operational costs
<b>In-kind Services To Be Applied To Project During Project Period:</b> MDA: Overhead, field equipment, computing/software, GIS and data management, and project management (\$12,000); U of M: UAV Lab equipment (\$10,000); and CCM: Approximate \$2.50/hr difference between actual cost per member (\$23.50/hr) and billing rate (\$21.00/hr) = \$4,500.	\$ 26,500	\$ 7,600	Project overhead and operations
<b>Current ENRTF Appropriation:</b> 2017 Elimination of Target Invasive Plants - Phase 2 project M.L. 2016, Chp. 186, Sec. 2, Subd. 06e1 and Subd. 06e2	\$ 750,000	\$ 326,578 as of Nov 2017 status report	With respect to Palmer, this funding enabled us to start a Palmer amaranth specialist before EI funds were available and to train people to identify and report Palmer.
<b>TOTAL OTHER FUNDS:</b>	<b>\$ 828,500</b>	<b>\$ 400,381.51</b>	

**VII. PROJECT STRATEGY:**

**A. Project Partners:**

**Partners receiving ENRTF funding**

Monika Chandler (MDA) will lead infestation monitoring, ground survey and report follow up. She will also provide overall project coordination. Demoz Gebre Egziabher (U of M) will lead the development and utilization of aerial survey methods. Dorian Hasselmann and Dustin Looman (CCM) will manage crews and lead Palmer amaranth control activities. Their salaries will not be paid with these funds. All organizations will provide in-kind equipment, facilities and GIS/technical support.

**Partners NOT receiving ENRTF funding**

We will collaborate with federal and state agencies and private landowners to identify sites to survey and to manage Palmer infestations.

**B. Project Impact and Long-term Strategy:**

Palmer amaranth eradication would have enormous positive ecological and economic implications. If Palmer amaranth becomes widespread in cropping systems, additional herbicides would be used. This could be detrimental to pollinators and water quality. Crop production costs would increase by an estimated \$20-30 per acre for soybean and \$15-20 for corn production. If half of Minnesota's 7.4 million acres of soybeans and 8.7 million acres of corn were infested, production costs would increase by approximately 165 million dollars annually. This burden would be borne by farmers and consumers and does not take into account the threat of

non-target treatment impacts to surrounding agricultural natural areas. Additionally, Palmer amaranth is becoming problematic in prairie in Illinois and is outcompeting native vegetation. The stakes are high. There is not much Palmer amaranth in Minnesota. Now is the time to control it and keep it out of conservation plantings.

Despite efforts to prevent contaminated seed from entering Minnesota, we anticipate additional introduction of Palmer amaranth. Early detection and rapid response to Palmer amaranth will be an ongoing effort.

**C. Funding History:**

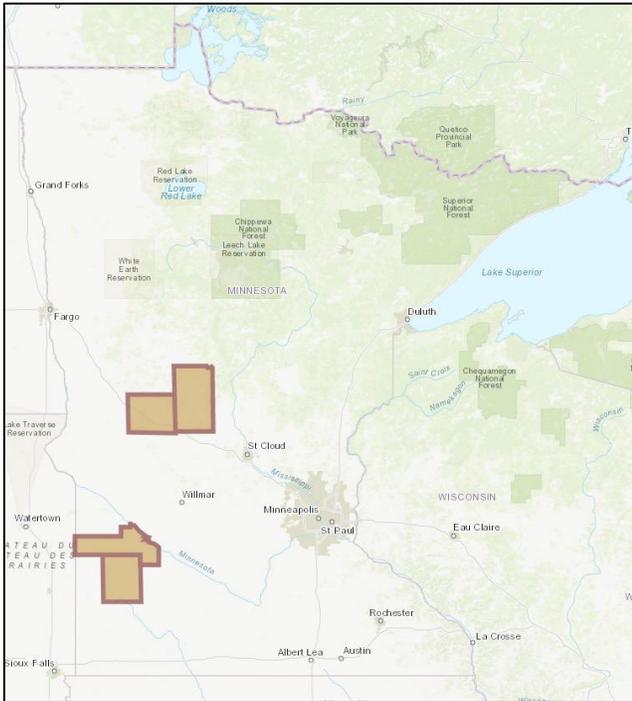
Funding Source and Use of Funds	Funding Timeframe	\$ Amount
Elimination of Target Invasive Plant Species Phase 1 project \$350,000 from ENRTF, 33,993 MDA general fund for salary, \$50,000 MDA in-kind and \$35,000 U of M in-kind. This project was early detection and rapid response to emerging invasive plants. The focus on widespread species in proposed project is different.	07/01/2013 – 06/30/2016	\$ 468,933
MDA Emergency Funds	10/27/16 - 05/31/2017	\$ 47,800
Total		\$ 516,733

**VIII. REPORTING REQUIREMENTS:**

- The project is for 12 months, will begin on 07/01/2017, and end on 06/30/2018.
- A project status update report will be submitted 01/31/18.
- A final report and associated products will be submitted after project completion.

**IX. VISUAL COMPONENT or MAP(S):**

**Palmer Amaranth Detection and Eradication**



Palmer amaranth was detected in Douglas, Lyon, Todd and Yellow Medicine Counties.



Palmer amaranth's long seedheads produce a lot of seed that enables spread.



Conservation Corps Minnesota burning Palmer amaranth in a conservation planting

**Environment and Natural Resources Trust Fund  
M.L. 2017 Project Final Budget**



**Project Title:** Palmer Amaranth Detection and Eradication

**Legal Citation:** M.L. 2015, Chp. 76, Sec. 2, Subd. 10 - Emerging Issues Account

**Project Manager:** Monika Chandler

**Organization:** Minnesota Department of Agriculture

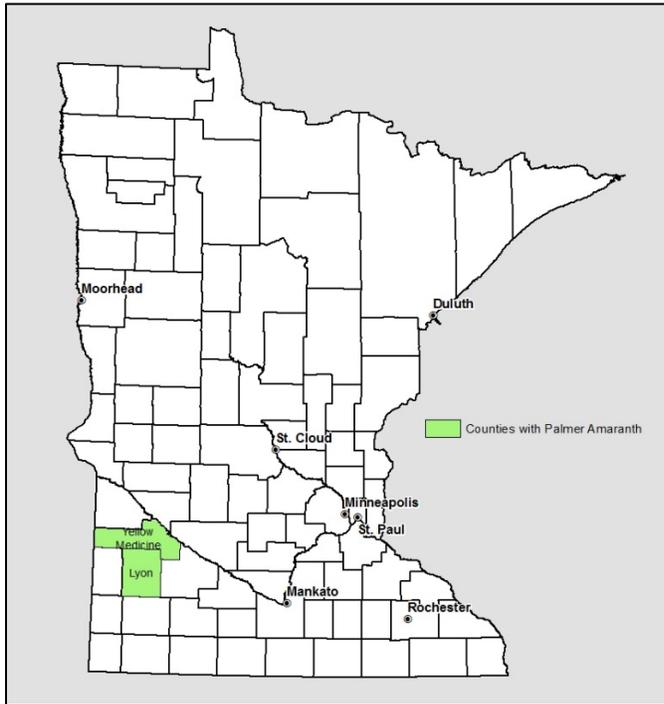
**M.L. 2017 ENRTF Appropriation:** \$ 173,000

**Project Length and Completion Date:** 12 months, June 30, 2018

**Date of Report:** January 31, 2019

<b>ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET</b>	<b>Revised Budget</b>	<b>Amount Spent</b>	<b>Activity 1 Balance</b>	<b>TOTAL BUDGET</b>	<b>TOTAL BALANCE</b>
<b>BUDGET ITEM</b>					
<b>MDA Personnel (Wages and Benefits)</b>	\$54,400	\$51,776	\$2,624	\$54,400	\$2,624
One full time Plant Health Specialist position estimated salary \$38,000 per year plus fringe benefits @ 46% for survey and coordination					
<b>MDA Travel expenses in Minnesota</b>					
Mileage \$2,000, approximately 14 days of lodging/yr (\$1,400) and 20 days of meals/yr (\$600)	\$5,700	\$5,697	\$3	\$5,700	\$3
<b>Professional/Technical/Service Contracts</b>					
Contract with Conservation Corps Minnesota for Palmer amaranth survey and management in conservation areas. Management methods include spot herbicide application, flame weeding and prescribed burning. Training and equipment for crews is included.	\$38,000	\$13,373	\$24,627	\$38,000	\$24,627
Contract with University of Minnesota to develop and utilize aerial survey methods. Costs include a 50% time engineer \$63,100 (salary \$47,325 and fringe @ 25% \$15,775), travel \$7,900 (mileage \$5,400 and meals and lodging \$2,500), and other (repairs \$1,000 and specialized pix4d software license \$2,900)	\$74,900	\$74,900	\$0	\$74,900	\$0
<b>COLUMN TOTAL</b>	<b>\$173,000</b>	<b>\$145,746</b>	<b>\$27,254</b>	<b>\$173,000</b>	<b>\$27,254</b>

## Palmer Amaranth Detection and Eradication



Palmer amaranth was detected in Yellow Medicine and Lyon Counties.



Palmer amaranth's long seedheads produce a lot of seed that enables spread.



Conservation Corps Minnesota burning Palmer amaranth in a conservation planting

